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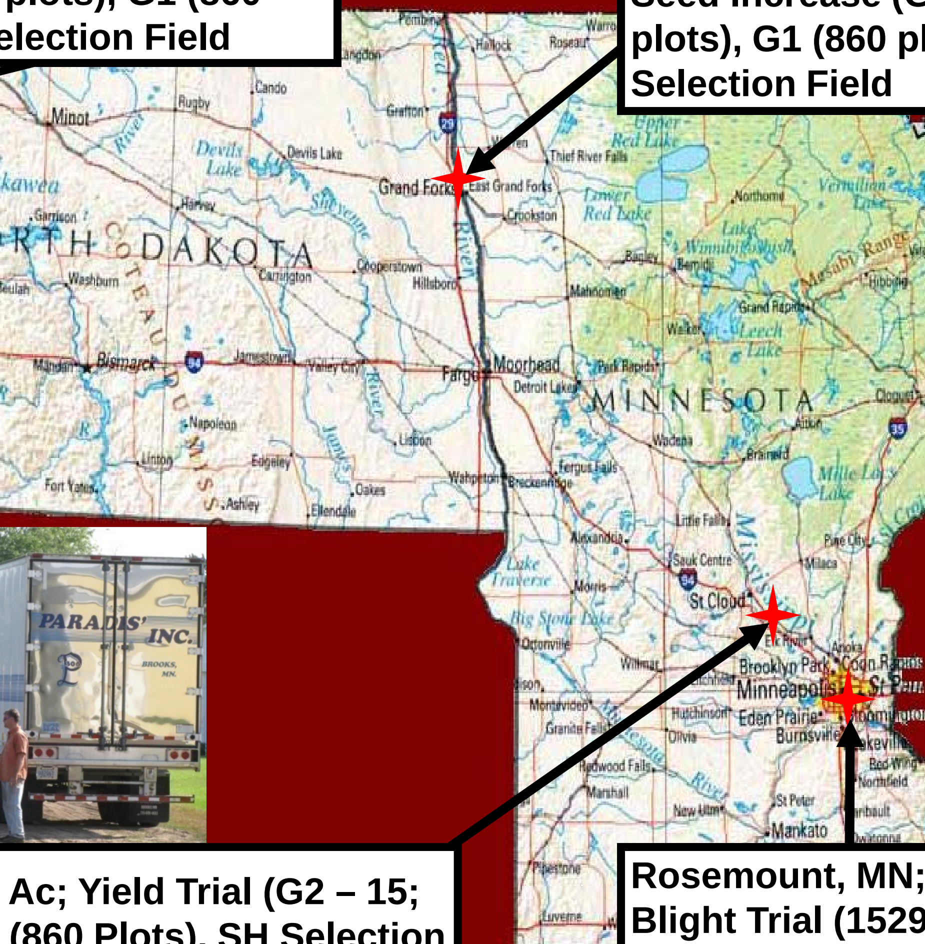
University of Minnesota Potato Breeding & Genetics 2008




Williston, ND; 3.5 Ac; Yield Trial (G2 – 15; 560 plots), G1 (860 Plots) & SH Selection Field

Grand Forks, ND; 3.5 Ac; Seed Increase (G2 – 15, 360 plots), G1 (860 plots) & SH Selection Field



Becker, MN; 4 Ac; Yield Trial (G2 – 15; 650 plots), G1 (860 Plots), SH Selection Field & Common Scab Plot (860 Plots)

Rosemount, MN; 2.5 Ac, Late Blight Trial (1529 Plots) & PVY/PLRV Trial (1835 Plots)





Minnesota Potato Breeding and Genetics 2008

University of Minnesota
College of Food, Agriculture, & Natural Resource Sciences

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Breeding Objectives

Objective 1: Evaluate early & advanced breeding lines for fresh market, chip, & processing potential across potato growing environments and regions.
Objective 2: Identify cold chipping early in potato breeding generations.
Objective 3: Train graduate students in the field of plant genetics & breeding; specifically potato genetics.

Yield, Grade and Quality Evaluations – Breeding selections advancing in our program are compared to commercial cultivars in field trials at irrigated locations in Minnesota and North Dakota. Typical yield, grade, and quality information is collected throughout the growing season, at harvest & during post-harvest evaluations. This data includes emergence, plant maturity, stand, total and US #1 marketable and size distribution yield, percentage of U.S. No. 1 yield and graded defect weights (malformed tubers, severe growth cracking, etc.), specific gravity, incidence and type of internal and external defects, and processing color. Then, evaluate for storability and processing as determined after 3, 5-months storage at 40 and 45F.

Report Contents

The scope of this report is on the fresh market, chipping, & processing clones currently under evaluation in the Minnesota potato breeding program. The clones range from our most advanced (G10+) material to our earliest (G2) material that has advanced through previous selection processes.

This Potato Breeding and Genetics report has five (5) major sections:

1) Minnesota Table A. 2008. Location, planting, vine kill (Days after planting, DAP), and harvest (DAP) dates of MN research trials at irrigated and non-irrigated locations.
2) Minnesota Table B. 2008. Number of MN clonal selections and cultivars at replicated yield trial and disease resistance trial locations.
3) Minnesota Table 1.2008. Specific gravity, chip scores, & yields of B's, A's, & Culls from irrigated locations in Becker (B), MN & Williston (W), ND.
4) Minnesota Table 2.2008. Total yields, US #1's, & size distributions of US #1's from irrigated locations in Becker (B), MN & Williston (W), ND.
5) Minnesota Table 3.2008. Internal defects, Common Scab, & Late Blight readings.

Minnesota Table A. 2008. Location, planting, vine kill (Days after planting, DAP), and harvest (DAP) dates of MN research trials at irrigated and non-irrigated locations.

Location	Irrigation	Planted	Kill DAP	Harvest DAP
Becker, MN				
Late	Irrigated	23 April	127	140
Single Hills & G1's	Irrigated	17 May	116	130
Williston, ND	Irrigated	8 May	123	140
Single Hills, G1's	Irrigated	15 May	116	140
Grand Forks, ND – Seed increase	Non irrigated	23 June	120	120
Grand Forks, ND – Single hills, G1's	Non irrigated	23 June	120	120
Expr - PLRV / PVY – Rosemount, MN	Non irrigated	5 June	100	120
Late Blight – Rosemount, MN	Irrigated	5 June	90	110
C. Scab – Becker, MN	Irrigated	6 May	127	140
Vert. – Grand Forks	Non irrigated	Not planted in 2008		

Clonal Evaluations and Procedures

Minnesota Table B. 2008. Number of MN clonal selections and cultivars at replicated yield trial and disease resistance trial locations.

	Number of MN Clonal selections and cultivars					
	Stages of development [1]					
Clonal Market type	G6 – G15	G2 – G5	G1		Checks	Total
Chipping ;dual purpose whites	11	79	259	3	Atlantic, NorValley, Snowden	352
Processing; LW/Rus	5	154	355	2	R. Burbank, Shepody	516
Fresh; Red	3	99	246	4	R. Norkotah, Red Norland, Red Pontiac, Yukon Gold	352
NCR	FF	Chip	Fresh			
North Dakota	1	2	3			6

Wisconsin	2	2		4
Michigan		3	1	4
Canada; Did Not Participate				
Other Germplasm Enhancement	2	673	23	
Disease Screening Trials	Clones Screened			
Late Blight - Natl	43			43
Late Blight - Breeding	486			486
Late Blight - Family selection	518			518
PVY expression	388			388
C. Scab - Natl	20			20
C. Scab - Breeding	409			409
Vert	409			409
New hybrid generation (Single-hills)			90,000	

Project Description

The University of Minnesota potato breeding research is emphasizing the development, evaluation, and distribution of potato cultivars and germplasm with improved yield, quality, and disease resistance by developing new hybrid progenies and evaluating them in multiple dryland and irrigated locations. Post harvest storage and quality characterizations are performed from 40, 42, 45, and 48F throughout the 7 month storage season; focusing on sugar end and cold induced sweetening. The most advanced selections will be evaluated for Nitrogen use efficiency, N timing and spacing. Novel breeding methods and germplasm enhancement strategies are pursued to increase the efficiency of determining disease and pest resistance characterization early in the breeding effort. A focus is on foliar and tuber late blight, common scab, PVY and PLRV symptom expression, CPB, aphids, *Verticillium* wilt, and sugar end and cold induced sweetening.

Grand Forks, ND – Seed increase field. 360 - 1x40 hill plots. Evaluate 860 - 1x4 hill G1 plots for further selection. Evaluate ~30,000 single hills and select new hybrids from breeding crosses for marketing potential. Evaluate enhanced potato germplasm for improved yield, yield stability, and marketing quality. Characterize germplasm for resistance sugar end, cold induced sweetening and to *Verticillium* wilt.

Becker, MN – Evaluate 325 - 1x20 hill replicated yield plots for improved yield, processing, yield stability & marketing qualities. Evaluate 860 - 1x4 hill G1 plots for further selection. Evaluate ~30,000 single hills and select new hybrids from breeding crosses for marketing potential. Evaluate the North Central Regional Potato Variety Trial (NCRPVT) along with other US breeding program materials for the aforementioned qualities. Characterize germplasm for resistance to sugar end, cold induced sweetening and to common scab. Determine the Nitrogen use efficiency, N-timing, and spacing requirements of potato breeding lines advancing from the potato breeding program.

Rosemount, MN – Evaluate 468 - 1x4 hill replicated plots for late blight resistance along with 592 - 8 hill families for late blight resistance. Determine the occurrence of symptom-less expression to potato viruses $PVY^{O/N}$ in breeding populations, and breed for host plant resistance to potato viruses. Exploit novel breeding methods for determining genetic gain for late blight resistance earlier in breeding, and develop foliar and tuber late blight resistance germplasm. Determine genomic differences, identifying genes involved in the reproductive biology of potato, and analyze post-zygotic crossing barriers that inhibit gene introgression between wild *Solanum* species and cultivated potato for late blight resistance.

Williston, ND – Evaluate 280 - 1x20 hill replicated yield plots for improved yield, processing, yield stability & marketing qualities. Evaluate 860 - 1x4 hill G1 plots for further selection. Evaluate ~30,000 single hills and select new hybrids from breeding crosses for marketing potential. Characterize germplasm for resistance to sugar end, and cold induced sweetening.

Breeding for host plant resistance to potato pests and diseases

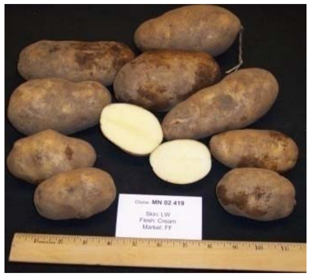
A breeder should not focus heavily first on disease and pest resistance, then marketability traits, or the reverse. A balanced approach is necessary since varieties having superior disease and pest resistance lacking marketability traits will be limited in commercial use, and varieties lacking disease and pest resistance will likely not sustain the viability of our industry. Most notable are susceptibilities to multiple diseases, pests, and viruses such as *Verticillium* wilt, late and early blight, storage rots *Fusarium* and *Erwinia*, common scab, Colorado potato beetle, green peach aphids, potato leafhoppers, and all common viruses. In the UM potato breeding program evaluations are made for resistance to multiple diseases and pests. We also evaluate germplasm from the north central region and other US breeding programs along with one (1) Canadian province. In UM breeding populations we apply EGS procedures to our screened population.

<u>Promising UMN Clones</u>:

1) <u>MN 15620</u>: Parentage: ♀MN 1006.81-4 x ♂MN 5.80-12; MN 15620 is an oblong light red tuber with an attractive yellow flesh. MN 15620 processes well out of 45F giving nice yellow French fries. It is also a good FM potato for boiling/mashing, holding its yellow color very well without fading or leaching.

This year, 2008, MN 15620 yielded 590 cwt in Becker, MN with 436 cwt (75%) being over 4 oz in weight & 404 cwt in Williston, ND with 342 cwt (80%) being over 4 oz. It's gravity of 1.078 is less than both that of Russet Burbank & Shepody, but processes better than both.

2) MN 02 419: Parentage: Uknown; MN 02 419 is a long white processor yielding less than Russet Burbank (690 , 492) at 418 cwt in Becker, MN & 319 cwt in Williston, ND. It has 80 & 84 % US #1's in Becker & Williston, respectively. 54 & 52% of MN 02 419 fall in the 4-10 oz size class in Becker & Williston, respectively. It processes from 45F better than Russet Burbank & Shepody. It's gravity of 1.085 is slightly better than either that of Russet Burbank or Shepody.




3) AOMN 03178-2: Parentage; ♀A92441-3 x ♂A93156-3; AOMN 03178-2 is a very attractive dual purpose russet that is suited for processing & fresh market use. It is a very uniformly shaped, blocky russet that performed well in both Becker, MN & Williston, ND. It is perhaps the most attractive russet in the University of Minnesota's program at this time. It's gravity of 1.081 is comparable to that of Russet Burbank & Shepody & much higher than that of Russet Norkotah. It yields less than Russet Burbank & Russet Norkotah. ~ 91% of AOMN 03178-2's tubers are US#1's in both Becker, MN & Williston, ND compared to the 80% for Russet Burbank & Russet Norkotah.

4) ATMN 03505-3: Parentage: ♀ A96741-2R x ♂ ND5256-7R; ATMN 03505-3 is a round to slightly oval red potato with excellent color and skin. It has smooth skin with cream colored flesh. Gravity of 1.069 is higher than either Red Norland or Red Pontiac. Even though it yields slightly less than Red Norland, its size distributions are very similar. In 2008 in Becker, MN it was very comparable to Red Norland.

5) <u>COMN 03021-1</u>: Parentage: ♀CO93037-6R x ♂Durango Red; COMN 03021-1 is a round oval bright red potato with excellent skin. It resists skinning, has shallow eyes & cream colored flesh. The tubers of COMN 03021-1 are small to medium, of uniform size & shape. It's gravity of 1.074 is much greather than Red Norland or Red Pontiac. ~ 55% of the tubers fall in the 4 – 10 oz range.

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
Atlantic	B	Chk	C	W	Cream	1.092	5.5	9	23.4	60.2	228.4	248.1	60.2	476.5	560.0
Atlantic	W	Chk						4	4.0	31.4	121.0	142.1	31.4	263.1	298.5
NorValley	B	Chk	C	W	Cream	1.080	4.3	11	0.0	100.7	310.7	155.6	100.7	466.4	567.0
NorValley	W	Chk						8	9.0	58.4	246.2	131.7	58.4	377.9	445.2
Snowden	B	Chk	C	W	Cream	1.092	3.8	9	17.0	44.0	288.9	283.5	44.0	572.4	633.4
Snowden	W	Chk						7	0	36.3	223.3	228.7	36.3	452.0	488.3
MN 99380-1	B	G9	C/FM	W	Yel-dk	1.073	4.0	10	0.0	83.7	297.7	137.1	83.7	434.8	518.5
MN 99380-1	W	G9						6	0	75.1	161.0	18.5	75.1	179.5	254.6
MN 00467-4	B	G8	C	W	W	1.080	5.0	8	24.7	47.4	238.4	218.0	47.4	456.4	528.5
MN 00467-4	W	G8						6	16.0	38.3	205.4	99.1	38.3	304.5	358.8
DEM 7	B	G6	C	W	W	1.082	5.5	11	0.0	115.4	293.2	56.5	115.4	349.7	465.1
DEM 7	W	G6						10	1.4	106.2	228.3	72.4	106.2	300.8	408.3
MN 02 529	B	G6	C	W	W	1.079	6.3	9	0.0	70.3	292.1	116.9	70.3	409.0	479.3
MN 02 529	W	G6						5	0	38.9	105.8	145.2	38.9	250.9	289.8
MN 02 586	B	G6	C/FM	W	Yel-lt	1.078	5.0	14	13.2	157.7	358.2	42.8	157.7	401.0	571.9
MN 02 586	W	G6						11	0	117.3	260.5	42.9	117.3	303.4	420.7
MN 02 587	B	G6	C	W	W	1.085	5.5	16	29.9	216.3	271.9	29.5	216.3	301.4	547.6
MN 02 588	B	G6	C/FM	W	Yel-lt	1.086	4.0	13	15.8	139.8	349.1	53.4	139.8	402.5	558.1
MN 02 588	W	G6						8	7.4	67.3	219.5	89.8	67.3	309.4	384.1
MN 02 589	B	G6	C	W	W	1.082	3.5	10	8.3	124.1	251.4	42.3	124.1	293.8	426.1
MN 02 589	W	G6						8	3.4	94.3	211.5	10.1	94.3	221.5	319.2
MN 02 598	B	G6	C/FM	W	Yel-lt	1.084	4.8	14	14.6	129.5	413.8	86.2	129.5	500.0	644.1
MN 02 598	W	G6						9	0	84.1	245.7	43.3	84.1	289.0	373.0
MN 02 678	B	G6	C	W	W	1.076	4.5	9	0.0	125.5	176.8	68.1	125.5	244.9	370.4
MN 02 678	W	G6						6	2.5	53.8	169.2	145.8	53.8	315.0	371.3
MN 02 703	B	G6	C	W	W	1.078	3.0	7	0.0	98.8	84.5	16.0	98.8	100.6	199.4
MN 02 703	W	G6						3	0	42.6	42.5	0.0	42.6	42.5	85.1
COMN 03049-5	B	G5	C/FM	W	Yel-lt	1.059	7.5	11	44.6	112.9	333.2	96.8	112.9	429.9	587.4
COMN 03049-5	W	G5						6	14.4	46.1	152.3	188.8	46.1	341.1	401.5
COMN 03051-1	B	G5	C	W	Cream	1.077	6.3	11	4.1	124.4	252.0	57.8	124.4	309.8	438.3

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 03051-1	W	G5						5	0	62.2	128.8	14.7	62.2	143.5	205.7
NDMN 03324-4	B	G5	C	W	Cream	1.086	3.0	13	5.2	115.7	365.8	127.9	115.7	493.7	614.6
NDMN 03324-4	W	G5						8	4.7	69.2	232.5	135.3	69.2	367.8	441.7
NDMN 03333-1	B	G5	C	W	W	1.079	3.8	7	4.3	51.5	232.4	84.4	51.5	316.7	372.5
NDMN 03333-1	W	G5						5	0	40.9	127.0	64.6	40.9	191.5	232.4
NDMN 03333-2	B	G5	C	W	W	1.067	5.0	6	13.6	50.9	205.6	92.1	50.9	297.8	362.3
NDMN 03333-2	W	G5						4	0	23.5	130.4	127.8	23.5	258.2	281.8
NDMN 03339-4	B	G5	C	W	Cream	1.091	4.0	8	2.7	57.6	273.9	107.5	57.6	381.4	441.7
NDMN 03339-4	W	G5						6	0	48.1	146.5	146.4	48.1	292.9	340.9
NDMN 03410-2	B	G5	C	W	Cream	1.075	5.0	11	0.0	174.1	131.3	9.8	174.1	141.1	315.2
NDMN 03410-2	W	G5						7	0	84.0	131.6	9.7	84.0	141.3	225.4
COMN 04651-03	B	G4	C	W	Cream	1.083	6.5	14	17.2	191.1	192.9	80.6	191.1	273.5	481.8
COMN 04651-03	W	G4						9	0	106.5	205.9	62.2	106.5	268.1	374.6
COMN 04659-06	B	G4	C	W	Cream	1.077	6.5	8	0.0	30.6	205.8	369.1	30.6	575.0	605.6
COMN 04659-06	W	G4						5	0	19.9	154.5	175.4	19.9	329.9	349.8
COMN 04674-02	B	G4	C	W	Cream	1.081	7.0	7	42.8	33.9	231.2	255.1	33.9	486.3	562.9
COMN 04674-02	W	G4						5	0	26.5	163.4	194.1	26.5	357.4	383.9
COMN 04696-01	B	G4	C	W	W	1.076	4.0	10	19.7	128.8	215.2	53.6	128.8	268.8	417.3
COMN 04696-01	W	G4						7	0.8	52.9	200.3	107.4	52.9	307.7	361.5
COMN 04788-02	B	G4	C	W	W	1.073	3.0	7	3.8	91.0	146.9	16.9	91.0	163.8	258.6
COMN 04788-02	W	G4						6	0	71.1	145.4	19.5	71.1	164.9	236.0
COMN 04788-03	B	G4	C	W	Cream	1.072	7.0	12	0.0	156.6	261.9	35.4	156.6	297.3	453.9
COMN 04788-03	W	G4						10	0	117.0	250.8	32.0	117.0	282.7	399.7
COMN 04788-04	B	G4	C	W	Cream	1.076	4.8	11	1.5	164.8	156.5	14.4	164.8	170.9	337.3
COMN 04788-04	W	G4						9	0	103.7	191.4	8.0	103.7	199.4	303.0
COMN 04788-05	B	G4	C	W	Cream	1.080	3.0	11	2.3	158.1	191.1	0.0	158.1	191.1	351.6
COMN 04788-05	W	G4						6	0	81.9	100.4	15.4	81.9	115.8	197.7
COMN 04788-09	B	G4	C	W	W	1.084	4.0	10	21.0	139.3	158.1	25.8	139.3	183.8	344.1
COMN 04788-09	W	G4						8	0	124.2	122.9	26.3	124.2	149.2	273.4
COMN 04788-10	B	G4	C	W	W	1.077	3.3	9	0.0	107.7	203.6	30.0	107.7	233.6	341.3
COMN 04788-10	W	G4						8	0	98.6	167.4	28.8	98.6	196.2	294.8

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
NDMN 04905-02	B	G4	C	W	Cream	1.072	5.5	9	4.8	98.1	247.2	44.4	98.1	291.7	394.7
NDMN 04905-02	W	G4						6	3.9	52.4	200.2	72.8	52.4	273.0	329.3
NDMN 04905-04	B	G4	C	W	W	1.088	5.0	8	0.5	67.6	238.7	74.2	67.6	312.9	381.0
NDMN 04905-04	W	G4						7	5.6	85.8	177.1	45.8	85.8	222.9	314.3
NDMN 04905-06	B	G4	C	W	Cream	1.073	6.0	5	2.0	23.8	131.1	128.8	23.8	260.0	285.7
NDMN 04905-06	W	G4						3	6.5	20.0	93.3	39.0	20.0	132.3	158.8
NDMN 04905-13	B	G4	C	W	W	1.084	3.5	15	0.0	219.9	245.6	11.0	219.9	256.6	476.5
NDMN 04905-13	W	G4						10	0	170.6	92.8	15.5	170.6	108.3	278.9
NDMN 04905-14	B	G4	C	W	W	1.079	5.3	8	0.0	78.9	235.0	37.8	78.9	272.8	351.8
NDMN 04905-14	W	G4						6	0	73.1	163.1	42.9	73.1	206.0	279.1
NDMN 04910-01	B	G4	C	W	Cream	1.089	4.0	15	13.4	150.5	454.2	123.3	150.5	577.5	741.5
NDMN 04910-01	W	G4						11	2.6	127.4	281.4	36.8	127.4	318.2	448.2
NDMN 04960-01	B	G4	C	W	W	1.095	3.5	12	13.3	147.1	295.3	56.6	147.1	351.9	512.3
NDMN 04960-01	W	G4						8	0	82.0	211.9	83.9	82.0	295.8	377.8
NDMN 04961-01	B	G4	C	W	W	1.076	4.5	6	38.5	45.8	148.3	93.2	45.8	241.5	325.8
NDMN 04961-01	W	G4						6	43.5	48.8	157.6	121.2	48.8	278.9	371.1
NDMN 04964-01	B	G4	C	W	Cream	1.075	5.8	10	8.0	136.9	198.1	58.0	136.9	256.1	401.0
NDMN 04964-01	W	G4						6	0	54.4	194.2	53.0	54.4	247.3	301.7
USDAWIMN 04060-1	B	G4	C	W	Cream	1.102	6.0	11	5.5	125.8	291.4	55.5	125.8	346.8	478.2
USDAWIMN 04060-1	W	G4						7	4.6	83.2	191.6	21.8	83.2	213.4	301.2
WIMN 04836-01	B	G4	C	W	W	1.072	5.8	10	0.0	87.3	290.6	123.6	87.3	414.2	501.4
WIMN 04836-01	W	G4						5	0	54.8	116.8	47.8	54.8	164.5	219.4
WIMN 04836-02	B	G4	C	W	W	1.072	4.3	6	20.2	55.5	135.7	111.4	55.5	247.1	322.8
WIMN 04836-02	W	G4						6	2.4	40.5	173.5	102.7	40.5	276.1	319.0
WIMN 04837-01	B	G4	C	W	Cream	1.080	3.0	7	17.0	69.0	158.3	115.4	69.0	273.7	359.7
WIMN 04837-01	W	G4						6	0	63.2	168.5	68.1	63.2	236.6	299.8
WIMN 04844-01	B	G4	C	W	Cream	1.085	4.0	11	0.0	86.7	316.7	128.0	86.7	444.7	531.4
WIMN 04844-01	W	G4						10	0	109.0	231.5	59.9	109.0	291.4	400.4
WIMN 04844-03	B	G4	C/FM	W	Yel	1.071	5.8	10	0.0	101.4	235.0	89.8	101.4	324.9	426.3
WIMN 04844-03	W	G4						7	0	69.6	189.5	82.3	69.6	271.8	341.3
WIMN 04844-06	B	G4	C	W	Cream	1.080	5.0	10	7.6	107.4	233.6	169.3	107.4	402.9	517.9
WIMN 04844-06	W	G4						7	0	40.8	205.0	197.2	40.8	402.3	443.1

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
WIMN 04844-07	B	G4	C/FM	W	Yel	1.078	4.0	8	0.0	84.1	201.2	37.9	84.1	239.1	323.2
WIMN 04844-07	W	G4						5	0	57.9	134.2	48.1	57.9	182.4	240.3
WIMN 04844-12	B	G4	C/FM	W	Yel-dk.	1.076	6.0	6	59.5	67.0	150.7	49.1	67.0	199.8	326.3
WIMN 04844-12	W	G4						7	1.8	82.3	147.8	48.2	82.3	196.0	280.1
WIMN 04854-07	B	G4	C	W	Cream	1.098	3.5	9	9.6	95.7	268.3	25.7	95.7	293.9	399.3
WIMN 04854-07	W	G4						8	0	104.1	146.4	18.9	104.1	165.2	269.3
WIMN 04855-02	B	G4	C	W	Cream	1.082	5.0	7	1.0	38.9	216.6	277.9	38.9	494.5	534.3
WIMN 04855-02	W	G4						5	4.5	29.0	162.7	255.5	29.0	418.2	451.7
WIMN 04866-02	B	G4	C	W	Cream	1.085	3.8	11	0.0	109.3	299.9	188.6	109.3	488.5	597.9
WIMN 04866-02	W	G4						6	3.9	48.4	181.2	94.5	48.4	275.7	328.1
MN 05001-151	B	G3	C	W	W	1.098	6.0	13	6.1	151.1	301.1	34.6	151.1	335.7	492.9
MN 05001-151	W	G3						8	0	90.1	218.2	25.9	90.1	244.1	334.2
MN 05001-156	B	G3	C	W	Cream	1.079	6.0	11	16.4	114.2	305.9	51.1	114.2	356.9	487.6
MN 05001-156	W	G3						8	14.0	63.9	236.9	66.9	63.9	303.8	381.8
MN 05001-166	B	G3	C	W	Yel	1.072	5.0	7	27.6	27.0	257.2	269.9	27.0	527.1	581.7
MN 05001-166	W	G3						5	0	26.9	179.2	186.0	26.9	365.3	392.2
MN 05001-171	B	G3	C	W	Cream	1.074	5.5	10	0.0	75.8	350.6	102.0	75.8	452.7	528.5
MN 05001-171	W	G3						7	0	64.7	211.9	56.3	64.7	268.2	332.9
MN 05001-186	B	G3	C	W	Cream	1.037	6.0	12	0.0	173.9	208.2	10.9	173.9	219.2	393.0
MN 05001-186	W	G3						9	0	136.4	119.3	4.6	136.4	123.9	260.3
MN 05001-189	B	G3	C	W	W	1.082	5.5	8	0.0	69.9	249.2	82.1	69.9	331.3	401.2
MN 05001-189	W	G3						6	0	67.9	155.7	25.7	67.9	181.4	249.4
MN 05001-192	B	G3	C	W	Cream	1.081	4.8	7	8.9	49.3	247.7	145.1	49.3	392.8	451.0
MN 05001-192	W	G3						4	5.7	27.3	114.7	132.7	27.3	247.4	280.4
R. Burbank	B	Chk	FF	Rus	Cream	1.084	7.0	13	17.2	112.3	359.5	200.5	112.3	559.9	689.4
R. Burbank	W	Chk						8	33.7	61.9	275.4	121.2	61.9	396.5	492.2
Shepody	B	Chk	FF	LW	W	1.083	6.6	8	67.5	40.6	248.2	330.1	40.6	578.3	686.4
Shepody	W	Chk						5	15.4	20.8	105.6	384.3	20.8	489.9	526.0
MN 15620	B	G15	FF	Red	Yel	1.078	5.0	13	11.2	142.7	352.0	84.0	142.7	436.0	590.0
MN 15620	W	G15						6	19.5	42.2	166.6	175.3	42.2	341.9	403.6

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
MN 19350	B	G15	FF	W	W	1.080	6.3	9	0.0	102.7	264.0	44.1	102.7	308.1	410.8
MN 19350	W	G15						7	0	64.7	184.4	61.6	64.7	246.0	310.6
MN 19470	B	G15	FF	LW	W	1.077	6.8	6	2.1	37.7	208.9	113.6	37.7	322.5	362.3
MN 19470	W	G15						5	0	39.2	118.0	108.9	39.2	226.9	266.1
MN 18710	B	G15	FF/FM	Rus	W	1.077	7.3	8	1.3	73.1	223.5	105.1	73.1	328.6	402.9
MN 18710	W	G15						5	1.7	38.4	166.7	90.9	38.4	257.6	297.8
MN 02 419	B	G6	FF	LW	Cream	1.085	6.3	8	11.1	82.5	223.6	101.1	82.5	324.7	418.3
MN 02 419	W	G6						6	5.3	51.8	165.7	96.3	51.8	262.0	319.1
AOMN 03178-2	B	G5	FF	Rus lt.	W	1.081	5.8	7	0.0	43.7	257.8	149.2	43.7	407.1	450.7
AOMN 03178-2	W	G5						6	2.0	31.1	188.8	196.6	31.1	385.4	418.4
AOMN 041027-01	B	G4	FF	Rus-lt	Cream	1.086	7.0	7	0.0	72.6	179.8	26.5	72.6	206.3	279.0
AOMN 041027-01	W	G4						4	0	27.2	141.6	77.6	27.2	219.1	246.3
AOMN 041050-02	B	G4	FF	Rus-lt	Cream	1.079	4.0	7	18.6	40.1	225.5	146.8	40.1	372.3	431.0
AOMN 041050-02	W	G4						5	3.6	26.5	194.2	105.5	26.5	299.7	329.8
AOMN 041070-01	B	G4	FF	Rus	Cream	1.078	7.0	7	2.6	72.1	155.0	73.3	72.1	228.3	303.0
AOMN 041070-01	W	G4						6	14.1	39.7	180.9	94.4	39.7	275.3	329.1
AOMN 041093-01	B	G4	FF	Rus-lt	W	1.068	7.8	7	19.6	38.5	169.7	260.4	38.5	430.1	488.2
AOMN 041093-01	W	G4						5	8.3	35.8	157.7	84.0	35.8	241.7	285.8
AOMN 041101-01	B	G4	FF	LW	W	1.076	7.3	8	8.9	30.2	251.9	300.2	30.2	552.0	591.1
AOMN 041101-01	W	G4						6	3.7	29.0	170.1	278.0	29.0	448.1	480.7
AOMN 041115-02	B	G4	FF	LW	Cream	1.070	6.3	7	0.0	57.7	204.6	122.0	57.7	326.6	384.3
AOMN 041115-02	W	G4						5	8.2	21.8	132.9	241.3	21.8	374.2	404.3
AOMN 041127-01	B	G4	FF	Rus-lt	Cream	1.087	6.0	9	9.7	89.7	228.8	158.7	89.7	387.6	486.9
AOMN 041127-01	W	G4						8	0	70.2	214.3	129.9	70.2	344.2	414.4
AOMN 041138-01	B	G4	FF	Rus	W	1.072	7.0	13	1.9	183.6	253.2	26.5	183.6	279.8	465.3
AOMN 041138-01	W	G4						8	3.6	76.2	212.2	63.6	76.2	275.8	355.6
COMN 04654-03	B	G4	FF	LW	Cream	1.081	7.0	14	14.6	163.1	330.8	101.1	163.1	432.0	609.7
COMN 04654-03	W	G4						8	8.7	92.5	224.5	44.2	92.5	268.7	370.0
COMN 04659-02	B	G4	FF	LW	Cream	1.083	5.5	8	0.0	48.5	278.8	98.2	48.5	376.9	425.4
COMN 04659-02	W	G4						6	0	59.4	206.8	32.2	59.4	239.0	298.4

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 04659-05	B	G4	FF	LW	Cream	1.084	7.0	12	62.4	131.3	294.0	105.0	131.3	399.0	592.7
COMN 04659-05	W	G4						8	0	66.3	212.3	116.4	66.3	328.8	395.0
COMN 04684-01	B	G4	FF	Rus	Cream	1.080	6.8	9	12.3	89.9	220.4	71.1	89.9	291.4	393.6
COMN 04684-01	W	G4						6	2.0	51.9	191.9	55.1	51.9	247.0	301.0
COMN 04686-02	B	G4	FF	LW	W	1.078	5.8	8	1.8	69.9	256.5	60.9	69.9	317.5	389.3
COMN 04686-02	W	G4						5	0	25.0	174.5	150.4	25.0	324.9	349.9
COMN 04692-05	B	G4	FF	Rus-lt	Cream	1.082	4.8	9	0.0	98.5	232.5	80.7	98.5	313.1	411.6
COMN 04692-05	W	G4						7	6.1	80.2	148.1	71.9	80.2	220.0	306.3
COMN 04692-10	B	G4	FF	Rus	Cream	1.069	4.5	9	3.1	99.2	227.7	40.5	99.2	268.2	370.4
COMN 04692-10	W	G4						7	2.8	50.3	205.4	96.3	50.3	301.6	354.7
COMN 04692-11	B	G4	FF	Rus	Cream	1.081	6.3	5	2.0	24.8	175.6	164.1	24.8	339.7	366.6
COMN 04692-11	W	G4						4	4.3	26.2	126.9	97.7	26.2	224.6	255.1
COMN 04702-01	B	G4	FF	Rus	W	1.072	7.3	7	0.0	53.3	197.8	173.1	53.3	370.9	424.2
COMN 04702-01	W	G4						4	0	22.4	157.4	64.6	22.4	221.9	244.3
COMN 04702-03	B	G4	FF	Rus	Cream	1.073	6.5	7	0.0	44.0	218.8	210.4	44.0	429.2	473.2
COMN 04702-03	W	G4						4	0	14.2	124.6	210.6	14.2	335.2	349.3
COMN 04702-05	B	G4	FF	Rus	W	1.069	6.0	4	4.1	24.7	157.2	92.2	24.7	249.4	278.2
COMN 04702-05	W	G4						3	0	8.0	82.9	132.6	8.0	215.5	223.5
COMN 04702-08	B	G4	FF	Rus	Cream	1.064	7.5	9	6.9	76.4	255.2	201.3	76.4	456.5	539.8
COMN 04702-08	W	G4						7	7.3	51.8	240.8	103.8	51.8	344.6	403.8
COMN 04702-09	B	G4	FF	Rus	Cream	1.077	6.8	9	8.4	88.1	239.6	46.4	88.1	285.9	382.4
COMN 04702-09	W	G4						6	0	79.9	141.7	4.6	79.9	146.3	226.2
COMN 04702-11	B	G4	FF	Rus	W	1.067	7.0	6	5.5	44.4	205.5	64.4	44.4	269.8	319.8
COMN 04702-11	W	G4						5	0	31.7	167.4	39.8	31.7	207.2	238.9
COMN 04702-14	B	G4	FF	Rus	Cream	1.072	6.8	8	0.0	42.9	209.1	316.4	42.9	525.5	568.4
COMN 04702-14	W	G4						5	0	32.0	185.2	68.3	32.0	253.4	285.4
COMN 04702-16	B	G4	FF	Rus	Cream	1.068	6.3	10	3.8	101.4	286.7	63.3	101.4	350.1	455.3
COMN 04702-16	W	G4						6	0	55.6	213.2	30.2	55.6	243.4	299.0
COMN 04704-01	B	G4	FF	Rus	W	1.069	6.5	11	0.0	121.1	284.8	112.3	121.1	397.1	518.2
COMN 04704-01	W	G4						4	4.8	43.6	115.3	48.6	43.6	163.9	212.3
COMN 04712-01	B	G4	FF	Rus-lt	W	1.070	8.3	9	52.2	61.1	256.6	286.6	61.1	543.2	656.4
COMN 04712-01	W	G4						7	35.7	47.9	211.9	147.3	47.9	359.2	442.7

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

									Culls	Size Distribution (cwtyld)			B's	A's	T. Yld
Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Cwtyld	<4oz.	≥4<10 oz.	≥10 oz.	< 4 oz.	≥4 oz.	Cwtyld
COMN 04713-03	B	G4	FF	Rus	Cream	1.077	6.5	11	4.2	96.2	323.5	156.6	96.2	480.1	580.4
COMN 04713-03	W	G4						6	7.2	61.5	166.7	103.6	61.5	270.3	338.9
COMN 04723-01	B	G4	FF	Rus	W	1.082	7.0	7	49.1	53.9	196.3	135.2	53.9	331.4	434.4
COMN 04723-01	W	G4						4	37.9	16.4	125.9	176.2	16.4	302.1	356.3
COMN 04733-01	B	G4	FF	Rus	Cream	1.075	7.5	8	5.1	61.3	270.2	121.1	61.3	391.2	457.7
COMN 04733-01	W	G4						6	0	34.3	198.4	76.4	34.3	274.8	309.1
COMN 04733-02	B	G4	FF	Rus	Cream	1.071	7.0	4	0.0	18.2	128.5	241.8	18.2	370.3	388.5
COMN 04733-02	W	G4						4	0	15.9	95.3	204.4	15.9	299.7	315.6
COMN 04744-01	B	G4	FF	Rus	Yel	1.083	5.5	6	1.1	62.3	143.0	137.4	62.3	280.4	343.8
COMN 04744-01	W	G4						5	0	40.7	146.8	52.1	40.7	198.9	239.6
COMN 04747-01	B	G4	FF	Rus	Cream	1.065	5.8	5	0.0	33.9	117.9	213.9	33.9	331.8	365.7
COMN 04747-01	W	G4						4	0	25.8	114.7	180.2	25.8	294.9	320.6
COMN 04756-04	B	G4	FF	Rus-lt	Cream	1.085	7.0	12	12.3	127.9	349.3	59.1	127.9	408.4	548.6
COMN 04756-04	W	G4						7	0	54.0	245.0	98.5	54.0	343.5	397.5
COMN 04759-03	B	G4	FF	Rus	Cream	1.085	6.0	10	2.2	102.5	267.6	77.1	102.5	344.7	449.4
COMN 04759-03	W	G4						7	4.1	66.3	188.2	50.6	66.3	238.8	309.2
COMN 04760-01	B	G4	FF	Rus	W	1.059	6.0	12	0.0	154.3	277.6	30.4	154.3	308.0	462.3
COMN 04760-01	W	G4						6	0	63.7	192.4	24.6	63.7	217.0	280.7
COMN 04787-04	B	G4	FF	Rus-lt	W	1.074	3.0	8	24.0	46.4	246.7	216.8	46.4	463.6	534.0
COMN 04787-04	W	G4						6	4.8	38.6	218.5	129.8	38.6	348.2	391.7
NDMN 04871-01	B	G4	FF	Rus	Cream	1.083	6.8	6	29.4	41.7	165.1	248.7	41.7	413.9	485.0
NDMN 04871-01	W	G4						4	0	23.8	113.4	134.8	23.8	248.3	272.1
NDMN 04938-01	B	G4	FF	LW	Cream	1.083	4.5	9	16.3	67.3	277.9	180.2	67.3	458.0	541.5
NDMN 04938-01	W	G4						7	3.0	65.6	186.2	124.6	65.6	310.8	379.3
NDMN 04964-04	B	G4	FF	LW	W	1.071	3.8	8	2.8	57.1	258.3	116.3	57.1	374.6	434.4
NDMN 04964-04	W	G4						7	0	48.0	189.8	140.9	48.0	330.7	378.7
WIMN 04860-01	B	G4	FF	LW	W	1.094	3.0	8	0.0	46.5	268.7	148.1	46.5	416.8	463.3
WIMN 04860-01	W	G4						4	12.2	27.5	124.3	160.2	27.5	284.5	324.2
MN 05001-018	B	G3	FF	Rus	Cream	1.078	7.0	13	1.6	154.8	258.9	144.9	154.8	403.9	560.3
MN 05001-018	W	G3						9	8.0	80.3	259.9	84.0	80.3	343.9	432.2
MN 05001-027	B	G3	FF	Rus	Cream	1.073	7.0	6	0.0	33.4	162.5	159.0	33.4	321.4	354.9

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
MN 05001-027	W	G3						3	0	21.4	84.7	120.1	21.4	204.8	226.2
MN 05001-028	B	G3	FF	Rus	W	1.084	6.5	9	0.0	81.4	302.5	62.6	81.4	365.1	446.5
MN 05001-028	W	G3						5	0	33.3	161.7	99.0	33.3	260.6	293.9
MN 05001-031	B	G3	FF	Rus	Cream	1.094	5.3	6	1.5	20.3	194.5	249.8	20.3	444.3	466.1
MN 05001-031	W	G3						4	0	14.2	92.1	229.1	14.2	321.2	335.3
MN 05001-032	B	G3	FF	Rus	W	1.091	4.0	9	6.7	100.4	236.3	59.4	100.4	295.7	402.8
MN 05001-032	W	G3						6	0	65.7	127.0	43.5	65.7	170.4	236.1
MN 05001-033	B	G3	FF	Rus	Cream	1.087	5.8	6	2.8	19.4	206.9	264.6	19.4	471.4	493.6
MN 05001-033	W	G3						4	131.3	12.1	82.7	283.6	12.1	366.3	509.7
MN 05001-036	B	G3	FF	Rus	Cream	1.072	7.0	9	18.2	51.3	320.5	168.1	51.3	488.6	558.1
MN 05001-036	W	G3						6	2.1	45.0	190.6	127.9	45.0	318.5	365.6
MN 05001-074	B	G3	FF	Rus	Cream	1.082	6.0	6	7.7	29.8	204.2	239.7	29.8	444.0	481.4
MN 05001-074	W	G3						4	7.8	19.1	124.3	221.4	19.1	345.8	372.6
MN 05001-092	B	G3	FF	Rus	Cream	1.086	5.8	9	0.0	70.4	254.3	159.9	70.4	414.2	484.6
MN 05001-092	W	G3						5	3.3	24.7	149.0	174.3	24.7	323.3	351.2
MN 05001-095	B	G3	FF	Rus	Cream	1.077	6.3	9	0.0	88.2	255.4	136.6	88.2	392.0	480.2
MN 05001-095	W	G3						6	4.2	43.1	204.4	76.8	43.1	281.2	328.5
MN 05001-096	B	G3	FF	Rus	Cream	1.074	6.0	9	0.0	78.9	282.3	101.0	78.9	383.2	462.1
MN 05001-096	W	G3						6	0	47.0	184.9	34.4	47.0	219.3	266.3
MN 05001-107	B	G3	FF	Rus	Cream	1.090	7.5	5	66.8	27.8	136.0	161.4	27.8	297.4	392.0
MN 05001-107	W	G3						4	8.8	24.2	114.2	148.4	24.2	262.6	295.6
MN 05001-124	B	G3	FF	Rus	Cream	1.084	5.8	8	6.5	79.4	234.3	91.0	79.4	325.3	411.2
MN 05001-124	W	G3						7	4.0	53.6	211.8	95.0	53.6	306.8	364.3
MN 05001-134	B	G3	FF	Rus	W	1.081	6.8	10	34.3	71.2	301.7	241.6	71.2	543.4	648.8
MN 05001-134	W	G3						7	14.7	50.2	263.5	123.7	50.2	387.2	452.1
MN 05001-142	B	G3	FF	Rus	Cream	1.071	6.0	7	7.1	32.2	250.5	211.5	32.2	461.9	501.2
MN 05001-142	W	G3						5	1.8	29.2	164.3	102.1	29.2	266.3	297.4
MN 05001-145	B	G3	FF	LW	W	1.068	7.3	9	0.0	59.7	279.5	138.4	59.7	417.9	477.6
MN 05001-145	W	G3						3	39.7	16.0	86.1	188.0	16.0	274.1	329.8
MN 05001-175	B	G3	FF	Rus	Cream	1.087	7.0	11	3.6	115.5	289.8	100.6	115.5	390.4	509.5
MN 05001-175	W	G3						6	15.5	54.7	163.4	65.9	54.7	229.3	299.5
MN 05001-176	B	G3	FF	Rus	Cream	1.086	6.0	7	5.0	53.7	175.0	166.2	53.7	341.2	399.9

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
MN 05001-176	W	G3						5	0	30.6	163.0	80.5	30.6	243.5	274.1
MN 05001-191	B	G3	FF	Rus	Cream	1.074	6.3	8	14.0	38.2	229.2	343.4	38.2	572.6	624.9
MN 05001-191	W	G3						6	27.5	26.7	174.2	218.4	26.7	392.6	446.8
MN 05001-193	B	G3	FF	Rus	Cream	1.076	6.3	6	10.6	18.3	153.0	363.8	18.3	516.9	545.7
MN 05001-193	W	G3						5	22.1	15.5	151.8	242.2	15.5	394.1	431.7
MN 05001-196	B	G3	FF	LW	Cream	1.090	6.3	17	10.4	186.0	464.4	108.5	186.0	572.9	769.3
MN 05001-196	W	G3						11	0	143.5	230.5	26.0	143.5	256.5	400.0
MN 05001-198	B	G3	FF	Rus	Cream	1.080	6.0	9	9.1	93.2	248.7	51.7	93.2	300.4	402.6
MN 05001-198	W	G3						6	0	34.9	162.6	215.7	34.9	378.3	413.2
R. Norkotah	B	Chk	FM	Rus	Cream	1.073	7.5	12	9.0	99.8	316.3	219.7	99.8	535.9	644.7
R. Norkotah	W	Chk						5	17.2	23.3	122.3	315.4	23.3	437.7	478.2
Red Norland	B	Chk	FM	Red	W	1.064	7.6	11	11.0	94.0	360.8	50.2	94.0	411.0	516.0
Red Norland	W	Chk						6	10.0	32.0	212.6	183.3	32.0	395.9	438.0
Red Pontiac	B	Chk	FM	Red	Cream	1.066	8.3	12	17.8	79.7	430.8	183.0	79.7	613.8	711.3
Red Pontiac	W	Chk						8	189.0	39.7	166.1	476.2	39.7	642.3	871.1
Y. Gold	B	Chk	FM	W	Yel	1.082	7.4	8	9.2	47.8	235.9	201.0	47.8	436.9	494.0
Y. Gold	W	Chk						5	25.6	19.0	137.2	199.0	19.0	336.2	380.8
MN 96013-1	B	G12	FM	Red	Yel-dk	1.075	7.0	6	11.0	41.2	163.5	131.0	41.2	294.5	346.7
MN 96013-1	W	G12						5	21.1	31.6	144.5	114.4	31.6	258.9	311.6
MN 99460-14	B	G9	FM	Red	W	1.072	6.5	5	17.8	55.8	134.8	17.7	55.8	152.4	226.1
MN 99460-14	W	G9						3	25.9	33.5	98.2	26.1	33.5	124.3	183.6
MN 00177-5	B	G8	FM	Red	W	1.062	7.5	5	5.0	50.5	150.2	13.2	50.5	163.4	218.8
MN 00177-5	W	G8						3	1.5	43.7	78.9	27.3	43.7	106.2	151.4
ATMN 03505-3	B	G5	FM	Red	Cream	1.069	6.5	9	12.6	81.2	272.6	121.9	81.2	394.5	488.3
ATMN 03505-3	W	G5						6	11.8	43.4	181.5	66.6	43.4	248.2	303.4
COMN 03019-4	B	G5	FM	Red	Cream	1.072	7.0	7	8.8	67.6	194.6	46.5	67.6	241.1	317.4
COMN 03019-4	W	G5						5	30.9	40.8	137.9	27.9	40.8	165.8	237.4
COMN 03020-3	B	G5	FM	Red	W	1.073	6.0	8	5.9	69.6	216.8	90.8	69.6	307.5	383.1
COMN 03020-3	W	G5						6	32.6	63.1	148.5	76.5	63.1	224.9	320.7

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 03021-1	B	G5	FM	Red	Cream	1.074	6.5	8	0.0	80.3	232.1	99.6	80.3	331.7	411.9
COMN 03021-1	W	G5						7	5.4	89.1	131.5	23.6	89.1	155.1	249.6
COMN 03024-6	B	G5	FM	Red	Cream	1.066	7.0	12	84.2	175.3	179.3	17.1	175.3	196.5	455.9
COMN 03024-6	W	G5						8	14.3	95.5	194.7	39.8	95.5	234.5	344.3
COMN 03027-1	B	G5	FM	Red	Cream	1.071	7.0	11	4.3	155.5	220.1	14.6	155.5	234.7	394.5
COMN 03027-1	W	G5						9	0	105.9	206.1	27.6	105.9	233.7	339.6
COMN 03030-1	B	G5	FM	Red	Cream	1.063	7.0	9	1.5	145.8	90.2	5.2	145.8	95.3	242.7
COMN 03030-1	W	G5						7	2.3	74.4	199.1	13.5	74.4	212.6	289.3
COMN 03035-5	B	G5	FM	Red	Cream	1.059	7.5	8	0.0	111.7	156.1	10.0	111.7	166.1	277.8
COMN 03035-5	W	G5						6	0	60.2	153.6	19.1	60.2	172.7	232.9
NDMN 03314-1	B	G5	FM	Red	Cream	1.068	6.0	11	240.2	148.0	247.5	42.5	148.0	290.0	678.2
NDMN 03314-1	W	G5						6	34.4	76.6	113.5	23.7	76.6	137.1	248.2
NDMN 03316-3	B	G5	FM	Red	Cream	1.062	9.0	11	17.7	117.6	281.6	61.3	117.6	342.9	478.2
NDMN 03316-3	W	G5						8	12.1	91.0	185.8	46.5	91.0	232.3	335.3
NDMN 03376-1	B	G5	FM	Red dk.	Cream	1.070	8.0	10	12.0	95.8	288.9	65.6	95.8	354.5	462.3
NDMN 03376-1	W	G5						6	12.8	68.1	149.0	30.9	68.1	180.0	260.9
NDMN 03382-2	B	G5	FM	Red dk.	W	1.071	7.8	12	38.0	182.6	210.9	9.1	182.6	220.0	440.6
NDMN 03382-2	W	G5						10	7.0	169.4	126.6	4.9	169.4	131.4	307.9
COMN 04668-01	B	G4	FM	Red	Cream	1.078	5.8	14	25.1	148.8	403.3	138.0	148.8	541.3	715.2
COMN 04668-01	W	G4						8	21.0	66.4	215.4	147.1	66.4	362.5	450.0
COMN 04670-02	B	G4	FM	Red	Cream	1.072	8.0	4	33.7	35.1	121.8	42.3	35.1	164.2	233.0
COMN 04670-02	W	G4						4	0	32.4	108.5	20.2	32.4	128.7	161.1
COMN 04697-02	B	G4	FM	Red	Cream	1.065	6.5	13	19.4	199.6	150.7	21.5	199.6	172.2	391.2
COMN 04697-02	W	G4						9	0.9	157.6	102.0	0.0	157.6	102.0	260.4
COMN 04699-05	B	G4	FM	Red	W	1.075	6.0	9	48.2	105.3	204.9	42.7	105.3	247.6	401.2
COMN 04699-05	W	G4						6	21.7	66.4	167.2	29.2	66.4	196.4	284.5
COMN 04778-02	B	G4	FM	Red	Cream	1.076	6.3	9	37.4	87.9	252.3	57.4	87.9	309.7	435.1
COMN 04778-02	W	G4						7	9.3	92.4	143.6	23.2	92.4	166.8	268.6
COMN 04779-01	B	G4	FM	Red	Cream	1.071	6.3	9	30.8	138.4	112.1	16.0	138.4	128.1	297.3
COMN 04779-01	W	G4						5	3.3	79.9	73.6	10.3	79.9	83.9	167.0
COMN 04779-02	B	G4	FM	Red	W	1.065	6.5	10	37.5	109.2	282.1	46.0	109.2	328.1	474.7

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 04779-02	W	G4						9	7.9	108.3	212.2	36.6	108.3	248.7	365.0
COMN 04780-01	B	G4	FM	Red	Cream	1.067	7.5	8	69.6	85.6	237.3	77.6	85.6	314.9	470.1
COMN 04780-01	W	G4						6	19.4	58.2	142.6	82.5	58.2	225.0	302.6
COMN 04780-06	B	G4	FM	Red	W	1.058	8.0	7	0.0	115.8	109.0	0.0	115.8	109.0	224.8
COMN 04780-06	W	G4						4	22.1	62.0	64.5	0.0	62.0	64.5	148.6
COMN 04781-04	B	G4	FM	Red	W	1.074	9.0	14	7.8	232.1	150.0	4.9	232.1	154.9	394.9
COMN 04781-04	W	G4						8	6.9	117.3	130.8	8.5	117.3	139.3	263.5
COMN 04782-01	B	G4	FM	Red	W	1.056	7.8	7	55.4	58.6	150.0	142.2	58.6	292.2	406.2
COMN 04782-01	W	G4						6	0	31.0	193.1	132.1	31.0	325.2	356.2
COMN 04782-04	B	G4	FM	Red	Cream	1.062	7.0	8	19.4	95.7	162.3	40.0	95.7	202.4	317.5
COMN 04782-04	W	G4						7	28.2	82.9	157.5	46.8	82.9	204.3	315.3
MN 04Morris-1	B	G4	FM	Red	W	1.068	9.0	9	22.7	105.8	201.0	35.4	105.8	236.3	364.9
MN 04Morris-1	W	G4						5	4.4	53.2	123.0	63.4	53.2	186.4	244.0
NDMN 04911-01	B	G4	FM	W	W	1.080	3.5	13	0.0	148.0	364.9	32.3	148.0	397.2	545.2
NDMN 04911-01	W	G4						8	1.6	112.2	170.0	50.0	112.2	220.0	333.8
NDMN 04911-02	B	G4	FM	W	W	1.085	3.8	12	0.0	181.7	221.8	10.3	181.7	232.0	413.8
NDMN 04911-02	W	G4						8	3.0	102.9	154.8	29.0	102.9	183.8	289.7
NDMN 04916-01	B	G4	FM	Red	W	1.084	7.3	12	25.4	102.0	395.2	95.1	102.0	490.3	617.7
NDMN 04916-01	W	G4						9	11.4	91.9	263.8	73.0	91.9	336.8	440.1
NDMN 04917-02	B	G4	FM	Red	W	1.059	9.0	5	61.4	31.5	148.6	122.9	31.5	271.6	364.4
NDMN 04917-02	W	G4						3	43.6	28.6	99.3	31.8	28.6	131.1	203.3
NDMN 04917-03	B	G4	FM	Red	W	1.065	8.0	8	20.7	83.0	211.7	45.8	83.0	257.5	361.1
NDMN 04917-03	W	G4						7	77.9	74.4	159.4	72.8	74.4	232.1	384.4
NDMN 04927-01	B	G4	FM	Red	Cream	1.075	7.8	7	51.9	72.5	212.9	43.8	72.5	256.7	381.2
NDMN 04927-01	W	G4						5	32.7	41.8	159.0	27.5	41.8	186.6	261.1
NDMN 04978-01	B	G4	FM	Red	Cream	1.057	7.5	10	19.4	116.6	240.8	41.2	116.6	282.0	418.0
NDMN 04978-01	W	G4						6	8.9	54.6	163.9	80.3	54.6	244.2	307.7
NDMN 04979-02	B	G4	FM	Red	W	1.072	7.8	11	5.3	135.0	220.5	33.0	135.0	253.6	393.8
NDMN 04979-02	W	G4						7	0	98.2	107.8	35.3	98.2	143.0	241.2
MN 05001-002	B	G3	FM	Red	Cream	1.067	7.8	12	3.9	104.1	380.7	140.1	104.1	520.8	628.9
MN 05001-002	W	G3						6	0	44.6	171.1	187.0	44.6	358.1	402.7

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
							3/45F								
MN 05001-007	B	G3	FM	Red	Cream	1.072	6.5	14	6.5	186.4	243.6	71.2	186.4	314.8	507.7
MN 05001-007	W	G3						9	10.1	120.9	163.5	25.9	120.9	189.5	320.5
MN 05001-017	B	G3	FM	Red	Cream	1.061	7.5	11	16.2	168.9	164.7	5.3	168.9	170.0	355.1
MN 05001-017	W	G3						8	5.9	104.5	170.4	37.0	104.5	207.5	318.0
MN 05001-047	B	G3	FM	Dk. Red	Cream	1.070	7.5	7	1.5	74.3	196.2	4.8	74.3	201.0	276.8
MN 05001-047	W	G3						4	14.3	34.4	119.8	56.6	34.4	176.4	225.1
MN 05001-051	B	G3	FM	Red	Yel	1.058	8.0	11	9.5	125.7	237.2	50.3	125.7	287.5	422.6
MN 05001-051	W	G3						8	4.0	100.0	153.1	52.9	100.0	206.0	310.0
MN 05001-054	B	G3	FM	Red	Cream	1.061	8.8	12	33.8	117.0	316.3	68.9	117.0	385.2	536.0
MN 05001-054	W	G3						7	6.7	49.7	179.3	192.1	49.7	371.4	427.8
MN 05001-088	B	G3	FM	Red	Yel	1.068	7.0	17	7.5	249.9	267.0	50.8	249.9	317.8	575.2
MN 05001-088	W	G3						11	9.6	140.6	229.6	81.7	140.6	311.2	461.4
MN 05001-090	B	G3	FM	Red	W	1.074	7.5	11	31.3	85.3	402.7	109.1	85.3	511.8	628.4
MN 05001-090	W	G3						6	26.5	28.9	182.2	172.5	28.9	354.7	410.1
MN 05001-094	B	G3	FM	Red	Yel	1.073	7.3	10	0.0	126.2	221.4	32.2	126.2	253.7	379.8
MN 05001-094	W	G3						7	46.9	80.3	147.5	55.7	80.3	203.2	330.3
MN 05001-115	B	G3	FM	Red	Yel-dk.	1.067	7.0	10	2.7	164.5	90.6	5.0	164.5	95.6	262.8
MN 05001-115	W	G3						7	9.4	114.3	76.9	0.0	114.3	76.9	200.6
MN 05001-127	B	G3	FM	Red	Yel-lt.	1.066	8.0	10	17.0	99.9	251.9	95.7	99.9	347.6	464.4
MN 05001-127	W	G3						9	18.7	112.6	174.8	42.0	112.6	216.8	348.0
MN 05001-180	B	G3	FM	Red	W	1.054	6.3	6	5.3	54.9	170.8	73.9	54.9	244.7	304.8
MN 05001-180	W	G3						7	1.3	57.6	229.1	49.2	57.6	278.3	337.2
MN 05001-197	B	G3	FM	Red	Cream	1.081	7.0	8	0.0	49.2	232.3	235.7	49.2	468.0	517.2
MN 05001-197	W	G3						5	0	39.8	126.1	163.7	39.8	289.8	329.6

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

						Mkt Yld	Size Distribution (%)							
Clone	Loc	Trial	Mkt	Skn	Flesh	Cwtyld	<4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
Atlantic	B	Chk	C	W	Cream	536.6	10.7	40.8	44.3	88.8	4.2	10.7	85.1	100.0
Atlantic	W	Chk				294.5	10.5	40.5	47.6	89.3	1.3	10.7	88.1	
NorValley	B	Chk	C	W	Cream	567.0	17.8	54.8	27.4	82.2	0.0	17.8	82.2	100.0
NorValley	W	Chk				436.3	13.1	55.3	29.6	86.6	2.0	13.4	84.9	
Snowden	B	Chk	C	W	Cream	616.4	6.9	45.6	44.8	92.9	2.7	6.9	90.4	100.0
Snowden	W	Chk				488.3	7.4	45.7	46.8	92.6	0.0	7.4	92.6	
MN 99380-1	B	G9	C/FM	W	Yel-dk	518.5	16.1	57.4	26.4	83.9	0.0	16.1	83.9	100.0
MN 99380-1	W	G9				254.6	29.5	63.2	7.3	70.5	0.0	29.5	70.5	
MN 00467-4	B	G8	C	W	W	503.8	9.0	45.1	41.2	90.6	4.7	9.0	86.4	100.0
MN 00467-4	W	G8				342.8	10.7	57.2	27.6	88.8	4.4	11.2	84.9	
DEM 7	B	G6	C	W	W	465.1	24.8	63.0	12.2	75.2	0.0	24.8	75.2	100.0
DEM 7	W	G6				406.9	26.0	55.9	17.7	73.9	0.3	26.1	73.7	
MN 02 529	B	G6	C	W	W	479.3	14.7	60.9	24.4	85.3	0.0	14.7	85.3	100.0
MN 02 529	W	G6				289.8	13.4	36.5	50.1	86.6	0.0	13.4	86.6	
MN 02 586	B	G6	C/FM	W	Yel-lt	558.7	27.6	62.6	7.5	71.8	2.3	27.6	70.1	100.0
MN 02 586	W	G6				420.7	27.9	61.9	10.2	72.1	0.0	27.9	72.1	
MN 02 587	B	G6	C	W	W	517.7	39.5	49.6	5.4	58.2	5.5	39.5	55.0	100.0
MN 02 588	B	G6	C/FM	W	Yel-lt	542.3	25.1	62.5	9.6	74.2	2.8	25.1	72.1	100.0
MN 02 588	W	G6				376.7	17.5	57.2	23.4	82.1	1.9	17.9	80.5	
MN 02 589	B	G6	C	W	W	417.8	29.1	59.0	9.9	70.3	1.9	29.1	68.9	100.0
MN 02 589	W	G6				315.8	29.5	66.3	3.2	70.1	1.1	29.9	69.4	
MN 02 598	B	G6	C/FM	W	Yel-lt	629.5	20.1	64.2	13.4	79.4	2.3	20.1	77.6	100.0
MN 02 598	W	G6				373.0	22.5	65.9	11.6	77.5	0.0	22.5	77.5	
MN 02 678	B	G6	C	W	W	370.4	33.9	47.7	18.4	66.1	0.0	33.9	66.1	100.0
MN 02 678	W	G6				368.8	14.5	45.6	39.3	85.4	0.7	14.6	84.8	
MN 02 703	B	G6	C	W	W	199.4	49.6	42.4	8.0	50.4	0.0	49.6	50.4	100.0
MN 02 703	W	G6				85.1	50.0	50.0	0.0	50.0	0.0	50.0	50.0	
COMN 03049-5	B	G5	C/FM	W	Yel-lt	542.8	19.2	56.7	16.5	79.2	7.6	19.2	73.2	100.0
COMN 03049-5	W	G5				387.1	11.5	37.9	47.0	88.1	3.6	11.9	84.9	
COMN 03051-1	B	G5	C	W	Cream	434.2	28.4	57.5	13.2	71.4	0.9	28.4	70.7	100.0
COMN 03051-1	W	G5				205.7	30.2	62.6	7.1	69.8	0.0	30.2	69.8	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
NDMN 03324-4	B	G5	C	W	Cream	609.4	18.8	59.5	20.8	81.0	0.8	18.8	80.3	100.0
NDMN 03324-4	W	G5				437.0	15.7	52.6	30.6	84.2	1.1	15.8	83.3	
NDMN 03333-1	B	G5	C	W	W	368.3	13.8	62.4	22.6	86.0	1.1	13.8	85.0	100.0
NDMN 03333-1	W	G5				232.4	17.6	54.6	27.8	82.4	0.0	17.6	82.4	
NDMN 03333-2	B	G5	C	W	W	348.6	14.0	56.8	25.4	85.4	3.8	14.0	82.2	100.0
NDMN 03333-2	W	G5				281.8	8.4	46.3	45.4	91.6	0.0	8.4	91.6	
NDMN 03339-4	B	G5	C	W	Cream	438.9	13.0	62.0	24.3	86.9	0.6	13.0	86.3	100.0
NDMN 03339-4	W	G5				340.9	14.1	43.0	42.9	85.9	0.0	14.1	85.9	
NDMN 03410-2	B	G5	C	W	Cream	315.2	55.2	41.6	3.1	44.8	0.0	55.2	44.8	100.0
NDMN 03410-2	W	G5				225.4	37.3	58.4	4.3	62.7	0.0	37.3	62.7	
COMN 04651-03	B	G4	C	W	Cream	464.6	39.7	40.0	16.7	58.9	3.6	39.7	56.8	100.0
COMN 04651-03	W	G4				374.6	28.4	55.0	16.6	71.6	0.0	28.4	71.6	
COMN 04659-06	B	G4	C	W	Cream	605.6	5.1	34.0	61.0	94.9	0.0	5.1	94.9	100.0
COMN 04659-06	W	G4				349.8	5.7	44.2	50.1	94.3	0.0	5.7	94.3	
COMN 04674-02	B	G4	C	W	Cream	520.2	6.0	41.1	45.3	93.5	7.6	6.0	86.4	100.0
COMN 04674-02	W	G4				383.9	6.9	42.6	50.5	93.1	0.0	6.9	93.1	
COMN 04696-01	B	G4	C	W	W	397.5	30.9	51.6	12.8	67.6	4.7	30.9	64.4	100.0
COMN 04696-01	W	G4				360.6	14.6	55.4	29.7	85.3	0.2	14.7	85.1	
COMN 04788-02	B	G4	C	W	W	254.8	35.2	56.8	6.5	64.3	1.5	35.2	63.3	100.0
COMN 04788-02	W	G4				236.0	30.1	61.6	8.3	69.9	0.0	30.1	69.9	
COMN 04788-03	B	G4	C	W	Cream	453.9	34.5	57.7	7.8	65.5	0.0	34.5	65.5	100.0
COMN 04788-03	W	G4				399.7	29.3	62.7	8.0	70.7	0.0	29.3	70.7	
COMN 04788-04	B	G4	C	W	Cream	335.8	48.9	46.4	4.3	50.9	0.5	48.9	50.7	100.0
COMN 04788-04	W	G4				303.0	34.2	63.2	2.6	65.8	0.0	34.2	65.8	
COMN 04788-05	B	G4	C	W	Cream	349.3	45.0	54.4	0.0	54.7	0.7	45.0	54.4	100.0
COMN 04788-05	W	G4				197.7	41.4	50.8	7.8	58.6	0.0	41.4	58.6	
COMN 04788-09	B	G4	C	W	W	323.1	40.5	45.9	7.5	56.9	6.1	40.5	53.4	100.0
COMN 04788-09	W	G4				273.4	45.4	45.0	9.6	54.6	0.0	45.4	54.6	
COMN 04788-10	B	G4	C	W	W	341.3	31.5	59.6	8.8	68.5	0.0	31.5	68.5	100.0
COMN 04788-10	W	G4				294.8	33.5	56.8	9.8	66.5	0.0	33.5	66.5	
NDMN 04905-02	B	G4	C	W	Cream	389.8	24.9	62.6	11.3	74.8	1.2	24.9	73.9	100.0
NDMN 04905-02	W	G4				325.3	15.9	60.8	22.1	83.9	1.2	16.1	82.9	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

						Mkt Yld	Size Distribution (%)							
Clone	Loc	Trial	Mkt	Skn	Flesh	Cwtyld	<4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
NDMN 04905-04	B	G4	C	W	W	380.4	17.7	62.6	19.5	82.2	0.1	17.7	82.1	100.0
NDMN 04905-04	W	G4				308.7	27.3	56.3	14.6	72.2	1.8	27.8	70.9	
NDMN 04905-06	B	G4	C	W	Cream	283.7	8.3	45.9	45.1	91.6	0.7	8.3	91.0	100.0
NDMN 04905-06	W	G4				152.3	12.6	58.8	24.5	86.9	4.1	13.1	83.3	
NDMN 04905-13	B	G4	C	W	W	476.5	46.2	51.5	2.3	53.8	0.0	46.2	53.8	100.0
NDMN 04905-13	W	G4				278.9	61.2	33.3	5.6	38.8	0.0	61.2	38.8	
NDMN 04905-14	B	G4	C	W	W	351.8	22.4	66.8	10.7	77.6	0.0	22.4	77.6	100.0
NDMN 04905-14	W	G4				279.1	26.2	58.4	15.4	73.8	0.0	26.2	73.8	
NDMN 04910-01	B	G4	C	W	Cream	728.0	20.3	61.3	16.6	79.3	1.8	20.3	77.9	100.0
NDMN 04910-01	W	G4				445.6	28.4	62.8	8.2	71.4	0.6	28.6	71.0	
NDMN 04960-01	B	G4	C	W	W	499.0	28.7	57.6	11.1	70.5	2.6	28.7	68.7	100.0
NDMN 04960-01	W	G4				377.8	21.7	56.1	22.2	78.3	0.0	21.7	78.3	
NDMN 04961-01	B	G4	C	W	W	287.3	14.1	45.5	28.6	84.0	11.8	14.1	74.1	100.0
NDMN 04961-01	W	G4				327.6	13.1	42.5	32.7	85.1	11.7	14.9	75.1	
NDMN 04964-01	B	G4	C	W	Cream	393.0	34.1	49.4	14.5	65.2	2.0	34.1	63.9	100.0
NDMN 04964-01	W	G4				301.7	18.0	64.4	17.6	82.0	0.0	18.0	82.0	
USDAWIMN 04060-1	B	G4	C	W	Cream	472.7	26.3	60.9	11.6	73.4	1.2	26.3	72.5	100.0
USDAWIMN 04060-1	W	G4				296.7	27.6	63.6	7.3	71.9	1.5	28.1	70.9	
WIMN 04836-01	B	G4	C	W	W	501.4	17.4	57.9	24.7	82.6	0.0	17.4	82.6	100.0
WIMN 04836-01	W	G4				219.4	25.0	53.2	21.8	75.0	0.0	25.0	75.0	
WIMN 04836-02	B	G4	C	W	W	302.6	17.2	42.0	34.5	81.7	6.2	17.2	76.6	100.0
WIMN 04836-02	W	G4				316.6	12.7	54.4	32.2	87.2	0.8	12.8	86.6	
WIMN 04837-01	B	G4	C	W	Cream	342.7	19.2	44.0	32.1	79.9	4.7	19.2	76.1	100.0
WIMN 04837-01	W	G4				299.8	21.1	56.2	22.7	78.9	0.0	21.1	78.9	
WIMN 04844-01	B	G4	C	W	Cream	531.4	16.3	59.6	24.1	83.7	0.0	16.3	83.7	100.0
WIMN 04844-01	W	G4				400.4	27.2	57.8	15.0	72.8	0.0	27.2	72.8	
WIMN 04844-03	B	G4	C/FM	W	Yel	426.3	23.8	55.1	21.1	76.2	0.0	23.8	76.2	100.0
WIMN 04844-03	W	G4				341.3	20.4	55.5	24.1	79.6	0.0	20.4	79.6	
WIMN 04844-06	B	G4	C	W	Cream	510.4	20.7	45.1	32.7	79.0	1.5	20.7	77.8	100.0
WIMN 04844-06	W	G4				443.1	9.2	46.3	44.5	90.8	0.0	9.2	90.8	
WIMN 04844-07	B	G4	C/FM	W	Yel	323.2	26.0	62.3	11.7	74.0	0.0	26.0	74.0	100.0
WIMN 04844-07	W	G4				240.3	24.1	55.9	20.0	75.9	0.0	24.1	75.9	
WIMN 04844-12	B	G4	C/FM	W	Yel-dk.	266.8	20.5	46.2	15.0	74.9	18.2	20.5	61.2	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
WIMN 04844-12	W	G4				278.3	29.4	52.8	17.2	70.4	0.6	29.6	70.0	
WIMN 04854-07	B	G4	C	W	Cream	389.7	24.0	67.2	6.4	75.4	2.4	24.0	73.6	100.0
WIMN 04854-07	W	G4				269.3	38.7	54.3	7.0	61.3	0.0	38.7	61.3	
WIMN 04855-02	B	G4	C	W	Cream	533.4	7.3	40.5	52.0	92.7	0.2	7.3	92.5	100.0
WIMN 04855-02	W	G4				447.2	6.4	36.0	56.6	93.5	1.0	6.5	92.6	
WIMN 04866-02	B	G4	C	W	Cream	597.9	18.3	50.2	31.6	81.7	0.0	18.3	81.7	100.0
WIMN 04866-02	W	G4				324.2	14.8	55.2	28.8	85.1	1.2	14.9	84.0	
MN 05001-151	B	G3	C	W	W	486.8	30.7	61.1	7.0	69.0	1.2	30.7	68.1	100.0
MN 05001-151	W	G3				334.2	27.0	65.3	7.8	73.0	0.0	27.0	73.0	
MN 05001-156	B	G3	C	W	Cream	471.2	23.4	62.7	10.5	75.8	3.4	23.4	73.2	100.0
MN 05001-156	W	G3				367.7	16.7	62.0	17.5	82.6	3.7	17.4	79.6	
MN 05001-166	B	G3	C	W	Yel	554.1	4.6	44.2	46.4	95.1	4.7	4.6	90.6	100.0
MN 05001-166	W	G3				392.2	6.9	45.7	47.4	93.1	0.0	6.9	93.1	
MN 05001-171	B	G3	C	W	Cream	528.5	14.3	66.4	19.3	85.7	0.0	14.3	85.7	100.0
MN 05001-171	W	G3				332.9	19.4	63.6	16.9	80.6	0.0	19.4	80.6	
MN 05001-186	B	G3	C	W	Cream	393.0	44.2	53.0	2.8	55.8	0.0	44.2	55.8	100.0
MN 05001-186	W	G3				260.3	52.4	45.8	1.8	47.6	0.0	52.4	47.6	
MN 05001-189	B	G3	C	W	W	401.2	17.4	62.1	20.5	82.6	0.0	17.4	82.6	100.0
MN 05001-189	W	G3				249.4	27.2	62.4	10.3	72.8	0.0	27.2	72.8	
MN 05001-192	B	G3	C	W	Cream	442.1	10.9	54.9	32.2	88.8	2.0	10.9	87.1	100.0
MN 05001-192	W	G3				274.7	9.7	40.9	47.3	90.1	2.0	9.9	88.2	
R. Burbank	B	Chk	FF	Rus	Cream	672.2	16.3	52.1	29.1	83.3	2.5	16.3	81.2	100.0
R. Burbank	W	Chk				458.5	12.6	55.9	24.6	86.5	6.8	13.5	80.6	
Shepody	B	Chk	FF	LW	W	618.9	5.9	36.2	48.1	93.4	9.8	5.9	84.2	100.0
Shepody	W	Chk				510.7	3.9	20.1	73.1	95.9	2.9	4.1	93.1	
MN 15620	B	G15	FF	Red	Yel	578.8	24.2	59.7	14.2	75.3	1.9	24.2	73.9	100.0
MN 15620	W	G15				384.2	10.5	41.3	43.4	89.0	4.8	11.0	84.7	
MN 19350	B	G15	FF	W	W	410.8	25.0	64.3	10.7	75.0	0.0	25.0	75.0	100.0
MN 19350	W	G15				310.6	20.8	59.3	19.8	79.2	0.0	20.8	79.2	
MN 19470	B	G15	FF	LW	W	360.2	10.4	57.7	31.4	89.5	0.6	10.4	89.0	100.0
MN 19470	W	G15				266.1	14.7	44.4	40.9	85.3	0.0	14.7	85.3	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
MN 18710	B	G15	FF/FM	Rus	W	401.7	18.1	55.5	26.1	81.8	0.3	18.1	81.5	100.0
MN 18710	W	G15				296.0	12.9	56.0	30.5	87.0	0.6	13.0	86.5	
MN 02 419	B	G6	FF	LW	Cream	407.2	19.7	53.5	24.2	79.7	2.7	19.7	77.6	100.0
MN 02 419	W	G6				313.8	16.2	51.9	30.2	83.5	1.7	16.5	82.1	
AOMN 03178-2	B	G5	FF	Rus lt.	W	450.7	9.7	57.2	33.1	90.3	0.0	9.7	90.3	100.0
AOMN 03178-2	W	G5				416.5	7.4	45.1	47.0	92.5	0.5	7.5	92.1	
AOMN 041027-01	B	G4	FF	Rus-lt	Cream	279.0	26.0	64.5	9.5	74.0	0.0	26.0	74.0	100.0
AOMN 041027-01	W	G4				246.3	11.0	57.5	31.5	89.0	0.0	11.0	89.0	
AOMN 041050-02	B	G4	FF	Rus-lt	Cream	412.4	9.3	52.3	34.1	90.3	4.3	9.3	86.4	100.0
AOMN 041050-02	W	G4				326.2	8.0	58.9	32.0	91.9	1.1	8.1	90.9	
AOMN 041070-01	B	G4	FF	Rus	Cream	300.5	23.8	51.2	24.2	76.0	0.8	23.8	75.3	100.0
AOMN 041070-01	W	G4				315.0	12.1	55.0	28.7	87.4	4.3	12.6	83.7	
AOMN 041093-01	B	G4	FF	Rus-lt	W	468.7	7.9	34.8	53.3	91.8	4.0	7.9	88.1	100.0
AOMN 041093-01	W	G4				277.5	12.5	55.2	29.4	87.1	2.9	12.9	84.6	
AOMN 041101-01	B	G4	FF	LW	W	582.2	5.1	42.6	50.8	94.8	1.5	5.1	93.4	100.0
AOMN 041101-01	W	G4				477.1	6.0	35.4	57.8	93.9	0.8	6.1	93.2	
AOMN 041115-02	B	G4	FF	LW	Cream	384.3	15.0	53.2	31.8	85.0	0.0	15.0	85.0	100.0
AOMN 041115-02	W	G4				396.1	5.4	32.9	59.7	94.5	2.0	5.5	92.6	
AOMN 041127-01	B	G4	FF	Rus-lt	Cream	477.2	18.4	47.0	32.6	81.2	2.0	18.4	79.6	100.0
AOMN 041127-01	W	G4				414.4	16.9	51.7	31.3	83.1	0.0	16.9	83.1	
AOMN 041138-01	B	G4	FF	Rus	W	463.4	39.5	54.4	5.7	60.4	0.4	39.5	60.1	100.0
AOMN 041138-01	W	G4				352.0	21.4	59.7	17.9	78.3	1.0	21.7	77.5	
COMN 04654-03	B	G4	FF	LW	Cream	595.0	26.7	54.3	16.6	72.6	2.4	26.7	70.9	100.0
COMN 04654-03	W	G4				361.2	25.0	60.7	11.9	74.4	2.4	25.6	72.6	
COMN 04659-02	B	G4	FF	LW	Cream	425.4	11.4	65.5	23.1	88.6	0.0	11.4	88.6	100.0
COMN 04659-02	W	G4				298.4	19.9	69.3	10.8	80.1	0.0	19.9	80.1	
COMN 04659-05	B	G4	FF	LW	Cream	530.4	22.2	49.6	17.7	75.2	10.5	22.2	67.3	100.0
COMN 04659-05	W	G4				395.0	16.8	53.8	29.5	83.2	0.0	16.8	83.2	
COMN 04684-01	B	G4	FF	Rus	Cream	381.3	22.8	56.0	18.1	76.4	3.1	22.8	74.0	100.0
COMN 04684-01	W	G4				298.9	17.2	63.8	18.3	82.6	0.7	17.4	82.1	
COMN 04686-02	B	G4	FF	LW	W	387.4	18.0	65.9	15.7	81.9	0.5	18.0	81.6	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
COMN 04686-02	W	G4				349.9	7.1	49.9	43.0	92.9	0.0	7.1	92.9	
COMN 04692-05	B	G4	FF	Rus-lt	Cream	411.6	23.9	56.5	19.6	76.1	0.0	23.9	76.1	100.0
COMN 04692-05	W	G4				300.2	26.2	48.3	23.5	73.3	2.0	26.7	71.8	
COMN 04692-10	B	G4	FF	Rus	Cream	367.4	26.8	61.5	10.9	73.0	0.8	26.8	72.4	100.0
COMN 04692-10	W	G4				351.9	14.2	57.9	27.1	85.7	0.8	14.3	85.0	
COMN 04692-11	B	G4	FF	Rus	Cream	364.5	6.8	47.9	44.8	93.2	0.6	6.8	92.7	100.0
COMN 04692-11	W	G4				250.9	10.3	49.7	38.3	89.5	1.7	10.5	88.0	
COMN 04702-01	B	G4	FF	Rus	W	424.2	12.6	46.6	40.8	87.4	0.0	12.6	87.4	100.0
COMN 04702-01	W	G4				244.3	9.2	64.4	26.4	90.8	0.0	9.2	90.8	
COMN 04702-03	B	G4	FF	Rus	Cream	473.2	9.3	46.2	44.5	90.7	0.0	9.3	90.7	100.0
COMN 04702-03	W	G4				349.3	4.1	35.7	60.3	95.9	0.0	4.1	95.9	
COMN 04702-05	B	G4	FF	Rus	W	274.1	8.9	56.5	33.1	91.0	1.5	8.9	89.6	100.0
COMN 04702-05	W	G4				223.5	3.6	37.1	59.3	96.4	0.0	3.6	96.4	
COMN 04702-08	B	G4	FF	Rus	Cream	532.8	14.2	47.3	37.3	85.7	1.3	14.2	84.6	100.0
COMN 04702-08	W	G4				396.4	12.8	59.6	25.7	86.9	1.8	13.1	85.3	
COMN 04702-09	B	G4	FF	Rus	Cream	374.0	23.0	62.6	12.1	76.4	2.2	23.0	74.8	100.0
COMN 04702-09	W	G4				226.2	35.3	62.7	2.0	64.7	0.0	35.3	64.7	
COMN 04702-11	B	G4	FF	Rus	W	314.3	13.9	64.3	20.1	85.9	1.7	13.9	84.4	100.0
COMN 04702-11	W	G4				238.9	13.3	70.1	16.7	86.7	0.0	13.3	86.7	
COMN 04702-14	B	G4	FF	Rus	Cream	568.4	7.5	36.8	55.7	92.5	0.0	7.5	92.5	100.0
COMN 04702-14	W	G4				285.4	11.2	64.9	23.9	88.8	0.0	11.2	88.8	
COMN 04702-16	B	G4	FF	Rus	Cream	451.5	22.3	63.0	13.9	77.5	0.8	22.3	76.9	100.0
COMN 04702-16	W	G4				299.0	18.6	71.3	10.1	81.4	0.0	18.6	81.4	
COMN 04704-01	B	G4	FF	Rus	W	518.2	23.4	55.0	21.7	76.6	0.0	23.4	76.6	100.0
COMN 04704-01	W	G4				207.5	20.5	54.3	22.9	79.0	2.3	21.0	77.2	
COMN 04712-01	B	G4	FF	Rus-lt	W	604.3	9.3	39.1	43.7	89.9	7.9	9.3	82.7	100.0
COMN 04712-01	W	G4				407.1	10.8	47.9	33.3	88.2	8.1	11.8	81.1	
COMN 04713-03	B	G4	FF	Rus	Cream	576.3	16.6	55.7	27.0	83.3	0.7	16.6	82.7	100.0
COMN 04713-03	W	G4				331.7	18.1	49.2	30.6	81.5	2.1	18.5	79.7	
COMN 04723-01	B	G4	FF	Rus	W	385.3	12.4	45.2	31.1	86.0	11.3	12.4	76.3	100.0
COMN 04723-01	W	G4				318.4	4.6	35.3	49.4	94.9	10.6	5.1	84.8	
COMN 04733-01	B	G4	FF	Rus	Cream	452.6	13.4	59.0	26.5	86.4	1.1	13.4	85.5	100.0
COMN 04733-01	W	G4				309.1	11.1	64.2	24.7	88.9	0.0	11.1	88.9	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
COMN 04733-02	B	G4	FF	Rus	Cream	388.5	4.7	33.1	62.2	95.3	0.0	4.7	95.3	100.0
COMN 04733-02	W	G4				315.6	5.0	30.2	64.8	95.0	0.0	5.0	95.0	
COMN 04744-01	B	G4	FF	Rus	Yel	342.6	18.1	41.6	40.0	81.8	0.3	18.1	81.6	100.0
COMN 04744-01	W	G4				239.6	17.0	61.3	21.7	83.0	0.0	17.0	83.0	
COMN 04747-01	B	G4	FF	Rus	Cream	365.7	9.3	32.2	58.5	90.7	0.0	9.3	90.7	100.0
COMN 04747-01	W	G4				320.6	8.0	35.8	56.2	92.0	0.0	8.0	92.0	
COMN 04756-04	B	G4	FF	Rus-lt	Cream	536.3	23.3	63.7	10.8	76.2	2.2	23.3	74.4	100.0
COMN 04756-04	W	G4				397.5	13.6	61.6	24.8	86.4	0.0	13.6	86.4	
COMN 04759-03	B	G4	FF	Rus	Cream	447.2	22.8	59.5	17.2	77.1	0.5	22.8	76.7	100.0
COMN 04759-03	W	G4				305.0	21.4	60.9	16.4	78.3	1.3	21.7	77.2	
COMN 04760-01	B	G4	FF	Rus	W	462.3	33.4	60.1	6.6	66.6	0.0	33.4	66.6	100.0
COMN 04760-01	W	G4				280.7	22.7	68.6	8.7	77.3	0.0	22.7	77.3	
COMN 04787-04	B	G4	FF	Rus-lt	W	510.0	8.7	46.2	40.6	90.9	4.5	8.7	86.8	100.0
COMN 04787-04	W	G4				386.8	9.9	55.8	33.1	90.0	1.2	10.0	88.9	
NDMN 04871-01	B	G4	FF	Rus	Cream	455.6	8.6	34.1	51.3	90.8	6.1	8.6	85.3	100.0
NDMN 04871-01	W	G4				272.1	8.8	41.7	49.6	91.2	0.0	8.8	91.2	
NDMN 04938-01	B	G4	FF	LW	Cream	525.3	12.4	51.3	33.3	87.2	3.0	12.4	84.6	100.0
NDMN 04938-01	W	G4				376.3	17.3	49.1	32.8	82.6	0.8	17.4	81.9	
NDMN 04964-04	B	G4	FF	LW	W	431.7	13.1	59.5	26.8	86.8	0.6	13.1	86.2	100.0
NDMN 04964-04	W	G4				378.7	12.7	50.1	37.2	87.3	0.0	12.7	87.3	
WIMN 04860-01	B	G4	FF	LW	W	463.3	10.0	58.0	32.0	90.0	0.0	10.0	90.0	100.0
WIMN 04860-01	W	G4				312.0	8.5	38.3	49.4	91.2	3.8	8.8	87.8	
MN 05001-018	B	G3	FF	Rus	Cream	558.7	27.6	46.2	25.9	72.3	0.3	27.6	72.1	100.0
MN 05001-018	W	G3				424.2	18.6	60.1	19.4	81.1	1.8	18.9	79.6	
MN 05001-027	B	G3	FF	Rus	Cream	354.9	9.4	45.8	44.8	90.6	0.0	9.4	90.6	100.0
MN 05001-027	W	G3				226.2	9.5	37.4	53.1	90.5	0.0	9.5	90.5	
MN 05001-028	B	G3	FF	Rus	W	446.5	18.2	67.8	14.0	81.8	0.0	18.2	81.8	100.0
MN 05001-028	W	G3				293.9	11.3	55.0	33.7	88.7	0.0	11.3	88.7	
MN 05001-031	B	G3	FF	Rus	Cream	464.6	4.4	41.7	53.6	95.6	0.3	4.4	95.3	100.0
MN 05001-031	W	G3				335.3	4.2	27.5	68.3	95.8	0.0	4.2	95.8	
MN 05001-032	B	G3	FF	Rus	W	396.2	24.9	58.7	14.7	74.6	1.7	24.9	73.4	100.0
MN 05001-032	W	G3				236.1	27.8	53.8	18.4	72.2	0.0	27.8	72.2	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
MN 05001-033	B	G3	FF	Rus	Cream	490.8	3.9	41.9	53.6	96.1	0.6	3.9	95.5	100.0
MN 05001-033	W	G3				378.4	2.4	16.2	55.6	96.8	25.8	3.2	71.9	
MN 05001-036	B	G3	FF	Rus	Cream	539.9	9.2	57.4	30.1	90.5	3.3	9.2	87.6	100.0
MN 05001-036	W	G3				363.5	12.3	52.1	35.0	87.6	0.6	12.4	87.1	
MN 05001-074	B	G3	FF	Rus	Cream	473.8	6.2	42.4	49.8	93.7	1.6	6.2	92.2	100.0
MN 05001-074	W	G3				364.9	5.1	33.4	59.4	94.8	2.1	5.2	92.8	
MN 05001-092	B	G3	FF	Rus	Cream	484.6	14.5	52.5	33.0	85.5	0.0	14.5	85.5	100.0
MN 05001-092	W	G3				347.9	7.0	42.4	49.6	92.9	0.9	7.1	92.0	
MN 05001-095	B	G3	FF	Rus	Cream	480.2	18.4	53.2	28.4	81.6	0.0	18.4	81.6	100.0
MN 05001-095	W	G3				324.3	13.1	62.2	23.4	86.7	1.3	13.3	85.6	
MN 05001-096	B	G3	FF	Rus	Cream	462.1	17.1	61.1	21.9	82.9	0.0	17.1	82.9	100.0
MN 05001-096	W	G3				266.3	17.7	69.4	12.9	82.3	0.0	17.7	82.3	
MN 05001-107	B	G3	FF	Rus	Cream	325.2	7.1	34.7	41.2	91.5	17.0	7.1	75.9	100.0
MN 05001-107	W	G3				286.8	8.2	38.6	50.2	91.5	3.0	8.5	88.8	
MN 05001-124	B	G3	FF	Rus	Cream	404.7	19.3	57.0	22.1	80.4	1.6	19.3	79.1	100.0
MN 05001-124	W	G3				360.4	14.7	58.1	26.1	85.1	1.1	14.9	84.2	
MN 05001-134	B	G3	FF	Rus	W	614.5	11.0	46.5	37.2	88.4	5.3	11.0	83.7	100.0
MN 05001-134	W	G3				437.4	11.1	58.3	27.3	88.5	3.3	11.5	85.6	
MN 05001-142	B	G3	FF	Rus	Cream	494.1	6.4	50.0	42.2	93.5	1.4	6.4	92.2	100.0
MN 05001-142	W	G3				295.5	9.8	55.2	34.3	90.1	0.6	9.9	89.6	
MN 05001-145	B	G3	FF	LW	W	477.6	12.5	58.5	29.0	87.5	0.0	12.5	87.5	100.0
MN 05001-145	W	G3				290.1	4.8	26.1	57.0	94.5	12.0	5.5	83.1	
MN 05001-175	B	G3	FF	Rus	Cream	505.9	22.7	56.9	19.7	77.2	0.7	22.7	76.6	100.0
MN 05001-175	W	G3				284.0	18.3	54.6	22.0	80.7	5.2	19.3	76.6	
MN 05001-176	B	G3	FF	Rus	Cream	394.9	13.4	43.8	41.6	86.4	1.2	13.4	85.3	100.0
MN 05001-176	W	G3				274.1	11.2	59.5	29.4	88.8	0.0	11.2	88.8	
MN 05001-191	B	G3	FF	Rus	Cream	610.8	6.1	36.7	55.0	93.7	2.2	6.1	91.6	100.0
MN 05001-191	W	G3				419.3	6.0	39.0	48.9	93.6	6.2	6.4	87.9	
MN 05001-193	B	G3	FF	Rus	Cream	535.2	3.4	28.0	66.7	96.6	1.9	3.4	94.7	100.0
MN 05001-193	W	G3				409.6	3.6	35.2	56.1	96.2	5.1	3.8	91.3	
MN 05001-196	B	G3	FF	LW	Cream	758.9	24.2	60.4	14.1	75.5	1.3	24.2	74.5	100.0
MN 05001-196	W	G3				400.0	35.9	57.6	6.5	64.1	0.0	35.9	64.1	
MN 05001-198	B	G3	FF	Rus	Cream	393.6	23.1	61.8	12.8	76.3	2.2	23.1	74.6	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
MN 05001-198	W	G3				413.2	8.4	39.4	52.2	91.6	0.0	8.4	91.6	
R. Norkotah	B	Chk	FM	Rus	Cream	635.7	15.5	49.1	34.1	84.3	1.4	15.5	83.1	100.0
R. Norkotah	W	Chk				461.0	4.9	25.6	66.0	95.0	3.6	5.0	91.5	
Red Norland	B	Chk	FM	Red	W	505.0	18.2	69.9	9.7	81.4	2.1	18.2	79.6	100.0
Red Norland	W	Chk				428.0	7.3	48.5	41.9	92.5	2.3	7.5	90.4	
Red Pontiac	B	Chk	FM	Red	Cream	693.5	11.2	60.6	25.7	88.5	2.5	11.2	86.3	100.0
Red Pontiac	W	Chk				682.0	4.6	19.1	54.7	94.2	21.7	5.8	73.7	
Y. Gold	B	Chk	FM	W	Yel	484.7	9.7	47.8	40.7	90.1	1.9	9.7	88.5	100.0
Y. Gold	W	Chk				355.3	5.0	36.0	52.3	94.6	6.7	5.4	88.3	
MN 96013-1	B	G12	FM	Red	Yel-dk	335.7	11.9	47.2	37.8	87.7	3.2	11.9	84.9	100.0
MN 96013-1	W	G12				290.5	10.2	46.4	36.7	89.1	6.8	10.9	83.1	
MN 99460-14	B	G9	FM	Red	W	208.3	24.7	59.6	7.8	73.2	7.9	24.7	67.4	100.0
MN 99460-14	W	G9				157.8	18.2	53.5	14.2	78.8	14.1	21.2	67.7	
MN 00177-5	B	G8	FM	Red	W	213.9	23.1	68.6	6.0	76.4	2.3	23.1	74.7	100.0
MN 00177-5	W	G8				149.9	28.9	52.1	18.0	70.9	1.0	29.1	70.1	
ATMN 03505-3	B	G5	FM	Red	Cream	475.7	16.6	55.8	25.0	82.9	2.6	16.6	80.8	100.0
ATMN 03505-3	W	G5				291.6	14.3	59.8	22.0	85.1	3.9	14.9	81.8	
COMN 03019-4	B	G5	FM	Red	Cream	308.7	21.3	61.3	14.6	78.1	2.8	21.3	75.9	100.0
COMN 03019-4	W	G5				206.5	17.2	58.1	11.7	80.3	13.0	19.7	69.8	
COMN 03020-3	B	G5	FM	Red	W	377.2	18.2	56.6	23.7	81.5	1.5	18.2	80.3	100.0
COMN 03020-3	W	G5				288.1	19.7	46.3	23.8	78.1	10.2	21.9	70.1	
COMN 03021-1	B	G5	FM	Red	Cream	411.9	19.5	56.3	24.2	80.5	0.0	19.5	80.5	100.0
COMN 03021-1	W	G5				244.1	35.7	52.7	9.4	63.5	2.2	36.5	62.1	
COMN 03024-6	B	G5	FM	Red	Cream	371.8	38.5	39.3	3.8	52.8	18.5	38.5	43.1	100.0
COMN 03024-6	W	G5				330.0	27.7	56.6	11.6	71.1	4.2	28.9	68.1	
COMN 03027-1	B	G5	FM	Red	Cream	390.2	39.4	55.8	3.7	60.2	1.1	39.4	59.5	100.0
COMN 03027-1	W	G5				339.6	31.2	60.7	8.1	68.8	0.0	31.2	68.8	
COMN 03030-1	B	G5	FM	Red	Cream	241.2	60.1	37.2	2.1	39.5	0.6	60.1	39.3	100.0
COMN 03030-1	W	G5				287.0	25.7	68.8	4.7	74.1	0.8	25.9	73.5	
COMN 03035-5	B	G5	FM	Red	Cream	277.8	40.2	56.2	3.6	59.8	0.0	40.2	59.8	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
COMN 03035-5	W	G5				232.9	25.9	65.9	8.2	74.1	0.0	25.9	74.1	
NDMN 03314-1	B	G5	FM	Red	Cream	438.1	21.8	36.5	6.3	66.2	35.4	21.8	42.8	100.0
NDMN 03314-1	W	G5				213.8	30.9	45.7	9.5	64.2	13.9	35.8	55.3	
NDMN 03316-3	B	G5	FM	Red	Cream	460.5	24.6	58.9	12.8	74.5	3.7	24.6	71.7	100.0
NDMN 03316-3	W	G5				323.3	27.1	55.4	13.9	71.9	3.6	28.1	69.3	
NDMN 03376-1	B	G5	FM	Red dk.	Cream	450.3	20.7	62.5	14.2	78.7	2.6	20.7	76.7	100.0
NDMN 03376-1	W	G5				248.1	26.1	57.1	11.9	72.5	4.9	27.5	69.0	
NDMN 03382-2	B	G5	FM	Red dk.	W	402.6	41.4	47.9	2.1	54.7	8.6	41.4	49.9	100.0
NDMN 03382-2	W	G5				300.9	55.0	41.1	1.6	43.7	2.3	56.3	42.7	
COMN 04668-01	B	G4	FM	Red	Cream	690.1	20.8	56.4	19.3	78.4	3.5	20.8	75.7	100.0
COMN 04668-01	W	G4				428.9	14.8	47.9	32.7	84.5	4.7	15.5	80.6	
COMN 04670-02	B	G4	FM	Red	Cream	199.3	15.1	52.3	18.2	82.4	14.5	15.1	70.5	100.0
COMN 04670-02	W	G4				161.1	20.1	67.4	12.5	79.9	0.0	20.1	79.9	
COMN 04697-02	B	G4	FM	Red	Cream	371.8	51.0	38.5	5.5	46.3	5.0	51.0	44.0	100.0
COMN 04697-02	W	G4				259.6	60.5	39.2	0.0	39.3	0.3	60.7	39.2	
COMN 04699-05	B	G4	FM	Red	W	352.9	26.3	51.1	10.7	70.2	12.0	26.3	61.7	100.0
COMN 04699-05	W	G4				262.8	23.3	58.8	10.3	74.7	7.6	25.3	69.0	
COMN 04778-02	B	G4	FM	Red	Cream	397.6	20.2	58.0	13.2	77.9	8.6	20.2	71.2	100.0
COMN 04778-02	W	G4				259.3	34.4	53.5	8.6	64.3	3.5	35.7	62.1	
COMN 04779-01	B	G4	FM	Red	Cream	266.5	46.5	37.7	5.4	48.1	10.4	46.5	43.1	100.0
COMN 04779-01	W	G4				163.8	47.8	44.1	6.2	51.2	2.0	48.8	50.2	
COMN 04779-02	B	G4	FM	Red	W	437.3	23.0	59.4	9.7	75.0	7.9	23.0	69.1	100.0
COMN 04779-02	W	G4				357.1	29.7	58.1	10.0	69.7	2.2	30.3	68.1	
COMN 04780-01	B	G4	FM	Red	Cream	400.5	18.2	50.5	16.5	78.6	14.8	18.2	67.0	100.0
COMN 04780-01	W	G4				283.2	19.2	47.1	27.3	79.5	6.4	20.5	74.4	
COMN 04780-06	B	G4	FM	Red	W	224.8	51.5	48.5	0.0	48.5	0.0	51.5	48.5	100.0
COMN 04780-06	W	G4				126.5	41.7	43.4	0.0	51.0	14.9	49.0	43.4	
COMN 04781-04	B	G4	FM	Red	W	387.0	58.8	38.0	1.2	40.0	2.0	58.8	39.2	100.0
COMN 04781-04	W	G4				256.6	44.5	49.6	3.2	54.3	2.6	45.7	52.9	
COMN 04782-01	B	G4	FM	Red	W	350.8	14.4	36.9	35.0	83.3	13.6	14.4	71.9	100.0
COMN 04782-01	W	G4				356.2	8.7	54.2	37.1	91.3	0.0	8.7	91.3	
COMN 04782-04	B	G4	FM	Red	Cream	298.1	30.2	51.1	12.6	67.9	6.1	30.2	63.7	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
COMN 04782-04	W	G4				287.1	26.3	49.9	14.8	71.1	8.9	28.9	64.8	
MN 04Morris-1	B	G4	FM	Red	W	342.1	29.0	55.1	9.7	69.1	6.2	29.0	64.8	100.0
MN 04Morris-1	W	G4				239.6	21.8	50.4	26.0	77.8	1.8	22.2	76.4	
NDMN 04911-01	B	G4	FM	W	W	545.2	27.1	66.9	5.9	72.9	0.0	27.1	72.9	100.0
NDMN 04911-01	W	G4				332.2	33.6	50.9	15.0	66.2	0.5	33.8	65.9	
NDMN 04911-02	B	G4	FM	W	W	413.8	43.9	53.6	2.5	56.1	0.0	43.9	56.1	100.0
NDMN 04911-02	W	G4				286.7	35.5	53.4	10.0	64.1	1.0	35.9	63.5	
NDMN 04916-01	B	G4	FM	Red	W	592.3	16.5	64.0	15.4	82.8	4.1	16.5	79.4	100.0
NDMN 04916-01	W	G4				428.7	20.9	59.9	16.6	78.6	2.6	21.4	76.5	
NDMN 04917-02	B	G4	FM	Red	W	303.0	8.6	40.8	33.7	89.6	16.9	8.6	74.5	100.0
NDMN 04917-02	W	G4				159.6	14.1	48.9	15.6	82.1	21.5	17.9	64.5	
NDMN 04917-03	B	G4	FM	Red	W	340.5	23.0	58.6	12.7	75.6	5.7	23.0	71.3	100.0
NDMN 04917-03	W	G4				306.6	19.4	41.5	18.9	75.7	20.3	24.3	60.4	
NDMN 04927-01	B	G4	FM	Red	Cream	329.2	19.0	55.8	11.5	78.0	13.6	19.0	67.3	100.0
NDMN 04927-01	W	G4				228.3	16.0	60.9	10.6	81.7	12.5	18.3	71.5	
NDMN 04978-01	B	G4	FM	Red	Cream	398.7	27.9	57.6	9.9	70.7	4.6	27.9	67.5	100.0
NDMN 04978-01	W	G4				298.8	17.8	53.3	26.1	81.7	2.9	18.3	79.4	
NDMN 04979-02	B	G4	FM	Red	W	388.5	34.3	56.0	8.4	65.3	1.3	34.3	64.4	100.0
NDMN 04979-02	W	G4				241.2	40.7	44.7	14.6	59.3	0.0	40.7	59.3	
MN 05001-002	B	G3	FM	Red	Cream	624.9	16.6	60.5	22.3	83.3	0.6	16.6	82.8	100.0
MN 05001-002	W	G3				402.7	11.1	42.5	46.4	88.9	0.0	11.1	88.9	
MN 05001-007	B	G3	FM	Red	Cream	501.3	36.7	48.0	14.0	62.8	1.3	36.7	62.0	100.0
MN 05001-007	W	G3				310.4	37.7	51.0	8.1	61.0	3.2	39.0	59.1	
MN 05001-017	B	G3	FM	Red	Cream	339.0	47.6	46.4	1.5	50.2	4.5	47.6	47.9	100.0
MN 05001-017	W	G3				312.0	32.9	53.6	11.6	66.5	1.9	33.5	65.3	
MN 05001-047	B	G3	FM	Dk. Red	Cream	275.3	26.9	70.9	1.7	73.0	0.5	26.9	72.6	100.0
MN 05001-047	W	G3				210.8	15.3	53.2	25.1	83.7	6.4	16.3	78.4	
MN 05001-051	B	G3	FM	Red	Yel	413.2	29.7	56.1	11.9	69.6	2.2	29.7	68.0	100.0
MN 05001-051	W	G3				306.0	32.2	49.4	17.1	67.3	1.3	32.7	66.5	
MN 05001-054	B	G3	FM	Red	Cream	502.3	21.8	59.0	12.9	76.7	6.3	21.8	71.9	100.0
MN 05001-054	W	G3				421.1	11.6	41.9	44.9	88.2	1.6	11.8	86.8	
MN 05001-088	B	G3	FM	Red	Yel	567.7	43.4	46.4	8.8	56.0	1.3	43.4	55.3	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
MN 05001-088	W	G3				451.9	30.5	49.7	17.7	68.9	2.1	31.1	67.4	
MN 05001-090	B	G3	FM	Red	W	597.1	13.6	64.1	17.4	85.7	5.0	13.6	81.4	100.0
MN 05001-090	W	G3				383.6	7.0	44.4	42.1	92.5	6.5	7.5	86.5	
MN 05001-094	B	G3	FM	Red	Yel	379.8	33.2	58.3	8.5	66.8	0.0	33.2	66.8	100.0
MN 05001-094	W	G3				283.4	24.3	44.7	16.8	71.7	14.2	28.3	61.5	
MN 05001-115	B	G3	FM	Red	Yel-dk.	260.1	62.6	34.5	1.9	36.8	1.0	62.6	36.4	100.0
MN 05001-115	W	G3				191.2	57.0	38.4	0.0	40.2	4.7	59.8	38.4	
MN 05001-127	B	G3	FM	Red	Yel-lt.	447.5	21.5	54.2	20.6	77.7	3.7	21.5	74.8	100.0
MN 05001-127	W	G3				329.3	32.3	50.2	12.1	65.8	5.4	34.2	62.3	
MN 05001-180	B	G3	FM	Red	W	299.5	18.0	56.0	24.2	81.7	1.7	18.0	80.3	100.0
MN 05001-180	W	G3				335.9	17.1	67.9	14.6	82.9	0.4	17.1	82.5	
MN 05001-197	B	G3	FM	Red	Cream	517.2	9.5	44.9	45.6	90.5	0.0	9.5	90.5	100.0
MN 05001-197	W	G3				329.6	12.1	38.3	49.7	87.9	0.0	12.1	87.9	

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab								Late Blight Resistance		
		2008		Color		Severity	C- Coverage		Internal Defects (%)					Avg.	Susc./Res.	
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	HH	IN	VD	BC	Bruises	Final	R1	R2
B	**Atlantic**	**Chk**	C	W	Cream	5.0	M	L	19	0	6	3	6	9	S	S
B	**NorValley**	**Chk**	C	W	Cream	4.5	M	L	0	0	0	0	3	9	S	S
B	**Snowden**	**Chk**	C	W	Cream	4.5	L	M	3	0	3	0	3	8	S	MS
B	MN 99380-1	G9	C/FM	W	Yel-dk	5.0	M	L	0	19	0	0	0	9	S	S
B	MN 00467-4	G8	C	W	W	1.0	0	L	0	0	0	0	6	9	S	S
B	DEM 7	G6	C	W	W	2.0	L	T	0	0	0	0	0	9	S	S
B	MN 02 529	G6	C	W	W	5.0	M	H	13	0	0	0	0	9	S	S
B	MN 02 582 (F)	G6	F	F	F	5.0	H	M	F	F	F	F	F	9	S	S
B	MN 02 586	G6	C/FM	W	Yel-lt	5.0	M	M	0	0	0	0	0	9	S	S
B	MN 02 587	G6	C	W	W	5.0	H	M	0	0	0	0	0	9	S	S
B	MN 02 588	G6	C/FM	W	Yel-lt	4.5	M	L	6	0	25	0	0	9	S	S
B	MN 02 589	G6	C	W	W	5.0	L	M	0	0	0	0	0	9	S	S
B	MN 02 598	G6	C/FM	W	Yel-lt	5.0	M	M	6	0	0	6	6	9	S	S
B	MN 02 678	G6	C	W	W	5.0	M	M	6	0	0	0	0	9	S	S
B	MN 02 703	G6	C	W	W	2.5	0	M	0	0	0	0	0	9	S	S
B	COMN 03049-5	G5	C	W	Yel-lt	5.0	M	M	31	0	13	0	0	8.5	S	S
B	COMN 03051-1	G5	C	W	Cream	5.0	H	M	0	0	0	0	0	9	S	S
B	NDMN 03324-4	G5	C	W	Cream	5.0	L	L	0	0	0	0	6	9	S	S
B	NDMN 03333-1	G5	C	W	W	5.0	M	T	25	0	0	0	6	9	S	S
B	NDMN 03333-2	G5	C	W	W	5.0	H	M	44	0	0	0	0	9	S	S
B	NDMN 03339-4	G5	C	W	Cream	5.0	T	M	0	0	0	0	0	9	S	S
B	NDMN 03410-2	G5	C	W	Cream	2.5	M	0	13	0	0	0	0	9	S	S
B	COMN 04651-03	G4	C	W	Cream	4.5	L	M	0	0	13	0	6	9	S	S
B	COMN 04659-06	G4	C	W	Cream	5.0	M	L	6	0	0	0	0	9	m	S
B	COMN 04674-02	G4	C	W	Cream	1.5	T	0	0	25	0	0	0	9	S	S
B	COMN 04696-01	G4	C	W	W	5.0	H	M	0	0	0	0	6	9	S	S
B	COMN 04788-02	G4	C	W	W	4.5	M	M	0	0	0	0	0	9	S	S
B	COMN 04788-03	G4	C	W	Cream	5.0	L	L	6	6	0	25	6	9	S	S
B	COMN 04788-04	G4	C	W	Cream	3.0	T	T	0	13	0	0	0	9	S	S
B	COMN 04788-05	G4	C	W	Cream	2.5	L	M	0	0	0	0	0	9	S	S
B	COMN 04788-09	G4	C	W	W	3.0	T	M	19	0	0	0	0	9	S	S

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab			Internal Defects (%)					Late Blight Resistance		
		2008		Color		Severity	C- Coverage							Avg.	Susc./Res.	
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	HH	IN	VD	BC	Bruises	Final	R1	R2
B	COMN 04788-10	G4	C	W	W	3.0	T	T	0	0	6	0	0	9	S	S
B	NDMN 04905-02	G4	C	W	Cream	3.0	M	L	0	0	0	0	0	9	S	S
B	NDMN 04905-04	G4	C	W	W	5.0	L	M	19	0	0	0	0	9	S	S
B	NDMN 04905-06	G4	C	W	Cream	5.0	T	M	13	0	0	0	0	9	S	S
B	NDMN 04905-13	G4	C	W	W	3.0	L	L	0	0	0	0	31	9	S	S
B	NDMN 04905-14	G4	C	W	W	5.0	H	L	19	0	0	0	0	9	S	S
B	NDMN 04910-01	G4	C	W	Cream	5.0	H	H	6	13	0	0	13	9	S	S
B	NDMN 04911-01	G4	C	W	W	4.0	L	M	0	0	0	0	0	9	S	S
B	NDMN 04911-02	G4	C	W	W	5.0	H	M	0	0	0	0	6	9	S	S
B	NDMN 04960-01	G4	C	W	W	5.0	L	M	6	0	0	0	0	9	S	S
B	NDMN 04961-01	G4	C	W	W	4.5	L	T	0	0	0	6	0	9	S	S
B	NDMN 04964-01	G4	C	W	Cream	5.0	L	M	6	0	6	0	6	9	S	S
B	USDAWIMN 04060-1	G4	C	W	Cream	5.0	L	L	0	13	6	0	0	9	S	S
B	WIMN 04836-01	G4	C	W	W	0.5	T	0	6	0	0	0	0	9	S	S
B	WIMN 04836-02	G4	C	W	W	3.0	L	M	44	0	0	0	0	9	S	S
B	WIMN 04837-01	G4	C	W	Cream	5.0	T	M	50	0	6	0	0	8.5	S	S
B	WIMN 04844-01	G4	C	W	Cream	4.5	M	L	0	0	0	0	13	9	S	S
B	WIMN 04844-03	G4	C	W	Yel	4.0	M	M	6	50	0	38	0	9	S	S
B	WIMN 04844-06	G4	C	W	Cream	5.0	M	L	0	31	13	13	0	9	S	S
B	WIMN 04844-07	G4	C	W	Yel	3.5	M	T	6	31	0	0	0	9	S	S
B	WIMN 04844-12	G4	C/FM	W	Yel-dk.	4.5	T	L	0	0	0	0	0	9	S	S
B	WIMN 04854-07	G4	C	W	Cream	3.0	T	L	6	0	0	0	6	9	S	S
B	WIMN 04855-02	G4	C	W	Cream	4.0	L	M	19	13	0	0	0	9	S	S
B	WIMN 04866-02	G4	C	W	Cream	5.0	M	L	13	0	0	0	13	9	S	S
B	MN 05001-151	G3	C	W	W	2.5	0	T	13	44	0	0	0	9	S	S
B	MN 05001-156	G3	C	W	Cream	4.5	M	T	0	0	0	0	0	9	S	S
B	MN 05001-166	G3	C	W	Yel	5.0	M	M	13	0	0	0	0	9	S	S
B	MN 05001-171	G3	C	W	Cream	4.0	L	M	6	56	0	31	0	9	S	S
B	MN 05001-186	G3	C	W	Cream	1.5	T	T	25	0	63	19	0	9	S	S
B	MN 05001-189	G3	C	W	W	2.5	T	M	0	50	0	0	0	9	S	S
B	MN 05001-192	G3	C	W	Cream	4.5	M	L	63	0	0	0	0	9	S	S
B	**Shepody**	**Chk**	FF	LW	W	5.0	L	M	21	0	15	6	3	9	S	S

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

				Color		Common Scab			Internal Defects (%)					Late Blight Resistance		
		2008				Severity	C- Coverage							Avg.	Susc./Res.	
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	HH	IN	VD	BC	Bruises	Final	R1	R2
B	MN 19470	G15	FF	LW	W	5.0	L	M	0	56	0	0	13	9	S	S
B	MN 02 419	G6	FF	LW	Cream	5.0	M	H	0	0	0	0	0	9	S	S
B	AOMN 041101-01	G4	FF	LW	W	4.0	L	M	0	6	0	0	0	9	S	S
B	AOMN 041115-02	G4	FF	LW	Cream	0.0	0	0	0	0	6	0	0	9	S	S
B	COMN 04654-03	G4	FF	LW	Cream	2.0	0	M	0	6	0	0	0	9	S	S
B	COMN 04659-02	G4	FF	LW	Cream	1.5	T	L	0	0	0	13	0	9	S	S
B	COMN 04659-05	G4	FF	LW	Cream	5.0	M	M	25	0	0	0	50	9	S	S
B	COMN 04686-02	G4	FF	LW	W	3.5	M	M	6	0	0	0	0	9	S	S
B	NDMN 04938-01	G4	FF	LW	Cream	5.0	H	L	6	6	6	0	0	9	S	S
B	NDMN 04964-04	G4	FF	LW	W	5.0	M	L	31	0	0	0	0	9	S	S
B	WIMN 04860-01	G4	FF	LW	W	2.5	M	0	13	0	0	0	6	7.5	S	MS
B	MN 05001-145	G3	FF	LW	W	5.0	H	T	0	0	6	0	0	9	S	S
B	MN 05001-196	G3	FF	LW	Cream	5.0	M	M	6	0	0	19	0	9	S	S
B	**R. Burbank**	**Chk**	FF	Rus	Cream	5.0	M	M	14	0	0	0	0	9	S	S
B	MN 15620	G15	FF	Red	Yel	5.0	M	T	6	0	0	0	69	9	S	S
B	MN 18710	G15	FF/FM	Rus	W	0.0	0	0	0	0	0	0	0	9	S	S
B	MN 19350	G15	FF	W	W	5.0	M	H	0	0	6	0	0	9	S	S
B	AOMN 03178-2	G5	FF	Rus lt.	W	1.5	T	T	38	0	13	0	0	9	S	S
B	AOMN 041027-01	G4	FF	Rus-lt	Cream	3.0	L	L	0	0	0	0	0	9	S	S
B	AOMN 041050-02	G4	FF	Rus-lt	Cream	2.5	H	T	19	0	0	0	0	9	S	S
B	AOMN 041070-01	G4	FF	Rus	Cream	0.0	0	0	0	0	13	0	0	9	S	S
B	AOMN 041093-01	G4	FF	Rus-lt	W	3.0	T	T	0	0	0	0	6	9	S	S
B	AOMN 041127-01	G4	FF	Rus-lt	Cream	3.5	M	T	0	0	6	0	6	9	S	S
B	AOMN 041138-01	G4	FF	Rus	W	3.5	L	L	0	0	0	0	0	9	S	S
B	COMN 04684-01	G4	FF	Rus	Cream	2.0	M	0	0	0	0	0	0	9	S	S
B	COMN 04692-05	G4	FF	Rus-lt	Cream	5.0	M	M	0	0	50	0	0	9	S	S
B	COMN 04692-10	G4	FF	Rus	Cream	3.0	M	M	0	6	13	0	0	9	S	S
B	COMN 04692-11	G4	FF	Rus	Cream	2.5	T	0	0	0	0	0	0	9	S	S
B	COMN 04702-01	G4	FF	Rus	W	0.0	0	0	0	0	0	0	6	9	S	S
B	COMN 04702-03	G4	FF	Rus	Cream	4.5	L	T	0	0	0	0	6	9	S	S

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab								Late Blight Resistance		
		2008		Color		Severity	C- Coverage		Internal Defects (%)					Avg.	Susc./Res.	
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	HH	IN	VD	BC	Bruises	Final	R1	R2
B	COMN 04702-05	G4	FF	Rus	W	1.0	0	T	0	0	0	0	0	9	S	S
B	COMN 04702-08	G4	FF	Rus	Cream	4.5	L	M	0	6	0	0	13	9	S	S
B	COMN 04702-09	G4	FF	Rus	Cream	5.0	T	M	0	0	13	0	13	9	S	S
B	COMN 04702-11	G4	FF	Rus	W	5.0	M	T	0	0	0	0	0	9	S	S
B	COMN 04702-14	G4	FF	Rus	Cream	5.0	L	M	6	0	0	0	0	9	S	S
B	COMN 04702-16	G4	FF	Rus	Cream	5.0	L	H	0	25	6	0	0	9	S	S
B	COMN 04704-01	G4	FF	Rus	W	3.0	L	L	0	0	0	0	6	9	S	S
B	COMN 04712-01	G4	FF	Rus-lt	W	4.5	L	L	25	0	6	0	31	9	S	S
B	COMN 04713-03	G4	FF	Rus	Cream	4.5	M	T	0	0	6	0	0	9	S	S
B	COMN 04723-01	G4	FF	Rus	W	1.0	L	L	13	0	0	6	13	8	MS	S
B	COMN 04733-01	G4	FF	Rus	Cream	5.0	M	M	0	0	0	0	0	9	S	S
B	COMN 04733-02	G4	FF	Rus	Cream	5.0	M	H	25	0	0	0	0	9	S	S
B	COMN 04744-01	G4	FF	Rus	Yel	5.0	L	T	0	6	0	0	0	9	S	S
B	COMN 04747-01	G4	FF	Rus	Cream	2.5	0	L	6	0	38	0	0	9	S	S
B	COMN 04756-04	G4	FF	Rus-lt	Cream	2.0	M	0	0	0	0	0	13	9	S	S
B	COMN 04759-03	G4	FF	Rus	Cream	3.5	L	L	0	0	0	0	6	9	S	S
B	COMN 04760-01	G4	FF	Rus	W	2.0	0	T	0	0	0	0	0	9	S	S
B	COMN 04787-04	G4	FF	Rus-lt	W	5.0	L	M	0	0	6	0	0	9	S	S
B	NDMN 04871-01	G4	FF	Rus	Cream	5.0	T	L	0	0	0	0	0	9	S	S
B	MN 05001-018	G3	FF	Rus	Cream	0.0	0	0	0	6	0	0	13	9	S	S
B	MN 05001-027	G3	FF	Rus	Cream	4.5	L	T	0	0	0	0	44	9	S	S
B	MN 05001-028	G3	FF	Rus	W	5.0	L	M	6	0	0	0	0	8.5	S	S
B	MN 05001-031	G3	FF	Rus	Cream	4.5	M	M	50	0	0	0	6	9	S	S
B	MN 05001-032	G3	FF	Rus	W	3.5	L	T	31	0	19	0	0	9	S	S
B	MN 05001-033	G3	FF	Rus	Cream	5.0	M	T	75	0	0	0	0	9	S	S
B	MN 05001-036	G3	FF	Rus	Cream	5.0	M	M	0	0	0	0	0	9	S	S
B	MN 05001-074	G3	FF	Rus	Cream	5.0	M	L	38	0	0	0	13	9	S	S
B	MN 05001-092	G3	FF	Rus	Cream	4.5	M	M	19	0	0	0	13	9	S	S
B	MN 05001-095	G3	FF	Rus	Cream	4.0	M	M	0	6	6	0	0	9	S	S
B	MN 05001-096	G3	FF	Rus	Cream	4.5	M	T	0	0	0	0	13	9	S	S
B	MN 05001-107	G3	FF	Rus	Cream	0.0	0	0	38	0	0	0	0	9	S	S
B	MN 05001-124	G3	FF	Rus	Cream	5.0	T	L	0	6	0	0	6	9	S	S
B	MN 05001-134	G3	FF	Rus	W	5.0	H	L	0	0	0	0	13	9	S	S

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

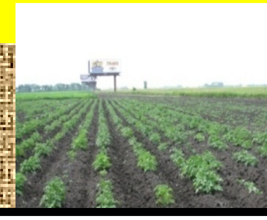
						Common Scab								Late Blight Resistance		
		2008		Color		Severity	C- Coverage		Internal Defects (%)					Avg.	Susc./Res.	
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	HH	IN	VD	BC	Bruises	Final	R1	R2
B	MN 05001-142	G3	FF	Rus	Cream	0.5	0	T	6	0	0	0	6	9	S	S
B	MN 05001-175	G3	FF	Rus	Cream	4.5	L	L	25	25	0	0	0	9	S	S
B	MN 05001-176	G3	FF	Rus	Cream	5.0	L	L	44	0	0	0	13	9	S	S
B	MN 05001-191	G3	FF	Rus	Cream	5.0	M	M	19	0	0	0	0	9	S	S
B	MN 05001-193	G3	FF	Rus	Cream	1.0	0	L	0	0	0	0	13	9	S	S
B	MN 05001-198	G3	FF	Rus	Cream	3.5	L	M	0	0	0	0	13	9	S	S
B	**R. Norkotah**	**Chk**	FM	Rus	Cream	2.5	0	L	3	0	11	0	0	9	S	S
B	**Red Norland**	**Chk**	FM	Red	W	5.0	L	M	3	0	0	0	0	9	S	S
B	**Red Pontiac**	**Chk**	FM	Red	Cream	5.0	M	M	0	0	8	3	0	9	S	S
B	**Y. Gold**	**Chk**	FM	W	Yel	4.5	M	H	6	0	0	0	0	9	S	S
B	MN 96013-1	G12	FM	Red	Yel-dk	2.5	L	0	6	0	0	0	0	9	S	S
B	MN 99460-14	G9	FM	Red	W	4.5	L	M	0	0	6	6	0	9	S	S
B	MN 00177-5	G8	FM	Red	W	5.0	L	M	0	0	0	0	6	9	S	S
B	ATMN 03505-3	G5	FM	Red	Cream	5.0	M	M	0	0	0	0	0	9	S	S
B	COMN 03019-4	G5	FM	Red	Cream	5.0	L	M	0	0	0	0	0	9	S	S
B	COMN 03020-3	G5	FM	Red	W	5.0	L	L	0	0	0	0	6	9	S	S
B	COMN 03021-1	G5	FM	Red	Cream	3.0	M	T	0	6	0	0	0	9	S	S
B	COMN 03024-6	G5	FM	Red	Cream	5.0	M	T	0	0	0	6	6	9	S	S
B	COMN 03027-1	G5	FM	Red	Cream	5.0	T	L	0	0	0	0	0	9	S	S
B	COMN 03030-1	G5	FM	Red	Cream	3.5	L	T	0	0	6	0	13	9	S	S
B	COMN 03035-5	G5	FM	Red	Cream	5.0	M	L	13	0	0	0	0	9	S	S
B	NDMN 03314-1	G5	FM	Red	Cream	4.5	L	L	0	0	0	0	31	9	S	S
B	NDMN 03316-3	G5	FM	Red	Cream	5.0	L	M	0	0	6	0	0	9	S	S
B	NDMN 03376-1	G5	FM	Red dk.	Cream	4.0	M	L	6	0	0	0	0	9	S	S
B	NDMN 03382-2	G5	FM	Red dk.	W	3.0	M	T	6	0	0	0	31	9	S	S
B	COMN 04668-01	G4	FM	Red	Cream	5.0	L	H	0	0	0	0	13	9	S	S
B	COMN 04670-02	G4	FM	Red	Cream	4.5	M	H	0	13	0	0	13	9	S	S
B	COMN 04697-02	G4	FM	Red	Cream	5.0	H	M	0	0	6	0	13	9	S	S
B	COMN 04699-05	G4	FM	Red	W	4.5	L	L	0	0	0	0	0	9	S	S
B	COMN 04778-02	G4	FM	Red	Cream	5.0	H	M	13	0	0	6	0	9	S	S

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab								Late Blight Resistance		
		2008		Color		Severity	C- Coverage		Internal Defects (%)					Avg.	Susc./Res.	
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	HH	IN	VD	BC	Bruises	Final	R1	R2
B	COMN 04779-01	G4	FM	Red	Cream	5.0	T	L	0	0	0	0	0	9	S	S
B	COMN 04779-02	G4	FM	Red	W	5.0	M	L	13	0	0	0	13	9	S	S
B	COMN 04780-01	G4	FM	Red	Cream	5.0	M	M	0	0	6	0	0	9	S	S
B	COMN 04780-06	G4	FM	Red	W	5.0	M	H	0	0	13	0	0	9	S	S
B	COMN 04781-04	G4	FM	Red	W	4.5	M	L	0	0	0	0	0	9	S	S
B	COMN 04782-01	G4	FM	Red	W	5.0	H	H	0	0	0	0	0	9	S	S
B	COMN 04782-04	G4	FM	Red	Cream	5.0	M	M	6	0	0	0	38	9	S	S
B	MN 04Morris-1	G4	FM	Red	W	5.0	L	L	0	0	0	0	44	9	S	S
B	NDMN 04916-01	G4	FM	Red	W	4.5	M	L	0	0	0	0	25	9	S	S
B	NDMN 04917-02	G4	FM	Red	W	3.5	L	L	0	0	0	0	0	9	S	S
B	NDMN 04917-03	G4	FM	Red	W	2.5	M	T	0	0	0	0	0	9	S	S
B	NDMN 04927-01	G4	FM	Red	Cream	3.0	M	M	0	6	0	0	0	9	S	S
B	NDMN 04978-01	G4	FM	Red	Cream	3.5	T	M	0	0	0	0	0	9	S	S
B	NDMN 04979-02	G4	FM	Red	W	5.0	L	L	0	0	0	0	6	9	S	S
B	MN 05001-002	G3	FM	Red	Cream	5.0	M	M	0	0	0	0	0	9	S	S
B	MN 05001-007	G3	FM	Red	Cream	5.0	T	L	0	0	13	0	0	9	S	S
B	MN 05001-017	G3	FM	Red	Cream	2.0	T	L	13	13	0	0	0	9	S	S
B	MN 05001-047	G3	FM	Dk. Red	Cream	4.0	M	M	0	0	6	0	0	9	S	S
B	MN 05001-051	G3	FM	Red	Yel	5.0	L	M	0	0	0	0	0	9	S	S
B	MN 05001-054	G3	FM	Red	Cream	4.0	M	L	0	0	25	0	6	9	S	S
B	MN 05001-088	G3	FM	Red	Yel	3.0	T	L	0	6	0	0	6	9	S	S
B	MN 05001-090	G3	FM	Red	W	5.0	L	M	0	0	6	0	0	9	S	S
B	MN 05001-094	G3	FM	Red	Yel	5.0	T	M	0	6	0	0	13	9	S	S
B	MN 05001-115	G3	FM	Red	Yel-dk.	3.0	T	M	0	0	6	0	0	9	S	S
B	MN 05001-127	G3	FM	Red	Yel-lt.	4.0	L	M	0	0	0	0	6	9	S	S
B	MN 05001-180	G3	FM	Red	W	0.5	0	T	0	0	0	0	6	9	S	S
B	MN 05001-197	G3	FM	Red	Cream	4.0	T	T	0	0	6	0	19	8.5	S	S

University of Minnesota Potato Breeding & Genetics 2008



Williston, ND; 3.5 Ac; Yield Trial (G2 – 15; 560 plots), G1 (860 Plots) & SH Selection Field

Grand Forks, ND; 3.5 Ac; Seed Increase (G2 – 15, 360 plots), G1 (860 plots) & SH Selection Field

Becker, MN; 4 Ac; Yield Trial (G2 – 15; 650 plots), G1 (860 Plots), SH Selection Field & Common Scab Plot (860 Plots)

Rosemount, MN; 2.5 Ac, Late Blight Trial (1529 Plots) & PVY/PLRV Trial (1835 Plots)





Minnesota Potato Breeding and Genetics 2008

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Breeding Objectives

Objective 1: Evaluate early & advanced breeding lines for fresh market, chip, & processing potential across potato growing environments and regions.
Objective 2: Identify cold chipping early in potato breeding generations.
Objective 3: Train graduate students in the field of plant genetics & breeding; specifically potato genetics.

Yield, Grade and Quality Evaluations – Breeding selections advancing in our program are compared to commercial cultivars in field trials at irrigated locations in Minnesota and North Dakota. Typical yield, grade, and quality information is collected throughout the growing season, at harvest & during post-harvest evaluations. This data includes emergence, plant maturity, stand, total and US #1 marketable and size distribution yield, percentage of U.S. No. 1 yield and graded defect weights (malformed tubers, severe growth cracking, etc.), specific gravity, incidence and type of internal and external defects, and processing color. Then, evaluate for storability and processing as determined after 3, 5-months storage at 40 and 45F.

Report Contents
The scope of this report is on the fresh market, chipping, & processing clones currently under evaluation in the Minnesota potato breeding program. The clones range from our most advanced (G10+) material to our earliest (G2) material that has advanced through previous selection processes.

This Potato Breeding and Genetics report has five (5) major sections:

1) Minnesota Table A. 2008. Location, planting, vine kill (Days after planting, DAP), and harvest (DAP) dates of MN research trials at irrigated and non-irrigated locations.
2) Minnesota Table B. 2008. Number of MN clonal selections and cultivars at replicated yield trial and disease resistance trial locations.
3) Minnesota Table 1.2008. Specific gravity, chip scores, & yields of B's, A's, & Culls from irrigated locations in Becker (B), MN & Williston (W), ND.
4) Minnesota Table 2.2008. Total yields, US #1's, & size distributions of US #1's from irrigated locations in Becker (B), MN & Williston (W), ND.
5) Minnesota Table 3.2008. Internal defects, Common Scab, & Late Blight readings.

Minnesota Table A. 2008. Location, planting, vine kill (Days after planting, DAP), and harvest (DAP) dates of MN research trials at irrigated and non-irrigated locations.

Location	Irrigation	Planted	Kill DAP	Harvest DAP
Becker, MN				
Late	Irrigated	23 April	127	140
Single Hills & G1's	Irrigated	17 May	116	130
Williston, ND	Irrigated	8 May	123	140
Single Hills, G1's	Irrigated	15 May	116	140
Grand Forks, ND – Seed increase	Non irrigated	23 June	120	120
Grand Forks, ND – Single hills, G1's	Non irrigated	23 June	120	120
Expr - PLRV / PVY – Rosemount, MN	Non irrigated	5 June	100	120
Late Blight – Rosemount, MN	Irrigated	5 June	90	110
C. Scab – Becker, MN	Irrigated	6 May	127	140
Vert. – Grand Forks	Non irrigated	Not planted in 2008		

Clonal Evaluations and Procedures

Minnesota Table B. 2008. Number of MN clonal selections and cultivars at replicated yield trial and disease resistance trial locations.

	Number of MN Clonal selections and cultivars					
	Stages of development [1]					
Clonal Market type	G6 – G15	G2 – G5	G1	Checks		Total
Chipping ;dual purpose whites	11	79	259	3	Atlantic, NorValley, Snowden	352
Processing; LW/Rus	5	154	355	2	R. Burbank, Shepody	516
Fresh; Red	3	99	246	4	R. Norkotah, Red Norland, Red Pontiac, Yukon Gold	352
NCR	FF	Chip	Fresh			
North Dakota	1	2	3			6

Wisconsin	2	2		4
Michigan		3	1	4
Canada; Did Not Participate				
Other Germplasm Enhancement	2	673	23	
Disease Screening Trials	Clones Screened			
Late Blight - Natl	43			43
Late Blight - Breeding	486			486
Late Blight - Family selection	518			518
PVY expression	388			388
C. Scab - Natl	20			20
C. Scab - Breeding	409			409
Vert	409			409
New hybrid generation (Single-hills)			90,000	

Project Description

The University of Minnesota potato breeding research is emphasizing the development, evaluation, and distribution of potato cultivars and germplasm with improved yield, quality, and disease resistance by developing new hybrid progenies and evaluating them in multiple dryland and irrigated locations. Post harvest storage and quality characterizations are performed from 40, 42, 45, and 48F throughout the 7 month storage season; focusing on sugar end and cold induced sweetening. The most advanced selections will be evaluated for Nitrogen use efficiency, N timing and spacing. Novel breeding methods and germplasm enhancement strategies are pursued to increase the efficiency of determining disease and pest resistance characterization early in the breeding effort. A focus is on foliar and tuber late blight, common scab, PVY and PLRV symptom expression, CPB, aphids, *Verticillium* wilt, and sugar end and cold induced sweetening.

Grand Forks, ND – Seed increase field. 360 - 1x40 hill plots. Evaluate 860 - 1x4 hill G1 plots for further selection. Evaluate ~30,000 single hills and select new hybrids from breeding crosses for marketing potential. Evaluate enhanced potato germplasm for improved yield, yield stability, and marketing quality. Characterize germplasm for resistance sugar end, cold induced sweetening and to *Verticillium* wilt.

Becker, MN – Evaluate 325 - 1x20 hill replicated yield plots for improved yield, processing, yield stability & marketing qualities. Evaluate 860 - 1x4 hill G1 plots for further selection. Evaluate ~30,000 single hills and select new hybrids from breeding crosses for marketing potential. Evaluate the North Central Regional Potato Variety Trial (NCRPVT) along with other US breeding program materials for the aforementioned qualities. Characterize germplasm for resistance to sugar end, cold induced sweetening and to common scab. Determine the Nitrogen use efficiency, N-timing, and spacing requirements of potato breeding lines advancing from the potato breeding program.

Rosemount, MN – Evaluate 468 - 1x4 hill replicated plots for late blight resistance along with 592 - 8 hill families for late blight resistance. Determine the occurrence of symptom-less expression to potato viruses $PVY^{O/N}$ in breeding populations, and breed for host plant resistance to potato viruses. Exploit novel breeding methods for determining genetic gain for late blight resistance earlier in breeding, and develop foliar and tuber late blight resistance germplasm. Determine genomic differences, identifying genes involved in the reproductive biology of potato, and analyze post-zygotic crossing barriers that inhibit gene introgression between wild *Solanum* species and cultivated potato for late blight resistance.

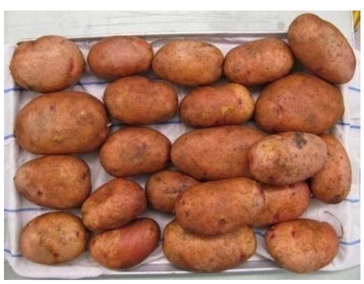
Williston, ND – Evaluate 280 - 1x20 hill replicated yield plots for improved yield, processing, yield stability & marketing qualities. Evaluate 860 - 1x4 hill G1 plots for further selection. Evaluate ~30,000 single hills and select new hybrids from breeding crosses for marketing potential. Characterize germplasm for resistance to sugar end, and cold induced sweetening.

Breeding for host plant resistance to potato pests and diseases

A breeder should not focus heavily first on disease and pest resistance, then marketability traits, or the reverse. A balanced approach is necessary since varieties having superior disease and pest resistance lacking marketability traits will be limited in commercial use, and varieties lacking disease and pest resistance will likely not sustain the viability of our industry. Most notable are susceptibilities to multiple diseases, pests, and viruses such as *Verticillium* wilt, late and early blight, storage rots *Fusarium* and *Erwinia*, common scab, Colorado potato beetle, green peach aphids, potato leafhoppers, and all common viruses. In the UM potato breeding program evaluations are made for resistance to multiple diseases and pests. We also evaluate germplasm from the north central region and other US breeding programs along with one (1) Canadian province. In UM breeding populations we apply EGS procedures to our screened population.

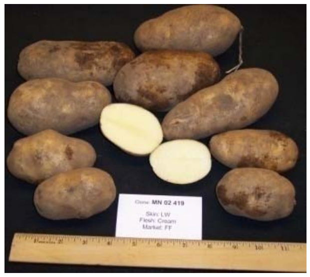
Promising UMN Clones:

1) MN 15620: Parentage: ♀MN 1006.81-4 x ♂MN 5.80-12; MN 15620 is an oblong light red tuber with an attractive yellow flesh. MN 15620 processes well out of 45F giving nice yellow French fries. It is also a good FM potato for boiling/mashing, holding its yellow color very well without fading or leaching.



This year, 2008, MN 15620 yielded 590 cwt in Becker, MN with 436 cwt (75%) being over 4 oz in weight & 404 cwt in Williston, ND with 342 cwt (80%) being over 4 oz. It's gravity of 1.078 is less than both that of Russet Burbank & Shepody, but processes better than both.

2) MN 02 419: Parentage: Uknown; MN 02 419 is a long white processor yielding less than Russet Burbank (690 , 492) at 418 cwt in Becker, MN & 319 cwt in Williston, ND. It has 80 & 84 % US #1's in Becker & Williston, respectively. 54 & 52% of MN 02 419 fall in the 4-10 oz size class in Becker & Williston, respectively. It processes from 45F better than Russet Burbank & Shepody. It's gravity of 1.085 is slightly better than either that of Russet Burbank or Shepody.




3) AOMN 03178-2: Parentage; ♀A92441-3 x ♂A93156-3; AOMN 03178-2 is a very attractive dual purpose russet that is suited for processing & fresh market use. It is a very uniformly shaped, blocky russet that performed well in both Becker, MN & Williston, ND. It is perhaps the most attractive russet in the University of Minnesota's program at this time. It's gravity of 1.081 is comparable to that of Russet Burbank & Shepody & much higher than that of Russet Norkotah. It yields less than Russet Burbank & Russet Norkotah. ~ 91% of AOMN 03178-2's tubers are US#1's in both Becker, MN & Williston, ND compared to the 80% for Russet Burbank & Russet Norkotah.

4) ATMN 03505-3: Parentage: ♀ A96741-2R x ♂ ND5256-7R; ATMN 03505-3 is a round to slightly oval red potato with excellent color and skin. It has smooth skin with cream colored flesh. Gravity of 1.069 is higher than either Red Norland or Red Pontiac. Even though it yields slightly less than Red Norland, its size distributions are very similar. In 2008 in Becker, MN it was very comparable to Red Norland.

5) COMN 03021-1: Parentage: ♀CO93037-6R x ♂Durango Red; COMN 03021-1 is a round oval bright red potato with excellent skin. It resists skinning, has shallow eyes & cream colored flesh. The tubers of COMN 03021-1 are small to medium, of uniform size & shape. It's gravity of 1.074 is much greather than Red Norland or Red Pontiac. ~ 55% of the tubers fall in the 4 – 10 oz range.

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	Size Distribution (cwtyld) ≥4<10 oz.	Size Distribution (cwtyld) ≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
Atlantic	B	Chk	C	W	Cream	1.092	5.5	9	23.4	60.2	228.4	248.1	60.2	476.5	560.0
Atlantic	W	Chk						4	4.0	31.4	121.0	142.1	31.4	263.1	298.5
NorValley	B	Chk	C	W	Cream	1.080	4.3	11	0.0	100.7	310.7	155.6	100.7	466.4	567.0
NorValley	W	Chk						8	9.0	58.4	246.2	131.7	58.4	377.9	445.2
Snowden	B	Chk	C	W	Cream	1.092	3.8	9	17.0	44.0	288.9	283.5	44.0	572.4	633.4
Snowden	W	Chk						7	0	36.3	223.3	228.7	36.3	452.0	488.3
MN 99380-1	B	G9	C/FM	W	Yel-dk	1.073	4.0	10	0.0	83.7	297.7	137.1	83.7	434.8	518.5
MN 99380-1	W	G9						6	0	75.1	161.0	18.5	75.1	179.5	254.6
MN 00467-4	B	G8	C	W	W	1.080	5.0	8	24.7	47.4	238.4	218.0	47.4	456.4	528.5
MN 00467-4	W	G8						6	16.0	38.3	205.4	99.1	38.3	304.5	358.8
DEM 7	B	G6	C	W	W	1.082	5.5	11	0.0	115.4	293.2	56.5	115.4	349.7	465.1
DEM 7	W	G6						10	1.4	106.2	228.3	72.4	106.2	300.8	408.3
MN 02 529	B	G6	C	W	W	1.079	6.3	9	0.0	70.3	292.1	116.9	70.3	409.0	479.3
MN 02 529	W	G6						5	0	38.9	105.8	145.2	38.9	250.9	289.8
MN 02 586	B	G6	C/FM	W	Yel-lt	1.078	5.0	14	13.2	157.7	358.2	42.8	157.7	401.0	571.9
MN 02 586	W	G6						11	0	117.3	260.5	42.9	117.3	303.4	420.7
MN 02 587	B	G6	C	W	W	1.085	5.5	16	29.9	216.3	271.9	29.5	216.3	301.4	547.6
MN 02 588	B	G6	C/FM	W	Yel-lt	1.086	4.0	13	15.8	139.8	349.1	53.4	139.8	402.5	558.1
MN 02 588	W	G6						8	7.4	67.3	219.5	89.8	67.3	309.4	384.1
MN 02 589	B	G6	C	W	W	1.082	3.5	10	8.3	124.1	251.4	42.3	124.1	293.8	426.1
MN 02 589	W	G6						8	3.4	94.3	211.5	10.1	94.3	221.5	319.2
MN 02 598	B	G6	C/FM	W	Yel-lt	1.084	4.8	14	14.6	129.5	413.8	86.2	129.5	500.0	644.1
MN 02 598	W	G6						9	0	84.1	245.7	43.3	84.1	289.0	373.0
MN 02 678	B	G6	C	W	W	1.076	4.5	9	0.0	125.5	176.8	68.1	125.5	244.9	370.4
MN 02 678	W	G6						6	2.5	53.8	169.2	145.8	53.8	315.0	371.3
MN 02 703	B	G6	C	W	W	1.078	3.0	7	0.0	98.8	84.5	16.0	98.8	100.6	199.4
MN 02 703	W	G6						3	0	42.6	42.5	0.0	42.6	42.5	85.1
COMN 03049-5	B	G5	C/FM	W	Yel-lt	1.059	7.5	11	44.6	112.9	333.2	96.8	112.9	429.9	587.4
COMN 03049-5	W	G5						6	14.4	46.1	152.3	188.8	46.1	341.1	401.5
COMN 03051-1	B	G5	C	W	Cream	1.077	6.3	11	4.1	124.4	252.0	57.8	124.4	309.8	438.3

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 03051-1	W	G5						5	0	62.2	128.8	14.7	62.2	143.5	205.7
NDMN 03324-4	B	G5	C	W	Cream	1.086	3.0	13	5.2	115.7	365.8	127.9	115.7	493.7	614.6
NDMN 03324-4	W	G5						8	4.7	69.2	232.5	135.3	69.2	367.8	441.7
NDMN 03333-1	B	G5	C	W	W	1.079	3.8	7	4.3	51.5	232.4	84.4	51.5	316.7	372.5
NDMN 03333-1	W	G5						5	0	40.9	127.0	64.6	40.9	191.5	232.4
NDMN 03333-2	B	G5	C	W	W	1.067	5.0	6	13.6	50.9	205.6	92.1	50.9	297.8	362.3
NDMN 03333-2	W	G5						4	0	23.5	130.4	127.8	23.5	258.2	281.8
NDMN 03339-4	B	G5	C	W	Cream	1.091	4.0	8	2.7	57.6	273.9	107.5	57.6	381.4	441.7
NDMN 03339-4	W	G5						6	0	48.1	146.5	146.4	48.1	292.9	340.9
NDMN 03410-2	B	G5	C	W	Cream	1.075	5.0	11	0.0	174.1	131.3	9.8	174.1	141.1	315.2
NDMN 03410-2	W	G5						7	0	84.0	131.6	9.7	84.0	141.3	225.4
COMN 04651-03	B	G4	C	W	Cream	1.083	6.5	14	17.2	191.1	192.9	80.6	191.1	273.5	481.8
COMN 04651-03	W	G4						9	0	106.5	205.9	62.2	106.5	268.1	374.6
COMN 04659-06	B	G4	C	W	Cream	1.077	6.5	8	0.0	30.6	205.8	369.1	30.6	575.0	605.6
COMN 04659-06	W	G4						5	0	19.9	154.5	175.4	19.9	329.9	349.8
COMN 04674-02	B	G4	C	W	Cream	1.081	7.0	7	42.8	33.9	231.2	255.1	33.9	486.3	562.9
COMN 04674-02	W	G4						5	0	26.5	163.4	194.1	26.5	357.4	383.9
COMN 04696-01	B	G4	C	W	W	1.076	4.0	10	19.7	128.8	215.2	53.6	128.8	268.8	417.3
COMN 04696-01	W	G4						7	0.8	52.9	200.3	107.4	52.9	307.7	361.5
COMN 04788-02	B	G4	C	W	W	1.073	3.0	7	3.8	91.0	146.9	16.9	91.0	163.8	258.6
COMN 04788-02	W	G4						6	0	71.1	145.4	19.5	71.1	164.9	236.0
COMN 04788-03	B	G4	C	W	Cream	1.072	7.0	12	0.0	156.6	261.9	35.4	156.6	297.3	453.9
COMN 04788-03	W	G4						10	0	117.0	250.8	32.0	117.0	282.7	399.7
COMN 04788-04	B	G4	C	W	Cream	1.076	4.8	11	1.5	164.8	156.5	14.4	164.8	170.9	337.3
COMN 04788-04	W	G4						9	0	103.7	191.4	8.0	103.7	199.4	303.0
COMN 04788-05	B	G4	C	W	Cream	1.080	3.0	11	2.3	158.1	191.1	0.0	158.1	191.1	351.6
COMN 04788-05	W	G4						6	0	81.9	100.4	15.4	81.9	115.8	197.7
COMN 04788-09	B	G4	C	W	W	1.084	4.0	10	21.0	139.3	158.1	25.8	139.3	183.8	344.1
COMN 04788-09	W	G4						8	0	124.2	122.9	26.3	124.2	149.2	273.4
COMN 04788-10	B	G4	C	W	W	1.077	3.3	9	0.0	107.7	203.6	30.0	107.7	233.6	341.3
COMN 04788-10	W	G4						8	0	98.6	167.4	28.8	98.6	196.2	294.8

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
NDMN 04905-02	B	G4	C	W	Cream	1.072	5.5	9	4.8	98.1	247.2	44.4	98.1	291.7	394.7
NDMN 04905-02	W	G4						6	3.9	52.4	200.2	72.8	52.4	273.0	329.3
NDMN 04905-04	B	G4	C	W	W	1.088	5.0	8	0.5	67.6	238.7	74.2	67.6	312.9	381.0
NDMN 04905-04	W	G4						7	5.6	85.8	177.1	45.8	85.8	222.9	314.3
NDMN 04905-06	B	G4	C	W	Cream	1.073	6.0	5	2.0	23.8	131.1	128.8	23.8	260.0	285.7
NDMN 04905-06	W	G4						3	6.5	20.0	93.3	39.0	20.0	132.3	158.8
NDMN 04905-13	B	G4	C	W	W	1.084	3.5	15	0.0	219.9	245.6	11.0	219.9	256.6	476.5
NDMN 04905-13	W	G4						10	0	170.6	92.8	15.5	170.6	108.3	278.9
NDMN 04905-14	B	G4	C	W	W	1.079	5.3	8	0.0	78.9	235.0	37.8	78.9	272.8	351.8
NDMN 04905-14	W	G4						6	0	73.1	163.1	42.9	73.1	206.0	279.1
NDMN 04910-01	B	G4	C	W	Cream	1.089	4.0	15	13.4	150.5	454.2	123.3	150.5	577.5	741.5
NDMN 04910-01	W	G4						11	2.6	127.4	281.4	36.8	127.4	318.2	448.2
NDMN 04960-01	B	G4	C	W	W	1.095	3.5	12	13.3	147.1	295.3	56.6	147.1	351.9	512.3
NDMN 04960-01	W	G4						8	0	82.0	211.9	83.9	82.0	295.8	377.8
NDMN 04961-01	B	G4	C	W	W	1.076	4.5	6	38.5	45.8	148.3	93.2	45.8	241.5	325.8
NDMN 04961-01	W	G4						6	43.5	48.8	157.6	121.2	48.8	278.9	371.1
NDMN 04964-01	B	G4	C	W	Cream	1.075	5.8	10	8.0	136.9	198.1	58.0	136.9	256.1	401.0
NDMN 04964-01	W	G4						6	0	54.4	194.2	53.0	54.4	247.3	301.7
USDAWIMN 04060-1	B	G4	C	W	Cream	1.102	6.0	11	5.5	125.8	291.4	55.5	125.8	346.8	478.2
USDAWIMN 04060-1	W	G4						7	4.6	83.2	191.6	21.8	83.2	213.4	301.2
WIMN 04836-01	B	G4	C	W	W	1.072	5.8	10	0.0	87.3	290.6	123.6	87.3	414.2	501.4
WIMN 04836-01	W	G4						5	0	54.8	116.8	47.8	54.8	164.5	219.4
WIMN 04836-02	B	G4	C	W	W	1.072	4.3	6	20.2	55.5	135.7	111.4	55.5	247.1	322.8
WIMN 04836-02	W	G4						6	2.4	40.5	173.5	102.7	40.5	276.1	319.0
WIMN 04837-01	B	G4	C	W	Cream	1.080	3.0	7	17.0	69.0	158.3	115.4	69.0	273.7	359.7
WIMN 04837-01	W	G4						6	0	63.2	168.5	68.1	63.2	236.6	299.8
WIMN 04844-01	B	G4	C	W	Cream	1.085	4.0	11	0.0	86.7	316.7	128.0	86.7	444.7	531.4
WIMN 04844-01	W	G4						10	0	109.0	231.5	59.9	109.0	291.4	400.4
WIMN 04844-03	B	G4	C/FM	W	Yel	1.071	5.8	10	0.0	101.4	235.0	89.8	101.4	324.9	426.3
WIMN 04844-03	W	G4						7	0	69.6	189.5	82.3	69.6	271.8	341.3
WIMN 04844-06	B	G4	C	W	Cream	1.080	5.0	10	7.6	107.4	233.6	169.3	107.4	402.9	517.9
WIMN 04844-06	W	G4						7	0	40.8	205.0	197.2	40.8	402.3	443.1

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
WIMN 04844-07	B	G4	C/FM	W	Yel	1.078	4.0	8	0.0	84.1	201.2	37.9	84.1	239.1	323.2
WIMN 04844-07	W	G4						5	0	57.9	134.2	48.1	57.9	182.4	240.3
WIMN 04844-12	B	G4	C/FM	W	Yel-dk.	1.076	6.0	6	59.5	67.0	150.7	49.1	67.0	199.8	326.3
WIMN 04844-12	W	G4						7	1.8	82.3	147.8	48.2	82.3	196.0	280.1
WIMN 04854-07	B	G4	C	W	Cream	1.098	3.5	9	9.6	95.7	268.3	25.7	95.7	293.9	399.3
WIMN 04854-07	W	G4						8	0	104.1	146.4	18.9	104.1	165.2	269.3
WIMN 04855-02	B	G4	C	W	Cream	1.082	5.0	7	1.0	38.9	216.6	277.9	38.9	494.5	534.3
WIMN 04855-02	W	G4						5	4.5	29.0	162.7	255.5	29.0	418.2	451.7
WIMN 04866-02	B	G4	C	W	Cream	1.085	3.8	11	0.0	109.3	299.9	188.6	109.3	488.5	597.9
WIMN 04866-02	W	G4						6	3.9	48.4	181.2	94.5	48.4	275.7	328.1
MN 05001-151	B	G3	C	W	W	1.098	6.0	13	6.1	151.1	301.1	34.6	151.1	335.7	492.9
MN 05001-151	W	G3						8	0	90.1	218.2	25.9	90.1	244.1	334.2
MN 05001-156	B	G3	C	W	Cream	1.079	6.0	11	16.4	114.2	305.9	51.1	114.2	356.9	487.6
MN 05001-156	W	G3						8	14.0	63.9	236.9	66.9	63.9	303.8	381.8
MN 05001-166	B	G3	C	W	Yel	1.072	5.0	7	27.6	27.0	257.2	269.9	27.0	527.1	581.7
MN 05001-166	W	G3						5	0	26.9	179.2	186.0	26.9	365.3	392.2
MN 05001-171	B	G3	C	W	Cream	1.074	5.5	10	0.0	75.8	350.6	102.0	75.8	452.7	528.5
MN 05001-171	W	G3						7	0	64.7	211.9	56.3	64.7	268.2	332.9
MN 05001-186	B	G3	C	W	Cream	1.037	6.0	12	0.0	173.9	208.2	10.9	173.9	219.2	393.0
MN 05001-186	W	G3						9	0	136.4	119.3	4.6	136.4	123.9	260.3
MN 05001-189	B	G3	C	W	W	1.082	5.5	8	0.0	69.9	249.2	82.1	69.9	331.3	401.2
MN 05001-189	W	G3						6	0	67.9	155.7	25.7	67.9	181.4	249.4
MN 05001-192	B	G3	C	W	Cream	1.081	4.8	7	8.9	49.3	247.7	145.1	49.3	392.8	451.0
MN 05001-192	W	G3						4	5.7	27.3	114.7	132.7	27.3	247.4	280.4
AOMN 06091-01	B	G2	C	W	Cream	1.082	8.0	10	19.7	122.6	229.2	70.2	122.6	299.4	441.6
AOMN 06091-01	W	G2						5	2.2	35.5	117.2	69.2	35.5	186.4	224.1
AOMN 06108-01	B	G2	C	W	Cream	1.072	6.0	6	0.0	33.5	260.4	88.4	33.5	348.8	382.3
AOMN 06108-01	W	G2						4	0	18.2	77.0	193.8	18.2	270.8	289.0
AOMN 06149-01	B	G2	C	W	W	1.072	5.5	20	9.1	239.5	471.3	104.7	239.5	576.0	824.6
AOMN 06149-01	W	G2						14	0	157.0	313.6	143.3	157.0	456.9	613.9
AOMN 06149-04	B	G2	C/FM	W	Yel-lt.	1.084	4.0	13	0.0	163.9	264.2	35.5	163.9	299.7	463.5

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
AOMN 06149-04	W	G2						8	0	111.9	168.0	35.9	111.9	203.8	315.7
AOMN 06150-02	B	G2	C	W	Cream	1.085	5.5	17	0.0	217.7	406.3	46.5	217.7	452.8	670.6
AOMN 06150-02	W	G2						12	0	162.7	236.6	15.4	162.7	252.0	414.8
AOMN 06150-03	B	G2	C	W	Cream	1.079	5.0	19	0.0	272.3	311.5	36.0	272.3	347.5	619.9
AOMN 06150-03	W	G2						13	0	219.1	105.0	19.6	219.1	124.5	343.7
COMN 06318-02	B	G2	C	W	Cream	1.061	5.5	12	0.0	139.7	305.5	26.2	139.7	331.7	471.4
COMN 06318-02	W	G2						8	0	71.8	203.7	84.7	71.8	288.3	360.1
COMN 06334-01	B	G2	C/FM	W	Yel-dk.	1.090	5.5	11	0.0	99.4	314.8	34.5	99.4	349.3	448.8
COMN 06334-01	W	G2						7	0	69.6	167.0	92.8	69.6	259.7	329.4
COMN 06344-01	B	G2	C/FM	W	Yel	1.082	7.0	13	0.0	153.3	340.2	44.0	153.3	384.2	537.5
COMN 06344-01	W	G2						8	0	76.5	216.6	132.2	76.5	348.8	425.3
COMN 06350-01	B	G2	C	W	W	1.087	5.0	17	2.2	258.4	346.2	12.2	258.4	358.4	619.1
COMN 06350-01	W	G2						12	72.6	140.5	308.9	52.1	140.5	361.0	574.1
COMN 06354-04	B	G2	C	W	Cream	1.080	6.0	13	0.0	141.9	342.5	63.2	141.9	405.7	547.6
COMN 06354-04	W	G2						9	8.7	97.3	242.8	50.8	97.3	293.6	399.6
COMN 06355-02	B	G2	C/FM	W	Yel-dk.	1.082	6.5	18	0.0	268.5	302.3	14.8	268.5	317.1	585.6
COMN 06355-02	W	G2						7	20.7	76.7	164.0	26.1	76.7	190.1	287.4
COMN 06355-03	B	G2	C	W	Cream	1.077	7.5	25	14.3	361.5	467.4	9.7	361.5	477.2	852.9
COMN 06355-03	W	G2						10	0	69.5	320.8	151.9	69.5	472.7	542.3
COMN 06358-04	B	G2	C/FM	W	Yel-dk.	1.065	7.0	19	0.0	170.0	618.3	121.6	170.0	739.9	910.0
COMN 06358-04	W	G2						9	4.5	62.4	289.7	155.3	62.4	445.1	511.9
COMN 06427-02	B	G2	C	W	W	1.082	6.0	13	0.0	171.6	256.0	11.6	171.6	267.7	439.3
COMN 06427-02	W	G2						7	2.3	80.7	131.0	22.9	80.7	153.9	237.0
COMN 06460-03	B	G2	C	W	Cream	1.067	5.0	10	0.0	89.9	338.9	40.9	89.9	379.8	469.6
COMN 06460-03	W	G2						6	0	57.1	186.3	63.2	57.1	249.5	306.6
COMN 06471-02	B	G2	C/FM	W	Yel	1.080	4.5	18	0.0	249.9	390.0	30.9	249.9	420.9	670.8
COMN 06471-02	W	G2						10	2.0	115.9	223.3	61.2	115.9	284.5	402.4
MN 061916-01	B	G2	C	W	Cream	1.085	6.0	14	0.0	221.1	249.6	48.3	221.1	297.9	519.0
MN 061916-01	W	G2						8	0	114.9	155.0	33.5	114.9	188.4	303.4
MN 061916-02	B	G2	C	W	Cream	1.085	5.5	18	0.0	222.2	377.2	63.5	222.2	440.8	663.0
MN 061916-02	W	G2						9	0	106.3	226.5	31.9	106.3	258.5	364.8
WIMN 06010-01	B	G2	C	W	W	1.083	5.5	11	42.0	124.7	237.4	133.4	124.7	370.8	537.5

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
WIMN 06010-01	W	G2						7	0	61.9	165.7	109.1	61.9	274.8	336.7
WIMN 06010-04	B	G2	C	W	W	1.076	6.0	8	7.2	79.9	217.4	78.6	79.9	296.0	383.2
WIMN 06010-04	W	G2						4	23.6	34.5	109.8	44.6	34.5	154.4	212.4
WIMN 06014-01	B	G2	C	W	Cream	1.053	6.0	14	0.0	119.4	434.4	118.4	119.4	552.8	672.2
WIMN 06014-01	W	G2						10	0	106.4	248.2	55.5	106.4	303.7	410.1
WIMN 06014-02	B	G2	C	W	W	1.079	7.0	8	0.0	66.2	168.4	198.4	66.2	366.8	433.0
WIMN 06014-02	W	G2						4	0	42.1	120.0	27.0	42.1	147.0	189.1
WIMN 06014-03	B	G2	C	W	Cream	1.072	4.0	12	0.0	140.1	260.4	21.6	140.1	281.9	422.1
WIMN 06014-03	W	G2						6	0	79.6	127.7	45.4	79.6	173.1	252.8
WIMN 06018-01	B	G2	C	W	W	1.091	6.0	0	278.9	0.0	0.0	0.0	0.0	0.0	278.9
WIMN 06018-01	W	G2						6	0	60.2	130.6	30.8	60.2	161.4	221.7
WIMN 06024-03	B	G2	C	W	Cream	1.071	5.0	7	0.0	67.3	222.6	23.1	67.3	245.7	313.0
WIMN 06024-03	W	G2						4	0	37.1	143.2	32.6	37.1	175.8	212.9
WIMN 06035-01	B	G2	C	W	Cream	1.082	5.0	11	3.3	103.7	356.1	97.7	103.7	453.7	560.8
WIMN 06035-01	W	G2						6	0	46.1	174.6	66.7	46.1	241.3	287.4
WIMN 06035-06	B	G2	C	W	W	1.090	5.0	14	0.0	159.0	327.0	125.9	159.0	452.9	612.0
WIMN 06035-06	W	G2						7	0	57.3	235.3	66.8	57.3	302.1	359.4
WIMN 06036-01	B	G2	C	W	Cream	1.085	6.0	11	12.8	60.1	277.9	402.5	60.1	680.4	753.4
WIMN 06036-01	W	G2						5	38.7	22.8	111.8	234.1	22.8	345.9	407.4
WIMN 06036-03	B	G2	C	W	W	1.103	5.0	12	0.0	147.7	334.6	22.6	147.7	357.2	504.9
WIMN 06036-03	W	G2						8	0	84.6	180.4	74.0	84.6	254.4	339.0
WIMN 06061-02	B	G2	C	W	Cream	1.080	4.0	14	0.0	200.8	249.1	29.6	200.8	278.7	479.5
WIMN 06061-02	W	G2						8	0	108.4	166.3	16.7	108.4	183.0	291.4
WIMN 06063-04	B	G2	C	W	W	1.091	5.5	12	0.0	122.6	394.1	20.6	122.6	414.7	537.3
WIMN 06063-04	W	G2						8	0	72.2	250.6	77.3	72.2	327.9	400.1
WIMN 06063-06	B	G2	C	W	Cream	1.086	3.0	10	27.1	90.2	283.5	121.9	90.2	405.4	522.7
WIMN 06063-06	W	G2						8	0	80.1	214.7	49.0	80.1	263.7	343.8
WIMN 06064-06	B	G2	C	W	Cream	1.084	4.0	18	0.0	302.3	190.4	5.5	302.3	195.9	498.2
WIMN 06064-06	W	G2						9	0	146.2	117.7	5.4	146.2	123.1	269.3
R. Burbank	B	Chk	FF	Rus	Cream	1.084	7.0	13	17.2	112.3	359.5	200.5	112.3	559.9	689.4
R. Burbank	W	Chk						8	33.7	61.9	275.4	121.2	61.9	396.5	492.2

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
Shepody	B	Chk	FF	LW	W	1.083	6.6	8	67.5	40.6	248.2	330.1	40.6	578.3	686.4
Shepody	W	Chk						5	15.4	20.8	105.6	384.3	20.8	489.9	526.0
MN 15620	B	G15	FF	Red	Yel	1.078	5.0	13	11.2	142.7	352.0	84.0	142.7	436.0	590.0
MN 15620	W	G15						6	19.5	42.2	166.6	175.3	42.2	341.9	403.6
MN 19350	B	G15	FF	W	W	1.080	6.3	9	0.0	102.7	264.0	44.1	102.7	308.1	410.8
MN 19350	W	G15						7	0	64.7	184.4	61.6	64.7	246.0	310.6
MN 19470	B	G15	FF	LW	W	1.077	6.8	6	2.1	37.7	208.9	113.6	37.7	322.5	362.3
MN 19470	W	G15						5	0	39.2	118.0	108.9	39.2	226.9	266.1
MN 18710	B	G15	FF/FM	Rus	W	1.077	7.3	8	1.3	73.1	223.5	105.1	73.1	328.6	402.9
MN 18710	W	G15						5	1.7	38.4	166.7	90.9	38.4	257.6	297.8
MN 02 419	B	G6	FF	LW	Cream	1.085	6.3	8	11.1	82.5	223.6	101.1	82.5	324.7	418.3
MN 02 419	W	G6						6	5.3	51.8	165.7	96.3	51.8	262.0	319.1
AOMN 03178-2	B	G5	FF	Rus lt.	W	1.081	5.8	7	0.0	43.7	257.8	149.2	43.7	407.1	450.7
AOMN 03178-2	W	G5						6	2.0	31.1	188.8	196.6	31.1	385.4	418.4
AOMN 041027-01	B	G4	FF	Rus-lt	Cream	1.086	7.0	7	0.0	72.6	179.8	26.5	72.6	206.3	279.0
AOMN 041027-01	W	G4						4	0	27.2	141.6	77.6	27.2	219.1	246.3
AOMN 041050-02	B	G4	FF	Rus-lt	Cream	1.079	4.0	7	18.6	40.1	225.5	146.8	40.1	372.3	431.0
AOMN 041050-02	W	G4						5	3.6	26.5	194.2	105.5	26.5	299.7	329.8
AOMN 041070-01	B	G4	FF	Rus	Cream	1.078	7.0	7	2.6	72.1	155.0	73.3	72.1	228.3	303.0
AOMN 041070-01	W	G4						6	14.1	39.7	180.9	94.4	39.7	275.3	329.1
AOMN 041093-01	B	G4	FF	Rus-lt	W	1.068	7.8	7	19.6	38.5	169.7	260.4	38.5	430.1	488.2
AOMN 041093-01	W	G4						5	8.3	35.8	157.7	84.0	35.8	241.7	285.8
AOMN 041101-01	B	G4	FF	LW	W	1.076	7.3	8	8.9	30.2	251.9	300.2	30.2	552.0	591.1
AOMN 041101-01	W	G4						6	3.7	29.0	170.1	278.0	29.0	448.1	480.7
AOMN 041115-02	B	G4	FF	LW	Cream	1.070	6.3	7	0.0	57.7	204.6	122.0	57.7	326.6	384.3
AOMN 041115-02	W	G4						5	8.2	21.8	132.9	241.3	21.8	374.2	404.3
AOMN 041127-01	B	G4	FF	Rus-lt	Cream	1.087	6.0	9	9.7	89.7	228.8	158.7	89.7	387.6	486.9
AOMN 041127-01	W	G4						8	0	70.2	214.3	129.9	70.2	344.2	414.4
AOMN 041138-01	B	G4	FF	Rus	W	1.072	7.0	13	1.9	183.6	253.2	26.5	183.6	279.8	465.3
AOMN 041138-01	W	G4						8	3.6	76.2	212.2	63.6	76.2	275.8	355.6

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

									Culls	Size Distribution (cwtyld)			B's	A's	T. Yld
Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Cwtyld	<4oz.	≥4<10 oz.	≥10 oz.	< 4 oz.	≥4 oz.	Cwtyld
COMN 04654-03	B	G4	FF	LW	Cream	1.081	7.0	14	14.6	163.1	330.8	101.1	163.1	432.0	609.7
COMN 04654-03	W	G4						8	8.7	92.5	224.5	44.2	92.5	268.7	370.0
COMN 04659-02	B	G4	FF	LW	Cream	1.083	5.5	8	0.0	48.5	278.8	98.2	48.5	376.9	425.4
COMN 04659-02	W	G4						6	0	59.4	206.8	32.2	59.4	239.0	298.4
COMN 04659-05	B	G4	FF	LW	Cream	1.084	7.0	12	62.4	131.3	294.0	105.0	131.3	399.0	592.7
COMN 04659-05	W	G4						8	0	66.3	212.3	116.4	66.3	328.8	395.0
COMN 04684-01	B	G4	FF	Rus	Cream	1.080	6.8	9	12.3	89.9	220.4	71.1	89.9	291.4	393.6
COMN 04684-01	W	G4						6	2.0	51.9	191.9	55.1	51.9	247.0	301.0
COMN 04686-02	B	G4	FF	LW	W	1.078	5.8	8	1.8	69.9	256.5	60.9	69.9	317.5	389.3
COMN 04686-02	W	G4						5	0	25.0	174.5	150.4	25.0	324.9	349.9
COMN 04692-05	B	G4	FF	Rus-lt	Cream	1.082	4.8	9	0.0	98.5	232.5	80.7	98.5	313.1	411.6
COMN 04692-05	W	G4						7	6.1	80.2	148.1	71.9	80.2	220.0	306.3
COMN 04692-10	B	G4	FF	Rus	Cream	1.069	4.5	9	3.1	99.2	227.7	40.5	99.2	268.2	370.4
COMN 04692-10	W	G4						7	2.8	50.3	205.4	96.3	50.3	301.6	354.7
COMN 04692-11	B	G4	FF	Rus	Cream	1.081	6.3	5	2.0	24.8	175.6	164.1	24.8	339.7	366.6
COMN 04692-11	W	G4						4	4.3	26.2	126.9	97.7	26.2	224.6	255.1
COMN 04702-01	B	G4	FF	Rus	W	1.072	7.3	7	0.0	53.3	197.8	173.1	53.3	370.9	424.2
COMN 04702-01	W	G4						4	0	22.4	157.4	64.6	22.4	221.9	244.3
COMN 04702-03	B	G4	FF	Rus	Cream	1.073	6.5	7	0.0	44.0	218.8	210.4	44.0	429.2	473.2
COMN 04702-03	W	G4						4	0	14.2	124.6	210.6	14.2	335.2	349.3
COMN 04702-05	B	G4	FF	Rus	W	1.069	6.0	4	4.1	24.7	157.2	92.2	24.7	249.4	278.2
COMN 04702-05	W	G4						3	0	8.0	82.9	132.6	8.0	215.5	223.5
COMN 04702-08	B	G4	FF	Rus	Cream	1.064	7.5	9	6.9	76.4	255.2	201.3	76.4	456.5	539.8
COMN 04702-08	W	G4						7	7.3	51.8	240.8	103.8	51.8	344.6	403.8
COMN 04702-09	B	G4	FF	Rus	Cream	1.077	6.8	9	8.4	88.1	239.6	46.4	88.1	285.9	382.4
COMN 04702-09	W	G4						6	0	79.9	141.7	4.6	79.9	146.3	226.2
COMN 04702-11	B	G4	FF	Rus	W	1.067	7.0	6	5.5	44.4	205.5	64.4	44.4	269.8	319.8
COMN 04702-11	W	G4						5	0	31.7	167.4	39.8	31.7	207.2	238.9
COMN 04702-14	B	G4	FF	Rus	Cream	1.072	6.8	8	0.0	42.9	209.1	316.4	42.9	525.5	568.4
COMN 04702-14	W	G4						5	0	32.0	185.2	68.3	32.0	253.4	285.4
COMN 04702-16	B	G4	FF	Rus	Cream	1.068	6.3	10	3.8	101.4	286.7	63.3	101.4	350.1	455.3
COMN 04702-16	W	G4						6	0	55.6	213.2	30.2	55.6	243.4	299.0

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 04704-01	B	G4	FF	Rus	W	1.069	6.5	11	0.0	121.1	284.8	112.3	121.1	397.1	518.2
COMN 04704-01	W	G4						4	4.8	43.6	115.3	48.6	43.6	163.9	212.3
COMN 04712-01	B	G4	FF	Rus-lt	W	1.070	8.3	9	52.2	61.1	256.6	286.6	61.1	543.2	656.4
COMN 04712-01	W	G4						7	35.7	47.9	211.9	147.3	47.9	359.2	442.7
COMN 04713-03	B	G4	FF	Rus	Cream	1.077	6.5	11	4.2	96.2	323.5	156.6	96.2	480.1	580.4
COMN 04713-03	W	G4						6	7.2	61.5	166.7	103.6	61.5	270.3	338.9
COMN 04723-01	B	G4	FF	Rus	W	1.082	7.0	7	49.1	53.9	196.3	135.2	53.9	331.4	434.4
COMN 04723-01	W	G4						4	37.9	16.4	125.9	176.2	16.4	302.1	356.3
COMN 04733-01	B	G4	FF	Rus	Cream	1.075	7.5	8	5.1	61.3	270.2	121.1	61.3	391.2	457.7
COMN 04733-01	W	G4						6	0	34.3	198.4	76.4	34.3	274.8	309.1
COMN 04733-02	B	G4	FF	Rus	Cream	1.071	7.0	4	0.0	18.2	128.5	241.8	18.2	370.3	388.5
COMN 04733-02	W	G4						4	0	15.9	95.3	204.4	15.9	299.7	315.6
COMN 04744-01	B	G4	FF	Rus	Yel	1.083	5.5	6	1.1	62.3	143.0	137.4	62.3	280.4	343.8
COMN 04744-01	W	G4						5	0	40.7	146.8	52.1	40.7	198.9	239.6
COMN 04747-01	B	G4	FF	Rus	Cream	1.065	5.8	5	0.0	33.9	117.9	213.9	33.9	331.8	365.7
COMN 04747-01	W	G4						4	0	25.8	114.7	180.2	25.8	294.9	320.6
COMN 04756-04	B	G4	FF	Rus-lt	Cream	1.085	7.0	12	12.3	127.9	349.3	59.1	127.9	408.4	548.6
COMN 04756-04	W	G4						7	0	54.0	245.0	98.5	54.0	343.5	397.5
COMN 04759-03	B	G4	FF	Rus	Cream	1.085	6.0	10	2.2	102.5	267.6	77.1	102.5	344.7	449.4
COMN 04759-03	W	G4						7	4.1	66.3	188.2	50.6	66.3	238.8	309.2
COMN 04760-01	B	G4	FF	Rus	W	1.059	6.0	12	0.0	154.3	277.6	30.4	154.3	308.0	462.3
COMN 04760-01	W	G4						6	0	63.7	192.4	24.6	63.7	217.0	280.7
COMN 04787-04	B	G4	FF	Rus-lt	W	1.074	3.0	8	24.0	46.4	246.7	216.8	46.4	463.6	534.0
COMN 04787-04	W	G4						6	4.8	38.6	218.5	129.8	38.6	348.2	391.7
NDMN 04871-01	B	G4	FF	Rus	Cream	1.083	6.8	6	29.4	41.7	165.1	248.7	41.7	413.9	485.0
NDMN 04871-01	W	G4						4	0	23.8	113.4	134.8	23.8	248.3	272.1
NDMN 04938-01	B	G4	FF	LW	Cream	1.083	4.5	9	16.3	67.3	277.9	180.2	67.3	458.0	541.5
NDMN 04938-01	W	G4						7	3.0	65.6	186.2	124.6	65.6	310.8	379.3
NDMN 04964-04	B	G4	FF	LW	W	1.071	3.8	8	2.8	57.1	258.3	116.3	57.1	374.6	434.4
NDMN 04964-04	W	G4						7	0	48.0	189.8	140.9	48.0	330.7	378.7
WIMN 04860-01	B	G4	FF	LW	W	1.094	3.0	8	0.0	46.5	268.7	148.1	46.5	416.8	463.3
WIMN 04860-01	W	G4						4	12.2	27.5	124.3	160.2	27.5	284.5	324.2

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
MN 05001-018	B	G3	FF	Rus	Cream	1.078	7.0	13	1.6	154.8	258.9	144.9	154.8	403.9	560.3
MN 05001-018	W	G3						9	8.0	80.3	259.9	84.0	80.3	343.9	432.2
MN 05001-027	B	G3	FF	Rus	Cream	1.073	7.0	6	0.0	33.4	162.5	159.0	33.4	321.4	354.9
MN 05001-027	W	G3						3	0	21.4	84.7	120.1	21.4	204.8	226.2
MN 05001-028	B	G3	FF	Rus	W	1.084	6.5	9	0.0	81.4	302.5	62.6	81.4	365.1	446.5
MN 05001-028	W	G3						5	0	33.3	161.7	99.0	33.3	260.6	293.9
MN 05001-031	B	G3	FF	Rus	Cream	1.094	5.3	6	1.5	20.3	194.5	249.8	20.3	444.3	466.1
MN 05001-031	W	G3						4	0	14.2	92.1	229.1	14.2	321.2	335.3
MN 05001-032	B	G3	FF	Rus	W	1.091	4.0	9	6.7	100.4	236.3	59.4	100.4	295.7	402.8
MN 05001-032	W	G3						6	0	65.7	127.0	43.5	65.7	170.4	236.1
MN 05001-033	B	G3	FF	Rus	Cream	1.087	5.8	6	2.8	19.4	206.9	264.6	19.4	471.4	493.6
MN 05001-033	W	G3						4	131.3	12.1	82.7	283.6	12.1	366.3	509.7
MN 05001-036	B	G3	FF	Rus	Cream	1.072	7.0	9	18.2	51.3	320.5	168.1	51.3	488.6	558.1
MN 05001-036	W	G3						6	2.1	45.0	190.6	127.9	45.0	318.5	365.6
MN 05001-074	B	G3	FF	Rus	Cream	1.082	6.0	6	7.7	29.8	204.2	239.7	29.8	444.0	481.4
MN 05001-074	W	G3						4	7.8	19.1	124.3	221.4	19.1	345.8	372.6
MN 05001-092	B	G3	FF	Rus	Cream	1.086	5.8	9	0.0	70.4	254.3	159.9	70.4	414.2	484.6
MN 05001-092	W	G3						5	3.3	24.7	149.0	174.3	24.7	323.3	351.2
MN 05001-095	B	G3	FF	Rus	Cream	1.077	6.3	9	0.0	88.2	255.4	136.6	88.2	392.0	480.2
MN 05001-095	W	G3						6	4.2	43.1	204.4	76.8	43.1	281.2	328.5
MN 05001-096	B	G3	FF	Rus	Cream	1.074	6.0	9	0.0	78.9	282.3	101.0	78.9	383.2	462.1
MN 05001-096	W	G3						6	0	47.0	184.9	34.4	47.0	219.3	266.3
MN 05001-107	B	G3	FF	Rus	Cream	1.090	7.5	5	66.8	27.8	136.0	161.4	27.8	297.4	392.0
MN 05001-107	W	G3						4	8.8	24.2	114.2	148.4	24.2	262.6	295.6
MN 05001-124	B	G3	FF	Rus	Cream	1.084	5.8	8	6.5	79.4	234.3	91.0	79.4	325.3	411.2
MN 05001-124	W	G3						7	4.0	53.6	211.8	95.0	53.6	306.8	364.3
MN 05001-134	B	G3	FF	Rus	W	1.081	6.8	10	34.3	71.2	301.7	241.6	71.2	543.4	648.8
MN 05001-134	W	G3						7	14.7	50.2	263.5	123.7	50.2	387.2	452.1
MN 05001-142	B	G3	FF	Rus	Cream	1.071	6.0	7	7.1	32.2	250.5	211.5	32.2	461.9	501.2
MN 05001-142	W	G3						5	1.8	29.2	164.3	102.1	29.2	266.3	297.4
MN 05001-145	B	G3	FF	LW	W	1.068	7.3	9	0.0	59.7	279.5	138.4	59.7	417.9	477.6

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
MN 05001-145	W	G3						3	39.7	16.0	86.1	188.0	16.0	274.1	329.8
MN 05001-175	B	G3	FF	Rus	Cream	1.087	7.0	11	3.6	115.5	289.8	100.6	115.5	390.4	509.5
MN 05001-175	W	G3						6	15.5	54.7	163.4	65.9	54.7	229.3	299.5
MN 05001-176	B	G3	FF	Rus	Cream	1.086	6.0	7	5.0	53.7	175.0	166.2	53.7	341.2	399.9
MN 05001-176	W	G3						5	0	30.6	163.0	80.5	30.6	243.5	274.1
MN 05001-191	B	G3	FF	Rus	Cream	1.074	6.3	8	14.0	38.2	229.2	343.4	38.2	572.6	624.9
MN 05001-191	W	G3						6	27.5	26.7	174.2	218.4	26.7	392.6	446.8
MN 05001-193	B	G3	FF	Rus	Cream	1.076	6.3	6	10.6	18.3	153.0	363.8	18.3	516.9	545.7
MN 05001-193	W	G3						5	22.1	15.5	151.8	242.2	15.5	394.1	431.7
MN 05001-196	B	G3	FF	LW	Cream	1.090	6.3	17	10.4	186.0	464.4	108.5	186.0	572.9	769.3
MN 05001-196	W	G3						11	0	143.5	230.5	26.0	143.5	256.5	400.0
MN 05001-198	B	G3	FF	Rus	Cream	1.080	6.0	9	9.1	93.2	248.7	51.7	93.2	300.4	402.6
MN 05001-198	W	G3						6	0	34.9	162.6	215.7	34.9	378.3	413.2
AOMN 06070-01	B	G2	FF	Rus	W	1.089	6.0	9	0.0	88.6	260.2	35.7	88.6	295.9	384.6
AOMN 06070-01	W	G2						4	0	35.1	112.8	60.8	35.1	173.6	208.6
AOMN 06077-01	B	G2	FF	Rus	Cream	1.083	7.0	13	0.0	135.2	367.2	107.3	135.2	474.5	609.7
AOMN 06077-01	W	G2						7	217.2	34.7	196.3	208.3	34.7	404.6	656.4
AOMN 06077-03	B	G2	FF	Rus	Cream	1.079	7.0	7	0.0	21.1	186.4	447.7	21.1	634.2	655.3
AOMN 06077-03	W	G2						4	0	17.6	69.0	509.8	17.6	578.8	596.4
AOMN 06085-01	B	G2	FF	Rus	W	1.084	6.5	11	9.6	94.7	329.0	137.2	94.7	466.1	570.4
AOMN 06085-01	W	G2						8	10.8	67.3	239.1	66.1	67.3	305.2	383.2
AOMN 06087-01	B	G2	FF	Rus	W	1.076	6.5	10	0.0	74.1	332.3	27.2	74.1	359.6	433.7
AOMN 06087-01	W	G2						6	0	33.7	202.4	162.1	33.7	364.4	398.1
AOMN 06098-02	B	G2	FF	Rus	Cream	1.105	4.0	9	0.0	132.2	171.6	4.8	132.2	176.4	308.6
AOMN 06098-02	W	G2						7	0	114.7	114.8	11.0	114.7	125.8	240.6
AOMN 06100-03	B	G2	FF	Rus	Cream	1.093	6.5	16	0.0	243.4	229.9	6.2	243.4	236.0	479.4
AOMN 06100-03	W	G2						10	0	124.2	191.9	50.3	124.2	242.2	366.4
AOMN 06100-05	B	G2	FF	Rus	Cream	1.069	7.0	14	43.9	119.8	468.8	109.6	119.8	578.4	742.1
AOMN 06100-05	W	G2						7	24.6	54.3	245.9	55.4	54.3	301.3	380.2
AOMN 06107-01	B	G2	FF	Rus	Cream	1.070	7.0	11	0.0	73.8	393.2	149.7	73.8	542.8	616.7
AOMN 06107-01	W	G2						6	14.3	26.7	209.1	153.9	26.7	363.0	404.0

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
AOMN 06118-01	B	G2	FF	Rus	Cream	1.081	6.0	5	13.8	24.2	106.7	341.6	24.2	448.4	486.4
AOMN 06118-01	W	G2						3	0	10.3	46.8	230.8	10.3	277.5	287.8
AOMN 06120-01	B	G2	FF	Rus	W	1.093	5.5	15	0.0	233.7	230.9	11.2	233.7	242.1	475.8
AOMN 06120-01	W	G2						10	0	159.0	153.3	5.0	159.0	158.3	317.3
AOMN 06126-02	B	G2	FF	Rus	Cream	1.063	7.0	10	0.0	61.5	283.0	263.1	61.5	546.1	607.6
AOMN 06126-02	W	G2						6	0	41.3	124.7	522.9	41.3	647.6	688.9
AOMN 06129-02	B	G2	FF	Rus	Cream	1.099	5.5	11	5.8	50.0	364.8	309.8	50.0	674.7	730.5
AOMN 06129-02	W	G2						6	10.5	40.2	171.7	146.6	40.2	318.2	368.9
AOMN 06131-01	B	G2	FF	Rus	W	1.077	7.0	9	0.0	43.0	290.4	337.6	43.0	627.9	670.9
AOMN 06131-01	W	G2						6	8.6	34.3	196.0	156.0	34.3	352.0	394.9
AOMN 06131-02	B	G2	FF	Rus	W	1.084	8.0	9	4.7	68.6	302.7	107.3	68.6	410.0	483.4
AOMN 06131-02	W	G2						6	0	41.3	186.1	127.0	41.3	313.1	354.4
AOMN 06134-02	B	G2	FF	LW	W	1.080	6.0	11	0.0	96.3	329.1	72.0	96.3	401.1	497.4
AOMN 06134-02	W	G2						6	0	59.8	197.2	32.8	59.8	230.0	289.9
AOMN 06135-01SD	B	G2	FF	Rus	Cream	1.076	5.5	8	0.0	40.8	221.6	292.4	40.8	513.9	554.7
AOMN 06135-01SD	W	G2						3	4.3	14.6	100.3	123.7	14.6	223.9	242.8
AOMN 06135-02SD	B	G2	FF	Rus	Cream	1.082	6.0	7	0.0	47.6	271.6	47.1	47.6	318.7	366.3
AOMN 06135-02SD	W	G2						4	0	30.4	115.7	40.5	30.4	156.2	186.6
AOMN 06135-03	B	G2	FF	LW/Rus	W	1.069	8.0	4	33.0	17.6	142.3	75.6	17.6	217.9	268.5
AOMN 06135-03	W	G2						4	6.4	16.3	126.6	98.5	16.3	225.1	247.8
AOMN 06136-05	B	G2	FF	Rus	W	1.070	7.5	10	0.0	95.5	289.0	47.4	95.5	336.4	431.9
AOMN 06136-05	W	G2						3	8.7	18.7	109.4	92.1	18.7	201.5	228.8
AOMN 06136-10	B	G2	FF	Rus	W	1.076	6.0	9	0.0	70.8	318.5	130.0	70.8	448.5	519.3
AOMN 06136-10	W	G2						6	9.2	37.6	184.2	155.1	37.6	339.4	386.2
AOMN 06136-11	B	G2	FF	LW	W	1.090	8.0	4	28.6	19.4	112.1	232.6	19.4	344.6	392.6
AOMN 06136-11	W	G2						4	20.4	18.3	106.8	166.9	18.3	273.7	312.4
AOMN 06136-13	B	G2	FF	Rus	Cream	1.083	6.0	12	10.0	150.7	262.7	0.0	150.7	262.7	423.4
AOMN 06136-13	W	G2						5	0	62.4	96.0	0.0	62.4	96.0	158.4
AOMN 06140-02	B	G2	FF	Rus	Cream	1.093	5.5	10	0.0	61.2	348.3	203.8	61.2	552.0	613.2
AOMN 06140-02	W	G2						5	0	29.5	149.4	130.7	29.5	280.2	309.7
AOMN 06142-01	B	G2	FF	Rus	Cream	1.071	7.0	12	0.0	176.6	187.4	27.7	176.6	215.1	391.7
AOMN 06142-01	W	G2						8	0	98.9	216.0	56.9	98.9	272.8	371.8

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
AOMN 06147-03	B	G2	FF	Rus	Cream	1.077	6.0	2	2.4	18.6	61.2	41.3	18.6	102.5	123.6
AOMN 06147-03	W	G2						3	0	18.6	78.2	79.3	18.6	157.5	176.1
AOMN 06147-05	B	G2	FF	Rus	Cream	1.083	6.0	9	7.3	63.1	260.3	193.6	63.1	453.9	524.3
AOMN 06147-05	W	G2						5	0	31.5	176.4	64.1	31.5	240.6	272.1
AOMN 06153-01	B	G2	FF	Rus	W	1.075	8.0	11	19.4	92.8	382.8	93.8	92.8	476.5	588.8
AOMN 06153-01	W	G2						5	9.0	31.5	128.3	238.5	31.5	366.8	407.3
AOMN 06153-01SD	B	G2	FF	Rus	W	1.072	7.0	11	5.2	93.2	360.4	195.7	93.2	556.1	654.5
AOMN 06153-01SD	W	G2						6	0	34.2	200.2	82.9	34.2	283.1	317.3
AOMN 06153-03	B	G2	FF	Rus	Cream	1.089	6.0	8	0.0	43.8	297.7	155.5	43.8	453.2	497.0
AOMN 06153-03	W	G2						5	9.7	13.2	127.6	312.1	13.2	439.6	462.5
AOMN 06153-05	B	G2	FF	Rus	Cream	1.083	6.0	5	0.0	16.2	101.6	408.4	16.2	510.0	526.2
AOMN 06153-05	W	G2						3	12.5	18.6	94.1	156.8	18.6	251.0	282.0
AOMN 06153-07	B	G2	FF	Rus	W	1.084	7.5	11	12.9	82.4	358.4	149.4	82.4	507.8	603.1
AOMN 06153-07	W	G2						5	10.4	30.2	131.3	258.6	30.2	390.0	430.6
AOMN 06153-08	B	G2	FF	Rus	Cream	1.097	7.0	17	0.0	259.2	305.8	14.5	259.2	320.3	579.5
AOMN 06153-08	W	G2						9	0	87.7	211.3	99.4	87.7	310.7	398.4
AOMN 06154-06	B	G2	FF	Rus	Cream	1.079	7.5	14	0.0	126.1	416.3	93.3	126.1	509.5	635.7
AOMN 06154-06	W	G2						7	0	66.6	227.7	43.2	66.6	270.9	337.5
AOMN 06156-02	B	G2	FF	Rus	Cream	1.090	4.0	7	11.4	23.3	147.3	428.6	23.3	576.0	610.6
AOMN 06156-02	W	G2						4	0	10.9	85.6	555.9	10.9	641.5	652.4
AOMN 06156-03	B	G2	FF	Rus	Cream	1.082	6.0	9	0.0	72.1	270.2	162.9	72.1	433.1	505.2
AOMN 06156-03	W	G2						6	0	53.6	175.6	53.3	53.6	229.0	282.6
AOMN 06156-04	B	G2	FF	LW	Cream	1.080	9.0	8	0.0	33.7	273.1	333.2	33.7	606.3	640.0
AOMN 06156-04	W	G2						4	80.3	8.6	130.2	206.6	8.6	336.8	425.7
AOMN 06161-01	B	G2	FF	Rus	W	1.078	7.0	14	50.8	166.6	324.1	70.1	166.6	394.2	611.7
AOMN 06161-01	W	G2													
AOMN 06162-02	B	G2	FF	Rus	Cream	1.074	8.0	7	42.0	27.3	177.3	376.7	27.3	554.0	623.4
AOMN 06162-02	W	G2						3	0	19.7	45.5	258.0	19.7	303.5	323.2
AOMN 06166-01	B	G2	FF	Rus	W	1.068	7.0	8	16.9	41.3	274.3	275.1	41.3	549.4	607.6
AOMN 06166-01	W	G2						4	37.6	19.5	119.3	178.9	19.5	298.2	355.4
AOMN 06167-01	B	G2	FF	LW	W	1.076	8.0	14	0.0	176.6	296.4	85.8	176.6	382.2	558.8
AOMN 06167-01	W	G2						10	0	100.7	245.3	107.5	100.7	352.8	453.4

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
AOMN 06171-03	B	G2	FF	Rus	Cream	1.073	8.0	10	0.0	55.8	292.2	283.1	55.8	575.3	631.1
AOMN 06171-03	W	G2						5	27.6	31.8	178.9	149.0	31.8	327.9	387.3
AOMN 06174-01	B	G2	FF	Rus	W	1.087	7.0	10	0.0	87.5	324.3	100.2	87.5	424.5	512.0
AOMN 06174-01	W	G2						6	11.9	36.6	214.1	122.6	36.6	336.7	385.2
AOMN 06174-01SD	B	G2	FF	Rus	Cream	1.090	6.0	6	0.0	31.6	266.3	95.3	31.6	361.6	393.2
AOMN 06174-01SD	W	G2						0	0	0.0	0.0	0.0	0.0	0.0	0.0
COMN 06329-01	B	G2	FF	Rus	W	1.071	7.5	11	0.0	173.4	115.2	38.4	173.4	153.6	327.0
COMN 06329-01	W	G2						7	0	65.9	200.8	64.4	65.9	265.3	331.2
COMN 06332-01	B	G2	FF	Rus	W	1.094	6.0	10	0.0	61.1	366.9	178.3	61.1	545.2	606.3
COMN 06332-01	W	G2						7	8.2	60.5	191.1	129.1	60.5	320.3	389.0
COMN 06333-01	B	G2	FF	Rus	Cream	1.080	6.0	8	0.0	71.5	202.6	79.4	71.5	282.0	353.5
COMN 06333-01	W	G2						6	18.0	46.8	154.5	216.5	46.8	370.9	435.8
COMN 06344-03	B	G2	FF	Rus/FM	Yel	1.094	7.0	14	0.0	126.5	457.1	98.5	126.5	555.6	682.1
COMN 06344-03	W	G2						9	0	87.5	246.2	46.9	87.5	293.1	380.6
COMN 06345-03	B	G2	FF	Rus	W	1.080	4.5	8	12.5	53.5	223.7	260.3	53.5	484.0	550.1
COMN 06345-03	W	G2						3	10.4	11.5	73.2	155.8	11.5	229.0	250.9
COMN 06345-05	B	G2	FF	Rus	Cream	1.092	6.5	12	3.2	95.1	424.8	82.5	95.1	507.2	605.5
COMN 06345-05	W	G2						3	0	28.5	81.5	17.7	28.5	99.2	127.7
COMN 06347-01	B	G2	FF	LW	W	1.080	7.0	11	40.1	61.3	351.0	397.6	61.3	748.6	850.0
COMN 06347-01	W	G2						5	16.2	26.5	134.4	274.8	26.5	409.1	451.9
COMN 06347-02	B	G2	FF	Rus	W	1.079	8.0	14	4.5	107.2	492.4	123.0	107.2	615.5	727.2
COMN 06347-02	W	G2						7	17.4	32.5	216.7	250.1	32.5	466.8	516.7
COMN 06348-01	B	G2	FF	Rus	Cream	1.078	6.5	13	11.6	117.8	423.3	87.8	117.8	511.1	640.5
COMN 06348-01	W	G2						7	0	40.9	242.9	103.9	40.9	346.7	387.6
COMN 06350-04	B	G2	FF	Rus	Cream	1.090	4.0	13	9.6	80.2	524.0	121.6	80.2	645.6	735.4
COMN 06350-04	W	G2						4	18.8	21.7	108.6	95.9	21.7	204.5	244.9
COMN 06354-03	B	G2	FF	LW	W	1.074	7.0	15	0.0	187.9	359.4	36.2	187.9	395.6	583.5
COMN 06354-03	W	G2						9	0	106.4	190.3	22.2	106.4	212.6	319.0
COMN 06354-05	B	G2	FF	Rus	Cream	1.048	7.0	10	6.9	65.9	374.0	116.3	65.9	490.3	563.1
COMN 06354-05	W	G2						5	0	20.8	143.4	228.6	20.8	372.0	392.7
COMN 06355-04	B	G2	FF	Rus	Cream	1.079	6.0	8	1.8	21.1	356.2	114.5	21.1	470.8	493.7
COMN 06355-04	W	G2						6	0	26.3	222.4	121.8	26.3	344.2	370.5

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 06358-02	B	G2	FF	Rus/FM	Yel-lt.	1.088	3.0	8	0.0	65.8	284.7	99.6	65.8	384.3	450.1
COMN 06358-02	W	G2													
COMN 06358-03	B	G2	FF	Rus/FM	Yel	1.085	7.0	7	0.0	65.5	219.5	68.8	65.5	288.3	353.8
COMN 06358-03	W	G2						4	0	29.5	113.5	133.9	29.5	247.4	276.9
COMN 06358-05	B	G2	FF	Rus	Cream	1.078	5.0	9	0.0	100.2	223.1	62.7	100.2	285.8	386.0
COMN 06358-05	W	G2						6	0	51.6	177.0	66.2	51.6	243.2	294.8
COMN 06360-01	B	G2	FF	Rus	Cream	1.086	7.0	9	0.0	58.4	359.8	109.1	58.4	468.9	527.2
COMN 06360-01	W	G2						18	3.8	148.1	510.6	410.5	148.1	921.1	1073.1
COMN 06363-01	B	G2	FF	Rus	Cream	1.081	7.0	7	5.9	24.6	244.7	250.7	24.6	495.4	525.8
COMN 06363-01	W	G2						5	0	18.2	171.9	228.3	18.2	400.1	418.3
COMN 06369-01	B	G2	FF	Rus	Cream	1.079	7.5	9	25.1	85.8	281.8	45.9	85.8	327.7	438.5
COMN 06369-01	W	G2						8	0	113.8	171.6	50.7	113.8	222.2	336.0
COMN 06369-02	B	G2	FF	Rus	Cream	1.085	7.5	13	0.0	226.3	110.5	4.8	226.3	115.4	341.6
COMN 06369-02	W	G2						0	0	0.0	0.0	0.0	0.0	0.0	0.0
COMN 06376-01	B	G2	FF	Rus	Cream	1.088	6.5	14	2.1	191.8	275.9	82.2	191.8	358.1	551.9
COMN 06376-01	W	G2						8	0	84.2	201.1	10.3	84.2	211.4	295.6
COMN 06376-02	B	G2	FF	Rus	Cream	1.084	6.5	13	45.0	173.2	274.2	48.2	173.2	322.4	540.6
COMN 06376-02	W	G2						5	30.4	48.3	138.6	64.6	48.3	203.2	281.9
COMN 06378-01	B	G2	FF	Rus	Cream	1.071	6.0	6	0.0	82.7	136.0	35.3	82.7	171.4	254.1
COMN 06378-01	W	G2						3	0	26.0	62.8	42.0	26.0	104.8	130.8
COMN 06379-04	B	G2	FF	Rus	W	1.076	7.0	7	0.0	39.6	212.5	269.6	39.6	482.1	521.7
COMN 06379-04	W	G2						5	0	33.3	159.8	97.2	33.3	257.0	290.3
COMN 06392-01	B	G2	FF	Rus	W	1.087	6.5	12	11.3	86.3	395.0	164.9	86.3	559.9	657.4
COMN 06392-01	W	G2						7	15.7	46.3	173.1	214.4	46.3	387.5	449.6
COMN 06399-01	B	G2	FF	Rus	W	1.078	8.0	11	0.0	102.8	311.0	97.1	102.8	408.1	510.9
COMN 06399-01	W	G2						4	0	33.6	116.4	147.6	33.6	264.0	297.6
COMN 06401-01	B	G2	FF	Rus	Cream	1.078	7.5	5	53.5	16.5	119.7	262.2	16.5	381.9	451.9
COMN 06401-01	W	G2						3	9.9	16.2	90.0	131.9	16.2	221.9	248.1
COMN 06401-02	B	G2	FF	Rus	Cream	1.079	8.0	12	20.3	101.8	417.9	114.7	101.8	532.6	654.8
COMN 06401-02	W	G2						8	0	56.5	254.6	292.4	56.5	547.1	603.6
COMN 06402-01	B	G2	FF	LW	W	1.067	7.0	5	0.0	37.5	136.7	41.1	37.5	177.7	215.2
COMN 06402-01	W	G2						3	0	29.5	89.0	48.0	29.5	137.0	166.5

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 06407-01	B	G2	FF	Rus	Cream	1.069	8.0	11	0.0	79.6	392.2	142.0	79.6	534.2	613.8
COMN 06407-01	W	G2						11	0	42.4	322.9	431.9	42.4	754.8	797.3
COMN 06419-01	B	G2	FF	Rus	Cream	1.069	7.0	13	7.5	137.8	313.1	117.3	137.8	430.4	575.8
COMN 06419-01	W	G2						5	0	46.6	167.1	37.8	46.6	204.8	251.4
COMN 06433-01	B	G2	FF	LW/Rus	Cream	1.068	7.5	8	14.2	20.2	284.9	242.9	20.2	527.8	562.1
COMN 06433-01	W	G2						5	0	13.3	164.5	272.6	13.3	437.1	450.4
COMN 06462-01	B	G2	FF	Rus	Cream	1.079	7.5	19	0.0	318.3	263.1	25.7	318.3	288.8	607.0
COMN 06462-01	W	G2						10	8.1	142.8	167.2	45.1	142.8	212.2	363.1
COMN 06465-02	B	G2	FF	Rus	Cream	1.080	6.5	13	0.0	137.2	343.5	20.2	137.2	363.7	500.9
COMN 06465-02	W	G2						6	0	50.7	199.4	57.0	50.7	256.4	307.2
MN 061788-01	B	G2	FF	Rus	Cream	1.084	6.0	11	9.1	54.1	453.9	115.3	54.1	569.2	632.4
MN 061788-01	W	G2						6	15.2	48.4	180.9	167.4	48.4	348.4	411.9
MN 061908-03	B	G2	FF	Rus	Cream	1.102	7.0	19	0.0	314.0	270.3	0.0	314.0	270.3	584.3
MN 061908-03	W	G2						11	0	159.5	193.8	15.7	159.5	209.5	369.1
MN 061908-06	B	G2	FF	LW	W	1.081	7.5	13	22.9	104.5	479.6	114.3	104.5	593.9	721.3
MN 061908-06	W	G2						9	5.9	82.7	241.6	151.8	82.7	393.4	482.0
MN 061910-03	B	G2	FF	LW	Yel	1.088	6.5	10	0.0	60.1	370.6	187.1	60.1	557.7	617.8
MN 061910-03	W	G2						10	0	117.7	202.8	30.4	117.7	233.1	350.8
MN 061910-07	B	G2	FF	Rus/FM	Yel	1.088	4.5	9	6.6	54.9	265.6	289.5	54.9	555.1	616.6
MN 061910-07	W	G2						5	0	33.2	157.7	87.3	33.2	245.0	278.3
MN 061912-02	B	G2	FF	Rus	Cream	1.069	9.0	9	10.1	48.2	325.6	198.9	48.2	524.6	582.9
MN 061912-02	W	G2						4	0	17.8	119.7	159.7	17.8	279.4	297.2
MN 061912-03	B	G2	FF	LW	Cream	1.070	7.0	8	0.0	73.3	274.4	40.8	73.3	315.2	388.5
MN 061912-03	W	G2						6	6.8	36.5	181.9	115.1	36.5	297.0	340.3
MN 061918-05	B	G2	FF	LW	W	1.075	7.0	13	15.5	131.8	367.6	101.7	131.8	469.2	616.6
MN 061918-05	W	G2						6	0	39.4	171.3	220.5	39.4	391.8	431.2
WIMN 06002-02	B	G2	FF	Rus	Cream	1.078	6.5	9	0.0	33.9	292.6	325.8	33.9	618.5	652.3
WIMN 06002-02	W	G2						5	0	28.9	143.9	117.8	28.9	261.6	290.6
WIMN 06004-02	B	G2	FF	LW	W	1.078	6.5	9	0.0	63.2	318.1	217.5	63.2	535.6	598.7
WIMN 06004-02	W	G2						5	205.6	23.2	104.2	553.2	23.2	657.4	886.2
WIMN 06006-02	B	G2	FF	LW	W	1.073	7.5	9	6.7	37.4	287.6	227.8	37.4	515.4	559.5
WIMN 06006-02	W	G2						5	48.5	25.4	131.6	407.7	25.4	539.2	613.2

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
WIMN 06022-03	B	G2	FF	Rus	Cream	1.078	8.0	7	10.8	3.5	256.7	384.5	3.5	641.3	655.6
WIMN 06022-03	W	G2						6	0	37.3	132.1	262.3	37.3	394.4	431.7
WIMN 06046-02	B	G2	FF	LW	Cream	1.067	6.0	7	7.5	45.0	254.6	136.3	45.0	390.9	443.4
WIMN 06046-02	W	G2						5	30.3	38.5	153.4	181.7	38.5	335.1	403.9
R. Norkotah	B	Chk	FM	Rus	Cream	1.073	7.5	12	9.0	99.8	316.3	219.7	99.8	535.9	644.7
R. Norkotah	W	Chk						5	17.2	23.3	122.3	315.4	23.3	437.7	478.2
Red Norland	B	Chk	FM	Red	W	1.064	7.6	11	11.0	94.0	360.8	50.2	94.0	411.0	516.0
Red Norland	W	Chk						6	10.0	32.0	212.6	183.3	32.0	395.9	438.0
Red Pontiac	B	Chk	FM	Red	Cream	1.066	8.3	12	17.8	79.7	430.8	183.0	79.7	613.8	711.3
Red Pontiac	W	Chk						8	189.0	39.7	166.1	476.2	39.7	642.3	871.1
Y. Gold	B	Chk	FM	W	Yel	1.082	7.4	8	9.2	47.8	235.9	201.0	47.8	436.9	494.0
Y. Gold	W	Chk						5	25.6	19.0	137.2	199.0	19.0	336.2	380.8
MN 96013-1	B	G12	FM	Red	Yel-dk	1.075	7.0	6	11.0	41.2	163.5	131.0	41.2	294.5	346.7
MN 96013-1	W	G12						5	21.1	31.6	144.5	114.4	31.6	258.9	311.6
MN 99460-14	B	G9	FM	Red	W	1.072	6.5	5	17.8	55.8	134.8	17.7	55.8	152.4	226.1
MN 99460-14	W	G9						3	25.9	33.5	98.2	26.1	33.5	124.3	183.6
MN 00177-5	B	G8	FM	Red	W	1.062	7.5	5	5.0	50.5	150.2	13.2	50.5	163.4	218.8
MN 00177-5	W	G8						3	1.5	43.7	78.9	27.3	43.7	106.2	151.4
ATMN 03505-3	B	G5	FM	Red	Cream	1.069	6.5	9	12.6	81.2	272.6	121.9	81.2	394.5	488.3
ATMN 03505-3	W	G5						6	11.8	43.4	181.5	66.6	43.4	248.2	303.4
COMN 03019-4	B	G5	FM	Red	Cream	1.072	7.0	7	8.8	67.6	194.6	46.5	67.6	241.1	317.4
COMN 03019-4	W	G5						5	30.9	40.8	137.9	27.9	40.8	165.8	237.4
COMN 03020-3	B	G5	FM	Red	W	1.073	6.0	8	5.9	69.6	216.8	90.8	69.6	307.5	383.1
COMN 03020-3	W	G5						6	32.6	63.1	148.5	76.5	63.1	224.9	320.7
COMN 03021-1	B	G5	FM	Red	Cream	1.074	6.5	8	0.0	80.3	232.1	99.6	80.3	331.7	411.9
COMN 03021-1	W	G5						7	5.4	89.1	131.5	23.6	89.1	155.1	249.6
COMN 03024-6	B	G5	FM	Red	Cream	1.066	7.0	12	84.2	175.3	179.3	17.1	175.3	196.5	455.9
COMN 03024-6	W	G5						8	14.3	95.5	194.7	39.8	95.5	234.5	344.3
COMN 03027-1	B	G5	FM	Red	Cream	1.071	7.0	11	4.3	155.5	220.1	14.6	155.5	234.7	394.5

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 03027-1	W	G5						9	0	105.9	206.1	27.6	105.9	233.7	339.6
COMN 03030-1	B	G5	FM	Red	Cream	1.063	7.0	9	1.5	145.8	90.2	5.2	145.8	95.3	242.7
COMN 03030-1	W	G5						7	2.3	74.4	199.1	13.5	74.4	212.6	289.3
COMN 03035-5	B	G5	FM	Red	Cream	1.059	7.5	8	0.0	111.7	156.1	10.0	111.7	166.1	277.8
COMN 03035-5	W	G5						6	0	60.2	153.6	19.1	60.2	172.7	232.9
NDMN 03314-1	B	G5	FM	Red	Cream	1.068	6.0	11	240.2	148.0	247.5	42.5	148.0	290.0	678.2
NDMN 03314-1	W	G5						6	34.4	76.6	113.5	23.7	76.6	137.1	248.2
NDMN 03316-3	B	G5	FM	Red	Cream	1.062	9.0	11	17.7	117.6	281.6	61.3	117.6	342.9	478.2
NDMN 03316-3	W	G5						8	12.1	91.0	185.8	46.5	91.0	232.3	335.3
NDMN 03376-1	B	G5	FM	Red dk.	Cream	1.070	8.0	10	12.0	95.8	288.9	65.6	95.8	354.5	462.3
NDMN 03376-1	W	G5						6	12.8	68.1	149.0	30.9	68.1	180.0	260.9
NDMN 03382-2	B	G5	FM	Red dk.	W	1.071	7.8	12	38.0	182.6	210.9	9.1	182.6	220.0	440.6
NDMN 03382-2	W	G5						10	7.0	169.4	126.6	4.9	169.4	131.4	307.9
COMN 04668-01	B	G4	FM	Red	Cream	1.078	5.8	14	25.1	148.8	403.3	138.0	148.8	541.3	715.2
COMN 04668-01	W	G4						8	21.0	66.4	215.4	147.1	66.4	362.5	450.0
COMN 04670-02	B	G4	FM	Red	Cream	1.072	8.0	4	33.7	35.1	121.8	42.3	35.1	164.2	233.0
COMN 04670-02	W	G4						4	0	32.4	108.5	20.2	32.4	128.7	161.1
COMN 04697-02	B	G4	FM	Red	Cream	1.065	6.5	13	19.4	199.6	150.7	21.5	199.6	172.2	391.2
COMN 04697-02	W	G4						9	0.9	157.6	102.0	0.0	157.6	102.0	260.4
COMN 04699-05	B	G4	FM	Red	W	1.075	6.0	9	48.2	105.3	204.9	42.7	105.3	247.6	401.2
COMN 04699-05	W	G4						6	21.7	66.4	167.2	29.2	66.4	196.4	284.5
COMN 04778-02	B	G4	FM	Red	Cream	1.076	6.3	9	37.4	87.9	252.3	57.4	87.9	309.7	435.1
COMN 04778-02	W	G4						7	9.3	92.4	143.6	23.2	92.4	166.8	268.6
COMN 04779-01	B	G4	FM	Red	Cream	1.071	6.3	9	30.8	138.4	112.1	16.0	138.4	128.1	297.3
COMN 04779-01	W	G4						5	3.3	79.9	73.6	10.3	79.9	83.9	167.0
COMN 04779-02	B	G4	FM	Red	W	1.065	6.5	10	37.5	109.2	282.1	46.0	109.2	328.1	474.7
COMN 04779-02	W	G4						9	7.9	108.3	212.2	36.6	108.3	248.7	365.0
COMN 04780-01	B	G4	FM	Red	Cream	1.067	7.5	8	69.6	85.6	237.3	77.6	85.6	314.9	470.1
COMN 04780-01	W	G4						6	19.4	58.2	142.6	82.5	58.2	225.0	302.6
COMN 04780-06	B	G4	FM	Red	W	1.058	8.0	7	0.0	115.8	109.0	0.0	115.8	109.0	224.8
COMN 04780-06	W	G4						4	22.1	62.0	64.5	0.0	62.0	64.5	148.6

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 04781-04	B	G4	FM	Red	W	1.074	9.0	14	7.8	232.1	150.0	4.9	232.1	154.9	394.9
COMN 04781-04	W	G4						8	6.9	117.3	130.8	8.5	117.3	139.3	263.5
COMN 04782-01	B	G4	FM	Red	W	1.056	7.8	7	55.4	58.6	150.0	142.2	58.6	292.2	406.2
COMN 04782-01	W	G4						6	0	31.0	193.1	132.1	31.0	325.2	356.2
COMN 04782-04	B	G4	FM	Red	Cream	1.062	7.0	8	19.4	95.7	162.3	40.0	95.7	202.4	317.5
COMN 04782-04	W	G4						7	28.2	82.9	157.5	46.8	82.9	204.3	315.3
MN 04Morris-1	B	G4	FM	Red	W	1.068	9.0	9	22.7	105.8	201.0	35.4	105.8	236.3	364.9
MN 04Morris-1	W	G4						5	4.4	53.2	123.0	63.4	53.2	186.4	244.0
NDMN 04911-01	B	G4	FM	W	W	1.080	3.5	13	0.0	148.0	364.9	32.3	148.0	397.2	545.2
NDMN 04911-01	W	G4						8	1.6	112.2	170.0	50.0	112.2	220.0	333.8
NDMN 04911-02	B	G4	FM	W	W	1.085	3.8	12	0.0	181.7	221.8	10.3	181.7	232.0	413.8
NDMN 04911-02	W	G4						8	3.0	102.9	154.8	29.0	102.9	183.8	289.7
NDMN 04916-01	B	G4	FM	Red	W	1.084	7.3	12	25.4	102.0	395.2	95.1	102.0	490.3	617.7
NDMN 04916-01	W	G4						9	11.4	91.9	263.8	73.0	91.9	336.8	440.1
NDMN 04917-02	B	G4	FM	Red	W	1.059	9.0	5	61.4	31.5	148.6	122.9	31.5	271.6	364.4
NDMN 04917-02	W	G4						3	43.6	28.6	99.3	31.8	28.6	131.1	203.3
NDMN 04917-03	B	G4	FM	Red	W	1.065	8.0	8	20.7	83.0	211.7	45.8	83.0	257.5	361.1
NDMN 04917-03	W	G4						7	77.9	74.4	159.4	72.8	74.4	232.1	384.4
NDMN 04927-01	B	G4	FM	Red	Cream	1.075	7.8	7	51.9	72.5	212.9	43.8	72.5	256.7	381.2
NDMN 04927-01	W	G4						5	32.7	41.8	159.0	27.5	41.8	186.6	261.1
NDMN 04978-01	B	G4	FM	Red	Cream	1.057	7.5	10	19.4	116.6	240.8	41.2	116.6	282.0	418.0
NDMN 04978-01	W	G4						6	8.9	54.6	163.9	80.3	54.6	244.2	307.7
NDMN 04979-02	B	G4	FM	Red	W	1.072	7.8	11	5.3	135.0	220.5	33.0	135.0	253.6	393.8
NDMN 04979-02	W	G4						7	0	98.2	107.8	35.3	98.2	143.0	241.2
MN 05001-002	B	G3	FM	Red	Cream	1.067	7.8	12	3.9	104.1	380.7	140.1	104.1	520.8	628.9
MN 05001-002	W	G3						6	0	44.6	171.1	187.0	44.6	358.1	402.7
MN 05001-007	B	G3	FM	Red	Cream	1.072	6.5	14	6.5	186.4	243.6	71.2	186.4	314.8	507.7
MN 05001-007	W	G3						9	10.1	120.9	163.5	25.9	120.9	189.5	320.5
MN 05001-017	B	G3	FM	Red	Cream	1.061	7.5	11	16.2	168.9	164.7	5.3	168.9	170.0	355.1
MN 05001-017	W	G3						8	5.9	104.5	170.4	37.0	104.5	207.5	318.0
MN 05001-047	B	G3	FM	Dk. Red	Cream	1.070	7.5	7	1.5	74.3	196.2	4.8	74.3	201.0	276.8

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
MN 05001-047	W	G3						4	14.3	34.4	119.8	56.6	34.4	176.4	225.1
MN 05001-051	B	G3	FM	Red	Yel	1.058	8.0	11	9.5	125.7	237.2	50.3	125.7	287.5	422.6
MN 05001-051	W	G3						8	4.0	100.0	153.1	52.9	100.0	206.0	310.0
MN 05001-054	B	G3	FM	Red	Cream	1.061	8.8	12	33.8	117.0	316.3	68.9	117.0	385.2	536.0
MN 05001-054	W	G3						7	6.7	49.7	179.3	192.1	49.7	371.4	427.8
MN 05001-088	B	G3	FM	Red	Yel	1.068	7.0	17	7.5	249.9	267.0	50.8	249.9	317.8	575.2
MN 05001-088	W	G3						11	9.6	140.6	229.6	81.7	140.6	311.2	461.4
MN 05001-090	B	G3	FM	Red	W	1.074	7.5	11	31.3	85.3	402.7	109.1	85.3	511.8	628.4
MN 05001-090	W	G3						6	26.5	28.9	182.2	172.5	28.9	354.7	410.1
MN 05001-094	B	G3	FM	Red	Yel	1.073	7.3	10	0.0	126.2	221.4	32.2	126.2	253.7	379.8
MN 05001-094	W	G3						7	46.9	80.3	147.5	55.7	80.3	203.2	330.3
MN 05001-115	B	G3	FM	Red	Yel-dk.	1.067	7.0	10	2.7	164.5	90.6	5.0	164.5	95.6	262.8
MN 05001-115	W	G3						7	9.4	114.3	76.9	0.0	114.3	76.9	200.6
MN 05001-127	B	G3	FM	Red	Yel-lt.	1.066	8.0	10	17.0	99.9	251.9	95.7	99.9	347.6	464.4
MN 05001-127	W	G3						9	18.7	112.6	174.8	42.0	112.6	216.8	348.0
MN 05001-180	B	G3	FM	Red	W	1.054	6.3	6	5.3	54.9	170.8	73.9	54.9	244.7	304.8
MN 05001-180	W	G3						7	1.3	57.6	229.1	49.2	57.6	278.3	337.2
MN 05001-197	B	G3	FM	Red	Cream	1.081	7.0	8	0.0	49.2	232.3	235.7	49.2	468.0	517.2
MN 05001-197	W	G3						5	0	39.8	126.1	163.7	39.8	289.8	329.6
AOMN 06100-06	B	G2	FM	Purple	Cream	1.089	7.0	17	0.0	285.8	184.7	8.0	285.8	192.6	478.5
AOMN 06100-06	W	G2						9	0	138.9	95.7	0.0	138.9	95.7	234.5
COMN 06320-01	B	G2	FM	Purple	Purple	1.066	Purp	14	2.8	195.4	307.9	20.2	195.4	328.2	526.4
COMN 06320-01	W	G2						8	20.7	68.8	244.4	45.3	68.8	289.6	379.2
COMN 06320-02	B	G2	FM	Red	Red	1.079	Red	26	0.0	442.5	161.3	0.0	442.5	161.3	603.8
COMN 06320-02	W	G2						11	12.4	148.0	169.8	18.5	148.0	188.3	348.7
COMN 06320-04	B	G2	FM	Red	Red	1.083	8.0	18	0.0	264.4	277.2	26.0	264.4	303.1	567.5
COMN 06320-04	W	G2						9	27.1	90.1	241.9	70.6	90.1	312.5	429.7
COMN 06322-02	B	G2	FM	Purple	Yel	1.077	6.0	19	0.0	308.8	101.8	0.0	308.8	101.8	410.5
COMN 06322-02	W	G2						11	0	154.0	185.7	14.8	154.0	200.4	354.4
COMN 06334-03	B	G2	FM	Red	Yel	1.086	4.5	13	5.4	179.7	201.1	5.7	179.7	206.8	391.9
COMN 06334-03	W	G2						7	0	130.5	28.1	0.0	130.5	28.1	158.6

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	Size Distribution (cwtyld) ≥4<10 oz.	Size Distribution (cwtyld) ≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 06335-01	B	G2	FM	Red	Red	1.079	8.0	12	7.9	146.5	266.1	29.8	146.5	296.0	450.4
COMN 06335-01	W	G2						8	0	78.6	197.1	66.8	78.6	263.9	342.5
COMN 06336-01	B	G2	FM	Purple	Purple	1.075	Purp	24	0.0	435.7	105.8	0.0	435.7	105.8	541.5
COMN 06336-01	W	G2						14	0	262.8	75.0	0.0	262.8	75.0	337.8
COMN 06341-02	B	G2	FM	Red	Red	1.064	Red	15	12.6	200.4	282.5	42.4	200.4	324.9	538.0
COMN 06341-02	W	G2						9	9.2	94.3	205.8	87.2	94.3	293.0	396.4
COMN 06353-04	B	G2	FM	Red	Cream	1.069	8.0	12	3.5	135.7	323.0	25.9	135.7	348.9	488.1
COMN 06353-04	W	G2						7	26.1	64.9	218.9	70.1	64.9	289.0	380.0
COMN 06356-01	B	G2	FM	Red	Cream	1.081	6.0	16	6.2	251.0	216.1	15.0	251.0	231.1	488.3
COMN 06356-01	W	G2						7	0	62.6	203.1	77.2	62.6	280.4	343.0
COMN 06356-02	B	G2	FM	Red	Cream	1.082	7.0	16	0.0	234.3	285.7	4.8	234.3	290.5	524.8
COMN 06356-02	W	G2						7	0	86.4	133.2	46.6	86.4	179.8	266.2
COMN 06356-05	B	G2	FM	Red	Cream	1.088	7.0	11	27.0	98.7	308.9	134.6	98.7	443.6	569.3
COMN 06356-05	W	G2						7	27.9	51.1	231.9	142.3	51.1	374.2	453.2
COMN 06371-01	B	G2	FM	Red	Cream	1.078	8.0	17	0.0	324.0	115.3	0.0	324.0	115.3	439.4
COMN 06371-01	W	G2						14	7.0	213.0	170.1	16.0	213.0	186.1	406.0
COMN 06372-02	B	G2	FM	Red	W	1.064	6.5	10	29.1	119.7	234.4	29.1	119.7	263.5	412.3
COMN 06372-02	W	G2						5	23.0	43.6	141.1	44.3	43.6	185.4	252.0
COMN 06373-01	B	G2	FM	Red	Yel-lt.	1.064	7.5	8	23.2	82.7	262.6	15.4	82.7	277.9	383.8
COMN 06373-01	W	G2						6	8.6	54.8	186.0	65.8	54.8	251.8	315.1
COMN 06377-01	B	G2	FM	Red	Cream	1.070	6.0	0	466.9	0.0	0.0	0.0	0.0	0.0	466.9
COMN 06377-01	W	G2						5	38.6	67.0	109.8	25.1	67.0	134.8	240.5
COMN 06422-01	B	G2	FM	Red	Yel-dk.	1.081	8.0	16	0.0	279.1	167.1	0.0	279.1	167.1	446.2
COMN 06422-01	W	G2						8	11.7	119.3	141.8	47.1	119.3	188.9	319.8
COMN 06437-01	B	G2	FM	Red	Cream	1.070	6.0	20	0.0	344.1	62.1	0.0	344.1	62.1	406.3
COMN 06437-01	W	G2						8	0	106.1	129.2	15.7	106.1	144.9	251.0
COMN 06438-01	B	G2	FM	Red	W	1.075	6.0	19	0.0	322.0	182.8	0.0	322.0	182.8	504.8
COMN 06438-01	W	G2						11	0	177.6	80.5	0.0	177.6	80.5	258.1
COMN 06438-02	B	G2	FM	Red	W	1.068	8.0	15	19.6	264.8	97.9	0.0	264.8	97.9	382.4
COMN 06438-02	W	G2						8	7.5	91.1	212.3	30.3	91.1	242.5	341.1
COMN 06451-01	B	G2	FM	Red	Cream	1.081	7.0	16	3.3	259.7	180.3	0.0	259.7	180.3	443.4
COMN 06451-01	W	G2						9	11.0	132.8	127.5	0.0	132.8	127.5	271.4

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
COMN 06454-01	B	G2	FM	Red	W	1.074	8.0	7	0.0	41.3	237.8	152.4	41.3	390.1	431.4
COMN 06454-01	W	G2						6	34.1	50.0	187.9	19.8	50.0	207.6	291.7
COMN 06454-02	B	G2	FM	Red	W	1.083	7.0	17	0.0	299.2	84.2	0.0	299.2	84.2	383.4
COMN 06454-02	W	G2						10	36.9	131.2	135.3	9.6	131.2	144.8	313.0
COMN 06456-02	B	G2	FM	Red	W	1.064	6.5	14	68.7	195.6	260.6	25.6	195.6	286.2	550.5
COMN 06456-02	W	G2						6	72.0	72.8	96.6	10.6	72.8	107.2	252.0
COMN 06456-03	B	G2	FM	Red	W	1.068	7.5	15	53.0	177.7	321.4	69.7	177.7	391.1	621.9
COMN 06456-03	W	G2						10	41.3	145.6	161.6	9.4	145.6	171.0	357.9
MN 061837-02	B	G2	FM	Red	Cream	1.066	8.0	0	733.1	0.0	0.0	0.0	0.0	0.0	733.1
MN 061837-02	W	G2						5	65.0	36.4	112.2	193.1	36.4	305.3	406.7
MN 061843-09	B	G2	FM	Red	W	1.067	6.0	13	0.0	124.2	380.3	41.0	124.2	421.3	545.5
MN 061843-09	W	G2													
MN 061845-03	B	G2	FM	Red	Cream	1.060	8.0	0	588.9	0.0	0.0	0.0	0.0	0.0	588.9
MN 061845-03	W	G2						2	52.7	23.0	20.3	95.3	23.0	115.6	191.3
MN 061845-04	B	G2	FM	Red	W	1.056	8.0	12	17.0	102.8	415.9	72.2	102.8	488.1	607.9
MN 061845-04	W	G2						5	25.5	35.4	120.6	163.3	35.4	283.9	344.7
MN 061845-06	B	G2	FM	Red	Cream	1.058	7.0	8	61.5	65.7	298.1	61.6	65.7	359.6	486.8
MN 061845-06	W	G2						4	14.8	25.8	96.8	99.5	25.8	196.3	236.9
MN 061845-08	B	G2	FM	Red	Cream	1.058	6.0	9	0.0	45.3	336.7	136.6	45.3	473.3	518.6
MN 061845-08	W	G2						4	24.8	33.5	91.1	71.1	33.5	162.2	220.5
MN 061857-02	B	G2	FM	Red	Cream	1.065	7.0	5	0.0	48.6	116.0	126.4	48.6	242.5	291.1
MN 061857-02	W	G2						3	0	14.3	79.2	139.9	14.3	219.1	233.4
MN 061859-02	B	G2	FM	Red	Cream	1.065	8.0	9	0.0	145.4	157.5	0.0	145.4	157.5	302.9
MN 061859-02	W	G2													
MN 061905-02	B	G2	FM	Red	Cream	1.065	8.0	8	26.9	54.2	260.8	179.7	54.2	440.5	521.5
MN 061905-02	W	G2						4	279.6	25.7	99.3	126.8	25.7	226.1	531.4
MN 061905-04	B	G2	FM	Red	Cream	1.068	9.0	0	512.7	0.0	0.0	0.0	0.0	0.0	512.7
MN 061905-04	W	G2						4	31.7	34.9	104.3	76.0	34.9	180.2	246.8
MN 061930-01	B	G2	FM	Red	Cream	1.065	9.0	15	76.5	160.7	423.5	53.6	160.7	477.2	714.4
MN 061930-01	W	G2						0	416.0	0.0	0.0	0.0	0.0	0.0	416.0
WIMN 06030-01	B	G2	FM	Red	W	1.079	3.5	20	0.0	336.9	91.8	0.0	336.9	91.8	428.7
WIMN 06030-01	W	G2						9	0	128.3	118.9	0.0	128.3	118.9	247.2

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
WIMN 06030-02	B	G2	FM	Red	Cream	1.077	8.5	27	0.0	371.2	14.8	0.0	371.2	14.8	386.0
WIMN 06030-02	W	G2						17	0	297.3	60.1	0.0	297.3	60.1	357.4
WIMN 06031-01	B	G2	FM	Red	W	1.074	7.5	17	20.3	249.7	298.5	20.6	249.7	319.1	589.1
WIMN 06031-01	W	G2						9	8.4	105.7	266.9	36.4	105.7	303.3	417.4
WIMN 06031-03	B	G2	FM	Red	Cream	1.081	7.0	12	5.6	165.7	256.3	28.5	165.7	284.8	456.1
WIMN 06031-03	W	G2						10	3.4	120.4	238.9	52.0	120.4	290.9	414.7
WIMN 06031-04	B	G2	FM	Red	Cream	1.061	7.0	11	81.2	100.5	353.6	65.5	100.5	419.1	600.9
WIMN 06031-04	W	G2						7	51.3	70.8	219.5	78.5	70.8	298.1	420.1
WIMN 06040-02	B	G2	FM	Red	Yel-lt.	1.082	7.0	18	50.0	190.8	494.3	25.2	190.8	519.4	760.3
WIMN 06040-02	W	G2						5	20.9	59.3	132.0	6.0	59.3	138.0	218.1
WIMN 06041-01	B	G2	FM	Red	Cream	1.072	6.5	17	0.0	219.5	332.5	31.2	219.5	363.7	583.2
WIMN 06041-01	W	G2						10	9.3	127.2	204.3	21.7	127.2	226.0	362.5
WIMN 06041-03	B	G2	FM	Red	Cream	1.074	8.0	12	46.7	127.8	343.9	66.1	127.8	410.0	584.5
WIMN 06041-03	W	G2						5	14.0	39.4	169.7	56.3	39.4	226.0	279.4
WIMN 06041-05	B	G2	FM	Red	Cream	1.069	8.0	9	42.4	95.0	223.9	25.9	95.0	249.8	387.2
WIMN 06041-05	W	G2						7	36.8	89.0	171.6	0.0	89.0	171.6	297.4
WIMN 06041-06	B	G2	FM	Red	Cream	1.065	7.0	22	0.0	268.2	531.0	54.9	268.2	585.9	854.1
WIMN 06041-06	W	G2						8	0	114.2	129.0	5.1	114.2	134.1	248.3
WIMN 06041-07	B	G2	FM	Red	Cream	1.017	9.0	0	631.2	0.0	0.0	0.0	0.0	0.0	631.2
WIMN 06041-07	W	G2						0	346.8	0.0	0.0	0.0	0.0	0.0	346.8
WIMN 06042-01	B	G2	FM	Red	W	1.047	8.0	5	0.0	61.6	86.9	5.9	61.6	92.8	154.4
WIMN 06042-01	W	G2						5	6.2	51.5	122.6	291.3	51.5	414.0	471.7
WIMN 06042-02	B	G2	FM	Red	W	1.070	6.0	14	0.0	144.6	392.2	88.8	144.6	481.0	625.6
WIMN 06042-02	W	G2						8	6.5	86.9	241.2	69.2	86.9	310.4	403.8
WIMN 06042-03	B	G2	FM	Red	W	1.067	7.0	16	43.8	228.4	281.1	40.7	228.4	321.8	594.0
WIMN 06042-03	W	G2						10	52.9	117.0	189.5	119.8	117.0	309.3	479.1
WIMN 06057-03	B	G2	FM	Red	Cream	1.074	8.0	14	8.2	127.0	466.6	40.8	127.0	507.4	642.5
WIMN 06057-03	W	G2						7	18.4	72.7	164.9	67.0	72.7	232.0	323.1
WIMN 06057-04	B	G2	FM	Red	Cream	1.072	8.0	8	223.2	52.8	272.3	93.7	52.8	366.0	642.1
WIMN 06057-04	W	G2						6	101.4	61.7	178.8	60.6	61.7	239.4	402.5
AND00272-1R	B	NCR	FM	Red	-	1.067	7.6	18	6.5	185.1	497.5	51.0	185.1	548.5	740.1

Minnesota Table 1. 2008. Sp. Gravity, Chip, & Yield distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	SpGr.	Chip 3/45F	#/plant	Culls Cwtyld	Size Distribution (cwtyld) <4oz.	≥4<10 oz.	≥10 oz.	B's < 4 oz.	A's ≥4 oz.	T. Yld Cwtyld
AOND95292-3Russ	B	NCR	FF	Rus	-	1.085	6.0	10	4.0	75.2	352.1	114.6	75.2	466.7	546.0
ATND98459-1RY	B	NCR	FM	Red	Yel	1.080	8.3	19	20.0	161.2	593.9	167.3	161.2	761.3	942.4
MSI005-20Y	B	NCR	FM	W	Yel	1.079	7.0	16	0.9	169.6	410.9	101.4	169.6	512.4	682.9
MSJ316-A	B	NCR	C	W	-	1.082	5.0	14	0.0	181.3	301.6	40.4	181.3	342.0	523.3
MSJ461-1	B	NCR	C	W	-	1.072	5.8	20	0.8	266.7	420.5	67.3	266.7	487.9	755.4
MSM171-A	B	NCR	C	W	-	1.062	7.3	10	13.2	61.4	287.9	374.1	61.4	662.0	736.6
ND7132-1R	B	NCR	FM	Red	-	1.067	5.9	11	14.8	67.2	395.9	147.1	67.2	543.0	625.0
ND8304-2	B	NCR	C	W	-	1.076	3.8	12	0.0	153.1	244.2	22.2	153.1	266.3	419.4
ND8307C-3	B	NCR	C	W	-	1.100	4.5	18	0.0	273.6	360.2	8.0	273.6	368.2	641.8
W2133-1	B	NCR	C	W	-	1.087	4.8	14	4.3	124.3	417.4	141.7	124.3	559.1	687.7
W2310-3	B	NCR	C	W	-	1.086	3.5	12	2.0	136.9	320.1	20.7	136.9	340.8	479.7
W2683-2rus	B	NCR	FF	Rus	-	1.081	5.8	11	8.6	85.8	316.1	280.7	85.8	596.8	691.2
W5716-1rus	B	NCR	FF	Rus	-	1.088	6.8	10	3.0	75.7	346.0	102.9	75.7	448.9	527.6
W5767-1R	B	NCR	FM	Red	-	1.077	7.0	11	16.3	92.7	315.4	142.5	92.7	457.9	567.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
Atlantic	B	Chk	C	W	Cream	536.6	10.7	40.8	44.3	88.8	4.2	10.7	85.1	100.0
Atlantic	W	Chk				294.5	10.5	40.5	47.6	89.3	1.3	10.7	88.1	
NorValley	B	Chk	C	W	Cream	567.0	17.8	54.8	27.4	82.2	0.0	17.8	82.2	100.0
NorValley	W	Chk				436.3	13.1	55.3	29.6	86.6	2.0	13.4	84.9	
Snowden	B	Chk	C	W	Cream	616.4	6.9	45.6	44.8	92.9	2.7	6.9	90.4	100.0
Snowden	W	Chk				488.3	7.4	45.7	46.8	92.6	0.0	7.4	92.6	
MN 99380-1	B	G9	C/FM	W	Yel-dk	518.5	16.1	57.4	26.4	83.9	0.0	16.1	83.9	100.0
MN 99380-1	W	G9				254.6	29.5	63.2	7.3	70.5	0.0	29.5	70.5	
MN 00467-4	B	G8	C	W	W	503.8	9.0	45.1	41.2	90.6	4.7	9.0	86.4	100.0
MN 00467-4	W	G8				342.8	10.7	57.2	27.6	88.8	4.4	11.2	84.9	
DEM 7	B	G6	C	W	W	465.1	24.8	63.0	12.2	75.2	0.0	24.8	75.2	100.0
DEM 7	W	G6				406.9	26.0	55.9	17.7	73.9	0.3	26.1	73.7	
MN 02 529	B	G6	C	W	W	479.3	14.7	60.9	24.4	85.3	0.0	14.7	85.3	100.0
MN 02 529	W	G6				289.8	13.4	36.5	50.1	86.6	0.0	13.4	86.6	
MN 02 586	B	G6	C/FM	W	Yel-lt	558.7	27.6	62.6	7.5	71.8	2.3	27.6	70.1	100.0
MN 02 586	W	G6				420.7	27.9	61.9	10.2	72.1	0.0	27.9	72.1	
MN 02 587	B	G6	C	W	W	517.7	39.5	49.6	5.4	58.2	5.5	39.5	55.0	100.0
MN 02 588	B	G6	C/FM	W	Yel-lt	542.3	25.1	62.5	9.6	74.2	2.8	25.1	72.1	100.0
MN 02 588	W	G6				376.7	17.5	57.2	23.4	82.1	1.9	17.9	80.5	
MN 02 589	B	G6	C	W	W	417.8	29.1	59.0	9.9	70.3	1.9	29.1	68.9	100.0
MN 02 589	W	G6				315.8	29.5	66.3	3.2	70.1	1.1	29.9	69.4	
MN 02 598	B	G6	C/FM	W	Yel-lt	629.5	20.1	64.2	13.4	79.4	2.3	20.1	77.6	100.0
MN 02 598	W	G6				373.0	22.5	65.9	11.6	77.5	0.0	22.5	77.5	
MN 02 678	B	G6	C	W	W	370.4	33.9	47.7	18.4	66.1	0.0	33.9	66.1	100.0
MN 02 678	W	G6				368.8	14.5	45.6	39.3	85.4	0.7	14.6	84.8	
MN 02 703	B	G6	C	W	W	199.4	49.6	42.4	8.0	50.4	0.0	49.6	50.4	100.0
MN 02 703	W	G6				85.1	50.0	50.0	0.0	50.0	0.0	50.0	50.0	
COMN 03049-5	B	G5	C/FM	W	Yel-lt	542.8	19.2	56.7	16.5	79.2	7.6	19.2	73.2	100.0
COMN 03049-5	W	G5				387.1	11.5	37.9	47.0	88.1	3.6	11.9	84.9	
COMN 03051-1	B	G5	C	W	Cream	434.2	28.4	57.5	13.2	71.4	0.9	28.4	70.7	100.0
COMN 03051-1	W	G5				205.7	30.2	62.6	7.1	69.8	0.0	30.2	69.8	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
NDMN 03324-4	B	G5	C	W	Cream	609.4	18.8	59.5	20.8	81.0	0.8	18.8	80.3	100.0
NDMN 03324-4	W	G5				437.0	15.7	52.6	30.6	84.2	1.1	15.8	83.3	
NDMN 03333-1	B	G5	C	W	W	368.3	13.8	62.4	22.6	86.0	1.1	13.8	85.0	100.0
NDMN 03333-1	W	G5				232.4	17.6	54.6	27.8	82.4	0.0	17.6	82.4	
NDMN 03333-2	B	G5	C	W	W	348.6	14.0	56.8	25.4	85.4	3.8	14.0	82.2	100.0
NDMN 03333-2	W	G5				281.8	8.4	46.3	45.4	91.6	0.0	8.4	91.6	
NDMN 03339-4	B	G5	C	W	Cream	438.9	13.0	62.0	24.3	86.9	0.6	13.0	86.3	100.0
NDMN 03339-4	W	G5				340.9	14.1	43.0	42.9	85.9	0.0	14.1	85.9	
NDMN 03410-2	B	G5	C	W	Cream	315.2	55.2	41.6	3.1	44.8	0.0	55.2	44.8	100.0
NDMN 03410-2	W	G5				225.4	37.3	58.4	4.3	62.7	0.0	37.3	62.7	
COMN 04651-03	B	G4	C	W	Cream	464.6	39.7	40.0	16.7	58.9	3.6	39.7	56.8	100.0
COMN 04651-03	W	G4				374.6	28.4	55.0	16.6	71.6	0.0	28.4	71.6	
COMN 04659-06	B	G4	C	W	Cream	605.6	5.1	34.0	61.0	94.9	0.0	5.1	94.9	100.0
COMN 04659-06	W	G4				349.8	5.7	44.2	50.1	94.3	0.0	5.7	94.3	
COMN 04674-02	B	G4	C	W	Cream	520.2	6.0	41.1	45.3	93.5	7.6	6.0	86.4	100.0
COMN 04674-02	W	G4				383.9	6.9	42.6	50.5	93.1	0.0	6.9	93.1	
COMN 04696-01	B	G4	C	W	W	397.5	30.9	51.6	12.8	67.6	4.7	30.9	64.4	100.0
COMN 04696-01	W	G4				360.6	14.6	55.4	29.7	85.3	0.2	14.7	85.1	
COMN 04788-02	B	G4	C	W	W	254.8	35.2	56.8	6.5	64.3	1.5	35.2	63.3	100.0
COMN 04788-02	W	G4				236.0	30.1	61.6	8.3	69.9	0.0	30.1	69.9	
COMN 04788-03	B	G4	C	W	Cream	453.9	34.5	57.7	7.8	65.5	0.0	34.5	65.5	100.0
COMN 04788-03	W	G4				399.7	29.3	62.7	8.0	70.7	0.0	29.3	70.7	
COMN 04788-04	B	G4	C	W	Cream	335.8	48.9	46.4	4.3	50.9	0.5	48.9	50.7	100.0
COMN 04788-04	W	G4				303.0	34.2	63.2	2.6	65.8	0.0	34.2	65.8	
COMN 04788-05	B	G4	C	W	Cream	349.3	45.0	54.4	0.0	54.7	0.7	45.0	54.4	100.0
COMN 04788-05	W	G4				197.7	41.4	50.8	7.8	58.6	0.0	41.4	58.6	
COMN 04788-09	B	G4	C	W	W	323.1	40.5	45.9	7.5	56.9	6.1	40.5	53.4	100.0
COMN 04788-09	W	G4				273.4	45.4	45.0	9.6	54.6	0.0	45.4	54.6	
COMN 04788-10	B	G4	C	W	W	341.3	31.5	59.6	8.8	68.5	0.0	31.5	68.5	100.0
COMN 04788-10	W	G4				294.8	33.5	56.8	9.8	66.5	0.0	33.5	66.5	
NDMN 04905-02	B	G4	C	W	Cream	389.8	24.9	62.6	11.3	74.8	1.2	24.9	73.9	100.0
NDMN 04905-02	W	G4				325.3	15.9	60.8	22.1	83.9	1.2	16.1	82.9	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
NDMN 04905-04	B	G4	C	W	W	380.4	17.7	62.6	19.5	82.2	0.1	17.7	82.1	100.0
NDMN 04905-04	W	G4				308.7	27.3	56.3	14.6	72.2	1.8	27.8	70.9	
NDMN 04905-06	B	G4	C	W	Cream	283.7	8.3	45.9	45.1	91.6	0.7	8.3	91.0	100.0
NDMN 04905-06	W	G4				152.3	12.6	58.8	24.5	86.9	4.1	13.1	83.3	
NDMN 04905-13	B	G4	C	W	W	476.5	46.2	51.5	2.3	53.8	0.0	46.2	53.8	100.0
NDMN 04905-13	W	G4				278.9	61.2	33.3	5.6	38.8	0.0	61.2	38.8	
NDMN 04905-14	B	G4	C	W	W	351.8	22.4	66.8	10.7	77.6	0.0	22.4	77.6	100.0
NDMN 04905-14	W	G4				279.1	26.2	58.4	15.4	73.8	0.0	26.2	73.8	
NDMN 04910-01	B	G4	C	W	Cream	728.0	20.3	61.3	16.6	79.3	1.8	20.3	77.9	100.0
NDMN 04910-01	W	G4				445.6	28.4	62.8	8.2	71.4	0.6	28.6	71.0	
NDMN 04960-01	B	G4	C	W	W	499.0	28.7	57.6	11.1	70.5	2.6	28.7	68.7	100.0
NDMN 04960-01	W	G4				377.8	21.7	56.1	22.2	78.3	0.0	21.7	78.3	
NDMN 04961-01	B	G4	C	W	W	287.3	14.1	45.5	28.6	84.0	11.8	14.1	74.1	100.0
NDMN 04961-01	W	G4				327.6	13.1	42.5	32.7	85.1	11.7	14.9	75.1	
NDMN 04964-01	B	G4	C	W	Cream	393.0	34.1	49.4	14.5	65.2	2.0	34.1	63.9	100.0
NDMN 04964-01	W	G4				301.7	18.0	64.4	17.6	82.0	0.0	18.0	82.0	
USDAWIMN 04060-1	B	G4	C	W	Cream	472.7	26.3	60.9	11.6	73.4	1.2	26.3	72.5	100.0
USDAWIMN 04060-1	W	G4				296.7	27.6	63.6	7.3	71.9	1.5	28.1	70.9	
WIMN 04836-01	B	G4	C	W	W	501.4	17.4	57.9	24.7	82.6	0.0	17.4	82.6	100.0
WIMN 04836-01	W	G4				219.4	25.0	53.2	21.8	75.0	0.0	25.0	75.0	
WIMN 04836-02	B	G4	C	W	W	302.6	17.2	42.0	34.5	81.7	6.2	17.2	76.6	100.0
WIMN 04836-02	W	G4				316.6	12.7	54.4	32.2	87.2	0.8	12.8	86.6	
WIMN 04837-01	B	G4	C	W	Cream	342.7	19.2	44.0	32.1	79.9	4.7	19.2	76.1	100.0
WIMN 04837-01	W	G4				299.8	21.1	56.2	22.7	78.9	0.0	21.1	78.9	
WIMN 04844-01	B	G4	C	W	Cream	531.4	16.3	59.6	24.1	83.7	0.0	16.3	83.7	100.0
WIMN 04844-01	W	G4				400.4	27.2	57.8	15.0	72.8	0.0	27.2	72.8	
WIMN 04844-03	B	G4	C/FM	W	Yel	426.3	23.8	55.1	21.1	76.2	0.0	23.8	76.2	100.0
WIMN 04844-03	W	G4				341.3	20.4	55.5	24.1	79.6	0.0	20.4	79.6	
WIMN 04844-06	B	G4	C	W	Cream	510.4	20.7	45.1	32.7	79.0	1.5	20.7	77.8	100.0
WIMN 04844-06	W	G4				443.1	9.2	46.3	44.5	90.8	0.0	9.2	90.8	
WIMN 04844-07	B	G4	C/FM	W	Yel	323.2	26.0	62.3	11.7	74.0	0.0	26.0	74.0	100.0
WIMN 04844-07	W	G4				240.3	24.1	55.9	20.0	75.9	0.0	24.1	75.9	
WIMN 04844-12	B	G4	C/FM	W	Yel-dk.	266.8	20.5	46.2	15.0	74.9	18.2	20.5	61.2	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
WIMN 04844-12	W	G4				278.3	29.4	52.8	17.2	70.4	0.6	29.6	70.0	
WIMN 04854-07	B	G4	C	W	Cream	389.7	24.0	67.2	6.4	75.4	2.4	24.0	73.6	100.0
WIMN 04854-07	W	G4				269.3	38.7	54.3	7.0	61.3	0.0	38.7	61.3	
WIMN 04855-02	B	G4	C	W	Cream	533.4	7.3	40.5	52.0	92.7	0.2	7.3	92.5	100.0
WIMN 04855-02	W	G4				447.2	6.4	36.0	56.6	93.5	1.0	6.5	92.6	
WIMN 04866-02	B	G4	C	W	Cream	597.9	18.3	50.2	31.6	81.7	0.0	18.3	81.7	100.0
WIMN 04866-02	W	G4				324.2	14.8	55.2	28.8	85.1	1.2	14.9	84.0	
MN 05001-151	B	G3	C	W	W	486.8	30.7	61.1	7.0	69.0	1.2	30.7	68.1	100.0
MN 05001-151	W	G3				334.2	27.0	65.3	7.8	73.0	0.0	27.0	73.0	
MN 05001-156	B	G3	C	W	Cream	471.2	23.4	62.7	10.5	75.8	3.4	23.4	73.2	100.0
MN 05001-156	W	G3				367.7	16.7	62.0	17.5	82.6	3.7	17.4	79.6	
MN 05001-166	B	G3	C	W	Yel	554.1	4.6	44.2	46.4	95.1	4.7	4.6	90.6	100.0
MN 05001-166	W	G3				392.2	6.9	45.7	47.4	93.1	0.0	6.9	93.1	
MN 05001-171	B	G3	C	W	Cream	528.5	14.3	66.4	19.3	85.7	0.0	14.3	85.7	100.0
MN 05001-171	W	G3				332.9	19.4	63.6	16.9	80.6	0.0	19.4	80.6	
MN 05001-186	B	G3	C	W	Cream	393.0	44.2	53.0	2.8	55.8	0.0	44.2	55.8	100.0
MN 05001-186	W	G3				260.3	52.4	45.8	1.8	47.6	0.0	52.4	47.6	
MN 05001-189	B	G3	C	W	W	401.2	17.4	62.1	20.5	82.6	0.0	17.4	82.6	100.0
MN 05001-189	W	G3				249.4	27.2	62.4	10.3	72.8	0.0	27.2	72.8	
MN 05001-192	B	G3	C	W	Cream	442.1	10.9	54.9	32.2	88.8	2.0	10.9	87.1	100.0
MN 05001-192	W	G3				274.7	9.7	40.9	47.3	90.1	2.0	9.9	88.2	
AOMN 06091-01	B	G2	C	W	Cream	422.0	27.8	51.9	15.9	71.0	4.5	27.8	67.8	100.0
AOMN 06091-01	W	G2				222.0	15.8	52.3	30.9	84.0	1.0	16.0	83.2	
AOMN 06108-01	B	G2	C	W	Cream	382.3	8.8	68.1	23.1	91.2	0.0	8.8	91.2	100.0
AOMN 06108-01	W	G2				289.0	6.3	26.6	67.1	93.7	0.0	6.3	93.7	
AOMN 06149-01	B	G2	C	W	W	815.5	29.0	57.2	12.7	70.6	1.1	29.0	69.8	100.0
AOMN 06149-01	W	G2				613.9	25.6	51.1	23.3	74.4	0.0	25.6	74.4	
AOMN 06149-04	B	G2	C/FM	W	Yel-lt.	463.5	35.4	57.0	7.7	64.6	0.0	35.4	64.6	100.0
AOMN 06149-04	W	G2				315.7	35.4	53.2	11.4	64.6	0.0	35.4	64.6	
AOMN 06150-02	B	G2	C	W	Cream	670.6	32.5	60.6	6.9	67.5	0.0	32.5	67.5	100.0
AOMN 06150-02	W	G2				414.8	39.2	57.0	3.7	60.8	0.0	39.2	60.8	
AOMN 06150-03	B	G2	C	W	Cream	619.9	43.9	50.3	5.8	56.1	0.0	43.9	56.1	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

						Mkt Yld	Size Distribution (%)							
Clone	Loc	Trial	Mkt	Skn	Flesh	Cwtyld	<4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
AOMN 06150-03	W	G2				343.7	63.8	30.5	5.7	36.2	0.0	63.8	36.2	
COMN 06318-02	B	G2	C	W	Cream	471.4	29.6	64.8	5.6	70.4	0.0	29.6	70.4	100.0
COMN 06318-02	W	G2				360.1	19.9	56.6	23.5	80.1	0.0	19.9	80.1	
COMN 06334-01	B	G2	C/FM	W	Yel-dk.	448.8	22.2	70.1	7.7	77.8	0.0	22.2	77.8	100.0
COMN 06334-01	W	G2				329.4	21.1	50.7	28.2	78.9	0.0	21.1	78.9	
COMN 06344-01	B	G2	C/FM	W	Yel	537.5	28.5	63.3	8.2	71.5	0.0	28.5	71.5	100.0
COMN 06344-01	W	G2				425.3	18.0	50.9	31.1	82.0	0.0	18.0	82.0	
COMN 06350-01	B	G2	C	W	W	616.9	41.7	55.9	2.0	58.1	0.4	41.7	57.9	100.0
COMN 06350-01	W	G2				501.4	24.5	53.8	9.1	72.0	12.6	28.0	62.9	
COMN 06354-04	B	G2	C	W	Cream	547.6	25.9	62.5	11.5	74.1	0.0	25.9	74.1	100.0
COMN 06354-04	W	G2				391.0	24.4	60.8	12.7	75.1	2.2	24.9	73.5	
COMN 06355-02	B	G2	C/FM	W	Yel-dk.	585.6	45.9	51.6	2.5	54.1	0.0	45.9	54.1	100.0
COMN 06355-02	W	G2				266.7	26.7	57.1	9.1	71.3	7.2	28.7	66.1	
COMN 06355-03	B	G2	C	W	Cream	838.7	42.4	54.8	1.1	56.9	1.7	42.4	55.9	100.0
COMN 06355-03	W	G2				542.3	12.8	59.2	28.0	87.2	0.0	12.8	87.2	
COMN 06358-04	B	G2	C/FM	W	Yel-dk.	910.0	18.7	67.9	13.4	81.3	0.0	18.7	81.3	100.0
COMN 06358-04	W	G2				507.4	12.2	56.6	30.3	87.7	0.9	12.3	86.9	
COMN 06427-02	B	G2	C	W	W	439.3	39.1	58.3	2.6	60.9	0.0	39.1	60.9	100.0
COMN 06427-02	W	G2				234.7	34.1	55.3	9.7	65.6	1.0	34.4	64.9	
COMN 06460-03	B	G2	C	W	Cream	469.6	19.1	72.2	8.7	80.9	0.0	19.1	80.9	100.0
COMN 06460-03	W	G2				306.6	18.6	60.8	20.6	81.4	0.0	18.6	81.4	
COMN 06471-02	B	G2	C/FM	W	Yel	670.8	37.3	58.1	4.6	62.7	0.0	37.3	62.7	100.0
COMN 06471-02	W	G2				400.4	28.8	55.5	15.2	71.1	0.5	28.9	70.7	
MN 061916-01	B	G2	C	W	Cream	519.0	42.6	48.1	9.3	57.4	0.0	42.6	57.4	100.0
MN 061916-01	W	G2				303.4	37.9	51.1	11.0	62.1	0.0	37.9	62.1	
MN 061916-02	B	G2	C	W	Cream	663.0	33.5	56.9	9.6	66.5	0.0	33.5	66.5	100.0
MN 061916-02	W	G2				364.8	29.1	62.1	8.8	70.9	0.0	29.1	70.9	
WIMN 06010-01	B	G2	C	W	W	495.5	23.2	44.2	24.8	74.8	7.8	23.2	69.0	100.0
WIMN 06010-01	W	G2				336.7	18.4	49.2	32.4	81.6	0.0	18.4	81.6	
WIMN 06010-04	B	G2	C	W	W	375.9	20.9	56.7	20.5	78.7	1.9	20.9	77.3	100.0
WIMN 06010-04	W	G2				188.8	16.2	51.7	21.0	81.8	11.1	18.2	72.7	
WIMN 06014-01	B	G2	C	W	Cream	672.2	17.8	64.6	17.6	82.2	0.0	17.8	82.2	100.0
WIMN 06014-01	W	G2				410.1	25.9	60.5	13.5	74.1	0.0	25.9	74.1	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
WIMN 06014-02	B	G2	C	W	W	433.0	15.3	38.9	45.8	84.7	0.0	15.3	84.7	100.0
WIMN 06014-02	W	G2				189.1	22.3	63.5	14.3	77.7	0.0	22.3	77.7	
WIMN 06014-03	B	G2	C	W	Cream	422.1	33.2	61.7	5.1	66.8	0.0	33.2	66.8	100.0
WIMN 06014-03	W	G2				252.8	31.5	50.5	18.0	68.5	0.0	31.5	68.5	
WIMN 06018-01	B	G2	C	W	W	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
WIMN 06018-01	W	G2				221.7	27.2	58.9	13.9	72.8	0.0	27.2	72.8	
WIMN 06024-03	B	G2	C	W	Cream	313.0	21.5	71.1	7.4	78.5	0.0	21.5	78.5	100.0
WIMN 06024-03	W	G2				212.9	17.4	67.3	15.3	82.6	0.0	17.4	82.6	
WIMN 06035-01	B	G2	C	W	Cream	557.4	18.5	63.5	17.4	81.4	0.6	18.5	80.9	100.0
WIMN 06035-01	W	G2				287.4	16.0	60.7	23.2	84.0	0.0	16.0	84.0	
WIMN 06035-06	B	G2	C	W	W	612.0	26.0	53.4	20.6	74.0	0.0	26.0	74.0	100.0
WIMN 06035-06	W	G2				359.4	15.9	65.5	18.6	84.1	0.0	15.9	84.1	
WIMN 06036-01	B	G2	C	W	Cream	740.6	8.0	36.9	53.4	91.9	1.7	8.0	90.3	100.0
WIMN 06036-01	W	G2				368.7	5.6	27.4	57.5	93.8	9.5	6.2	84.9	
WIMN 06036-03	B	G2	C	W	W	504.9	29.3	66.3	4.5	70.7	0.0	29.3	70.7	100.0
WIMN 06036-03	W	G2				339.0	25.0	53.2	21.8	75.0	0.0	25.0	75.0	
WIMN 06061-02	B	G2	C	W	Cream	479.5	41.9	51.9	6.2	58.1	0.0	41.9	58.1	100.0
WIMN 06061-02	W	G2				291.4	37.2	57.1	5.7	62.8	0.0	37.2	62.8	
WIMN 06063-04	B	G2	C	W	W	537.3	22.8	73.4	3.8	77.2	0.0	22.8	77.2	100.0
WIMN 06063-04	W	G2				400.1	18.0	62.6	19.3	82.0	0.0	18.0	82.0	
WIMN 06063-06	B	G2	C	W	Cream	495.6	17.3	54.2	23.3	81.8	5.2	17.3	77.6	100.0
WIMN 06063-06	W	G2				343.8	23.3	62.4	14.3	76.7	0.0	23.3	76.7	
WIMN 06064-06	B	G2	C	W	Cream	498.2	60.7	38.2	1.1	39.3	0.0	60.7	39.3	100.0
WIMN 06064-06	W	G2				269.3	54.3	43.7	2.0	45.7	0.0	54.3	45.7	
R. Burbank	B	Chk	FF	Rus	Cream	672.2	16.3	52.1	29.1	83.3	2.5	16.3	81.2	100.0
R. Burbank	W	Chk				458.5	12.6	55.9	24.6	86.5	6.8	13.5	80.6	
Shepody	B	Chk	FF	LW	W	618.9	5.9	36.2	48.1	93.4	9.8	5.9	84.2	100.0
Shepody	W	Chk				510.7	3.9	20.1	73.1	95.9	2.9	4.1	93.1	
MN 15620	B	G15	FF	Red	Yel	578.8	24.2	59.7	14.2	75.3	1.9	24.2	73.9	100.0
MN 15620	W	G15				384.2	10.5	41.3	43.4	89.0	4.8	11.0	84.7	
MN 19350	B	G15	FF	W	W	410.8	25.0	64.3	10.7	75.0	0.0	25.0	75.0	100.0
MN 19350	W	G15				310.6	20.8	59.3	19.8	79.2	0.0	20.8	79.2	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
MN 19470	B	G15	FF	LW	W	360.2	10.4	57.7	31.4	89.5	0.6	10.4	89.0	100.0
MN 19470	W	G15				266.1	14.7	44.4	40.9	85.3	0.0	14.7	85.3	
MN 18710	B	G15	FF/FM	Rus	W	401.7	18.1	55.5	26.1	81.8	0.3	18.1	81.5	100.0
MN 18710	W	G15				296.0	12.9	56.0	30.5	87.0	0.6	13.0	86.5	
MN 02 419	B	G6	FF	LW	Cream	407.2	19.7	53.5	24.2	79.7	2.7	19.7	77.6	100.0
MN 02 419	W	G6				313.8	16.2	51.9	30.2	83.5	1.7	16.5	82.1	
AOMN 03178-2	B	G5	FF	Rus lt.	W	450.7	9.7	57.2	33.1	90.3	0.0	9.7	90.3	100.0
AOMN 03178-2	W	G5				416.5	7.4	45.1	47.0	92.5	0.5	7.5	92.1	
AOMN 041027-01	B	G4	FF	Rus-lt	Cream	279.0	26.0	64.5	9.5	74.0	0.0	26.0	74.0	100.0
AOMN 041027-01	W	G4				246.3	11.0	57.5	31.5	89.0	0.0	11.0	89.0	
AOMN 041050-02	B	G4	FF	Rus-lt	Cream	412.4	9.3	52.3	34.1	90.3	4.3	9.3	86.4	100.0
AOMN 041050-02	W	G4				326.2	8.0	58.9	32.0	91.9	1.1	8.1	90.9	
AOMN 041070-01	B	G4	FF	Rus	Cream	300.5	23.8	51.2	24.2	76.0	0.8	23.8	75.3	100.0
AOMN 041070-01	W	G4				315.0	12.1	55.0	28.7	87.4	4.3	12.6	83.7	
AOMN 041093-01	B	G4	FF	Rus-lt	W	468.7	7.9	34.8	53.3	91.8	4.0	7.9	88.1	100.0
AOMN 041093-01	W	G4				277.5	12.5	55.2	29.4	87.1	2.9	12.9	84.6	
AOMN 041101-01	B	G4	FF	LW	W	582.2	5.1	42.6	50.8	94.8	1.5	5.1	93.4	100.0
AOMN 041101-01	W	G4				477.1	6.0	35.4	57.8	93.9	0.8	6.1	93.2	
AOMN 041115-02	B	G4	FF	LW	Cream	384.3	15.0	53.2	31.8	85.0	0.0	15.0	85.0	100.0
AOMN 041115-02	W	G4				396.1	5.4	32.9	59.7	94.5	2.0	5.5	92.6	
AOMN 041127-01	B	G4	FF	Rus-lt	Cream	477.2	18.4	47.0	32.6	81.2	2.0	18.4	79.6	100.0
AOMN 041127-01	W	G4				414.4	16.9	51.7	31.3	83.1	0.0	16.9	83.1	
AOMN 041138-01	B	G4	FF	Rus	W	463.4	39.5	54.4	5.7	60.4	0.4	39.5	60.1	100.0
AOMN 041138-01	W	G4				352.0	21.4	59.7	17.9	78.3	1.0	21.7	77.5	
COMN 04654-03	B	G4	FF	LW	Cream	595.0	26.7	54.3	16.6	72.6	2.4	26.7	70.9	100.0
COMN 04654-03	W	G4				361.2	25.0	60.7	11.9	74.4	2.4	25.6	72.6	
COMN 04659-02	B	G4	FF	LW	Cream	425.4	11.4	65.5	23.1	88.6	0.0	11.4	88.6	100.0
COMN 04659-02	W	G4				298.4	19.9	69.3	10.8	80.1	0.0	19.9	80.1	
COMN 04659-05	B	G4	FF	LW	Cream	530.4	22.2	49.6	17.7	75.2	10.5	22.2	67.3	100.0
COMN 04659-05	W	G4				395.0	16.8	53.8	29.5	83.2	0.0	16.8	83.2	
COMN 04684-01	B	G4	FF	Rus	Cream	381.3	22.8	56.0	18.1	76.4	3.1	22.8	74.0	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
COMN 04684-01	W	G4				298.9	17.2	63.8	18.3	82.6	0.7	17.4	82.1	
COMN 04686-02	B	G4	FF	LW	W	387.4	18.0	65.9	15.7	81.9	0.5	18.0	81.6	100.0
COMN 04686-02	W	G4				349.9	7.1	49.9	43.0	92.9	0.0	7.1	92.9	
COMN 04692-05	B	G4	FF	Rus-lt	Cream	411.6	23.9	56.5	19.6	76.1	0.0	23.9	76.1	100.0
COMN 04692-05	W	G4				300.2	26.2	48.3	23.5	73.3	2.0	26.7	71.8	
COMN 04692-10	B	G4	FF	Rus	Cream	367.4	26.8	61.5	10.9	73.0	0.8	26.8	72.4	100.0
COMN 04692-10	W	G4				351.9	14.2	57.9	27.1	85.7	0.8	14.3	85.0	
COMN 04692-11	B	G4	FF	Rus	Cream	364.5	6.8	47.9	44.8	93.2	0.6	6.8	92.7	100.0
COMN 04692-11	W	G4				250.9	10.3	49.7	38.3	89.5	1.7	10.5	88.0	
COMN 04702-01	B	G4	FF	Rus	W	424.2	12.6	46.6	40.8	87.4	0.0	12.6	87.4	100.0
COMN 04702-01	W	G4				244.3	9.2	64.4	26.4	90.8	0.0	9.2	90.8	
COMN 04702-03	B	G4	FF	Rus	Cream	473.2	9.3	46.2	44.5	90.7	0.0	9.3	90.7	100.0
COMN 04702-03	W	G4				349.3	4.1	35.7	60.3	95.9	0.0	4.1	95.9	
COMN 04702-05	B	G4	FF	Rus	W	274.1	8.9	56.5	33.1	91.0	1.5	8.9	89.6	100.0
COMN 04702-05	W	G4				223.5	3.6	37.1	59.3	96.4	0.0	3.6	96.4	
COMN 04702-08	B	G4	FF	Rus	Cream	532.8	14.2	47.3	37.3	85.7	1.3	14.2	84.6	100.0
COMN 04702-08	W	G4				396.4	12.8	59.6	25.7	86.9	1.8	13.1	85.3	
COMN 04702-09	B	G4	FF	Rus	Cream	374.0	23.0	62.6	12.1	76.4	2.2	23.0	74.8	100.0
COMN 04702-09	W	G4				226.2	35.3	62.7	2.0	64.7	0.0	35.3	64.7	
COMN 04702-11	B	G4	FF	Rus	W	314.3	13.9	64.3	20.1	85.9	1.7	13.9	84.4	100.0
COMN 04702-11	W	G4				238.9	13.3	70.1	16.7	86.7	0.0	13.3	86.7	
COMN 04702-14	B	G4	FF	Rus	Cream	568.4	7.5	36.8	55.7	92.5	0.0	7.5	92.5	100.0
COMN 04702-14	W	G4				285.4	11.2	64.9	23.9	88.8	0.0	11.2	88.8	
COMN 04702-16	B	G4	FF	Rus	Cream	451.5	22.3	63.0	13.9	77.5	0.8	22.3	76.9	100.0
COMN 04702-16	W	G4				299.0	18.6	71.3	10.1	81.4	0.0	18.6	81.4	
COMN 04704-01	B	G4	FF	Rus	W	518.2	23.4	55.0	21.7	76.6	0.0	23.4	76.6	100.0
COMN 04704-01	W	G4				207.5	20.5	54.3	22.9	79.0	2.3	21.0	77.2	
COMN 04712-01	B	G4	FF	Rus-lt	W	604.3	9.3	39.1	43.7	89.9	7.9	9.3	82.7	100.0
COMN 04712-01	W	G4				407.1	10.8	47.9	33.3	88.2	8.1	11.8	81.1	
COMN 04713-03	B	G4	FF	Rus	Cream	576.3	16.6	55.7	27.0	83.3	0.7	16.6	82.7	100.0
COMN 04713-03	W	G4				331.7	18.1	49.2	30.6	81.5	2.1	18.5	79.7	
COMN 04723-01	B	G4	FF	Rus	W	385.3	12.4	45.2	31.1	86.0	11.3	12.4	76.3	100.0
COMN 04723-01	W	G4				318.4	4.6	35.3	49.4	94.9	10.6	5.1	84.8	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

						Mkt Yld	Size Distribution (%)							
Clone	Loc	Trial	Mkt	Skn	Flesh	Cwtyld	<4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
COMN 04733-01	B	G4	FF	Rus	Cream	452.6	13.4	59.0	26.5	86.4	1.1	13.4	85.5	100.0
COMN 04733-01	W	G4				309.1	11.1	64.2	24.7	88.9	0.0	11.1	88.9	
COMN 04733-02	B	G4	FF	Rus	Cream	388.5	4.7	33.1	62.2	95.3	0.0	4.7	95.3	100.0
COMN 04733-02	W	G4				315.6	5.0	30.2	64.8	95.0	0.0	5.0	95.0	
COMN 04744-01	B	G4	FF	Rus	Yel	342.6	18.1	41.6	40.0	81.8	0.3	18.1	81.6	100.0
COMN 04744-01	W	G4				239.6	17.0	61.3	21.7	83.0	0.0	17.0	83.0	
COMN 04747-01	B	G4	FF	Rus	Cream	365.7	9.3	32.2	58.5	90.7	0.0	9.3	90.7	100.0
COMN 04747-01	W	G4				320.6	8.0	35.8	56.2	92.0	0.0	8.0	92.0	
COMN 04756-04	B	G4	FF	Rus-lt	Cream	536.3	23.3	63.7	10.8	76.2	2.2	23.3	74.4	100.0
COMN 04756-04	W	G4				397.5	13.6	61.6	24.8	86.4	0.0	13.6	86.4	
COMN 04759-03	B	G4	FF	Rus	Cream	447.2	22.8	59.5	17.2	77.1	0.5	22.8	76.7	100.0
COMN 04759-03	W	G4				305.0	21.4	60.9	16.4	78.3	1.3	21.7	77.2	
COMN 04760-01	B	G4	FF	Rus	W	462.3	33.4	60.1	6.6	66.6	0.0	33.4	66.6	100.0
COMN 04760-01	W	G4				280.7	22.7	68.6	8.7	77.3	0.0	22.7	77.3	
COMN 04787-04	B	G4	FF	Rus-lt	W	510.0	8.7	46.2	40.6	90.9	4.5	8.7	86.8	100.0
COMN 04787-04	W	G4				386.8	9.9	55.8	33.1	90.0	1.2	10.0	88.9	
NDMN 04871-01	B	G4	FF	Rus	Cream	455.6	8.6	34.1	51.3	90.8	6.1	8.6	85.3	100.0
NDMN 04871-01	W	G4				272.1	8.8	41.7	49.6	91.2	0.0	8.8	91.2	
NDMN 04938-01	B	G4	FF	LW	Cream	525.3	12.4	51.3	33.3	87.2	3.0	12.4	84.6	100.0
NDMN 04938-01	W	G4				376.3	17.3	49.1	32.8	82.6	0.8	17.4	81.9	
NDMN 04964-04	B	G4	FF	LW	W	431.7	13.1	59.5	26.8	86.8	0.6	13.1	86.2	100.0
NDMN 04964-04	W	G4				378.7	12.7	50.1	37.2	87.3	0.0	12.7	87.3	
WIMN 04860-01	B	G4	FF	LW	W	463.3	10.0	58.0	32.0	90.0	0.0	10.0	90.0	100.0
WIMN 04860-01	W	G4				312.0	8.5	38.3	49.4	91.2	3.8	8.8	87.8	
MN 05001-018	B	G3	FF	Rus	Cream	558.7	27.6	46.2	25.9	72.3	0.3	27.6	72.1	100.0
MN 05001-018	W	G3				424.2	18.6	60.1	19.4	81.1	1.8	18.9	79.6	
MN 05001-027	B	G3	FF	Rus	Cream	354.9	9.4	45.8	44.8	90.6	0.0	9.4	90.6	100.0
MN 05001-027	W	G3				226.2	9.5	37.4	53.1	90.5	0.0	9.5	90.5	
MN 05001-028	B	G3	FF	Rus	W	446.5	18.2	67.8	14.0	81.8	0.0	18.2	81.8	100.0
MN 05001-028	W	G3				293.9	11.3	55.0	33.7	88.7	0.0	11.3	88.7	
MN 05001-031	B	G3	FF	Rus	Cream	464.6	4.4	41.7	53.6	95.6	0.3	4.4	95.3	100.0
MN 05001-031	W	G3				335.3	4.2	27.5	68.3	95.8	0.0	4.2	95.8	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
MN 05001-032	B	G3	FF	Rus	W	396.2	24.9	58.7	14.7	74.6	1.7	24.9	73.4	100.0
MN 05001-032	W	G3				236.1	27.8	53.8	18.4	72.2	0.0	27.8	72.2	
MN 05001-033	B	G3	FF	Rus	Cream	490.8	3.9	41.9	53.6	96.1	0.6	3.9	95.5	100.0
MN 05001-033	W	G3				378.4	2.4	16.2	55.6	96.8	25.8	3.2	71.9	
MN 05001-036	B	G3	FF	Rus	Cream	539.9	9.2	57.4	30.1	90.5	3.3	9.2	87.6	100.0
MN 05001-036	W	G3				363.5	12.3	52.1	35.0	87.6	0.6	12.4	87.1	
MN 05001-074	B	G3	FF	Rus	Cream	473.8	6.2	42.4	49.8	93.7	1.6	6.2	92.2	100.0
MN 05001-074	W	G3				364.9	5.1	33.4	59.4	94.8	2.1	5.2	92.8	
MN 05001-092	B	G3	FF	Rus	Cream	484.6	14.5	52.5	33.0	85.5	0.0	14.5	85.5	100.0
MN 05001-092	W	G3				347.9	7.0	42.4	49.6	92.9	0.9	7.1	92.0	
MN 05001-095	B	G3	FF	Rus	Cream	480.2	18.4	53.2	28.4	81.6	0.0	18.4	81.6	100.0
MN 05001-095	W	G3				324.3	13.1	62.2	23.4	86.7	1.3	13.3	85.6	
MN 05001-096	B	G3	FF	Rus	Cream	462.1	17.1	61.1	21.9	82.9	0.0	17.1	82.9	100.0
MN 05001-096	W	G3				266.3	17.7	69.4	12.9	82.3	0.0	17.7	82.3	
MN 05001-107	B	G3	FF	Rus	Cream	325.2	7.1	34.7	41.2	91.5	17.0	7.1	75.9	100.0
MN 05001-107	W	G3				286.8	8.2	38.6	50.2	91.5	3.0	8.5	88.8	
MN 05001-124	B	G3	FF	Rus	Cream	404.7	19.3	57.0	22.1	80.4	1.6	19.3	79.1	100.0
MN 05001-124	W	G3				360.4	14.7	58.1	26.1	85.1	1.1	14.9	84.2	
MN 05001-134	B	G3	FF	Rus	W	614.5	11.0	46.5	37.2	88.4	5.3	11.0	83.7	100.0
MN 05001-134	W	G3				437.4	11.1	58.3	27.3	88.5	3.3	11.5	85.6	
MN 05001-142	B	G3	FF	Rus	Cream	494.1	6.4	50.0	42.2	93.5	1.4	6.4	92.2	100.0
MN 05001-142	W	G3				295.5	9.8	55.2	34.3	90.1	0.6	9.9	89.6	
MN 05001-145	B	G3	FF	LW	W	477.6	12.5	58.5	29.0	87.5	0.0	12.5	87.5	100.0
MN 05001-145	W	G3				290.1	4.8	26.1	57.0	94.5	12.0	5.5	83.1	
MN 05001-175	B	G3	FF	Rus	Cream	505.9	22.7	56.9	19.7	77.2	0.7	22.7	76.6	100.0
MN 05001-175	W	G3				284.0	18.3	54.6	22.0	80.7	5.2	19.3	76.6	
MN 05001-176	B	G3	FF	Rus	Cream	394.9	13.4	43.8	41.6	86.4	1.2	13.4	85.3	100.0
MN 05001-176	W	G3				274.1	11.2	59.5	29.4	88.8	0.0	11.2	88.8	
MN 05001-191	B	G3	FF	Rus	Cream	610.8	6.1	36.7	55.0	93.7	2.2	6.1	91.6	100.0
MN 05001-191	W	G3				419.3	6.0	39.0	48.9	93.6	6.2	6.4	87.9	
MN 05001-193	B	G3	FF	Rus	Cream	535.2	3.4	28.0	66.7	96.6	1.9	3.4	94.7	100.0
MN 05001-193	W	G3				409.6	3.6	35.2	56.1	96.2	5.1	3.8	91.3	
MN 05001-196	B	G3	FF	LW	Cream	758.9	24.2	60.4	14.1	75.5	1.3	24.2	74.5	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
MN 05001-196	W	G3				400.0	35.9	57.6	6.5	64.1	0.0	35.9	64.1	
MN 05001-198	B	G3	FF	Rus	Cream	393.6	23.1	61.8	12.8	76.3	2.2	23.1	74.6	100.0
MN 05001-198	W	G3				413.2	8.4	39.4	52.2	91.6	0.0	8.4	91.6	
AOMN 06070-01	B	G2	FF	Rus	W	384.6	23.0	67.7	9.3	77.0	0.0	23.0	77.0	100.0
AOMN 06070-01	W	G2				208.6	16.8	54.1	29.1	83.2	0.0	16.8	83.2	
AOMN 06077-01	B	G2	FF	Rus	Cream	609.7	22.2	60.2	17.6	77.8	0.0	22.2	77.8	100.0
AOMN 06077-01	W	G2				439.2	5.3	29.9	31.7	92.1	33.1	7.9	61.6	
AOMN 06077-03	B	G2	FF	Rus	Cream	655.3	3.2	28.5	68.3	96.8	0.0	3.2	96.8	100.0
AOMN 06077-03	W	G2				596.4	3.0	11.6	85.5	97.0	0.0	3.0	97.0	
AOMN 06085-01	B	G2	FF	Rus	W	560.8	16.6	57.7	24.0	83.1	1.7	16.6	81.7	100.0
AOMN 06085-01	W	G2				372.5	17.6	62.4	17.2	81.9	2.8	18.1	79.6	
AOMN 06087-01	B	G2	FF	Rus	W	433.7	17.1	76.6	6.3	82.9	0.0	17.1	82.9	100.0
AOMN 06087-01	W	G2				398.1	8.5	50.8	40.7	91.5	0.0	8.5	91.5	
AOMN 06098-02	B	G2	FF	Rus	Cream	308.6	42.8	55.6	1.5	57.2	0.0	42.8	57.2	100.0
AOMN 06098-02	W	G2				240.6	47.7	47.7	4.6	52.3	0.0	47.7	52.3	
AOMN 06100-03	B	G2	FF	Rus	Cream	479.4	50.8	47.9	1.3	49.2	0.0	50.8	49.2	100.0
AOMN 06100-03	W	G2				366.4	33.9	52.4	13.7	66.1	0.0	33.9	66.1	
AOMN 06100-05	B	G2	FF	Rus	Cream	698.2	16.1	63.2	14.8	82.8	5.9	16.1	77.9	100.0
AOMN 06100-05	W	G2				355.6	14.3	64.7	14.6	84.7	6.5	15.3	79.3	
AOMN 06107-01	B	G2	FF	Rus	Cream	616.7	12.0	63.8	24.3	88.0	0.0	12.0	88.0	100.0
AOMN 06107-01	W	G2				389.7	6.6	51.7	38.1	93.1	3.5	6.9	89.8	
AOMN 06118-01	B	G2	FF	Rus	Cream	472.6	5.0	21.9	70.2	94.9	2.8	5.0	92.2	100.0
AOMN 06118-01	W	G2				287.8	3.6	16.2	80.2	96.4	0.0	3.6	96.4	
AOMN 06120-01	B	G2	FF	Rus	W	475.8	49.1	48.5	2.4	50.9	0.0	49.1	50.9	100.0
AOMN 06120-01	W	G2				317.3	50.1	48.3	1.6	49.9	0.0	50.1	49.9	
AOMN 06126-02	B	G2	FF	Rus	Cream	607.6	10.1	46.6	43.3	89.9	0.0	10.1	89.9	100.0
AOMN 06126-02	W	G2				688.9	6.0	18.1	75.9	94.0	0.0	6.0	94.0	
AOMN 06129-02	B	G2	FF	Rus	Cream	724.6	6.8	49.9	42.4	93.1	0.8	6.8	92.4	100.0
AOMN 06129-02	W	G2				358.5	10.9	46.5	39.7	88.8	2.8	11.2	86.3	
AOMN 06131-01	B	G2	FF	Rus	W	670.9	6.4	43.3	50.3	93.6	0.0	6.4	93.6	100.0
AOMN 06131-01	W	G2				386.3	8.7	49.6	39.5	91.1	2.2	8.9	89.1	
AOMN 06131-02	B	G2	FF	Rus	W	478.7	14.2	62.6	22.2	85.7	1.0	14.2	84.8	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

						Mkt Yld	Size Distribution (%)							
Clone	Loc	Trial	Mkt	Skn	Flesh	Cwtyld	<4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
AOMN 06131-02	W	G2				354.4	11.7	52.5	35.8	88.3	0.0	11.7	88.3	
AOMN 06134-02	B	G2	FF	LW	W	497.4	19.4	66.2	14.5	80.6	0.0	19.4	80.6	100.0
AOMN 06134-02	W	G2				289.9	20.6	68.0	11.3	79.4	0.0	20.6	79.4	
AOMN 06135-01SD	B	G2	FF	Rus	Cream	554.7	7.4	39.9	52.7	92.6	0.0	7.4	92.6	100.0
AOMN 06135-01SD	W	G2				238.6	6.0	41.3	50.9	93.9	1.8	6.1	92.2	
AOMN 06135-02SD	B	G2	FF	Rus	Cream	366.3	13.0	74.1	12.9	87.0	0.0	13.0	87.0	100.0
AOMN 06135-02SD	W	G2				186.6	16.3	62.0	21.7	83.7	0.0	16.3	83.7	
AOMN 06135-03	B	G2	FF	LW/Rus	W	235.5	6.6	53.0	28.2	92.5	12.3	6.6	81.2	100.0
AOMN 06135-03	W	G2				241.3	6.6	51.1	39.8	93.3	2.6	6.7	90.9	
AOMN 06136-05	B	G2	FF	Rus	W	431.9	22.1	66.9	11.0	77.9	0.0	22.1	77.9	100.0
AOMN 06136-05	W	G2				220.2	8.2	47.8	40.3	91.5	3.8	8.5	88.1	
AOMN 06136-10	B	G2	FF	Rus	W	519.3	13.6	61.3	25.0	86.4	0.0	13.6	86.4	100.0
AOMN 06136-10	W	G2				376.9	9.7	47.7	40.2	90.0	2.4	10.0	87.9	
AOMN 06136-11	B	G2	FF	LW	W	364.0	4.9	28.6	59.2	94.7	7.3	4.9	87.8	100.0
AOMN 06136-11	W	G2				291.9	5.8	34.2	53.4	93.7	6.5	6.3	87.6	
AOMN 06136-13	B	G2	FF	Rus	Cream	413.4	35.6	62.0	0.0	63.5	2.4	35.6	62.0	100.0
AOMN 06136-13	W	G2				158.4	39.4	60.6	0.0	60.6	0.0	39.4	60.6	
AOMN 06140-02	B	G2	FF	Rus	Cream	613.2	10.0	56.8	33.2	90.0	0.0	10.0	90.0	100.0
AOMN 06140-02	W	G2				309.7	9.5	48.3	42.2	90.5	0.0	9.5	90.5	
AOMN 06142-01	B	G2	FF	Rus	Cream	391.7	45.1	47.8	7.1	54.9	0.0	45.1	54.9	100.0
AOMN 06142-01	W	G2				371.8	26.6	58.1	15.3	73.4	0.0	26.6	73.4	
AOMN 06147-03	B	G2	FF	Rus	Cream	121.2	15.1	49.5	33.4	84.6	2.0	15.1	83.0	100.0
AOMN 06147-03	W	G2				176.1	10.6	44.4	45.0	89.4	0.0	10.6	89.4	
AOMN 06147-05	B	G2	FF	Rus	Cream	517.0	12.0	49.6	36.9	87.8	1.4	12.0	86.6	100.0
AOMN 06147-05	W	G2				272.1	11.6	64.8	23.6	88.4	0.0	11.6	88.4	
AOMN 06153-01	B	G2	FF	Rus	W	569.4	15.8	65.0	15.9	83.7	3.3	15.8	80.9	100.0
AOMN 06153-01	W	G2				398.3	7.7	31.5	58.6	92.1	2.2	7.9	90.1	
AOMN 06153-01SD	B	G2	FF	Rus	W	649.3	14.2	55.1	29.9	85.6	0.8	14.2	85.0	100.0
AOMN 06153-01SD	W	G2				317.3	10.8	63.1	26.1	89.2	0.0	10.8	89.2	
AOMN 06153-03	B	G2	FF	Rus	Cream	497.0	8.8	59.9	31.3	91.2	0.0	8.8	91.2	100.0
AOMN 06153-03	W	G2				452.8	2.9	27.6	67.5	97.1	2.1	2.9	95.1	
AOMN 06153-05	B	G2	FF	Rus	Cream	526.2	3.1	19.3	77.6	96.9	0.0	3.1	96.9	100.0
AOMN 06153-05	W	G2				269.5	6.6	33.4	55.6	93.1	4.4	6.9	89.0	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

						Mkt Yld	Size Distribution (%)							
Clone	Loc	Trial	Mkt	Skn	Flesh	Cwtyld	<4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
AOMN 06153-07	B	G2	FF	Rus	W	590.2	13.7	59.4	24.8	86.0	2.1	13.7	84.2	100.0
AOMN 06153-07	W	G2				420.2	7.0	30.5	60.1	92.8	2.4	7.2	90.6	
AOMN 06153-08	B	G2	FF	Rus	Cream	579.5	44.7	52.8	2.5	55.3	0.0	44.7	55.3	100.0
AOMN 06153-08	W	G2				398.4	22.0	53.0	25.0	78.0	0.0	22.0	78.0	
AOMN 06154-06	B	G2	FF	Rus	Cream	635.7	19.8	65.5	14.7	80.2	0.0	19.8	80.2	100.0
AOMN 06154-06	W	G2				337.5	19.7	67.5	12.8	80.3	0.0	19.7	80.3	
AOMN 06156-02	B	G2	FF	Rus	Cream	599.3	3.8	24.1	70.2	96.1	1.9	3.8	94.3	100.0
AOMN 06156-02	W	G2				652.4	1.7	13.1	85.2	98.3	0.0	1.7	98.3	
AOMN 06156-03	B	G2	FF	Rus	Cream	505.2	14.3	53.5	32.2	85.7	0.0	14.3	85.7	100.0
AOMN 06156-03	W	G2				282.6	19.0	62.2	18.9	81.0	0.0	19.0	81.0	
AOMN 06156-04	B	G2	FF	LW	Cream	640.0	5.3	42.7	52.1	94.7	0.0	5.3	94.7	100.0
AOMN 06156-04	W	G2				345.4	2.0	30.6	48.5	97.5	18.9	2.5	79.1	
AOMN 06161-01	B	G2	FF	Rus	W	560.8	27.2	53.0	11.5	70.3	8.3	27.2	64.4	100.0
AOMN 06161-01	W	G2												
AOMN 06162-02	B	G2	FF	Rus	Cream	581.3	4.4	28.4	60.4	95.3	6.7	4.4	88.9	100.0
AOMN 06162-02	W	G2				323.2	6.1	14.1	79.8	93.9	0.0	6.1	93.9	
AOMN 06166-01	B	G2	FF	Rus	W	590.7	6.8	45.1	45.3	93.0	2.8	6.8	90.4	100.0
AOMN 06166-01	W	G2				317.8	5.5	33.6	50.3	93.8	10.6	6.2	83.9	
AOMN 06167-01	B	G2	FF	LW	W	558.8	31.6	53.0	15.4	68.4	0.0	31.6	68.4	100.0
AOMN 06167-01	W	G2				453.4	22.2	54.1	23.7	77.8	0.0	22.2	77.8	
AOMN 06171-03	B	G2	FF	Rus	Cream	631.1	8.8	46.3	44.9	91.2	0.0	8.8	91.2	100.0
AOMN 06171-03	W	G2				359.7	8.2	46.2	38.5	91.2	7.1	8.8	84.7	
AOMN 06174-01	B	G2	FF	Rus	W	512.0	17.1	63.3	19.6	82.9	0.0	17.1	82.9	100.0
AOMN 06174-01	W	G2				373.3	9.5	55.6	31.8	90.2	3.1	9.8	87.4	
AOMN 06174-01SD	B	G2	FF	Rus	Cream	393.2	8.0	67.7	24.2	92.0	0.0	8.0	92.0	100.0
AOMN 06174-01SD	W	G2				0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	
COMN 06329-01	B	G2	FF	Rus	W	327.0	53.0	35.2	11.7	47.0	0.0	53.0	47.0	100.0
COMN 06329-01	W	G2				331.2	19.9	60.6	19.5	80.1	0.0	19.9	80.1	
COMN 06332-01	B	G2	FF	Rus	W	606.3	10.1	60.5	29.4	89.9	0.0	10.1	89.9	100.0
COMN 06332-01	W	G2				380.8	15.6	49.1	33.2	84.1	2.1	15.9	82.3	
COMN 06333-01	B	G2	FF	Rus	Cream	353.5	20.2	57.3	22.5	79.8	0.0	20.2	79.8	100.0
COMN 06333-01	W	G2				417.8	10.7	35.4	49.7	88.8	4.1	11.2	85.1	
COMN 06344-03	B	G2	FF	Rus/FM	Yel	682.1	18.5	67.0	14.4	81.5	0.0	18.5	81.5	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
COMN 06344-03	W	G2				380.6	23.0	64.7	12.3	77.0	0.0	23.0	77.0	
COMN 06345-03	B	G2	FF	Rus	W	537.5	9.7	40.7	47.3	90.0	2.3	9.7	88.0	100.0
COMN 06345-03	W	G2				240.5	4.6	29.2	62.1	95.2	4.1	4.8	91.3	
COMN 06345-05	B	G2	FF	Rus	Cream	602.3	15.7	70.2	13.6	84.2	0.5	15.7	83.8	100.0
COMN 06345-05	W	G2				127.7	22.3	63.8	13.9	77.7	0.0	22.3	77.7	
COMN 06347-01	B	G2	FF	LW	W	809.9	7.2	41.3	46.8	92.4	4.7	7.2	88.1	100.0
COMN 06347-01	W	G2				435.6	5.9	29.7	60.8	93.9	3.6	6.1	90.5	
COMN 06347-02	B	G2	FF	Rus	W	722.7	14.7	67.7	16.9	85.2	0.6	14.7	84.6	100.0
COMN 06347-02	W	G2				499.3	6.3	41.9	48.4	93.5	3.4	6.5	90.3	
COMN 06348-01	B	G2	FF	Rus	Cream	628.9	18.4	66.1	13.7	81.3	1.8	18.4	79.8	100.0
COMN 06348-01	W	G2				387.6	10.5	62.7	26.8	89.5	0.0	10.5	89.5	
COMN 06350-04	B	G2	FF	Rus	Cream	725.8	10.9	71.3	16.5	89.0	1.3	10.9	87.8	100.0
COMN 06350-04	W	G2				226.2	8.9	44.3	39.1	90.4	7.7	9.6	83.5	
COMN 06354-03	B	G2	FF	LW	W	583.5	32.2	61.6	6.2	67.8	0.0	32.2	67.8	100.0
COMN 06354-03	W	G2				319.0	33.4	59.7	7.0	66.6	0.0	33.4	66.6	
COMN 06354-05	B	G2	FF	Rus	Cream	556.1	11.7	66.4	20.7	88.2	1.2	11.7	87.1	100.0
COMN 06354-05	W	G2				392.7	5.3	36.5	58.2	94.7	0.0	5.3	94.7	
COMN 06355-04	B	G2	FF	Rus	Cream	491.9	4.3	72.2	23.2	95.7	0.4	4.3	95.4	100.0
COMN 06355-04	W	G2				370.5	7.1	60.0	32.9	92.9	0.0	7.1	92.9	
COMN 06358-02	B	G2	FF	Rus/FM	Yel-lt.	450.1	14.6	63.3	22.1	85.4	0.0	14.6	85.4	100.0
COMN 06358-02	W	G2												
COMN 06358-03	B	G2	FF	Rus/FM	Yel	353.8	18.5	62.0	19.4	81.5	0.0	18.5	81.5	100.0
COMN 06358-03	W	G2				276.9	10.7	41.0	48.4	89.3	0.0	10.7	89.3	
COMN 06358-05	B	G2	FF	Rus	Cream	386.0	26.0	57.8	16.2	74.0	0.0	26.0	74.0	100.0
COMN 06358-05	W	G2				294.8	17.5	60.0	22.4	82.5	0.0	17.5	82.5	
COMN 06360-01	B	G2	FF	Rus	Cream	527.2	11.1	68.2	20.7	88.9	0.0	11.1	88.9	100.0
COMN 06360-01	W	G2				1069.3	13.8	47.6	38.3	86.1	0.4	13.9	85.8	
COMN 06363-01	B	G2	FF	Rus	Cream	520.0	4.7	46.5	47.7	95.3	1.1	4.7	94.2	100.0
COMN 06363-01	W	G2				418.3	4.4	41.1	54.6	95.6	0.0	4.4	95.6	
COMN 06369-01	B	G2	FF	Rus	Cream	413.5	19.6	64.3	10.5	79.3	5.7	19.6	74.7	100.0
COMN 06369-01	W	G2				336.0	33.9	51.1	15.1	66.1	0.0	33.9	66.1	
COMN 06369-02	B	G2	FF	Rus	Cream	341.6	66.2	32.4	1.4	33.8	0.0	66.2	33.8	100.0
COMN 06369-02	W	G2				0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
COMN 06376-01	B	G2	FF	Rus	Cream	549.9	34.7	50.0	14.9	65.1	0.4	34.7	64.9	100.0
COMN 06376-01	W	G2				295.6	28.5	68.0	3.5	71.5	0.0	28.5	71.5	
COMN 06376-02	B	G2	FF	Rus	Cream	495.6	32.0	50.7	8.9	65.1	8.3	32.0	59.6	100.0
COMN 06376-02	W	G2				251.5	17.1	49.2	22.9	80.8	10.8	19.2	72.1	
COMN 06378-01	B	G2	FF	Rus	Cream	254.1	32.6	53.5	13.9	67.4	0.0	32.6	67.4	100.0
COMN 06378-01	W	G2				130.8	19.9	48.0	32.1	80.1	0.0	19.9	80.1	
COMN 06379-04	B	G2	FF	Rus	W	521.7	7.6	40.7	51.7	92.4	0.0	7.6	92.4	100.0
COMN 06379-04	W	G2				290.3	11.5	55.1	33.5	88.5	0.0	11.5	88.5	
COMN 06392-01	B	G2	FF	Rus	W	646.1	13.1	60.1	25.1	86.6	1.7	13.1	85.2	100.0
COMN 06392-01	W	G2				433.9	10.3	38.5	47.7	89.3	3.5	10.7	86.2	
COMN 06399-01	B	G2	FF	Rus	W	510.9	20.1	60.9	19.0	79.9	0.0	20.1	79.9	100.0
COMN 06399-01	W	G2				297.6	11.3	39.1	49.6	88.7	0.0	11.3	88.7	
COMN 06401-01	B	G2	FF	Rus	Cream	398.4	3.7	26.5	58.0	95.9	11.8	3.7	84.5	100.0
COMN 06401-01	W	G2				238.2	6.5	36.3	53.2	93.2	4.0	6.8	89.5	
COMN 06401-02	B	G2	FF	Rus	Cream	634.4	15.5	63.8	17.5	84.0	3.1	15.5	81.3	100.0
COMN 06401-02	W	G2				603.6	9.4	42.2	48.4	90.6	0.0	9.4	90.6	
COMN 06402-01	B	G2	FF	LW	W	215.2	17.4	63.5	19.1	82.6	0.0	17.4	82.6	100.0
COMN 06402-01	W	G2				166.5	17.7	53.4	28.8	82.3	0.0	17.7	82.3	
COMN 06407-01	B	G2	FF	Rus	Cream	613.8	13.0	63.9	23.1	87.0	0.0	13.0	87.0	100.0
COMN 06407-01	W	G2				797.3	5.3	40.5	54.2	94.7	0.0	5.3	94.7	
COMN 06419-01	B	G2	FF	Rus	Cream	568.3	23.9	54.4	20.4	75.7	1.3	23.9	74.8	100.0
COMN 06419-01	W	G2				251.4	18.5	66.4	15.0	81.5	0.0	18.5	81.5	
COMN 06433-01	B	G2	FF	LW/Rus	Cream	547.9	3.6	50.7	43.2	96.3	2.5	3.6	93.9	100.0
COMN 06433-01	W	G2				450.4	3.0	36.5	60.5	97.0	0.0	3.0	97.0	
COMN 06462-01	B	G2	FF	Rus	Cream	607.0	52.4	43.3	4.2	47.6	0.0	52.4	47.6	100.0
COMN 06462-01	W	G2				355.0	39.3	46.0	12.4	59.8	2.2	40.2	58.4	
COMN 06465-02	B	G2	FF	Rus	Cream	500.9	27.4	68.6	4.0	72.6	0.0	27.4	72.6	100.0
COMN 06465-02	W	G2				307.2	16.5	64.9	18.6	83.5	0.0	16.5	83.5	
MN 061788-01	B	G2	FF	Rus	Cream	623.3	8.6	71.8	18.2	91.3	1.4	8.6	90.0	100.0
MN 061788-01	W	G2				396.7	11.7	43.9	40.6	87.8	3.7	12.2	84.6	
MN 061908-03	B	G2	FF	Rus	Cream	584.3	53.7	46.3	0.0	46.3	0.0	53.7	46.3	100.0
MN 061908-03	W	G2				369.1	43.2	52.5	4.3	56.8	0.0	43.2	56.8	
MN 061908-06	B	G2	FF	LW	W	698.4	14.5	66.5	15.8	85.0	3.2	14.5	82.3	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
MN 061908-06	W	G2				476.1	17.2	50.1	31.5	82.6	1.2	17.4	81.6	
MN 061910-03	B	G2	FF	LW	Yel	617.8	9.7	60.0	30.3	90.3	0.0	9.7	90.3	100.0
MN 061910-03	W	G2				350.8	33.5	57.8	8.7	66.5	0.0	33.5	66.5	
MN 061910-07	B	G2	FF	Rus/FM	Yel	610.0	8.9	43.1	47.0	91.0	1.1	8.9	90.0	100.0
MN 061910-07	W	G2				278.3	11.9	56.7	31.4	88.1	0.0	11.9	88.1	
MN 061912-02	B	G2	FF	Rus	Cream	572.7	8.3	55.9	34.1	91.6	1.7	8.3	90.0	100.0
MN 061912-02	W	G2				297.2	6.0	40.3	53.7	94.0	0.0	6.0	94.0	
MN 061912-03	B	G2	FF	LW	Cream	388.5	18.9	70.6	10.5	81.1	0.0	18.9	81.1	100.0
MN 061912-03	W	G2				333.5	10.7	53.4	33.8	89.1	2.0	10.9	87.3	
MN 061918-05	B	G2	FF	LW	W	601.0	21.4	59.6	16.5	78.1	2.5	21.4	76.1	100.0
MN 061918-05	W	G2				431.2	9.1	39.7	51.1	90.9	0.0	9.1	90.9	
WIMN 06002-02	B	G2	FF	Rus	Cream	652.3	5.2	44.9	50.0	94.8	0.0	5.2	94.8	100.0
WIMN 06002-02	W	G2				290.6	10.0	49.5	40.5	90.0	0.0	10.0	90.0	
WIMN 06004-02	B	G2	FF	LW	W	598.7	10.6	53.1	36.3	89.4	0.0	10.6	89.4	100.0
WIMN 06004-02	W	G2				680.6	2.6	11.8	62.4	96.6	23.2	3.4	74.2	
WIMN 06006-02	B	G2	FF	LW	W	552.8	6.7	51.4	40.7	93.2	1.2	6.7	92.1	100.0
WIMN 06006-02	W	G2				564.7	4.1	21.5	66.5	95.5	7.9	4.5	87.9	
WIMN 06022-03	B	G2	FF	Rus	Cream	644.8	0.5	39.2	58.7	99.5	1.6	0.5	97.8	100.0
WIMN 06022-03	W	G2				431.7	8.6	30.6	60.8	91.4	0.0	8.6	91.4	
WIMN 06046-02	B	G2	FF	LW	Cream	435.9	10.1	57.4	30.7	89.7	1.7	10.1	88.2	100.0
WIMN 06046-02	W	G2				373.6	9.5	38.0	45.0	89.7	7.5	10.3	83.0	
R. Norkotah	B	Chk	FM	Rus	Cream	635.7	15.5	49.1	34.1	84.3	1.4	15.5	83.1	100.0
R. Norkotah	W	Chk				461.0	4.9	25.6	66.0	95.0	3.6	5.0	91.5	
Red Norland	B	Chk	FM	Red	W	505.0	18.2	69.9	9.7	81.4	2.1	18.2	79.6	100.0
Red Norland	W	Chk				428.0	7.3	48.5	41.9	92.5	2.3	7.5	90.4	
Red Pontiac	B	Chk	FM	Red	Cream	693.5	11.2	60.6	25.7	88.5	2.5	11.2	86.3	100.0
Red Pontiac	W	Chk				682.0	4.6	19.1	54.7	94.2	21.7	5.8	73.7	
Y. Gold	B	Chk	FM	W	Yel	484.7	9.7	47.8	40.7	90.1	1.9	9.7	88.5	100.0
Y. Gold	W	Chk				355.3	5.0	36.0	52.3	94.6	6.7	5.4	88.3	
MN 96013-1	B	G12	FM	Red	Yel-dk	335.7	11.9	47.2	37.8	87.7	3.2	11.9	84.9	100.0
MN 96013-1	W	G12				290.5	10.2	46.4	36.7	89.1	6.8	10.9	83.1	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
MN 99460-14	B	G9	FM	Red	W	208.3	24.7	59.6	7.8	73.2	7.9	24.7	67.4	100.0
MN 99460-14	W	G9				157.8	18.2	53.5	14.2	78.8	14.1	21.2	67.7	
MN 00177-5	B	G8	FM	Red	W	213.9	23.1	68.6	6.0	76.4	2.3	23.1	74.7	100.0
MN 00177-5	W	G8				149.9	28.9	52.1	18.0	70.9	1.0	29.1	70.1	
ATMN 03505-3	B	G5	FM	Red	Cream	475.7	16.6	55.8	25.0	82.9	2.6	16.6	80.8	100.0
ATMN 03505-3	W	G5				291.6	14.3	59.8	22.0	85.1	3.9	14.9	81.8	
COMN 03019-4	B	G5	FM	Red	Cream	308.7	21.3	61.3	14.6	78.1	2.8	21.3	75.9	100.0
COMN 03019-4	W	G5				206.5	17.2	58.1	11.7	80.3	13.0	19.7	69.8	
COMN 03020-3	B	G5	FM	Red	W	377.2	18.2	56.6	23.7	81.5	1.5	18.2	80.3	100.0
COMN 03020-3	W	G5				288.1	19.7	46.3	23.8	78.1	10.2	21.9	70.1	
COMN 03021-1	B	G5	FM	Red	Cream	411.9	19.5	56.3	24.2	80.5	0.0	19.5	80.5	100.0
COMN 03021-1	W	G5				244.1	35.7	52.7	9.4	63.5	2.2	36.5	62.1	
COMN 03024-6	B	G5	FM	Red	Cream	371.8	38.5	39.3	3.8	52.8	18.5	38.5	43.1	100.0
COMN 03024-6	W	G5				330.0	27.7	56.6	11.6	71.1	4.2	28.9	68.1	
COMN 03027-1	B	G5	FM	Red	Cream	390.2	39.4	55.8	3.7	60.2	1.1	39.4	59.5	100.0
COMN 03027-1	W	G5				339.6	31.2	60.7	8.1	68.8	0.0	31.2	68.8	
COMN 03030-1	B	G5	FM	Red	Cream	241.2	60.1	37.2	2.1	39.5	0.6	60.1	39.3	100.0
COMN 03030-1	W	G5				287.0	25.7	68.8	4.7	74.1	0.8	25.9	73.5	
COMN 03035-5	B	G5	FM	Red	Cream	277.8	40.2	56.2	3.6	59.8	0.0	40.2	59.8	100.0
COMN 03035-5	W	G5				232.9	25.9	65.9	8.2	74.1	0.0	25.9	74.1	
NDMN 03314-1	B	G5	FM	Red	Cream	438.1	21.8	36.5	6.3	66.2	35.4	21.8	42.8	100.0
NDMN 03314-1	W	G5				213.8	30.9	45.7	9.5	64.2	13.9	35.8	55.3	
NDMN 03316-3	B	G5	FM	Red	Cream	460.5	24.6	58.9	12.8	74.5	3.7	24.6	71.7	100.0
NDMN 03316-3	W	G5				323.3	27.1	55.4	13.9	71.9	3.6	28.1	69.3	
NDMN 03376-1	B	G5	FM	Red dk.	Cream	450.3	20.7	62.5	14.2	78.7	2.6	20.7	76.7	100.0
NDMN 03376-1	W	G5				248.1	26.1	57.1	11.9	72.5	4.9	27.5	69.0	
NDMN 03382-2	B	G5	FM	Red dk.	W	402.6	41.4	47.9	2.1	54.7	8.6	41.4	49.9	100.0
NDMN 03382-2	W	G5				300.9	55.0	41.1	1.6	43.7	2.3	56.3	42.7	
COMN 04668-01	B	G4	FM	Red	Cream	690.1	20.8	56.4	19.3	78.4	3.5	20.8	75.7	100.0
COMN 04668-01	W	G4				428.9	14.8	47.9	32.7	84.5	4.7	15.5	80.6	
COMN 04670-02	B	G4	FM	Red	Cream	199.3	15.1	52.3	18.2	82.4	14.5	15.1	70.5	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
COMN 04670-02	W	G4				161.1	20.1	67.4	12.5	79.9	0.0	20.1	79.9	
COMN 04697-02	B	G4	FM	Red	Cream	371.8	51.0	38.5	5.5	46.3	5.0	51.0	44.0	100.0
COMN 04697-02	W	G4				259.6	60.5	39.2	0.0	39.3	0.3	60.7	39.2	
COMN 04699-05	B	G4	FM	Red	W	352.9	26.3	51.1	10.7	70.2	12.0	26.3	61.7	100.0
COMN 04699-05	W	G4				262.8	23.3	58.8	10.3	74.7	7.6	25.3	69.0	
COMN 04778-02	B	G4	FM	Red	Cream	397.6	20.2	58.0	13.2	77.9	8.6	20.2	71.2	100.0
COMN 04778-02	W	G4				259.3	34.4	53.5	8.6	64.3	3.5	35.7	62.1	
COMN 04779-01	B	G4	FM	Red	Cream	266.5	46.5	37.7	5.4	48.1	10.4	46.5	43.1	100.0
COMN 04779-01	W	G4				163.8	47.8	44.1	6.2	51.2	2.0	48.8	50.2	
COMN 04779-02	B	G4	FM	Red	W	437.3	23.0	59.4	9.7	75.0	7.9	23.0	69.1	100.0
COMN 04779-02	W	G4				357.1	29.7	58.1	10.0	69.7	2.2	30.3	68.1	
COMN 04780-01	B	G4	FM	Red	Cream	400.5	18.2	50.5	16.5	78.6	14.8	18.2	67.0	100.0
COMN 04780-01	W	G4				283.2	19.2	47.1	27.3	79.5	6.4	20.5	74.4	
COMN 04780-06	B	G4	FM	Red	W	224.8	51.5	48.5	0.0	48.5	0.0	51.5	48.5	100.0
COMN 04780-06	W	G4				126.5	41.7	43.4	0.0	51.0	14.9	49.0	43.4	
COMN 04781-04	B	G4	FM	Red	W	387.0	58.8	38.0	1.2	40.0	2.0	58.8	39.2	100.0
COMN 04781-04	W	G4				256.6	44.5	49.6	3.2	54.3	2.6	45.7	52.9	
COMN 04782-01	B	G4	FM	Red	W	350.8	14.4	36.9	35.0	83.3	13.6	14.4	71.9	100.0
COMN 04782-01	W	G4				356.2	8.7	54.2	37.1	91.3	0.0	8.7	91.3	
COMN 04782-04	B	G4	FM	Red	Cream	298.1	30.2	51.1	12.6	67.9	6.1	30.2	63.7	100.0
COMN 04782-04	W	G4				287.1	26.3	49.9	14.8	71.1	8.9	28.9	64.8	
MN 04Morris-1	B	G4	FM	Red	W	342.1	29.0	55.1	9.7	69.1	6.2	29.0	64.8	100.0
MN 04Morris-1	W	G4				239.6	21.8	50.4	26.0	77.8	1.8	22.2	76.4	
NDMN 04911-01	B	G4	FM	W	W	545.2	27.1	66.9	5.9	72.9	0.0	27.1	72.9	100.0
NDMN 04911-01	W	G4				332.2	33.6	50.9	15.0	66.2	0.5	33.8	65.9	
NDMN 04911-02	B	G4	FM	W	W	413.8	43.9	53.6	2.5	56.1	0.0	43.9	56.1	100.0
NDMN 04911-02	W	G4				286.7	35.5	53.4	10.0	64.1	1.0	35.9	63.5	
NDMN 04916-01	B	G4	FM	Red	W	592.3	16.5	64.0	15.4	82.8	4.1	16.5	79.4	100.0
NDMN 04916-01	W	G4				428.7	20.9	59.9	16.6	78.6	2.6	21.4	76.5	
NDMN 04917-02	B	G4	FM	Red	W	303.0	8.6	40.8	33.7	89.6	16.9	8.6	74.5	100.0
NDMN 04917-02	W	G4				159.6	14.1	48.9	15.6	82.1	21.5	17.9	64.5	
NDMN 04917-03	B	G4	FM	Red	W	340.5	23.0	58.6	12.7	75.6	5.7	23.0	71.3	100.0
NDMN 04917-03	W	G4				306.6	19.4	41.5	18.9	75.7	20.3	24.3	60.4	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
NDMN 04927-01	B	G4	FM	Red	Cream	329.2	19.0	55.8	11.5	78.0	13.6	19.0	67.3	100.0
NDMN 04927-01	W	G4				228.3	16.0	60.9	10.6	81.7	12.5	18.3	71.5	
NDMN 04978-01	B	G4	FM	Red	Cream	398.7	27.9	57.6	9.9	70.7	4.6	27.9	67.5	100.0
NDMN 04978-01	W	G4				298.8	17.8	53.3	26.1	81.7	2.9	18.3	79.4	
NDMN 04979-02	B	G4	FM	Red	W	388.5	34.3	56.0	8.4	65.3	1.3	34.3	64.4	100.0
NDMN 04979-02	W	G4				241.2	40.7	44.7	14.6	59.3	0.0	40.7	59.3	
MN 05001-002	B	G3	FM	Red	Cream	624.9	16.6	60.5	22.3	83.3	0.6	16.6	82.8	100.0
MN 05001-002	W	G3				402.7	11.1	42.5	46.4	88.9	0.0	11.1	88.9	
MN 05001-007	B	G3	FM	Red	Cream	501.3	36.7	48.0	14.0	62.8	1.3	36.7	62.0	100.0
MN 05001-007	W	G3				310.4	37.7	51.0	8.1	61.0	3.2	39.0	59.1	
MN 05001-017	B	G3	FM	Red	Cream	339.0	47.6	46.4	1.5	50.2	4.5	47.6	47.9	100.0
MN 05001-017	W	G3				312.0	32.9	53.6	11.6	66.5	1.9	33.5	65.3	
MN 05001-047	B	G3	FM	Dk. Red	Cream	275.3	26.9	70.9	1.7	73.0	0.5	26.9	72.6	100.0
MN 05001-047	W	G3				210.8	15.3	53.2	25.1	83.7	6.4	16.3	78.4	
MN 05001-051	B	G3	FM	Red	Yel	413.2	29.7	56.1	11.9	69.6	2.2	29.7	68.0	100.0
MN 05001-051	W	G3				306.0	32.2	49.4	17.1	67.3	1.3	32.7	66.5	
MN 05001-054	B	G3	FM	Red	Cream	502.3	21.8	59.0	12.9	76.7	6.3	21.8	71.9	100.0
MN 05001-054	W	G3				421.1	11.6	41.9	44.9	88.2	1.6	11.8	86.8	
MN 05001-088	B	G3	FM	Red	Yel	567.7	43.4	46.4	8.8	56.0	1.3	43.4	55.3	100.0
MN 05001-088	W	G3				451.9	30.5	49.7	17.7	68.9	2.1	31.1	67.4	
MN 05001-090	B	G3	FM	Red	W	597.1	13.6	64.1	17.4	85.7	5.0	13.6	81.4	100.0
MN 05001-090	W	G3				383.6	7.0	44.4	42.1	92.5	6.5	7.5	86.5	
MN 05001-094	B	G3	FM	Red	Yel	379.8	33.2	58.3	8.5	66.8	0.0	33.2	66.8	100.0
MN 05001-094	W	G3				283.4	24.3	44.7	16.8	71.7	14.2	28.3	61.5	
MN 05001-115	B	G3	FM	Red	Yel-dk.	260.1	62.6	34.5	1.9	36.8	1.0	62.6	36.4	100.0
MN 05001-115	W	G3				191.2	57.0	38.4	0.0	40.2	4.7	59.8	38.4	
MN 05001-127	B	G3	FM	Red	Yel-lt.	447.5	21.5	54.2	20.6	77.7	3.7	21.5	74.8	100.0
MN 05001-127	W	G3				329.3	32.3	50.2	12.1	65.8	5.4	34.2	62.3	
MN 05001-180	B	G3	FM	Red	W	299.5	18.0	56.0	24.2	81.7	1.7	18.0	80.3	100.0
MN 05001-180	W	G3				335.9	17.1	67.9	14.6	82.9	0.4	17.1	82.5	
MN 05001-197	B	G3	FM	Red	Cream	517.2	9.5	44.9	45.6	90.5	0.0	9.5	90.5	100.0
MN 05001-197	W	G3				329.6	12.1	38.3	49.7	87.9	0.0	12.1	87.9	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
AOMN 06100-06	B	G2	FM	Purple	Cream	478.5	59.7	38.6	1.7	40.3	0.0	59.7	40.3	100.0
AOMN 06100-06	W	G2				234.5	59.2	40.8	0.0	40.8	0.0	59.2	40.8	
COMN 06320-01	B	G2	FM	Purple	Purple	523.6	37.1	58.5	3.8	62.7	0.5	37.1	62.3	100.0
COMN 06320-01	W	G2				358.4	18.1	64.4	11.9	80.8	5.5	19.2	76.4	
COMN 06320-02	B	G2	FM	Red	Red	603.8	73.3	26.7	0.0	26.7	0.0	73.3	26.7	100.0
COMN 06320-02	W	G2				336.3	42.4	48.7	5.3	56.0	3.5	44.0	54.0	
COMN 06320-04	B	G2	FM	Red	Red	567.5	46.6	48.8	4.6	53.4	0.0	46.6	53.4	100.0
COMN 06320-04	W	G2				402.6	21.0	56.3	16.4	77.6	6.3	22.4	72.7	
COMN 06322-02	B	G2	FM	Purple	Yel	410.5	75.2	24.8	0.0	24.8	0.0	75.2	24.8	100.0
COMN 06322-02	W	G2				354.4	43.4	52.4	4.2	56.6	0.0	43.4	56.6	
COMN 06334-03	B	G2	FM	Red	Yel	386.5	45.9	51.3	1.4	53.5	1.4	45.9	52.8	100.0
COMN 06334-03	W	G2				158.6	82.3	17.7	0.0	17.7	0.0	82.3	17.7	
COMN 06335-01	B	G2	FM	Red	Red	442.5	32.5	59.1	6.6	66.9	1.8	32.5	65.7	100.0
COMN 06335-01	W	G2				342.5	23.0	57.5	19.5	77.0	0.0	23.0	77.0	
COMN 06336-01	B	G2	FM	Purple	Purple	541.5	80.5	19.5	0.0	19.5	0.0	80.5	19.5	100.0
COMN 06336-01	W	G2				337.8	77.8	22.2	0.0	22.2	0.0	77.8	22.2	
COMN 06341-02	B	G2	FM	Red	Red	525.3	37.3	52.5	7.9	61.9	2.4	37.3	60.4	100.0
COMN 06341-02	W	G2				387.2	23.8	51.9	22.0	75.7	2.3	24.3	73.9	
COMN 06353-04	B	G2	FM	Red	Cream	484.6	27.8	66.2	5.3	72.0	0.7	27.8	71.5	100.0
COMN 06353-04	W	G2				353.9	17.1	57.6	18.4	81.7	6.9	18.3	76.0	
COMN 06356-01	B	G2	FM	Red	Cream	482.1	51.4	44.3	3.1	47.9	1.3	51.4	47.3	100.0
COMN 06356-01	W	G2				343.0	18.2	59.2	22.5	81.8	0.0	18.2	81.8	
COMN 06356-02	B	G2	FM	Red	Cream	524.8	44.7	54.4	0.9	55.3	0.0	44.7	55.3	100.0
COMN 06356-02	W	G2				266.2	32.5	50.0	17.5	67.5	0.0	32.5	67.5	
COMN 06356-05	B	G2	FM	Red	Cream	542.2	17.3	54.3	23.6	81.8	4.8	17.3	77.9	100.0
COMN 06356-05	W	G2				425.3	11.3	51.2	31.4	88.0	6.2	12.0	82.6	
COMN 06371-01	B	G2	FM	Red	Cream	439.4	73.7	26.3	0.0	26.3	0.0	73.7	26.3	100.0
COMN 06371-01	W	G2				399.0	52.5	41.9	3.9	46.6	1.7	53.4	45.8	
COMN 06372-02	B	G2	FM	Red	W	383.2	29.0	56.9	7.1	68.8	7.1	29.0	63.9	100.0
COMN 06372-02	W	G2				229.0	17.3	56.0	17.6	81.0	9.1	19.0	73.6	
COMN 06373-01	B	G2	FM	Red	Yel-lt.	360.6	21.5	68.4	4.0	77.1	6.1	21.5	72.4	100.0
COMN 06373-01	W	G2				306.5	17.4	59.0	20.9	82.1	2.7	17.9	79.9	
COMN 06377-01	B	G2	FM	Red	Cream	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
COMN 06377-01	W	G2				201.8	27.9	45.6	10.4	66.8	16.1	33.2	56.1	
COMN 06422-01	B	G2	FM	Red	Yel-dk.	446.2	62.5	37.5	0.0	37.5	0.0	62.5	37.5	100.0
COMN 06422-01	W	G2				308.1	37.3	44.3	14.7	61.3	3.7	38.7	59.1	
COMN 06437-01	B	G2	FM	Red	Cream	406.3	84.7	15.3	0.0	15.3	0.0	84.7	15.3	100.0
COMN 06437-01	W	G2				251.0	42.3	51.5	6.3	57.7	0.0	42.3	57.7	
COMN 06438-01	B	G2	FM	Red	W	504.8	63.8	36.2	0.0	36.2	0.0	63.8	36.2	100.0
COMN 06438-01	W	G2				258.1	68.8	31.2	0.0	31.2	0.0	68.8	31.2	
COMN 06438-02	B	G2	FM	Red	W	362.7	69.3	25.6	0.0	27.0	5.1	69.3	25.6	100.0
COMN 06438-02	W	G2				333.6	26.7	62.2	8.9	72.7	2.2	27.3	71.1	
COMN 06451-01	B	G2	FM	Red	Cream	440.0	58.6	40.7	0.0	41.0	0.8	58.6	40.7	100.0
COMN 06451-01	W	G2				260.4	48.9	47.0	0.0	49.0	4.1	51.0	47.0	
COMN 06454-01	B	G2	FM	Red	W	431.4	9.6	55.1	35.3	90.4	0.0	9.6	90.4	100.0
COMN 06454-01	W	G2				257.6	17.1	64.4	6.8	80.6	11.7	19.4	71.2	
COMN 06454-02	B	G2	FM	Red	W	383.4	78.0	22.0	0.0	22.0	0.0	78.0	22.0	100.0
COMN 06454-02	W	G2				276.1	41.9	43.2	3.1	52.5	11.8	47.5	46.3	
COMN 06456-02	B	G2	FM	Red	W	481.8	35.5	47.3	4.7	59.4	12.5	35.5	52.0	100.0
COMN 06456-02	W	G2				180.1	28.9	38.3	4.2	59.6	28.6	40.4	42.6	
COMN 06456-03	B	G2	FM	Red	W	568.8	28.6	51.7	11.2	68.8	8.5	28.6	62.9	100.0
COMN 06456-03	W	G2				316.6	40.7	45.2	2.6	54.0	11.5	46.0	47.8	
MN 061837-02	B	G2	FM	Red	Cream	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
MN 061837-02	W	G2				341.6	8.9	27.6	47.5	89.4	16.0	10.6	75.1	
MN 061843-09	B	G2	FM	Red	W	545.5	22.8	69.7	7.5	77.2	0.0	22.8	77.2	100.0
MN 061843-09	W	G2												
MN 061845-03	B	G2	FM	Red	Cream	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
MN 061845-03	W	G2				138.6	12.0	10.6	49.8	83.4	27.6	16.6	60.4	
MN 061845-04	B	G2	FM	Red	W	590.8	16.9	68.4	11.9	82.6	2.8	16.9	80.3	100.0
MN 061845-04	W	G2				319.3	10.3	35.0	47.4	88.9	7.4	11.1	82.3	
MN 061845-06	B	G2	FM	Red	Cream	425.3	13.5	61.2	12.7	84.6	12.6	13.5	73.9	100.0
MN 061845-06	W	G2				222.1	10.9	40.9	42.0	88.4	6.2	11.6	82.9	
MN 061845-08	B	G2	FM	Red	Cream	518.6	8.7	64.9	26.3	91.3	0.0	8.7	91.3	100.0
MN 061845-08	W	G2				195.7	15.2	41.3	32.3	82.9	11.3	17.1	73.6	
MN 061857-02	B	G2	FM	Red	Cream	291.1	16.7	39.9	43.4	83.3	0.0	16.7	83.3	100.0
MN 061857-02	W	G2				233.4	6.1	33.9	60.0	93.9	0.0	6.1	93.9	

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

						Mkt Yld	Size Distribution (%)							
Clone	Loc	Trial	Mkt	Skn	Flesh	Cwtyld	<4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
MN 061859-02	B	G2	FM	Red	Cream	302.9	48.0	52.0	0.0	52.0	0.0	48.0	52.0	100.0
MN 061859-02	W	G2												
MN 061905-02	B	G2	FM	Red	Cream	494.6	10.4	50.0	34.5	89.0	5.2	10.4	84.5	100.0
MN 061905-02	W	G2				251.8	4.8	18.7	23.9	89.8	52.6	10.2	42.6	
MN 061905-04	B	G2	FM	Red	Cream	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
MN 061905-04	W	G2				215.1	14.1	42.2	30.8	83.8	12.8	16.2	73.0	
MN 061930-01	B	G2	FM	Red	Cream	637.9	22.5	59.3	7.5	74.8	10.7	22.5	66.8	100.0
MN 061930-01	W	G2				0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	
WIMN 06030-01	B	G2	FM	Red	W	428.7	78.6	21.4	0.0	21.4	0.0	78.6	21.4	100.0
WIMN 06030-01	W	G2				247.2	51.9	48.1	0.0	48.1	0.0	51.9	48.1	
WIMN 06030-02	B	G2	FM	Red	Cream	386.0	96.2	3.8	0.0	3.8	0.0	96.2	3.8	100.0
WIMN 06030-02	W	G2				357.4	83.2	16.8	0.0	16.8	0.0	83.2	16.8	
WIMN 06031-01	B	G2	FM	Red	W	568.8	42.4	50.7	3.5	56.1	3.4	42.4	54.2	100.0
WIMN 06031-01	W	G2				409.0	25.3	63.9	8.7	74.1	2.0	25.9	72.7	
WIMN 06031-03	B	G2	FM	Red	Cream	450.5	36.3	56.2	6.3	63.2	1.2	36.3	62.4	100.0
WIMN 06031-03	W	G2				411.3	29.0	57.6	12.5	70.7	0.8	29.3	70.1	
WIMN 06031-04	B	G2	FM	Red	Cream	519.6	16.7	58.8	10.9	80.7	13.5	16.7	69.8	100.0
WIMN 06031-04	W	G2				368.8	16.8	52.3	18.7	80.8	12.2	19.2	71.0	
WIMN 06040-02	B	G2	FM	Red	Yel-lt.	710.2	25.1	65.0	3.3	73.1	6.6	25.1	68.3	100.0
WIMN 06040-02	W	G2				197.2	27.2	60.5	2.7	70.0	9.6	30.0	63.3	
WIMN 06041-01	B	G2	FM	Red	Cream	583.2	37.6	57.0	5.4	62.4	0.0	37.6	62.4	100.0
WIMN 06041-01	W	G2				353.2	35.1	56.4	6.0	64.0	2.6	36.0	62.4	
WIMN 06041-03	B	G2	FM	Red	Cream	537.8	21.9	58.8	11.3	76.2	8.0	21.9	70.2	100.0
WIMN 06041-03	W	G2				265.4	14.1	60.7	20.2	85.2	5.0	14.8	80.9	
WIMN 06041-05	B	G2	FM	Red	Cream	344.8	24.5	57.8	6.7	72.5	11.0	24.5	64.5	100.0
WIMN 06041-05	W	G2				260.6	29.9	57.7	0.0	65.8	12.4	34.2	57.7	
WIMN 06041-06	B	G2	FM	Red	Cream	854.1	31.4	62.2	6.4	68.6	0.0	31.4	68.6	100.0
WIMN 06041-06	W	G2				248.3	46.0	51.9	2.1	54.0	0.0	46.0	54.0	
WIMN 06041-07	B	G2	FM	Red	Cream	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
WIMN 06041-07	W	G2				0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	
WIMN 06042-01	B	G2	FM	Red	W	154.4	39.9	56.3	3.8	60.1	0.0	39.9	60.1	100.0
WIMN 06042-01	W	G2				465.5	10.9	26.0	61.8	88.9	1.3	11.1	87.8	
WIMN 06042-02	B	G2	FM	Red	W	625.6	23.1	62.7	14.2	76.9	0.0	23.1	76.9	100.0

Minnesota Table 2. 2008. % size distributions from irrigated sites in Becker (B), MN & Williston (W) , ND.

Clone	Loc	Trial	Mkt	Skn	Flesh	Mkt Yld Cwtyld	Size Distribution (%) <4oz.	≥4<10 oz.	≥10 oz.	% US #1	% Culls	% B's	% A's	Total %
WIMN 06042-02	W	G2				397.3	21.5	59.7	17.1	78.1	1.6	21.9	76.9	
WIMN 06042-03	B	G2	FM	Red	W	550.2	38.4	47.3	6.9	58.5	7.4	38.4	54.2	100.0
WIMN 06042-03	W	G2				426.3	24.4	39.6	25.0	72.6	11.0	27.4	64.6	
WIMN 06057-03	B	G2	FM	Red	Cream	634.4	19.8	72.6	6.4	80.0	1.3	19.8	79.0	100.0
WIMN 06057-03	W	G2				304.7	22.5	51.1	20.8	76.1	5.7	23.9	71.8	
WIMN 06057-04	B	G2	FM	Red	Cream	418.9	8.2	42.4	14.6	87.4	34.8	8.2	57.0	100.0
WIMN 06057-04	W	G2				301.1	15.3	44.4	15.1	79.5	25.2	20.5	59.5	
AND00272-1R	B	NCR	FM	Red	-	733.6	25.0	67.2	6.9	74.8	0.9	25.0	74.1	100.0
AOND95292-3Russ	B	NCR	FF	Rus	-	542.0	13.8	64.5	21.0	86.1	0.7	13.8	85.5	100.0
ATND98459-1RY	B	NCR	FM	Red	Yel	922.4	17.1	63.0	17.8	82.5	2.1	17.1	80.8	100.0
MSI005-20Y	B	NCR	FM	W	Yel	682.0	24.8	60.2	14.9	75.1	0.1	24.8	75.0	100.0
MSJ316-A	B	NCR	C	W	-	523.3	34.6	57.6	7.7	65.4	0.0	34.6	65.4	100.0
MSJ461-1	B	NCR	C	W	-	754.6	35.3	55.7	8.9	64.7	0.1	35.3	64.6	100.0
MSM171-A	B	NCR	C	W	-	723.4	8.3	39.1	50.8	91.5	1.8	8.3	89.9	100.0
ND7132-1R	B	NCR	FM	Red	-	610.2	10.7	63.3	23.5	89.0	2.4	10.7	86.9	100.0
ND8304-2	B	NCR	C	W	-	419.4	36.5	58.2	5.3	63.5	0.0	36.5	63.5	100.0
ND8307C-3	B	NCR	C	W	-	641.8	42.6	56.1	1.3	57.4	0.0	42.6	57.4	100.0
W2133-1	B	NCR	C	W	-	683.4	18.1	60.7	20.6	81.8	0.6	18.1	81.3	100.0
W2310-3	B	NCR	C	W	-	477.7	28.5	66.7	4.3	71.4	0.4	28.5	71.1	100.0
W2683-2rus	B	NCR	FF	Rus	-	682.6	12.4	45.7	40.6	87.4	1.2	12.4	86.3	100.0
W5716-1rus	B	NCR	FF	Rus	-	524.6	14.3	65.6	19.5	85.6	0.6	14.3	85.1	100.0
W5767-1R	B	NCR	FM	Red	-	550.6	16.3	55.6	25.1	83.2	2.9	16.3	80.8	100.0

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab									Late Blight Resistance			
		2008		Color		Severity	C- Coverage			Internal Defects (%)					Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	**Atlantic**	**Chk**	C	W	Cream	5.0	M	L	L	19	0	6	3	6	9	S	S	-
B	**NorValley**	**Chk**	C	W	Cream	4.5	M	L	-	0	0	0	0	3	9	S	S	-
B	**Snowden**	**Chk**	C	W	Cream	4.5	L	M	-	3	0	3	0	3	8	S	MS	-
B	MN 99380-1	G9	C/FM	W	Yel-dk	5.0	M	L	-	0	19	0	0	0	9	S	S	-
B	MN 00467-4	G8	C	W	W	1.0	0	L	-	0	0	0	0	6	9	S	S	-
B	DEM 7	G6	C	W	W	2.0	L	T	-	0	0	0	0	0	9	S	S	-
B	MN 02 529	G6	C	W	W	5.0	M	H	-	13	0	0	0	0	9	S	S	-
B	MN 02 582 (F)	G6	F	F	F	5.0	H	M	-	F	F	F	F	F	9	S	S	-
B	MN 02 586	G6	C/FM	W	Yel-lt	5.0	M	M	-	0	0	0	0	0	9	S	S	-
B	MN 02 587	G6	C	W	W	5.0	H	M	-	0	0	0	0	0	9	S	S	-
B	MN 02 588	G6	C/FM	W	Yel-lt	4.5	M	L	-	6	0	25	0	0	9	S	S	-
B	MN 02 589	G6	C	W	W	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	MN 02 598	G6	C/FM	W	Yel-lt	5.0	M	M	-	6	0	0	6	6	9	S	S	-
B	MN 02 678	G6	C	W	W	5.0	M	M	-	6	0	0	0	0	9	S	S	-
B	MN 02 703	G6	C	W	W	2.5	0	M	-	0	0	0	0	0	9	S	S	-
B	COMN 03049-5	G5	C	W	Yel-lt	5.0	M	M	-	31	0	13	0	0	8.5	S	S	-
B	COMN 03051-1	G5	C	W	Cream	5.0	H	M	-	0	0	0	0	0	9	S	S	-
B	NDMN 03324-4	G5	C	W	Cream	5.0	L	L	-	0	0	0	0	6	9	S	S	-
B	NDMN 03333-1	G5	C	W	W	5.0	M	T	-	25	0	0	0	6	9	S	S	-
B	NDMN 03333-2	G5	C	W	W	5.0	H	M	-	44	0	0	0	0	9	S	S	-
B	NDMN 03339-4	G5	C	W	Cream	5.0	T	M	-	0	0	0	0	0	9	S	S	-
B	NDMN 03410-2	G5	C	W	Cream	2.5	M	0	-	13	0	0	0	0	9	S	S	-
B	COMN 04651-03	G4	C	W	Cream	4.5	L	M	-	0	0	13	0	6	9	S	S	-
B	COMN 04659-06	G4	C	W	Cream	5.0	M	L	-	6	0	0	0	0	9	m	S	-
B	COMN 04674-02	G4	C	W	Cream	1.5	T	0	-	0	25	0	0	0	9	S	S	-
B	COMN 04696-01	G4	C	W	W	5.0	H	M	-	0	0	0	0	6	9	S	S	-
B	COMN 04788-02	G4	C	W	W	4.5	M	M	-	0	0	0	0	0	9	S	S	-
B	COMN 04788-03	G4	C	W	Cream	5.0	L	L	-	6	6	0	25	6	9	S	S	-
B	COMN 04788-04	G4	C	W	Cream	3.0	T	T	-	0	13	0	0	0	9	S	S	-
B	COMN 04788-05	G4	C	W	Cream	2.5	L	M	-	0	0	0	0	0	9	S	S	-
B	COMN 04788-09	G4	C	W	W	3.0	T	M	-	19	0	0	0	0	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab									Late Blight Resistance			
		2008		Color		Severity	C- Coverage			Internal Defects (%)					Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	COMN 04788-10	G4	C	W	W	3.0	T	T	-	0	0	6	0	0	9	S	S	-
B	NDMN 04905-02	G4	C	W	Cream	3.0	M	L	-	0	0	0	0	0	9	S	S	-
B	NDMN 04905-04	G4	C	W	W	5.0	L	M	-	19	0	0	0	0	9	S	S	-
B	NDMN 04905-06	G4	C	W	Cream	5.0	T	M	-	13	0	0	0	0	9	S	S	-
B	NDMN 04905-13	G4	C	W	W	3.0	L	L	-	0	0	0	0	31	9	S	S	-
B	NDMN 04905-14	G4	C	W	W	5.0	H	L	-	19	0	0	0	0	9	S	S	-
B	NDMN 04910-01	G4	C	W	Cream	5.0	H	H	-	6	13	0	0	13	9	S	S	-
B	NDMN 04911-01	G4	C	W	W	4.0	L	M	-	0	0	0	0	0	9	S	S	-
B	NDMN 04911-02	G4	C	W	W	5.0	H	M	-	0	0	0	0	6	9	S	S	-
B	NDMN 04960-01	G4	C	W	W	5.0	L	M	-	6	0	0	0	0	9	S	S	-
B	NDMN 04961-01	G4	C	W	W	4.5	L	T	-	0	0	0	6	0	9	S	S	-
B	NDMN 04964-01	G4	C	W	Cream	5.0	L	M	-	6	0	6	0	6	9	S	S	-
B	USDAWIMN 04060-1	G4	C	W	Cream	5.0	L	L	-	0	13	6	0	0	9	S	S	-
B	WIMN 04836-01	G4	C	W	W	0.5	T	0	-	6	0	0	0	0	9	S	S	-
B	WIMN 04836-02	G4	C	W	W	3.0	L	M	-	44	0	0	0	0	9	S	S	-
B	WIMN 04837-01	G4	C	W	Cream	5.0	T	M	-	50	0	6	0	0	8.5	S	S	-
B	WIMN 04844-01	G4	C	W	Cream	4.5	M	L	-	0	0	0	0	13	9	S	S	-
B	WIMN 04844-03	G4	C	W	Yel	4.0	M	M	-	6	50	0	38	0	9	S	S	-
B	WIMN 04844-06	G4	C	W	Cream	5.0	M	L	-	0	31	13	13	0	9	S	S	-
B	WIMN 04844-07	G4	C	W	Yel	3.5	M	T	-	6	31	0	0	0	9	S	S	-
B	WIMN 04844-12	G4	C/FM	W	Yel-dk.	4.5	T	L	-	0	0	0	0	0	9	S	S	-
B	WIMN 04854-07	G4	C	W	Cream	3.0	T	L	-	6	0	0	0	6	9	S	S	-
B	WIMN 04855-02	G4	C	W	Cream	4.0	L	M	-	19	13	0	0	0	9	S	S	-
B	WIMN 04866-02	G4	C	W	Cream	5.0	M	L	-	13	0	0	0	13	9	S	S	-
B	MN 05001-151	G3	C	W	W	2.5	0	T	-	13	44	0	0	0	9	S	S	-
B	MN 05001-156	G3	C	W	Cream	4.5	M	T	-	0	0	0	0	0	9	S	S	-
B	MN 05001-166	G3	C	W	Yel	5.0	M	M	-	13	0	0	0	0	9	S	S	-
B	MN 05001-171	G3	C	W	Cream	4.0	L	M	-	6	56	0	31	0	9	S	S	-
B	MN 05001-186	G3	C	W	Cream	1.5	T	T	-	25	0	63	19	0	9	S	S	-
B	MN 05001-189	G3	C	W	W	2.5	T	M	-	0	50	0	0	0	9	S	S	-
B	MN 05001-192	G3	C	W	Cream	4.5	M	L	-	63	0	0	0	0	9	S	S	-
B	AOMN 06091-01	G2	C	W	Cream	5.0	M	M	-	13	0	0	0	0	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

				Color		Common Scab				Internal Defects (%)					Late Blight Resistance			
		2008				Severity	C- Coverage								Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	AOMN 06108-01	G2	C	W	Cream	4.5	L	M	-	0	0	0	88	0	9	S	S	-
B	AOMN 06149-01	G2	C	W	W	5.0	L	M	-	0	0	0	0	0	8.5	S	S	-
B	AOMN 06149-04	G2	C	W	Yel-lt.	5.0	T	M	-	0	0	0	0	0	9	S	S	-
B	AOMN 06150-02	G2	C	W	Cream	5.0	L	L	-	0	50	0	0	0	9	S	S	-
B	AOMN 06150-03	G2	C	W	Cream	2.5	M	T	-	0	75	0	0	0	9	S	S	-
B	COMN 06318-02	G2	C	W	Cream	5.0	H	H	-	0	0	0	0	0	9	S	S	-
B	COMN 06334-01	G2	C/FM	W	Yel-dk.	3.0	L	T	-	0	0	0	0	0	9	S	S	-
B	COMN 06344-01	G2	C/FM	W	Yel	3.5	M	T	-	0	0	0	0	13	9	S	S	-
B	COMN 06350-01	G2	C	W	W	4.0	M	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06354-04	G2	C	W	Cream	5.0	M	L	-	0	0	0	0	0	9	S	S	-
B	COMN 06355-02	G2	C/FM	W	Yel-dk.	5.0	L	H	-	0	25	0	0	0	6.5	MS	MS	-
B	COMN 06355-03	G2	C	W	Cream	4.5	L	L	-	0	25	0	0	0	7.5	S	MS	-
B	COMN 06358-04	G2	C/FM	W	Yel-dk.	5.0	M	L	-	63	0	0	0	0	5	MS	MS	-
B	COMN 06427-02	G2	C	W	W	5.0	M	L	-	13	0	0	0	0	9	S	S	-
B	COMN 06460-03	G2	C	W	Cream	4.0	L	M	-	25	38	0	0	0	9	S	S	-
B	COMN 06471-02	G2	C/FM	W	Yel	5.0	M	T	-	0	0	0	13	0	8.5	S	S	-
B	MN 061916-01	G2	C	W	Cream	5.0	M	M	-	0	0	0	38	0	9	S	S	-
B	MN 061916-02	G2	C	W	Cream	4.5	L	M	-	13	25	0	0	13	9	S	S	-
B	WIMN 06010-01	G2	C	W	W	4.0	L	L	-	0	0	0	0	0	9	S	S	-
B	WIMN 06010-04	G2	C	W	W	0.0	0	0	-	13	0	13	0	38	9	S	S	-
B	WIMN 06014-01	G2	C	W	Cream	3.0	T	M	-	0	50	0	0	0	9	S	S	-
B	WIMN 06014-02	G2	C	W	W	0.5	0	T	-	0	0	0	0	13	9	S	S	-
B	WIMN 06014-03	G2	C	W	Cream	5.0	L	M	-	63	0	0	0	0	9	S	S	-
B	WIMN 06018-01	G2	C	W	W	4.0	M	M	-	0	0	0	0	25	9	m	S	-
B	WIMN 06024-03	G2	C	W	Cream	5.0	L	L	-	0	0	0	0	0	9	S	S	-
B	WIMN 06035-01	G2	C	W	Cream	5.0	H	M	-	50	0	0	0	0	9	S	S	-
B	WIMN 06035-06	G2	C	W	W	5.0	M	M	-	13	13	0	0	0	9	S	S	-
B	WIMN 06036-01	G2	C	W	Cream	4.5	M	L	-	63	0	0	0	0	8.5	S	S	-
B	WIMN 06036-03	G2	C	W	W	3.0	T	M	-	0	0	0	0	0	9	S	S	-
B	WIMN 06061-02	G2	C	W	Cream	4.5	L	M	-	13	0	0	25	0	9	S	S	-
B	WIMN 06063-04	G2	C	W	W	2.5	0	L	-	0	0	13	0	0	9	S	S	-
B	WIMN 06063-06	G2	C	W	Cream	0.5	T	0	-	0	0	0	50	0	9	S	S	-
B	WIMN 06064-06	G2	C	W	Cream	1.5	0	L	-	0	13	0	0	0	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

				Color		Common Scab Severity	Common Scab C- Coverage			Internal Defects (%)					Late Blight Resistance Avg.	Susc./Resitant		
Loc	Clone	2008 Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	**Shepody**	**Chk**	FF	LW	W	5.0	L	M	-	21	0	15	6	3	9	S	S	-
B	MN 19470	G15	FF	LW	W	5.0	L	M	-	0	56	0	0	13	9	S	S	-
B	MN 02 419	G6	FF	LW	Cream	5.0	M	H	-	0	0	0	0	0	9	S	S	-
B	AOMN 041101-01	G4	FF	LW	W	4.0	L	M	-	0	6	0	0	0	9	S	S	-
B	AOMN 041115-02	G4	FF	LW	Cream	0.0	0	0	-	0	0	6	0	0	9	S	S	-
B	COMN 04654-03	G4	FF	LW	Cream	2.0	0	M	-	0	6	0	0	0	9	S	S	-
B	COMN 04659-02	G4	FF	LW	Cream	1.5	T	L	-	0	0	0	13	0	9	S	S	-
B	COMN 04659-05	G4	FF	LW	Cream	5.0	M	M	-	25	0	0	0	50	9	S	S	-
B	COMN 04686-02	G4	FF	LW	W	3.5	M	M	-	6	0	0	0	0	9	S	S	-
B	NDMN 04938-01	G4	FF	LW	Cream	5.0	H	L	-	6	6	6	0	0	9	S	S	-
B	NDMN 04964-04	G4	FF	LW	W	5.0	M	L	-	31	0	0	0	0	9	S	S	-
B	WIMN 04860-01	G4	FF	LW	W	2.5	M	0	-	13	0	0	0	6	7.5	S	MS	-
B	MN 05001-145	G3	FF	LW	W	5.0	H	T	-	0	0	6	0	0	9	S	S	-
B	MN 05001-196	G3	FF	LW	Cream	5.0	M	M	-	6	0	0	19	0	9	S	S	-
B	AOMN 06134-02	G2	FF	LW	W	4.0	L	M	-	13	0	0	0	0	9	S	S	-
B	AOMN 06136-11	G2	FF	LW	W	5.0	H	M	-	0	0	0	0	13	8.5	S	S	-
B	AOMN 06156-04	G2	FF	LW	Cream	5.0	H	M	-	13	0	0	0	0	9	S	S	-
B	AOMN 06167-01	G2	FF	LW	W	5.0	M	L	-	0	0	0	0	0	9	S	S	-
B	COMN 06347-01	G2	FF	LW	W	3.5	M	L	-	0	0	0	0	0	9	S	S	-
B	COMN 06354-03	G2	FF	LW	W	5.0	M	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06402-01	G2	FF	LW	W	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	MN 061908-06	G2	FF	LW	W	5.0	L	M	-	13	0	0	0	75	8.5	S	S	-
B	MN 061910-03	G2	FF	LW	Yel	5.0	M	M	-	0	0	0	0	63	9	S	S	-
B	MN 061912-03	G2	FF	LW	Cream	5.0	L	L	-	0	0	0	0	13	9	S	S	-
B	MN 061918-05	G2	FF	LW	W	4.5	M	M	-	0	0	0	0	0	9	S	S	-
B	WIMN 06004-02	G2	FF	LW	W	5.0	M	M	-	0	0	0	0	0	9	S	S	-
B	WIMN 06006-02	G2	FF	LW	W	2.5	L	L	-	0	0	13	0	25	9	S	S	-
B	WIMN 06046-02	G2	FF	LW	Cream	0.0	0	0	-	0	0	0	0	0	9	S	S	-
B	AOMN 06135-03	G2	FF	LW/Rus	W	0.5	0	T	-	0	75	13	0	0	9	S	S	-
B	COMN 06433-01	G2	FF	LW/Rus	Cream	5.0	H	H	-	0	0	0	0	0	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab									Late Blight Resistance			
		2008		Color		Severity	C- Coverage			Internal Defects (%)					Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	**R. Burbank**	**Chk**	FF	Rus	Cream	5.0	M	M	M	14	0	0	0	0	9	S	S	-
B	MN 15620	G15	FF	Red	Yel	5.0	M	T	-	6	0	0	0	69	9	S	S	-
B	MN 18710	G15	FF/FM	Rus	W	0.0	0	0	-	0	0	0	0	0	9	S	S	-
B	MN 19350	G15	FF	W	W	5.0	M	H	-	0	0	6	0	0	9	S	S	-
B	AOMN 03178-2	G5	FF	Rus lt.	W	1.5	T	T	-	38	0	13	0	0	9	S	S	-
B	AOMN 041027-01	G4	FF	Rus-lt	Cream	3.0	L	L	-	0	0	0	0	0	9	S	S	-
B	AOMN 041050-02	G4	FF	Rus-lt	Cream	2.5	H	T	-	19	0	0	0	0	9	S	S	-
B	AOMN 041070-01	G4	FF	Rus	Cream	0.0	0	0	-	0	0	13	0	0	9	S	S	-
B	AOMN 041093-01	G4	FF	Rus-lt	W	3.0	T	T	-	0	0	0	0	6	9	S	S	-
B	AOMN 041127-01	G4	FF	Rus-lt	Cream	3.5	M	T	-	0	0	6	0	6	9	S	S	-
B	AOMN 041138-01	G4	FF	Rus	W	3.5	L	L	-	0	0	0	0	0	9	S	S	-
B	COMN 04684-01	G4	FF	Rus	Cream	2.0	M	0	-	0	0	0	0	0	9	S	S	-
B	COMN 04692-05	G4	FF	Rus-lt	Cream	5.0	M	M	-	0	0	50	0	0	9	S	S	-
B	COMN 04692-10	G4	FF	Rus	Cream	3.0	M	M	-	0	6	13	0	0	9	S	S	-
B	COMN 04692-11	G4	FF	Rus	Cream	2.5	T	0	-	0	0	0	0	0	9	S	S	-
B	COMN 04702-01	G4	FF	Rus	W	0.0	0	0	-	0	0	0	0	6	9	S	S	-
B	COMN 04702-03	G4	FF	Rus	Cream	4.5	L	T	-	0	0	0	0	6	9	S	S	-
B	COMN 04702-05	G4	FF	Rus	W	1.0	0	T	-	0	0	0	0	0	9	S	S	-
B	COMN 04702-08	G4	FF	Rus	Cream	4.5	L	M	-	0	6	0	0	13	9	S	S	-
B	COMN 04702-09	G4	FF	Rus	Cream	5.0	T	M	-	0	0	13	0	13	9	S	S	-
B	COMN 04702-11	G4	FF	Rus	W	5.0	M	T	-	0	0	0	0	0	9	S	S	-
B	COMN 04702-14	G4	FF	Rus	Cream	5.0	L	M	-	6	0	0	0	0	9	S	S	-
B	COMN 04702-16	G4	FF	Rus	Cream	5.0	L	H	-	0	25	6	0	0	9	S	S	-
B	COMN 04704-01	G4	FF	Rus	W	3.0	L	L	-	0	0	0	0	6	9	S	S	-
B	COMN 04712-01	G4	FF	Rus-lt	W	4.5	L	L	-	25	0	6	0	31	9	S	S	-
B	COMN 04713-03	G4	FF	Rus	Cream	4.5	M	T	-	0	0	6	0	0	9	S	S	-
B	COMN 04723-01	G4	FF	Rus	W	1.0	L	L	-	13	0	0	6	13	8	MS	S	-
B	COMN 04733-01	G4	FF	Rus	Cream	5.0	M	M	-	0	0	0	0	0	9	S	S	-
B	COMN 04733-02	G4	FF	Rus	Cream	5.0	M	H	-	25	0	0	0	0	9	S	S	-
B	COMN 04744-01	G4	FF	Rus	Yel	5.0	L	T	-	0	6	0	0	0	9	S	S	-
B	COMN 04747-01	G4	FF	Rus	Cream	2.5	0	L	-	6	0	38	0	0	9	S	S	-
B	COMN 04756-04	G4	FF	Rus-lt	Cream	2.0	M	0	-	0	0	0	0	13	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab									Late Blight Resistance			
		2008		Color		Severity	C- Coverage			Internal Defects (%)					Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	COMN 04759-03	G4	FF	Rus	Cream	3.5	L	L	-	0	0	0	0	6	9	S	S	-
B	COMN 04760-01	G4	FF	Rus	W	2.0	0	T	-	0	0	0	0	0	9	S	S	-
B	COMN 04787-04	G4	FF	Rus-lt	W	5.0	L	M	-	0	0	6	0	0	9	S	S	-
B	NDMN 04871-01	G4	FF	Rus	Cream	5.0	T	L	-	0	0	0	0	0	9	S	S	-
B	MN 05001-018	G3	FF	Rus	Cream	0.0	0	0	-	0	6	0	0	13	9	S	S	-
B	MN 05001-027	G3	FF	Rus	Cream	4.5	L	T	-	0	0	0	0	44	9	S	S	-
B	MN 05001-028	G3	FF	Rus	W	5.0	L	M	-	6	0	0	0	0	8.5	S	S	-
B	MN 05001-031	G3	FF	Rus	Cream	4.5	M	M	-	50	0	0	0	6	9	S	S	-
B	MN 05001-032	G3	FF	Rus	W	3.5	L	T	-	31	0	19	0	0	9	S	S	-
B	MN 05001-033	G3	FF	Rus	Cream	5.0	M	T	-	75	0	0	0	0	9	S	S	-
B	MN 05001-036	G3	FF	Rus	Cream	5.0	M	M	-	0	0	0	0	0	9	S	S	-
B	MN 05001-074	G3	FF	Rus	Cream	5.0	M	L	-	38	0	0	0	13	9	S	S	-
B	MN 05001-092	G3	FF	Rus	Cream	4.5	M	M	-	19	0	0	0	13	9	S	S	-
B	MN 05001-095	G3	FF	Rus	Cream	4.0	M	M	-	0	6	6	0	0	9	S	S	-
B	MN 05001-096	G3	FF	Rus	Cream	4.5	M	T	-	0	0	0	0	13	9	S	S	-
B	MN 05001-107	G3	FF	Rus	Cream	0.0	0	0	-	38	0	0	0	0	9	S	S	-
B	MN 05001-124	G3	FF	Rus	Cream	5.0	T	L	-	0	6	0	0	6	9	S	S	-
B	MN 05001-134	G3	FF	Rus	W	5.0	H	L	-	0	0	0	0	13	9	S	S	-
B	MN 05001-142	G3	FF	Rus	Cream	0.5	0	T	-	6	0	0	0	6	9	S	S	-
B	MN 05001-175	G3	FF	Rus	Cream	4.5	L	L	-	25	25	0	0	0	9	S	S	-
B	MN 05001-176	G3	FF	Rus	Cream	5.0	L	L	-	44	0	0	0	13	9	S	S	-
B	MN 05001-191	G3	FF	Rus	Cream	5.0	M	M	-	19	0	0	0	0	9	S	S	-
B	MN 05001-193	G3	FF	Rus	Cream	1.0	0	L	-	0	0	0	0	13	9	S	S	-
B	MN 05001-198	G3	FF	Rus	Cream	3.5	L	M	-	0	0	0	0	13	9	S	S	-
B	AOMN 06070-01	G2	FF	Rus	W	2.0	0	L	-	13	0	0	0	0	9	S	S	-
B	AOMN 06077-01	G2	FF	Rus	Cream	4.0	M	M	-	25	0	0	0	0	9	S	S	-
B	AOMN 06077-03	G2	FF	Rus	Cream	3.5	L	M	-	0	0	0	0	25	9	S	S	-
B	AOMN 06085-01	G2	FF	Rus	W	5.0	M	L	-	0	0	0	0	0	9	S	S	-
B	AOMN 06087-01	G2	FF	Rus	W	5.0	H	M	-	0	0	13	0	0	9	S	S	-
B	AOMN 06098-02	G2	FF	Rus	Cream	4.5	M	H	-	0	0	0	0	0	9	S	S	-
B	AOMN 06100-03	G2	FF	Rus	Cream	1.5	L	0	-	13	13	25	0	0	9	S	S	-
B	AOMN 06100-05	G2	FF	Rus	Cream	4.0	L	L	-	63	0	13	0	0	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

				Color		Common Scab Severity	C- Coverage			Internal Defects (%)					Late Blight Resistance Avg.	Susc./Resitant		
Loc	Clone	2008 Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	AOMN 06107-01	G2	FF	Rus	Cream	3.5	T	M	-	38	0	0	0	0	9	S	S	-
B	AOMN 06118-01	G2	FF	Rus	Cream	1.0	T	0	-	0	0	13	0	0	9	S	S	-
B	AOMN 06120-01	G2	FF	Rus	W	4.5	M	M	-	13	0	0	0	0	9	S	S	-
B	AOMN 06126-02	G2	FF	Rus	Cream	4.5	M	H	-	0	0	0	0	13	9	S	S	-
B	AOMN 06129-02	G2	FF	Rus	Cream	5.0	L	M	-	0	0	0	0	0	8.5	S	S	-
B	AOMN 06131-01	G2	FF	Rus	W	4.5	M	L	-	0	0	0	0	0	9	S	S	-
B	AOMN 06131-02	G2	FF	Rus	W	2.5	L	0	-	0	0	0	0	0	9	S	S	-
B	AOMN 06135-01SD	G2	FF	Rus	Cream	4.5	L	M	-	0	0	0	0	0	9	S	S	-
B	AOMN 06135-02SD	G2	FF	Rus	Cream	2.0	0	M	-	0	0	0	0	0	9	S	S	-
B	AOMN 06136-05	G2	FF	Rus	W	1.0	0	T	-	25	0	0	0	0	9	S	S	-
B	AOMN 06136-10	G2	FF	Rus	W	0.5	T	0	-	0	0	13	0	0	9	S	S	-
B	AOMN 06136-13	G2	FF	Rus	Cream	5.0	M	L	-	0	0	0	0	0	9	S	S	-
B	AOMN 06140-02	G2	FF	Rus	Cream	5.0	M	H	-	0	0	0	0	0	9	S	S	-
B	AOMN 06142-01	G2	FF	Rus	Cream	1.0	L	T	-	13	0	13	0	0	9	S	S	-
B	AOMN 06147-03	G2	FF	Rus	Cream	5.0	H	M	-	67	0	0	0	17	5.5	MR	MS	-
B	AOMN 06147-05	G2	FF	Rus	Cream	4.5	M	T	-	25	0	0	0	0	9	S	S	-
B	AOMN 06153-01	G2	FF	Rus	W	0.0	0	0	-	13	0	0	0	0	8	S	MS	-
B	AOMN 06153-01SD	G2	FF	Rus	W	5.0	L	L	-	0	0	0	0	0	9	S	S	-
B	AOMN 06153-03	G2	FF	Rus	Cream	2.5	L	T	-	0	0	0	0	0	9	S	S	-
B	AOMN 06153-05	G2	FF	Rus	Cream	0.5	0	T	-	25	0	0	0	0	7	S	MS	-
B	AOMN 06153-07	G2	FF	Rus	W	0.0	0	0	-	0	0	0	0	0	8.5	S	S	-
B	AOMN 06153-08	G2	FF	Rus	Cream	2.5	L	L	-	25	0	0	0	0	8.5	S	S	-
B	AOMN 06154-06	G2	FF	Rus	Cream	4.5	L	T	-	25	0	0	0	0	8.5	S	S	-
B	AOMN 06156-02	G2	FF	Rus	Cream	2.0	0	L	-	0	0	0	0	0	9	S	S	-
B	AOMN 06156-03	G2	FF	Rus	Cream	4.5	L	L	-	38	0	0	0	13	9	S	S	-
B	AOMN 06161-01	G2	FF	Rus	W	3.5	L	L	-	0	0	13	0	0	9	S	S	-
B	AOMN 06162-02	G2	FF	Rus	Cream	0.0	0	0	-	0	0	0	0	0	9	S	S	-
B	AOMN 06166-01	G2	FF	Rus	W	3.5	L	L	-	0	0	0	0	0	9	S	S	-
B	AOMN 06171-03	G2	FF	Rus	Cream	5.0	M	L	-	25	0	0	0	0	9	S	S	-
B	AOMN 06174-01	G2	FF	Rus	W	5.0	L	M	-	13	0	0	0	0	9	S	S	-
B	AOMN 06174-01SD	G2	FF	Rus	Cream	4.5	L	M	-	0	0	0	0	0	8.5	S	S	-
B	COMN 06329-01	G2	FF	Rus	W	0.0	0	0	-	0	0	0	0	38	9	S	S	-
B	COMN 06332-01	G2	FF	Rus	W	4.5	M	L	-	13	0	0	0	25	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab									Late Blight Resistance			
		2008		Color		Severity	C- Coverage			Internal Defects (%)					Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	COMN 06333-01	G2	FF	Rus	Cream	5.0	L	M	-	50	0	0	0	25	5.5	MS	MS	-
B	COMN 06344-03	G2	FF	Rus	Yel	5.0	H	L	-	13	0	0	0	0	9	S	S	-
B	COMN 06345-03	G2	FF	Rus	W	0.0	0	0	-	13	0	0	0	50	9	S	S	-
B	COMN 06345-05	G2	FF	Rus	Cream	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06347-02	G2	FF	Rus	W	3.0	T	H	-	25	0	0	13	0	9	S	S	-
B	COMN 06348-01	G2	FF	Rus	Cream	5.0	L	M	-	0	0	13	0	13	9	S	S	-
B	COMN 06350-04	G2	FF	Rus	Cream	4.5	H	T	-	0	13	0	0	38	8	S	S	-
B	COMN 06354-05	G2	FF	Rus	Cream	3.0	L	M	-	50	0	13	0	0	9	S	S	-
B	COMN 06355-04	G2	FF	Rus	Cream	5.0	T	L	-	88	0	0	0	0	9	S	S	-
B	COMN 06358-02	G2	FF	Rus	Yel-lt.	0.0	0	0	-	0	0	0	0	0	9	S	S	-
B	COMN 06358-03	G2	FF	Rus	Yel	1.5	0	T	-	0	0	0	0	0	8.5	S	S	-
B	COMN 06358-05	G2	FF	Rus	Cream	4.5	M	M	-	88	0	0	0	0	9	S	S	-
B	COMN 06360-01	G2	FF	Rus	Cream	5.0	H	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06363-01	G2	FF	Rus	Cream	5.0	M	L	-	0	0	0	0	0	8	S	S	-
B	COMN 06369-01	G2	FF	Rus	Cream	1.5	0	M	-	0	13	0	0	0	9	S	S	-
B	COMN 06369-02	G2	FF	Rus	Cream	5.0	M	M	-	25	0	0	0	13	9	S	S	-
B	COMN 06376-01	G2	FF	Rus	Cream	3.0	M	L	-	0	0	13	0	0	9	S	S	-
B	COMN 06376-02	G2	FF	Rus	Cream	0.0	0	0	-	50	0	100	0	0	9	S	S	-
B	COMN 06378-01	G2	FF	Rus	Cream	0.0	0	0	-	0	0	0	0	13	9	S	S	-
B	COMN 06379-04	G2	FF	Rus	W	1.0	T	0	-	0	0	0	0	38	9	S	S	-
B	COMN 06392-01	G2	FF	Rus	W	3.0	L	L	-	0	0	0	0	0	9	S	S	-
B	COMN 06399-01	G2	FF	Rus	W	5.0	T	L	-	0	0	0	0	0	9	S	S	-
B	COMN 06401-01	G2	FF	Rus	Cream	1.5	0	T	-	0	0	0	0	25	9	S	S	-
B	COMN 06401-02	G2	FF	Rus	Cream	3.5	M	T	-	0	0	0	0	0	8.5	S	S	-
B	COMN 06407-01	G2	FF	Rus	Cream	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06419-01	G2	FF	Rus	Cream	4.5	H	M	-	0	0	0	0	25	9	S	S	-
B	COMN 06462-01	G2	FF	Rus	Cream	4.0	L	L	-	0	0	0	0	13	9	S	S	-
B	COMN 06465-02	G2	FF	Rus	Cream	2.0	M	0	-	0	0	0	0	0	9	S	S	-
B	MN 061788-01	G2	FF	Rus	Cream	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	MN 061908-03	G2	FF	Rus	Cream	5.0	M	M	-	25	75	0	0	13	8	S	S	-
B	MN 061910-07	G2	FF	Rus	Yel	4.0	T	L	-	0	0	0	0	50	9	S	S	-
B	MN 061912-02	G2	FF	Rus	Cream	5.0	L	H	-	0	0	0	0	0	8.5	S	S	-
B	WIMN 06002-02	G2	FF	Rus	Cream	4.5	M	M	-	0	0	0	0	0	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab									Late Blight Resistance			
		2008		Color		Severity	C- Coverage			Internal Defects (%)					Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	WIMN 06022-03	G2	FF	Rus	Cream	5.0	M	H	-	0	0	0	0	13	9	S	S	-
B	**R. Norkotah**	**Chk**	FM	Rus	Cream	2.5	0	L	-	3	0	11	0	0	9	S	S	-
B	**Red Norland**	**Chk**	FM	Red	W	5.0	L	M	-	3	0	0	0	0	9	S	S	-
B	**Red Pontiac**	**Chk**	FM	Red	Cream	5.0	M	M	-	0	0	8	3	0	9	S	S	-
B	**Y. Gold**	**Chk**	FM	W	Yel	4.5	M	H	-	6	0	0	0	0	9	S	S	-
B	MN 96013-1	G12	FM	Red	Yel-dk	2.5	L	0	-	6	0	0	0	0	9	S	S	-
B	MN 99460-14	G9	FM	Red	W	4.5	L	M	-	0	0	6	6	0	9	S	S	-
B	MN 00177-5	G8	FM	Red	W	5.0	L	M	-	0	0	0	0	6	9	S	S	-
B	ATMN 03505-3	G5	FM	Red	Cream	5.0	M	M	-	0	0	0	0	0	9	S	S	-
B	COMN 03019-4	G5	FM	Red	Cream	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	COMN 03020-3	G5	FM	Red	W	5.0	L	L	-	0	0	0	0	6	9	S	S	-
B	COMN 03021-1	G5	FM	Red	Cream	3.0	M	T	-	0	6	0	0	0	9	S	S	-
B	COMN 03024-6	G5	FM	Red	Cream	5.0	M	T	-	0	0	0	6	6	9	S	S	-
B	COMN 03027-1	G5	FM	Red	Cream	5.0	T	L	-	0	0	0	0	0	9	S	S	-
B	COMN 03030-1	G5	FM	Red	Cream	3.5	L	T	-	0	0	6	0	13	9	S	S	-
B	COMN 03035-5	G5	FM	Red	Cream	5.0	M	L	-	13	0	0	0	0	9	S	S	-
B	NDMN 03314-1	G5	FM	Red	Cream	4.5	L	L	-	0	0	0	0	31	9	S	S	-
B	NDMN 03316-3	G5	FM	Red	Cream	5.0	L	M	-	0	0	6	0	0	9	S	S	-
B	NDMN 03376-1	G5	FM	Red dk.	Cream	4.0	M	L	-	6	0	0	0	0	9	S	S	-
B	NDMN 03382-2	G5	FM	Red dk.	W	3.0	M	T	-	6	0	0	0	31	9	S	S	-
B	COMN 04668-01	G4	FM	Red	Cream	5.0	L	H	-	0	0	0	0	13	9	S	S	-
B	COMN 04670-02	G4	FM	Red	Cream	4.5	M	H	-	0	13	0	0	13	9	S	S	-
B	COMN 04697-02	G4	FM	Red	Cream	5.0	H	M	-	0	0	6	0	13	9	S	S	-
B	COMN 04699-05	G4	FM	Red	W	4.5	L	L	-	0	0	0	0	0	9	S	S	-
B	COMN 04778-02	G4	FM	Red	Cream	5.0	H	M	-	13	0	0	6	0	9	S	S	-
B	COMN 04779-01	G4	FM	Red	Cream	5.0	T	L	-	0	0	0	0	0	9	S	S	-
B	COMN 04779-02	G4	FM	Red	W	5.0	M	L	-	13	0	0	0	13	9	S	S	-
B	COMN 04780-01	G4	FM	Red	Cream	5.0	M	M	-	0	0	6	0	0	9	S	S	-
B	COMN 04780-06	G4	FM	Red	W	5.0	M	H	-	0	0	13	0	0	9	S	S	-
B	COMN 04781-04	G4	FM	Red	W	4.5	M	L	-	0	0	0	0	0	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab				Internal Defects (%)					Late Blight Resistance			
		2008		Color		Severity	C- Coverage								Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	COMN 04782-01	G4	FM	Red	W	5.0	H	H	-	0	0	0	0	0	9	S	S	-
B	COMN 04782-04	G4	FM	Red	Cream	5.0	M	M	-	6	0	0	0	38	9	S	S	-
B	MN 04Morris-1	G4	FM	Red	W	5.0	L	L	-	0	0	0	0	44	9	S	S	-
B	NDMN 04916-01	G4	FM	Red	W	4.5	M	L	-	0	0	0	0	25	9	S	S	-
B	NDMN 04917-02	G4	FM	Red	W	3.5	L	L	-	0	0	0	0	0	9	S	S	-
B	NDMN 04917-03	G4	FM	Red	W	2.5	M	T	-	0	0	0	0	0	9	S	S	-
B	NDMN 04927-01	G4	FM	Red	Cream	3.0	M	M	-	0	6	0	0	0	9	S	S	-
B	NDMN 04978-01	G4	FM	Red	Cream	3.5	T	M	-	0	0	0	0	0	9	S	S	-
B	NDMN 04979-02	G4	FM	Red	W	5.0	L	L	-	0	0	0	0	6	9	S	S	-
B	MN 05001-002	G3	FM	Red	Cream	5.0	M	M	-	0	0	0	0	0	9	S	S	-
B	MN 05001-007	G3	FM	Red	Cream	5.0	T	L	-	0	0	13	0	0	9	S	S	-
B	MN 05001-017	G3	FM	Red	Cream	2.0	T	L	-	13	13	0	0	0	9	S	S	-
B	MN 05001-047	G3	FM	Dk. Red	Cream	4.0	M	M	-	0	0	6	0	0	9	S	S	-
B	MN 05001-051	G3	FM	Red	Yel	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	MN 05001-054	G3	FM	Red	Cream	4.0	M	L	-	0	0	25	0	6	9	S	S	-
B	MN 05001-088	G3	FM	Red	Yel	3.0	T	L	-	0	6	0	0	6	9	S	S	-
B	MN 05001-090	G3	FM	Red	W	5.0	L	M	-	0	0	6	0	0	9	S	S	-
B	MN 05001-094	G3	FM	Red	Yel	5.0	T	M	-	0	6	0	0	13	9	S	S	-
B	MN 05001-115	G3	FM	Red	Yel-dk.	3.0	T	M	-	0	0	6	0	0	9	S	S	-
B	MN 05001-127	G3	FM	Red	Yel-lt.	4.0	L	M	-	0	0	0	0	6	9	S	S	-
B	MN 05001-180	G3	FM	Red	W	0.5	0	T	-	0	0	0	0	6	9	S	S	-
B	MN 05001-197	G3	FM	Red	Cream	4.0	T	T	-	0	0	6	0	19	8.5	S	S	-
B	AOMN 06100-06	G2	FM	Purple	Cream	1.5	L	0	-	25	0	0	0	0	9	S	S	-
B	COMN 06320-01	G2	FM	Purple	Purple	2.0	M	T	-	0	0	63	0	0	9	S	S	-
B	COMN 06320-02	G2	FM	Red	Red	3.5	L	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06320-04	G2	FM	Red	Red	5.0	M	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06322-02	G2	FM	Purple	Yel	2.5	0	M	-	0	0	0	0	25	9	S	S	-
B	COMN 06334-03	G2	FM	Red	Yel	5.0	H	H	-	0	0	0	0	0	9	S	S	-
B	COMN 06335-01	G2	FM	Red	Red	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06336-01	G2	FM	Purple	Purple	4.0	M	T	-	13	0	0	0	0	9	S	S	-
B	COMN 06341-02	G2	FM	Red	Red	5.0	M	H	-	0	0	50	0	0	9	S	S	-
B	COMN 06353-04	G2	FM	Red	Cream	5.0	M	H	-	0	0	13	0	0	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab									Late Blight Resistance			
		2008		Color		Severity	C- Coverage			Internal Defects (%)					Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	COMN 06356-01	G2	FM	Red	Cream	4.5	L	L	-	0	0	0	0	0	9	S	S	-
B	COMN 06356-02	G2	FM	Red	Cream	5.0	M	T	-	0	0	0	0	0	9	S	S	-
B	COMN 06356-05	G2	FM	Red	Cream	5.0	L	T	-	0	0	0	0	0	9	S	S	-
B	COMN 06371-01	G2	FM	Red	Cream	5.0	M	T	-	0	0	0	0	0	9	S	S	-
B	COMN 06372-02	G2	FM	Red	W	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06373-01	G2	FM	Red	Yel-lt.	5.0	H	M	-	13	0	13	25	0	9	S	S	-
B	COMN 06377-01	G2	FM	Red	Cream	5.0	L	T	-	0	0	0	13	0	9	S	S	-
B	COMN 06422-01	G2	FM	Red	Yel-dk.	4.5	M	L	-	0	0	0	0	0	9	S	S	-
B	COMN 06437-01	G2	FM	Red	Cream	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06438-01	G2	FM	Red	W	5.0	M	L	-	0	0	0	0	0	9	S	S	-
B	COMN 06438-02	G2	FM	Red	W	3.0	T	L	-	0	0	0	0	0	9	S	S	-
B	COMN 06451-01	G2	FM	Red	Cream	2.5	0	M	-	0	0	0	0	25	9	S	S	-
B	COMN 06454-01	G2	FM	Red	W	0.5	T	0	-	0	0	0	0	13	9	S	S	-
B	COMN 06454-02	G2	FM	Red	W	5.0	L	M	-	0	0	0	0	0	9	S	S	-
B	COMN 06456-02	G2	FM	Red	W	3.5	T	L	-	0	0	0	0	13	9	S	S	-
B	COMN 06456-03	G2	FM	Red	W	5.0	M	H	-	0	0	0	0	0	9	S	S	-
B	MN 061837-02	G2	FM	Red	Cream	1.0	T	0	-	0	0	0	0	0	9	S	S	-
B	MN 061843-09	G2	FM	Red	W	1.0	L	0	-	0	0	0	0	13	9	S	S	-
B	MN 061845-03	G2	FM	Red	Cream	5.0	M	H	-	0	0	13	0	50	9	S	S	-
B	MN 061845-04	G2	FM	Red	W	5.0	M	M	-	0	0	0	0	25	9	S	S	-
B	MN 061845-06	G2	FM	Red	Cream	5.0	T	M	-	13	0	0	0	50	9	S	S	-
B	MN 061845-08	G2	FM	Red	Cream	5.0	L	L	-	0	0	0	0	50	9	S	S	-
B	MN 061857-02	G2	FM	Red	Cream	2.5	T	M	-	0	63	0	0	0	9	S	S	-
B	MN 061859-02	G2	FM	Red	Cream	3.5	L	M	-	13	0	0	0	0	9	S	S	-
B	MN 061905-02	G2	FM	Red	Cream	4.5	M	M	-	13	0	0	0	25	9	S	S	-
B	MN 061905-04	G2	FM	Red	Cream	1.0	0	T	-	0	0	0	0	63	9	S	S	-
B	MN 061930-01	G2	FM	Red	Cream	5.0	L	M	-	13	0	0	0	75	9	S	S	-
B	WIMN 06030-01	G2	FM	Red	W	5.0	L	L	-	0	0	0	0	0	9	S	S	-
B	WIMN 06030-02	G2	FM	Red	Cream	3.5	T	M	-	0	0	0	0	50	9	S	S	-
B	WIMN 06031-01	G2	FM	Red	W	5.0	L	T	-	0	0	13	0	25	9	S	S	-
B	WIMN 06031-03	G2	FM	Red	Cream	3.5	L	T	-	13	0	0	0	0	9	S	S	-
B	WIMN 06031-04	G2	FM	Red	Cream	4.0	L	M	-	0	50	0	0	25	9	S	S	-
B	WIMN 06040-02	G2	FM	Red	Yel-lt.	5.0	L	M	-	0	0	0	0	0	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab									Late Blight Resistance			
		2008		Color		Severity	C- Coverage			Internal Defects (%)					Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	WIMN 06041-01	G2	FM	Red	Cream	5.0	M	M	-	13	0	0	13	0	9	S	S	-
B	WIMN 06041-03	G2	FM	Red	Cream	5.0	L	M	-	0	0	0	0	63	9	S	S	-
B	WIMN 06041-05	G2	FM	Red	Cream	5.0	M	L	-	0	0	0	0	0	9	S	S	-
B	WIMN 06041-06	G2	FM	Red	Cream	5.0	M	M	-	25	0	0	0	0	9	S	S	-
B	WIMN 06041-07	G2	FM	Red	Cream	5.0	M	H	-	0	0	0	0	100	9	S	S	-
B	WIMN 06042-01	G2	FM	Red	W	5.0	M	M	-	38	0	0	0	0	8.5	S	S	-
B	WIMN 06042-02	G2	FM	Red	W	5.0	M	M	-	0	0	0	0	0	9	S	S	-
B	WIMN 06042-03	G2	FM	Red	W	5.0	M	M	-	0	13	0	0	0	9	S	S	-
B	WIMN 06057-03	G2	FM	Red	Cream	5.0	M	M	-	0	0	0	0	13	9	S	S	-
B	WIMN 06057-04	G2	FM	Red	Cream	5.0	L	T	-	13	0	0	0	0	9	S	S	-
B	AND00272-1R	NCR	FM	Red	W	4.5	L	M	-	0	0	0	0	0	9	S	S	-
B	AOND95292-3Russ	NCR	FF/FM	Rus	Cream	5.0	M	L	-	17	0	0	0	0	8.5	S	S	-
B	ATND98459-1RY	NCR	FM	Red	Yel	5.0	M	L	-	0	0	0	0	0	9	S	S	-
B	MSI005-20Y	NCR	FM	W	Yel	4.5	L	L	-	0	0	3	0	0	9	S	S	-
B	MSJ316-A	NCR	C	W	Cream	4.0	L	L	-	0	47	3	0	0	7	m	MS	-
B	MSJ461-1	NCR	C	W	Cream	5.0	M	M	-	0	8	3	0	0	6.5	MS	MS	-
B	MSM171-A	NCR	C	W	W	3.5	H	T	-	11	0	0	0	0	9	S	S	-
B	ND7132-1R	NCR	FM	Red	W	5.0	M	H	-	0	3	0	0	44	9	S	S	-
B	ND8304-2	NCR	C	W	Cream	5.0	H	L	-	0	0	0	0	0	9	S	S	-
B	ND8307C-3	NCR	C	W	W	3.5	M	L	-	0	0	0	6	6	9	S	S	-
B	W2133-1	NCR	C	W	W	3.0	L	T	-	0	8	6	0	0	9	S	S	-
B	W2310-3	NCR	C	W	W	4.5	M	M	-	0	0	0	0	3	9	S	S	-
B	W2683-2rus	NCR	FF	Rus	Cream	0.0	0	0	-	0	0	0	0	0	9	S	S	-
B	W5716-1rus	NCR	FF	Rus	Cream	5.0	L	H	-	0	0	0	0	0	9	S	S	-
B	W5767-1R	NCR	FM	Red	Cream	5.0	M	H	-	3	14	0	0	8	9	S	S	-
B	W2253-5rus	Disease	FF	Rus	Cream	1.5	T	T	-	-	-	-	-	-	8	S	MS	-
B	W2609-1R	Disease	FM	Red	Cream	3.0	L	L	-	-	-	-	-	-	9	S	S	-
B	W3160-5rus	Disease	FF	Rus	Cream	4.0	L	T	-	-	-	-	-	-	8.5	S	S	-
B	W3186-2	Disease	C	W	Cream	4.5	M	L	-	-	-	-	-	-	9	S	S	-
B	W3743-5rus	Disease	FF	Rus	Cream	5.0	L	H	-	-	-	-	-	-	9	S	S	-
B	W3952-3rus	Disease	FF	Rus	Cream	0.5	L	0	-	-	-	-	-	-	9	S	S	-
B	A95109-1	N Scab	-	-	-	3.0	0	L	L	-	-	-	-	-	-	-	-	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab									Late Blight Resistance			
		2008		Color		Severity	C- Coverage			Internal Defects (%)					Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	A97066-42LB	N Scab	-	-	-	3.3	M	M	M	-	-	-	-	-	-	-	-	-
B	AF2497-2	N Scab	-	-	-	2.3	L	T	L	-	-	-	-	-	-	-	-	-
B	AF2936-2	N Scab	-	-	-	3.7	M	M	L	-	-	-	-	-	-	-	-	-
B	AF3000-1	N Scab	-	-	-	3.3	0	L	L	-	-	-	-	-	-	-	-	-
B	AOA95154-1	N Scab	-	-	-	0.0	0	0	0	-	-	-	-	-	-	-	-	-
B	B2332-2	N Scab	-	-	-	5.0	M	T	T	-	-	-	-	-	-	-	-	-
B	B2460-23	N Scab	-	-	-	3.0	0	L	M	-	-	-	-	-	-	-	-	-
B	MSJ036-A (Kalkaska)	N Scab	-	-	-	2.7	L	M	0	-	-	-	-	-	-	-	-	-
B	MSK061-4	N Scab	-	-	-	3.7	M	H	M	-	-	-	-	-	-	-	-	-
B	MSK409-1	N Scab	-	-	-	1.0	0	M	T	-	-	-	-	-	-	-	-	-
B	NY 138	N Scab	-	-	-	3.0	0	L	M	-	-	-	-	-	-	-	-	-
B	NY 139	N Scab	-	-	-	2.7	T	T	L	-	-	-	-	-	-	-	-	-
B	POR01PG16-1	N Scab	-	-	-	5.0	M	H	M	-	-	-	-	-	-	-	-	-
B	POR01PG20-12	N Scab	-	-	-	5.0	L	M	M	-	-	-	-	-	-	-	-	-
B	POR01PG22-1	N Scab	-	-	-	5.0	L	T	L	-	-	-	-	-	-	-	-	-
B	Ranger Russet (check)	N Scab	-	-	-	4.7	M	M	H	-	-	-	-	-	-	-	-	-
B	Superior (check)	N Scab	-	-	-	4.7	M	H	M	-	-	-	-	-	-	-	-	-
B	E10/10A	SG 09-08	C	W	W	1.5	0	M	-	-	-	-	-	-	9	S	S	-
B	E10/13B	SG 03-08	C	W	W	3.5	L	L	-	-	-	-	-	-	9	S	S	-
B	E10/13G	SG 13-08	C	W	W	1.0	0	L	-	-	-	-	-	-	9	S	S	-
B	E10/20A	SG 07-08	C	W	W	2.0	T	T	-	-	-	-	-	-	9	S	S	-
B	E10/3B	SG 17-08	C	W	W	4.0	L	M	-	-	-	-	-	-	9	S	S	-
B	**E10/4A**					-	-	-	-	-	-	-	-	-	9	S	S	-
B	E10/4B	SG 14-08	C	W	W	3.5	L	T	-	-	-	-	-	-	9	S	S	-
B	E10/4C	SG 06-08	C	W	W	3.5	T	L	-	-	-	-	-	-	9	S	S	-
B	E10/4D	SG 19-08	C	W	W	4.5	M	T	-	-	-	-	-	-	9	S	S	-
B	E14/14A	SG 05-08	C	W	W	1.5	T	L	-	-	-	-	-	-	8.5	S	S	-
B	E14/15A	SG 35-08	C	W	W	3.0	T	T	-	-	-	-	-	-	9	S	S	-
B	E14/4B	SG 23-08	C	W	W	2.0	M	0	-	-	-	-	-	-	9	S	S	-
B	E15/1A	SG 58-08	C	W	W	5.0	T	T	-	-	-	-	-	-	9	S	S	-
B	F99E29/2G	SG 67-08	C	W	W	1.0	T	0	-	-	-	-	-	-	8.5	S	S	-
B	**F99E31/11A**					-	-	-	-	-	-	-	-	-	8.5	S	S	-
B	WT	SG 32-08(WT)	C	W	W	2.5	0	L	-	-	-	-	-	-	9	S	S	-

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

						Common Scab									Late Blight Resistance			
		2008		Color		Severity	C- Coverage			Internal Defects (%)					Avg.	Susc./Resitant		
Loc	Clone	Trial	Mkt	Skin	Flesh	S	R1	R2	R3	HH	IN	VD	BC	Bruises	Final	R1	R2	R3
B	WT	SG 62-08(WT)	C	W	W	1.0	0	T	-	-	-	-	-	-		S	S	-
B	WT	SG 66-08(WT)	C	W	W	0.0	-	0	-	-	-	-	-	-	9	S	S	-
RLB	A0008-1TE	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	A95109-1	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	A96814-65LB	NLB	-	-	-	-	-	-	-	-	-	-	-	-	5	MS	MR	MS
RLB	A97066-42LB	NLB	-	-	-	-	-	-	-	-	-	-	-	-	4.3	MR	MR	MS
RLB	AF2376-5	NLB	-	-	-	-	-	-	-	-	-	-	-	-	6	MS	MS	MS
RLB	AF2574-1	NLB	-	-	-	-	-	-	-	-	-	-	-	-	6.7	S	MS	MS
RLB	AO96141-3	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8.7	S	S	S
RLB	AO96160-3	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	AO96164-1	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	AOND 95249-3 Russ	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8.7	S	S	S
RLB	AOND95249-1Russ	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8.3	S	S	S
RLB	AWn86514-2	NLB	-	-	-	-	-	-	-	-	-	-	-	-	2	R	R	R
RLB	B0692-4	NLB	-	-	-	-	-	-	-	-	-	-	-	-	4	MS	MR	MR
RLB	B0718-3	NLB	-	-	-	-	-	-	-	-	-	-	-	-	2.7	R	MR	MR
RLB	B1992-106	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	B2424-82	NLB	-	-	-	-	-	-	-	-	-	-	-	-	6.3	MS	MS	MS
RLB	B2430-4	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8	MS	S	S
RLB	B2432-33	NLB	-	-	-	-	-	-	-	-	-	-	-	-	5.3	MR	MS	MS
RLB	B2460-23	NLB	-	-	-	-	-	-	-	-	-	-	-	-	6	MS	MS	MS
RLB	BNC48-1	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	Canela Russet (AC9200	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8.7	S	S	S
RLB	CO95051-7W	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	CO96141-4W	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	LBR1R2R3R4	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8.7	S	S	S
RLB	LBR5	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	LBR7	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8.3	S	S	S
RLB	LBR9	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	MSL268-D	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	MSM171-A	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	MSM182-1	NLB	-	-	-	-	-	-	-	-	-	-	-	-	5	MS	MS	MR
RLB	MSP459-5	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S

Minnesota Table 3. 2008. Common Scab, Internal Defects, & Late Blight (LB) scores from Becker & Rosemount, MN.

Loc	Clone	2008 Trial	Mkt	Color Skin	Color Flesh	Common Scab Severity S	Common Scab C- Coverage R1	R2	R3	Internal Defects (%) HH	IN	VD	BC	Bruises	Late Blight Resistance Avg. Final	Susc./Resitant R1	R2	R3
RLB	MSQ070-1	NLB	-	-	-	-	-	-	-	-	-	-	-	-	3.7	R	R	MS
RLB	ND8229-3	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8.7	S	S	S
RLB	OR03029-2	NLB	-	-	-	-	-	-	-	-	-	-	-	-	5.3	MS	MS	MR
RLB	Premier Russet	NLB	-	-	-	-	-	-	-	-	-	-	-	-	7.7	S	MS	MS
RLB	Rio Colorado (NDC528	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	Rio Grande Russet (AC8	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8.7	S	S	S
RLB	W1836-3Rus	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	W2133-1	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8.3	S	S	S
RLB	W2324-1	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	W2683-2rus	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S
RLB	W5015-5	NLB	-	-	-	-	-	-	-	-	-	-	-	-	8	S	S	MS
RLB	W6360-1	NLB	-	-	-	-	-	-	-	-	-	-	-	-	3.3	MS	MR	R
RLB	Yukon Gem (NDA5507	NLB	-	-	-	-	-	-	-	-	-	-	-	-	9	S	S	S

Evaluation of advanced potato breeding clones for storage and processing performance.

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East Grand Forks, MN. – The concentration of reducing sugars that are found in a potato cultivar during storage determines its processing potential for chips, fries, or fresh markets (Sowokinos and Glynn, 2000). The darkening effect that undesirable reducing sugars have on the color of chip and fry products is well known. Potatoes that resist sweetening when cold-stressed generally have a greater ability to resist sweetening when subjected to field stress such as temperature, moisture, infertility and early dying (Sowokinos et al., 2000).

Potato breeding is an expensive and labor-intensive process. Tens of thousands of potato clones are grown annually by breeders in an effort to find a "single clone" that may meet all of the horticultural requirements necessary to make a successful cultivar (i, e., yield, solids content, disease resistance, etc.). Once a new clone has undergone several years of field trials, it often fails because of storage and marketing-related problems. This study reports on the storage potential of advanced clones provided by state and federal breeders and is funded, in part, by the Northern Plains Potato Growers Association.

Material and Methods:
Eighty-four advanced clones from Maine, Michigan, Minnesota, New York, Idaho, Wisconsin, Oregon, Texas and Alberta, Canada were grown under irrigation south of Avilla, ND. All potatoes were harvested mid-September, suberized two weeks at room temperature and then placed into 45^o F, 42^o F and 38^o F storage. Tubers were evaluated for sugar content, Agtron color values, and chip appearance at four intervals (i.e. harvest, 3, 6 and 7 month's storage. Potatoes were also reconditioned at 55^o F for one month following 6 months of storage at 42^o F and 38^o F. All storage and processing evaluations were conducted at the USDA/ARS Potato Research Worksite, East Grand Forks, MN, following 7-months of storage.

Results
The individual clones demonstrated a wide range of ability to accumulate sugars from starch when subjected to cold stress. Following seven months of storage at 42^o F , the concentration of glucose ranged from 0.038 mg/g in W 4013-1 (Table 1) to 6.97 in Stampede Russet (Table 3). **This shows greater than a 180-fold difference in a potato clone's ability to accumulate sugars when placed into cold storage**. Based on sugar content and chip appearance, the clones were categorized into three classes.

Class A: Clones that have the ability to process following 42° F storage (Table 1).

Class B: Clones that have the ability to process following 45° F storage, but not from 42° F (Table 2).

Class C: Clones that do not chip acceptably from either 45° F or 42° F storage (Table 3).

Table 1 shows the 'Class A' clones that process successfully from 42° F without reconditioning. Reconditioning, however, did have a positive effect by improving most of the Agtron scores. Nine of the top 32 performers were from North Dakota (ND 7519-1, ND 5255-59, ND 7799c-1, ND 8304-2, ND 8305-1, NDA 5507-3Y, Sport 860 is ND 860-2-8, Dakota Pearl, and N8-14 (a selected clone of NorValley)). Michigan had six clones (MSJ 147-1, MSN 191-2Y, MSK 409-1, MSJ 126-9Y, MSK 061-4 and MSL 007-13). Wisconsin, six (W –4013-1, W 2133-1, W 2438-34, W 2324-1, W 2978-3 and W 2310-3). Others in the top ten were from USDA (B 2490-7, B 1992-106 and B 2489-4, Minnesota (MN 02 586, MN 02 588), New York (NY 139, NY 138). Idaho and Maine each had one (A 91814-5 and AF 2211-4), respectively.

Table 2 shows the 'Class B' clones that process from 45° F but not from 42° F. Snowden is a well known cultivar in this class. Other Class B clones were from Minnesota, North Dakota, Maine, USDA, Canada, and Michigan. Although these clones do not have the sweetening-resistance potential of those clones listed in Table 1 (class A), their level of performance is still acceptable when chipped out of storage temperatures of 45 ° F or above. Consequently, the clones in Table 2, can and do play an important role in meeting industry's needs.

Table 3 lists 'Class C' clones that do not chip successfully from either 42° F or 45° F storage. Cultivars such as Red Pontiac, Russet Burbank and Russet Norkotah are in this class. Their higher inherent 'basal level' of sugars serves to direct their end use more towards fry and/or fresh markets.

Summary

The thirty-two 'Class A' clones listed in Table 1 provide the quality advantages listed below**.**

- Decreased microbial spoilage.
- Retention of dry matter
- Reduced shrinkage
- Decreased need for sprout inhibition
- Decreased physiological aging
- Increased marketing window.

For a new potato cultivar to be successful, however, it must also demonstrate a variety of other horticultural and marketing qualities that are required by the processor and the consumer. Contact the respective potato breeder (listed below) if you are interested in any particular quality traits demonstrated by the potato clone of interest.

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References

Sowokinos, J. R. and M. Glynn 2000 Marketing potential of advanced potato breeding clones. *Valley Potato Grower*. 65(110):6-8

Sowokinos, J. R., S. K. Gupta and M. Glynn. 2000. Potato clones with a new anti-sweetening gene (*Asgene) Valley Potato Grower* 65(115):4-6.

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Table 1. 2007-08 Class A Cones: Potato clones that process successfully following 7 months storage at 42^o F Clones are aligned in order of increasing glucose values from 42^o F storage.

CLONE	SOURCE	CC[1]	AGTRON	GLUCOSE mg/g
W 4013-1	WI	1	71	0.03
MSJ 147-1	MI	1	69	0.05
W 2133-1	WI	1	68	0.05
SPORT 860	ND	1	67	0.06
DAKOTA PEARL	ND	1	68	0.06
W 2438-34	WI	1	68	0.07
MSN 191-2Y	MI	1	66	0.09

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ND 7519-1	ND	1	68	0.10
CO 95051-7W	CO/OR	1	65	0.15
MSK 409-1	MI	1	65	0.15
MSJ 126-9Y	MI	1	66	0.16
N 8-14	ND	1	65	0.19
B 2490-7	USDA	1	65	0.21
B 1992-106	USDA	1	65	0.29
NY 139	NY	1	65	0.38
A 91814-5	ID	2	64	0.40
B 2489-4	USDA	2	63	0.46
ND 5255-59	ND	2	62	0.51
W 2310-3	WI	2	62	0.52
MSK 061-4	MI	2	63	0.53
ND 7799c-1	ND	2	59	0.63
NY 138	NY	2	59	0.68
MN 02 586	MN	2	59	0.74
ND 8304-2	ND	2	58	0.78
W 2324-1	WI	2	58	0.79
ND 8305-1	ND	2	57	0.80
MSL 007-13	MI	2	57	0.81
AF 2211-4	ME	2	56	0.83
MN 02 588	MN	2	56	0.85
W 2978-3	WI	2	56	0.91
NDA 5507-3Y	ND/ID	2	56	0.91
PREMIER RUSSET	ID	2	56	0.95

[1]CC = Represents chip color relating to the Potato Chip/Snack Food Association five-code color chart: 1 and 2 are acceptable color, 3 is marginal, 4 and 5 are unacceptable color.

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Table 2. 2007-08 Class B Cones: Potato clones that process successfully following 7 months at 45^o F. Clones are aligned in order of increasing glucose values from 42^o F storage.

CLONE	SOURCE	CC[1]	AGTRON	GLUCOSE mg/g
ND 5775-3	ND	3	54	1.03
BNC 49-2	USDA	3	54	1.12
W 2683-2	WI	3	54	1.15
CO 97043-14W	CO/OR	3	53	1.20
MSJ 036-A	MI	3	52	1.21
WV 4298-1	CAN/ALB	3	52	1.31
B 2477-8	USDA	3	51	1.32
CO 96052-1RU	CO/OR	3	49	1.32
ND 7192-1	ND	3	49	1.35
AF 2291-10	ME	3	47	1.35
BNC 48-1	CAN/ALB	3	47	1.37
VHB 0950-2	CAN/ALB	3	47	1.56
SNOWDEN	WI	3	46	1.58

[1]CC = Represents chip color relating to the Potato Chip/Snack Food Association five-code color chart: 1 and 2 are acceptable color, 3 is marginal, 4 and 5 are unacceptable color.

Table 3. 2007-08 Class C Cones: Potato clones that do not chip successfully following 7 months storage at either 45^o F or 42^o F storage. Clones are aligned in order of increasing glucose values from 42^o F storage.

CLONE	SOURCE	CC[1]	AGTRON	GLUCOSE mg/g
CO 96141-4W	CO/OR	3	45	1.66
MN 15620	MN	3	45	1.77
ATLANTIC	USDA	3	45	1.84
CvV97065-1	CAN/ALB	3	44	1.87
AOA 95154-1	ID/OR/ID	4	45	1.93
CV 98112-3	CAN/ALB	3	45	2.08
AF 2426-1	ME	4	27	2.10
ND 8201-2	ND	4	30	2.15
CO 97065-7W	CO/OR	3	24	2.19
AOTX 95265-2ARU	ID/OR/TX	3	36	2.33
AOTX 95265-4RU	ID/OR/TX	3	22	2.57
VC 1009-1W/Y	CAN/ALB	3	25	2.60
RUSSET BURBANK	CO/OR	3	30	2.62
SHEPODY	CAN/NB	5	27	2.77

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ATTX 98500-2P/Y	ID/TX/TX	5	27	2.86
B 2452-3	USDA	5	23	3.08
B 2451-6	USDA	5	35	3.13
AF 2413-4	ME	5	29	3.27
ATTX 961014-1R/Y	ID/TX/TX	5	27	3.27
RIO ROJO		4	22	3.32
RUSSET NORKOTAH	ND	4	30	3.35
AF 2290-8	ME	4	27	3.41
IRISH COBBLER		4	31	3.43
CO 95172-3 RU	CO/OR	4	30	3.47
MN 02 419	MN	5	27	3.56
A 95109-1	ID	5	23	3.77
D.R NORLAND	ND	5	26	3.85
AF 2199-6	ME	5	33	3.87
A 96510-4Y	ID	5	22	3.91
YUKON GOLD		4	37	4.04
W 2564-2	WI	5	31	4.14
AF 2431-2	ME	5	23	4.35
A 95409-1	ID	5	24	4.73
RED PONTIAC	USDA/MI/FL	5	20	4.98
HIGHLAND RUSSET	ID	5	20	6.04
NDTX 4271-5R	ND/TX	5	20	6.17
NDTX 4784-7R	ND/TX	5	17	6.82
STAMPEDE RUSSET	ID	5	26	6.97

[1]CC = Represents chip color relating to the Potato Chip/Snack Food Association five-code color chart: 1 and 2 are acceptable color, 3 is marginal, 4 and 5 are unacceptable color.

Marketing Potential
of Advanced Breeding Clones

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Using a scale based on a potato's harvest sucrose-rating (SR) and its glucose-forming-potential (GFP) in storage (Sowokinos, 1987), eighty-four of the most promising potato clones were categorized as having the most potential for chipping, fry and/or fresh market utilization.

The purpose of this information is intended to (1) assist the potato breeder in correctly marketing their new breeding selections and (2) to aid in the identification of promising genotypes for future crosses. Marketing suggestions are based on sugar content and processing characteristics as described previously by Sowokinos and Preston (1988).

Storage and processing evaluations were conducted at the U.S. Department of Agriculture (USDA) Potato Research Worksite in East Grand Forks, MN. For acceptable chip color, two genetic requirements must be met. First, the potato should be capable of reducing its SR value to near 1.0 mg sucrose/ g tuber FW by harvest or less. Secondly, the tuber should demonstrate a low GFP in storage (i.e., 0.35 mg glucose/ g tuber FW or less for chips and 1.0 mg glucose/g tuber FW for fries). Higher levels of glucose lead to the production of dark brown to black pigmented chips or fries after the raw product is cooked in oil at a high temperature. This study is funded, in part, by the Northern Plains Potato Growers Association.

Results

Breeding programs nationwide provide the advanced breeding clones used in this study. Along with control varieties, sugar content and processing quality of all clones directly from 9^{o} C (48.2^{o} F) storage were evaluated. In addition to harvest analysis, clones were evaluated following 3 and 7 months in storage. Potatoes with a glucose content of 0.35 mg/g or less should yield acceptable colored potato chips. This amount of glucose is equivalent to 0.035 % on a FW weight basis and represents chips giving an Agtron value of 60 or higher. Clones with glucose levels of 1.0 mg/g to 1.3 mg/g are still acceptable for french fry quality, although lower levels are generally desired. Potatoes with higher levels of glucose are destined for fresh market utilization.

A summary of results for the 2007-2008 storage season is presented in Table 1.

References

Sowokinos, J.R., 1987. Variations in glucose forming potential (GFP) between potato clones. Amer. Potato J. 64:459

Sowokinos, J. R., and D. A. Preston, 1988, Maintenance of potato processing quality by chemical maturity monitoring (CMM) Minn. Ag Expt. Station Bulletin, 586-1988(Item No. AD-SB-3441), pp 1-11

Table 1. Marketing-potential of advanced potato breeding clones stored at 9^{o} C(48.2^{o} F) for 3 and 7 months. Clones are aligned in order of decreasing Agtron values following 7 months in storage.

		Glucose mg/g FW Desired Value for Chips, 0.35 or less Months in Storage		Agtron Desired Value 60 or above Months in Storage				
Clone	**Source**	**Three**	**Seven**	**Three**	**Seven**	**Chip**	**Fries**	**Fresh**
CO 95051-7W	CO/OR	0.12	0.03	75	72	x	x	x
MN 02 588	MN	0.12	0.03	73	70	x	x	x
W 4013-1	WI	0.01	0.03	72	69	x	x	x
ND 7519-1	ND	0.06	0.01	72	69	x	x	x
DAKOTA PEARL	ND	0.03	0.01	72	69	x	x	x
SPORT 860	ND	0.09	0.28	71	68	x	x	x
MSN 191-2Y	MI	0.01	0.07	70	67	x	x	x
MSJ 126-9Y	MI	0.02	0.10	70	67	x	x	x
W 2438-34	WI	0.02	0.04	69	66	x	x	x
NY 139	NY	0.09	0.08	69	66	x	x	x
N 8-14	ND	0.06	0.02	69	66	x	x	x
MSK 409-1	MI	0.02	0.31	69	66	x	x	x
B 2490-7	USDA	0.26	0.52	69	66	x	x	x
W 2133-1	WI	0.20	0.02	60	65	x	x	x
ND 5775-3	ND	0.78	0.06	68	65	x	x	x
MSN 191-2Y	MI	0.03	0.14	68	65	x	x	x
A 91814-5	ID	0.39	0.07	68	65	x	x	x
MSK 061-4	MI	0.01	0.21	67	64	x	x	x
B 2489-4	USDA	0.26	0.08	67	64	x	x	x
W 2310-3	WI	0.03	0.08	66	63	x	x	x
ND 5255-59	ND	0.15	0.31	66	63	x	x	x
NY 138	NY	0.59	0.34	63	60	x	x	x
MSJ 147-1	MI	0.02	0.04	63	60	x	x	x

MN 02 586	MN	0.03	----	63	60	x	x	x
W 2324-1	WI	0.11	0.78	62	59		x	x
ND 8304-2	ND	0.15	0.52	62	59		x	x
ND 8305-1	ND	0.16	0.17	61	58		x	x
MSL 007-13	MI	0.24	0.28	61	58		x	x
W 2978-3	WI	0.13	0.24	60	57		x	x
PREMIER RUSSET	ID	0.04	0.32	60	57		x	x
NDA 5507-3Y	ND/ID	0.17	0.10	60	57		x	x
BNC 49-2	USDA	0.16	0.05	60	57		x	x
AF 2211-4	ME	0.11	0.06	60	57		x	x
W 2683-2	WI	0.64	0.13	58	55		x	x
ND 7799c-1	ND	0.04	0.04	58	55		x	x
BNC 48-1	CAN/ALB	0.05	0.05	58	55		x	x
CO 97043-14W	CO/OR	1.08	0.70	57	54		x	x
WV 4298-1	CAN/ALB	1.44	0.10	56	53		x	x
RUSSET NORKOTAH	ND	1.13	1.30	56	53		x	x
RUSSET BURBANK	CO/OR	0.81	0.29	56	52		x	x
MSJ 036-A	MI	1.06	0.15	56	53		x	x
B 2477-8	USDA	0.32	1.72	55	52		x	x
ND 7192-1	ND	0.55	0.72	53	50		x	x
CO 96052-1RU	CO/OR	0.53	0.99	53	50		x	x
VHB 0950-2	CAN/ALB	0.32	0.19	53	50		x	x
SHEPODY	CAN/NB	0.34	0.44	53	50		x	x
UNTX 383-3WRE/Y		0.26	0.45	52	49			x
B 1992-106	USDA	0.07	0.05	51	48			x
AF 2291-10	ME	0.92	0.64	51	48			x
MN 00177-5	MN	0.67	0.35	51	48			x
MN 15620	MN	0.53	0.24	49	46			x
CV 98112-3	CAN/ALB	0.18	1.10	49	46			x
CO 96141-4W	CO/OR	0.27	0.74	49	46			x
ATLANTIC	USDA	2.05	0.17	49	46			x
AOA 95154-1	ID/OR/ID	0.19	0.51	49	46			x
CvV97065-1	CAN/ALB	0.77	0.30	48	45			x
YUKON GOLD		1.47	1.54	41	38			x

AOTX 95265-2ARU	ID/OR/TX	1.57	0.81	40	37			x
B 2451-6	USDA	1.44	2.33	39	36			x
AF 2199-6	ME	0.37	2.30	37	34			x
W 2564-2	WI	1.84	2.43	35	32			x
IRISH COBBLER		1.68	1.03	35	32			x
ND 8201-2	ND	1.63	1.78	34	31			x
CO 95172-3 RU	CO/OR	1.65	1.41	34	31			x
AF 2413-4	ME	1.63	1.12	33	30			x
MN 02 419	MN	1.08	0.55	31	28			x
ATTX 98500-2P/Y	ID/TX/TX	2.20	2.20	31	28			x
ATTX 961014-1R/Y	ID/TX/TX	3.95	1.39	31	28			x
AF 2426-1	ME	2.17	1.38	31	28			x
AF 2290-8	ME	1.90	0.96	31	28			x
STAMPEDE RUSSET	ID	0.23	0.38	30	27			x
D.R NORLAND	ND	1.62	1.21	30	27			x
VC 1009-1W/Y	CAN/ALB	1.86	2.42	29	26			x
CO 97065-7W	CO/OR	1.20	0.42	28	25			x
A 95409-1	ID	2.35	1.33	28	25			x
B 2452-3	USDA	1.82	1.11	27	24			x
AF 2431-2	ME	3.72	2.64	27	24			x
A 95109-1	ID	2.27	2.48	27	24			x
RIO ROJO		1.44	1.41	26	23			x
AOTX 95265-4RU	ID/OR/TX	1.72	1.50	26	23			x
A 96510-4Y	ID	3.93	2.24	26	23			x
RED PONTIAC	USDA/MI/FL	3.26	2.53	24	21			x
NDTX 4271-5R	ND/TX	1.68	1.48	24	21			x
HIGHLAND RUSSET	ID	2.94	4.39	24	21			x
NDTX 4784-7R	ND/TX	2.80	1.43	21	18			x

Use of Eptam for weed control in irrigated potato. Harlene Hatterman-Valenti and Collin Auwarter.
A study was conducted west of Inkster, ND at the Northern Plains Potato Growers Association Irrigation Research site to evaluate several Eptam based programs with Dual II Magnum + Sencor for weed control in irrigated 'Russet Burbank' potatoes. Plots were 4 rows by 25 ft arranged in a randomized complete block design with 4 replicates. Seed pieces (2 oz) were planted on 36 inch rows and 12 inch spacing on May 23, 2009. Treatments were applied prior to planting ('A') and after hilling ('B'), but prior to emergence. Extension recommendations were used for cultural practices throughout the year. The herbicide treatments were applied to the middle two rows using a CO_2 backpack sprayer equipped with 8002 flat-fan nozzles with an output of 20 gpa and a pressure of 40 psi. Weed control was evaluated on June 22, July 14, and August 13. Treated rows were harvested on September 26 and graded at Fargo.

Application Date:	5/23/09	6/16/09
Air Temperature (F):	65	67
Rel. Humidity (%):	60	76
Wind (mph):	2	8
Soil Moisture:	Adequate	Below normal
Cloud Cover (%):	0	100

Table 1. Effect of herbicide treatments on weed control.

				Colq	Rrpw	Grft	Colq	Rrpw	Grft	Colq	Rrpw	Grft
		Rate		-------6/22/09------			---------7/14/09---------			---------8/13/09---------		
Name	Rate	Unit	Code	-----% Control-----			---------Control---------			------% Control--------		
Untreated				0	0	0	0	0	0	0	0	0
Eptam	5.5	pt/a	A	96	100	99	94	100	100	98	98	100
Eptam +	4.5	pt/a	A	100	100	100	100	100	100	100	100	100
Sencor	0.33	lb/a	B									
Eptam +	4.5	pt/a	A	100	100	100	100	100	100	100	100	100
Matrix	1.5	oz/a	B									
Dual II	2	pt/a	B	100	100	100	100	100	100	100	100	100
Magnum+												
Sencor	0.33	lb/a	B									

Rrpw = redroot pigweed, Colq = common lambsquarters, Grft = green foxtail

Table 2. Effect of herbicide treatments on potato yield and grade.

		Rate		<4oz	4-6oz	6-8oz	8-10oz	10-12oz	>12oz	Total	>4oz
Name	Rate	Unit	Code	--------------------------------CWT/A-----------------------------------							
Untreated				144	133	81	42	13	11	424	279
Eptam	5.5	pt/a	A	149	119	70	25	19	17	400	251
Eptam +	4.5	pt/a	A	126	118	77	45	16	17	399	273
Sencor	0.33	lb/a	B								
Eptam +	4.5	pt/a	A	135	103	82	47	19	26	413	278
Matrix	1.5	oz/a	B								
Dual II	2	pt/a	B	141	132	78	51	16	20	438	297
Magnum +											
Sencor	0.33	lb/a	B								

Weed control evaluations showed all treatments performed well. The new location did not have the weed pressure previously reported. Total yields showed no differences and that the untreated performed as well as any other treatment. This was attributed to the limited weed pressure. There was no significant difference in grade. All treatments had between 63 and 68% of their tubers greater than the 4 oz size. Results indicate that Eptam and Eptam combinations provide similar weed control as the combination of Dual II Magnum + Sencor and that plants treated with these herbicides had similar yields and grades.

Weed control in irrigated potatoes with V-10142. Harlene Hatterman-Valenti and Collin Auwarter.

A study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate crop safety and weed control with V-10206 on irrigated Russet Burbank. Application information is provided below. The experiment was a randomized complete block design with four replicates.

Sprayer: GPA	20	20
PSI	40	40
Nozzle	8002 flat-fan	8002 flat-fan
Application Date:	6/4/2008	6/26/2008
Application Timing:	PRE	POST
Air Temperature:	55 F	70 F
Rel. Humidity:	92%	60%
Wind Velocity	4	8
Soil Moisture:	Normal	Normal
% Cloud Cover:	90	50

Table 2. Weed control 20, 40, and 80 days after treatment.

Treatment	Rate	Applic		20DAA			40 DAA			80 DAA	
	lb ai/A	timing	Colq	Rrpw	Yeft		Colq	Rrpw	Yeft	Colq	Rrpw	Yeft
Untreated			0	0	0	0	0	0	0	0	0	0
V-10142	0.2	A	100	100	92.3	99.8	100	86.3	93.8	98.8	100	97.5
V-10142	0.3	A	100	100	97.3	100	100	82.5	92.5	100	100	95
V-10142	0.4	A	100	100	97	99.8	100	87.5	93.8	100	100	97.5
V10142 + V10142 + Dyna-A-Pak	0.2+0.2 + 1%	A+B	100	100	92.5	98.8	100	90	95	100	100	98.8
V10142 + V10142 + Dyna-A-Pak	0.3+0.3 + 1%	A+B	100	100	89.8	100	100	90	91.3	100	100	97.5
V10142 + V10142 + Dyna-A-Pak	0.4+0.2 + 1%	A+B	100	100	92.5	100	100	86.3	96.3	100	100	93.8
V10142+DualII Mag+V10142+ Dyna-A-Pak	0.2+1.0 +0.2+ 1%	A+B	100	100	95.8	100	100	91	93.8	100	100	97.5
Matrix+DualII Mag + Matrix + NIS	0.016+1 +0.016 +0.25 %	A+B	98.8	100	99.5	100	100	97.3	90	100	100	98.8
DualII Mag+Sencor +V10142+Dyna-A-Pak	1.0+0.2 +0.2+1 %	A+B	100	100	100	100	100	96.3	93.8	98.8	100	97.5
DualII Mag+Sencor +Matrix+NIS	.0+0.2+ 0.016+ 0.25%	A+B	100	100	100	100	100	96.3	91.3	100	100	98.8
LSD 0.05			1.09	---	6.07	1.15	---	5.56	3.18	1.56	---	3.66

Summary: No crop injury was observed and all treatments generally provided good season-long weed control.

Weed control in irrigated potatoes Cheminova metribuzin. Harlene Hatterman-Valenti and Collin Auwarter.

A study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate crop safety and weed control with Cheminova metribuzin on irrigated Russet Burbank. Application information is provided below. The experiment was a randomized complete block design with four replicates.

Sprayer: GPA	20	20
PSI	40	40
Nozzle	8002 flat-fan	8002 flat-fan

Application Date:	6/4/2008	6/26/2008
Application Timing:	PRE	POST
Air Temperature:	55 F	70 F
Rel. Humidity:	92%	60%
Wind Velocity	4	8
Soil Moisture:	Normal	Normal
% Cloud Cover:	90	50

Table 2. Weed control 20, 40, and 80 days after treatment.

Treatment	Rate	Applic	20DAA			40 DAA			80 DAA		
	lb ai/A	timing	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft
Untreated			0	0	0	0	0	0	0	0	0
Metribuzin	0.5	A	100	100	95	100	100	94	98	100	99
Metribuzin	1.0	A	100	100	96	100	98	97	100	100	96
Sencor	0.5	A	100	100	88	100	99	94	100	100	98
Metribuzin	0.25	B	0	0	0	100	100	94	99	100	96
Metribuzin	0.5	B	0	0	0	100	100	97	100	100	98
Sencor	0.25	B	0	0	0	99	96	90	100	100	96
LSD 0.05			---	---	7	1	4	4	2	---	4

Summary: For the preemergence application, the 2L bottles (mixed16 hours prior to application) were difficult to get the Metribuzin into solution again. Possibly not enough room to agitate even though the Sencor bottles mixed easily. There were no mixing problems with the postemergence Metribuzin applications. No crop injury was observed and all treatments generally provided good season-long weed control.

Weed control in non-irrigated potatoes with V-10142. Harlene Hatterman-Valenti and Collin Auwarter.

An experiment was conducted at NDSU Fargo, ND to evaluate crop safety and weed control with V-10142 on Red Norland. The field was field cultivated prior to planting. Red Norland, was planted June 23, 2008. Fertilizer, insecticides and fungicides were applied as needed. Potatoes were hilled on July 15. Application information is provided below. The experiment was a randomized complete block design with four replicates.

Sprayer: GPA	20	20
PSI	40	40
Nozzle	8002 flat-fan	8002 flat-fan
Application Date:	7/15/2008	8/18/2008
Time of Day:	12:00	10:00
Application Timing:	PRE	POST
Air Temperature:	65 F	80 F
Rel. Humidity:	70%	65%
Wind Velocity	0	5
Soil Moisture:	Below normal	Above normal
% Cloud Cover:	0	25

Table 2. Weed control 10 and 40 days after treatment.

Treatment	Rate lb ai/A	Applic timing	Injury	10 DAA Rrpw	10 DAA Colq	10 DAA Yeft	40 DAA Rrpw	40 DAA Colq	40 DAA Yeft
			%						
V-10142	0.2	A	0	94	70	100	92	100	100
V-10142	0.3	A	0	99	70	99	99	100	97
V-10142	0.4	A	2	95	69	100	87	100	97
V10142 + V10142 + Dyna-A-Pak	0.2+0.2 + 1%	A+B	1	97	76	100	95	100	99
V10142 + V10142 + Dyna-A-Pak	0.3+0.3 + 1%	A+B	0	96	75	100	95	100	99
V10142 + V10142 + Dyna-A-Pak	0.4+0.2 + 1%	A+B	0	99	65	99	95	100	95
Sencor + Dual Magnum + Matrix + NIS	0.2+1.0 +0.016 +0.25%	A+B	0	97	96	100	97	100	99
Untreated			0				0	0	0
LSD 0.05			2	8	32	1	14	---	5

Summary: Injury from V-10142 was very minor stunting. V-10142 control of common lambsquarters was below satisfactory control (≥85%) at 10 DAA. Plants were very small but present. However, by the end of the season all treatments provided satisfactory control of the main annual broadleaf and grass species that infest potato land.

Effect of Avail in irrigated potatoes. This study was conducted at the Northern Plains Potato Grower's Association Irrigation site near Tappen, ND to evaluate MAP and 10-34-0 with Avail and MAP and 10-34-0 without Avail as grower standard practice. The study was conducted on loamy sand soil with 1.8% O.M, 7.4 pH, and 21 P ppm. Onions were grown in 2007. Plots were 4 rows by 30 ft arranged in a randomized complete block design with four replicates. Seed pieces (2 oz) were planted on 36 inch rows and 12 inch spacing on May 16, 2008. Treatments were hilled June 5. MAP and 10-34-0 fertilizer applications were done at planting (May 16-A). There was one treatment that had Avail on MAP and Nutrishpere on Urea to examine if synergy with products could occur. Urea was applied at planting (May 16-A), hilling (June 5-B), emergence (June 20-C), and tuber bulking (July 17-D). Our goal with Phosphorus was 150 lbs/A.

Trt	Fertilizer	Rate	Unit	Time	------------------------------CWT/A-------------------------------							
					0-4oz	4-6 oz	6-8 oz	8-10 oz	10-12 oz	>12 oz	Total	>4 oz
1	MAP 11-52-0	288	LB/A	A	133	139	113	67	47	51	550	417
	Urea 46-0-0	93	LB/A	A								
	Potash 0-0-60	333	LB/A	A								
	Urea 46-0-0	109	LB/A	B								
	Urea 46	163	LB/A	C								
	Urea 46	109	LB/A	D								
2	MAP 11-52-0	245	LB/A	A	120	124	112	79	51	67	551	431
	Urea 46-0-0	104	LB/A	A								
	Potash 0-0-60	333	LB/A	A								
	Urea 46-0-0	109	LB/A	B								
	Urea 46-0-0	163	LB/A	C								
	Urea 46-0-0	109	LB/A	D								
3	10-34-0	150	LB A/A	A	106	117	100	72	52	57	503	397
	Urea 46-0-0	67	LB/A	A								
	Potash 0-0-60	333	LB/A	A								
	Urea 46-0-0	109	LB/A	B								
	Urea 46-0-0	163	LB/A	C								
	Urea 46-0-0	109	LB/A	D								
4	10-34-0	128	LB A/A	A	122	137	96	78	46	51	530	408
	Urea 46-0-0	80	LB/A	A								
	Potash 0-0-60	333	LB/A	A								
	Urea 46-0-0	109	LB/A	B								
	Urea 46-0-0	163	LB/A	C								
	Urea 46-0-0	109	LB/A	D								
5	MAP+Avail 11-52-0	288	LB/A	A	97	123	95	63	37	82	497	400
	Urea 46-0-0	93	LB/A	A								
	Potash 0-0-60	333	LB/A	A								
	Urea 46-0-0	109	LB/A	B								
	Urea 46-0-0	163	LB/A	C								
	Urea 46-0-0	109	LB/A	D								
6	MAP+Avail 11-52-0	245	LB/A	A	124	134	106	71	41	63	540	416
	Urea 46-0-0	104	LB/A	A								
	Potash 0-0-60	333	LB/A	A								
	Urea 46-0-0	109	LB/A	B								
	Urea 46-0-0	163	LB/A	C								
	Urea 46-0-0	109	LB/A	D								
7	10-34-0 + Avail	150	LB A/A	A	119	138	120	73	47	36	533	414
	Urea 46-0-0	67	LB/A	A								
	Potash 0-0-60	333	LB/A	A								
	Urea 46-0-0	109	LB/A	B								
	Urea 46-0-0	163	LB/A	C								
	Urea 46-0-0	109	LB/A	D								
8	10-34-0 + Avail	128	LB A/A	A	114	113	105	75	42	61	510	396
	Urea 46-0-0	80	LB/A	A								
	Potash	333	LB/A	A								
	Urea 46-0-0	109	LB/A	B								
	Urea 46-0-0	163	LB/A	C								
	Urea 46-0-0	109	LB/A	D								
9	MAP+Avail 11-52-0	144	LB/A	A	131	131	104	74	37	41	518	387
	10-34-0 + AVAIL	75	LB A/A	A								
	Urea 46-0-0	98	LB/A	A								
	Potash 0-0-60	333	LB/A	A								
	Urea 46-0-0	109	LB/A	B								
	Urea 46-0-0	163	LB/A	C								
	Urea 46-0-0	109	LB/A	D								
10	MAP+Avail 11-52-0	288	LB/A	A	140	123	90	61	31	40	485	345
	Urea+Nutrisphere 46-0-0	218	LB/A	A								
	Potash 0-0-60	333	LB/A	A								

All treatments yielded well, 485 -551 cwt/a, no significant difference. The highest yielding treatments were 100% and 85% GSP PPI MAP with yields of 550 and 551 cwt/a, respectively.

Micronutrient Trial. This study was conducted at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate additional nutrients to our fertility program on Russet Burbank potato. The study was conducted on loamy sand soil with 1.8% O.M. and 7.4 pH. Onions were grown during 2007. Plots were 4 rows by 25 ft arranged in a randomized complete block design with 4 replicates. Seed pieces (2 oz) were planted on 36 inch rows and 12 inch spacing on May 21, 2008. Treatments at time 'A' were seed dipped and also applied at planting, May 21. Time 'B' treatments were applied when plants were 6"(June 26), time 'C' was at the tuber hooking stage (July 10), time 'D' was at the tuber set stage (July 24), time 'E' was golf ball sized tubers (July 29), and time 'F' was at row closure (August 15). Water was not limiting as irrigation was scheduled every 3 to 4 d once potato had emerged following hilling. Two plants per plot were collected on July 29 and September 9 to measure differences in tubers, roots, or foliage. Potatoes were machine harvested September 25 and graded December 22.

Trt	Name	Rate	Time	-----------------------------CWT/A----------------------------							
				0-4 oz	4-6 oz	6-8 oz	8-10 oz	10-12 oz	>12 oz	Total	>4 oz
1	Untreated			118	121	92	66	40	51	487	369
2	Row Prod	100 ml/18.9 L H2O	A	115	139	102	66	45	30	497	382
3	Row Prod	100 ml/18.9 L H2O	A	134	131	103	56	27	25	476	342
	Row Prod	6.4 fl oz/A	D								
	Row Prod	6.4 fl oz/A	E								
4	InRow	2 qt/A	A	117	126	94	58	25	48	467	350
5	InRow	1 qt/A	A	110	126	101	62	35	41	475	365
	FPF	1 qt/A	B								
	FPF	1 qt/A	C								
	FPF	1 qt/A	E								
	FPF	1 qt/A	F								
6	AG 01008	1 gal/A	B	105	105	80	50	36	42	418	313
	AG 01008	1 gal/A	E								
7	AG 01008	0.5 gal/A	B	106	122	99	60	38	42	468	361
	AGM 06023	0.5 gal/A	B								
	AG 01008	0.5 gal/A	E								
	AGM 06023	0.5 gal/A	E								
8	AGM 06023	1 gal/A	B	124	131	82	56	29	38	460	337
	AGM 06023	1 gal/A	E								
9	AG 01008	1 gal/A	C	100	124	88	61	24	27	425	324
	AGM 06023	1 gal/A	C								
	AG 01008	1 gal/A	E								
	AGM 06023	1 gal/A	E								
10	AGM 06018	1.5 pt/A	C	108	119	91	56	38	42	452	345

The two plant samplings during the season showed little difference among treatments. Overall yield showed treatment 2 had the highest yield with 497 cwt/A, followed by the untreated with 487 cwt/A. Treatment 6 had the lowest yield with 418 cwt/A. The marketable (>4 oz) showed similar results as the overall yield. Treatment 2 had the highest marketable yield with 382 cwt/a, followed by the untreated with 369 cwt/a. Treatment 6 had the lowest marketable yield with 313 cwt/a. Treatment 5 and treatment 7 both had marketable yields of over 360 cwt/a. All treatments had between 71-77% of overall yield >4 oz.

Nutrisphere Trial. This study was conducted at the Northern Plains Potato Grower's Association Irrigation site near Tappen, ND to evaluate Urea with Nutrisphere against Urea using grower standard practices. The study was conducted on loamy sand soil with 1.8% O.M, 7.4 pH, 12.7 CEC and 20 lbs N. Onions were grown in 2007. Plots were 4 rows by 25 ft arranged in a randomized complete block design with four replicates. Seed pieces (2 oz) were planted on 36 inch rows and 12 inch spacing on May 16, 2008. Treatments were hilled June 5. Fertilizer applications were done at planting (May 16-A), hilling (June 5-B), emergence (June 20-C), and tuber bulking (July 17-D). Our goal with Nitrogen for the year was 250 lbs/A. Potatoes were machine harvested September 26 and graded in early December.

Trt	Fertilizer	Rate	Unit	Time	-------------------------CWT/A--------------------------							
					0-4 oz	4-6 oz	6-8 oz	8-10 oz	10-12 oz	>12 oz	Total	>4 oz
1	Urea 46-0-0	163	LB/A	A	151a	150a	110a	67a	44a	37ab	559a	408a
	Urea 46-0-0	109	LB/A	B								
	Urea 46-0-0	163	LB/A	C								
	Urea 46-0-0	109	LB/A	D								
2	Urea 46-0-0	138	LB/A	A	158a	165a	117a	58a	31ab	35ab	565a	407a
	Urea 46-0-0	92	LB/A	B								
	Urea 46-0-0	138	LB/A	C								
	Urea 46-0-0	92	LB/A	D								
3	Urea+Nutrisphere 46-0-0	543	LB/A	A	198a	137a	65bc	42a	19ab	25ab	485a	287ab
4	Urea+Nutrisphere 46-0-0	326	LB/A	A	133a	135a	95ab	53a	37ab	47a	499a	366a
	Urea+Nutrisphere 46-0-0	217	LB/A	B								
5	Urea+Nutrisphere 46-0-0	462	LB/A	A	184a	128a	48c	21a	7b	5b	393b	209b
6	Urea+Nutrisphere 46-0-0	277	LB/A	A	175a	157a	98ab	42a	27ab	29ab	529a	354a
	Urea+Nutrisphere 46-0-0	185	LB/A	C								

-Petiole samples on August 10; 30-35 petioles taken from all four reps for each treatment.

Treatment 1: 6485 ppm
Treatment 2: 3966 ppm
Treatment 3: 1667 ppm
Treatment 4: 1196 ppm
Treatment 5: 857 ppm
Treatment 6: 1078 ppm

All petiole samples indicated N deficiency, but total yields showed otherwise, except for treatment 5 (85% N as urea with Nutrisphere pre-plant and at planting), which was significantly lower than the others (Table 1).

Treatment 2 (85% N as grower standard practice) was the highest yielding (565 cwt/a), followed closely by treatment 1 (100% N as grower standard practice) with 559 cwt/a. Treatment 6 (85% N as Urea with Nutrisphere split application) was the highest yielding within the Nutrisphere treatments with 529 cwt/a. Marketable yield (>4 oz) was similar as total yield with only treatment 5 yielding significantly less marketable tubers compared to the other treatment.

Conclusion: All treatments, except treatment 5 (85% N as urea with Nutrisphere pre-plant and at planting), yielded exceptionally well (~ 500 cwt/A) even though petiole NO_3-N levels were well below the critical petiole NO3-N levels of 13,000 to 15,000 ppm during tuber bulking. Urea with Nutrisphere can be used to reduce the number of N applications during a growing season, but application timing is important with a tendency to reduce yields when the pre-plant incorporation timing was used.

<u>Effect of Simulated Glyphosate Drift to Irrigated Potatoes at Different Growth Stages</u>. Harlene M. Hatterman-Valenti and Collin P. Auwarter. A study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate glyphosate drift on potatoes at different growth stages. The study was conducted on loamy sand soil with 1.8 % organic matter and 7.7 pH. Onions were grown the previous year. Plots were 4 rows by 25 ft arranged in a randomized complete block design with four replicates. Seed pieces (2 oz) were planted on 36 inch rows and 12 inch spacing on May 13. The objective of this study was to compare the injury from glyphosate applied to irrigated Russet Burbank potatoes at the tuber hook stage (TH), tuber set stage (TI), early bulking stage (EB), and late tuber bulking/early senescence stage (LB). Potatoes were planted on June 2 using a Harrison double-row planter with 12 inch spacing between seed pieces and 36 inches between rows. Glyphosate was applied at rates one-third, one-sixth, one-twelfth, and one-twenty-forth the standard use rate (0.25, 0.125, 0.0625, and 0.0313 lb ae/A) on June 26, July 7, July 23, and August 25 with a CO_2 pressurized sprayer equipped with 8002 flat-fan nozzles with a spray volume of 30 GPA and a pressure of 40 psi. The amount of AMS added to the spray solution was also reduced accordingly. Field design was a randomized complete block, factorial arrangement, with four replications. Extension recommendations were used for cultural practices. Vines were desiccated 2 weeks prior to harvest with diquat (0.5 lb ai/A), and flailed one day prior to harvest. Harvesting was done with a single-row Hasia harvester on October 19. Application, environmental, and crop data are listed below:

Date:		6/26	7/7	7/23	8/25
Treatment:		POST	POST	POST	POST
Sprayer:	GPA:	30	30	30	30
	PSI:	40	40	40	40
	Nozzle:	8002	8002	8002	8002
Temperature:	Air (F):	72	71	73	72
	Soil (4 inch):	71	75	73	77
Rel. hum. (%)		50	66	50	85
Wind (mph)		8	6	9	6
Soil moisture:		Adequate	Adequate	Adequate	Adequate
Cloud cover:		20	50	20	60

<u>Summary:</u> Total yield from plants treated with 0.25 lb/A glyphosate at the TH, TI, and EB stages or with 0.125 lb/A glyphosate at the TI and EB stages were significantly lower than any other treatment, except 0.063 lb/A glyphosate at the TI stage. Results were similar for marketable tubers except that plants treated with 0.063 lb/A glyphosate at the TI stage also had significantly less marketable tubers. Glyphosate caused an increase in cull tubers when potatoes were treated with 0.25 or 0.125 lb/A at TI in comparison to the untreated. Glyphosate also depressed tuber growth. Fewer 4 to 6 oz tubers were produced when potatoes were treated with 0.25 lb/A glyphosate at the TH, TI, and EB stages. Likewise, fewer 6 to 10 oz tubers were produced when potatoes were treated with 0.25 lb/A glyphosate at the TH, TI, and EB stages, or with 0.125 lb/A glyphosate at the TI and EB stages, or with 0.063 lb/A glyphosate at the TI stage. Large tuber production (>10 oz) was decreased when plants were treated with 0.25 lb/A glyphosate at the TH, TI, or LB stages, or when treated with 0.125 lb/A glyphosate at the TI and EB stages, or when treated with 0.063 lb/A glyphosate at the TI stage.

The negative tuber yield effect from simulated glyphosate drift was most severe at the TH, TI, and EB stages. Total yield was reduced 2X, 2X, and 1.9X, respectively, when plants were treated with 0.25 lb/A glyphosate at the TH, TI, and EB stages, and marketable yield was reduced 2.7X, 4X, and 3.4X, respectively, when plant were treated with 0.25 lb/A glyphosate at the TH, TI, and EB stages, compared to the untreated. It was concluded that the effect of air temperature on vine growth and tuber production contributed to the differences between years.

Table 1. Yield and grade after glyphosate spray drift to potatoes.

Treatment	Tuber Stage	Rate	<4 oz	4-6 oz	6-8 oz	8-10oz	10-12 oz	>12 oz	total
			----------------------------CWT/A----------------------------						
Glyphosate AMS	TH	0.25 lb ae/A 4 lb/100 gal	149bc	55cd	24c	8c	5c	4c	244c
Glyphosate AMS	TI	0.25 lb ae/A 4 lb/100 gal	206a	78bcd	28c	11c	4c	1c	328bc
Glyphosate AMS	TI	0.125 lb ae/A 2 lb/100 gal	155bc	121ab	68ab	34bc	17bc	23abc	418ab
Glyphosate AMS	TI	0.0625 lb ae/A 1 lb/100 gal	125bc	132a	99a	65a	37a	38ab	495a
Glyphosate AMS	TI	0.0313 lb ae/A 0.5 lb/100 gal	161b	60cd	28c	12c	4c	8bc	274c
Glyphosate AMS	EB	0.25 lb ae/A 4 lb/100 gal	138bc	97abc	49bc	28c	8c	5c	325bc
Glyphosate AMS	EB	0.125 lb ae/A 2 lb/100 gal	140bc	136a	98a	59ab	27ab	29abc	489a
Glyphosate AMS	EB	0.0625 lb ae/A 1 lb/100 gal	108c	117ab	95a	60ab	37a	48a	465a
Glyphosate AMS	EB	0.0313 lb ae/A 0.5 lb/100 gal	140bc	135a	100a	58ab	28ab	39ab	499a
Glyphosate AMS	LB	0.25 lb ae/A 4 lb/100 gal	138bc	135a	101a	57ab	34ab	37ab	502a
Glyphosate AMS	LB	0.125 lb ae/A 2 lb/100 gal	124bc	128a	99a	60ab	37abc	32abc	480a
Glyphosate AMS	LB	0.0625 lb ae/A 1 lb/100 gal	120bc	130a	104a	60ab	28a	42a	483a
Glyphosate AMS	LB	0.0313 lb ae/A 0.5 lb/100 gal	118bc	48d	30c	20c	12abc	31abc	259c
Untreated			131bc	134a	100a	70a	32a	51a	518a

Weed control in irrigated potatoes with Reflex. Harlene Hatterman-Valenti and Collin Auwarter.

A study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate crop safety and weed control with Reflex on irrigated Russet Burbank. Application information is provided below. The experiment was a randomized complete block design with four replicates.

Sprayer: GPA	20	20
PSI	40	40
Nozzle	8002 flat-fan	8002 flat-fan
Application Date:	6/4/2008	6/26/2008
Application Timing:	PRE	POST
Air Temperature:	55 F	70 F
Rel. Humidity:	92%	60%
Wind Velocity	4	8
Soil Moisture:	Normal	Normal
% Cloud Cover:	90	50

Table 2. Weed control 20, 40, and 80 days after treatment.

Treatment	Rate	Applic	20DAA			40 DAA			80 DAA		
	oz ai/A	timing	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft
Untreated			0	0	0	0	0	0	0	0	0
Reflex	4	A	90	99	88	94	98	95	95	100	98
Reflex	8	A	99	98	85	97	100	90	100	100	100
Dual Magnum	15.3	A	88	99	98	91	100	100	98	100	100
Reflex+Dual Mag	4+15.3	A	98	100	99	94	100	100	99	99	98
Boundary	19.4	A	100	100	98	100	100	98	99	99	99
Boundary+Reflex	19.4+4	A	100	100	100	99	100	99	99	100	100
Boundary+Reflex	19.4+2	A	100	100	100	99	100	99	99	100	99
Dual Mag+Sencor	15,3+3	A	100	100	99	99	100	100	99	100	100
Dual Mag+Matrix	15.3+ 0.25	A	100	100	99	98	100	99	99	100	98
Matrix + MSO	0.375	B	0	0	0	90	99	98	96	100	99
LSD 0.05			4	2	6	6	2	4	4	1	2

Summary: No crop injury was observed and all treatments generally provided excellent season-long weed control.

Effect of simulated glyphosate drift to seed potatoes. Harlene M. Hatterman-Valenti and Collin P. Auwarter. A study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate the effect of glyphosate drift to daughter tubers when the herbicide was applied the previous year to potatoes at different growth stages. The study was conducted on loamy sand soil with 1.8 % organic matter and 7.7 pH. Onions were grown the previous year. Plots were 4 rows by 25 ft arranged in a randomized complete block design with four replicates. Seed pieces (2 oz) were taken from plot samples placed into cold storage at 65º F with approximately 90% RH until the following year at which time they were planted on 36 inch rows and 12 inch spacing (May 13). The previous year glyphosate was applied to irrigated Russet Burbank potatoes at the tuber hook stage (TH), tuber set stage (TI), early bulking stage (EB), and late tuber bulking/early senescence stage (LB) at rates one-third, one-sixth, one-twelfth, and one-twenty-forth the standard use rate (0.25, 0.125, 0.0625, and 0.0313 lb ae/A). The plots were 2 rows by 10 ft arranged in a randomized complete block design with four replicates. Extension recommendations were used for cultural practices. Plots were desiccated on September 19, harvested October 11 and graded into the various categories after harvest.

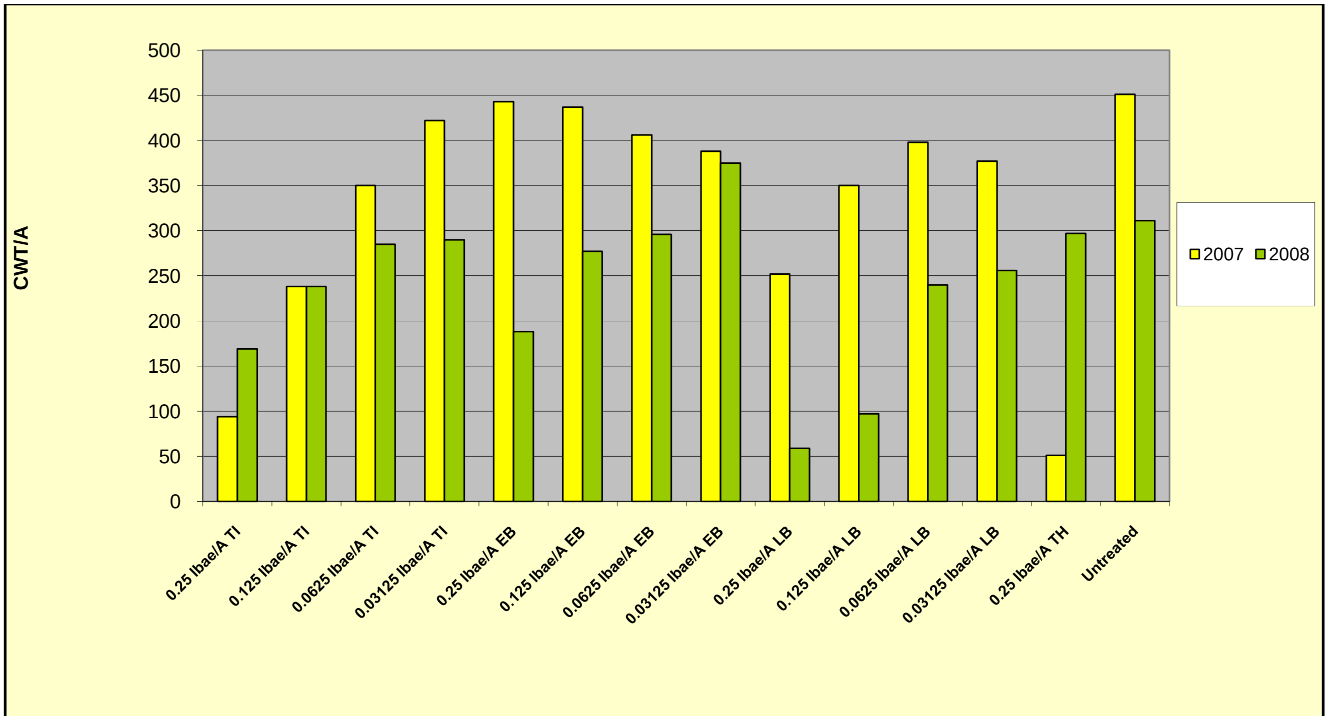


Figure 1. CWT/A of marketable tubers from 2007 and 2008

Total yield was reduced when daughter tubers were planted from plants receiving glyphosate at the TI, EB, and LB stages and significantly increased at the TH stage in 2008. (Figure 1). Potatoes treated with 0.25 lb/A glyphosate at the TH stage in 2007 produced significantly more tubers in 2008 primarily due to the early application in the season and not much glyphosate moving into the seed tubers (Figure 2). Potatoes treated with 0.25 and 0.125 lb/A at the LB stage showed a yield loss of 200 and 100 cwt/A, respectively, compared to the untreated during 2007. In 2008, seed from these two treatments resulted in a loss of 329 and 250 cwt/A compared to the untreated.

Potatoes treated with 0.25 lb/A glyphosate at the LB stage in 2007 and replanted in 2008 had nearly two-thirds of total yield unmarketable.

Potatoes treated at the tuber hooking stage had a significantly lower yield of tubers >4 oz with 51 cwt/A in 2007. In contrast, replanted seed had a yield of 297 cwt/A of tubers >4 oz in 2008.

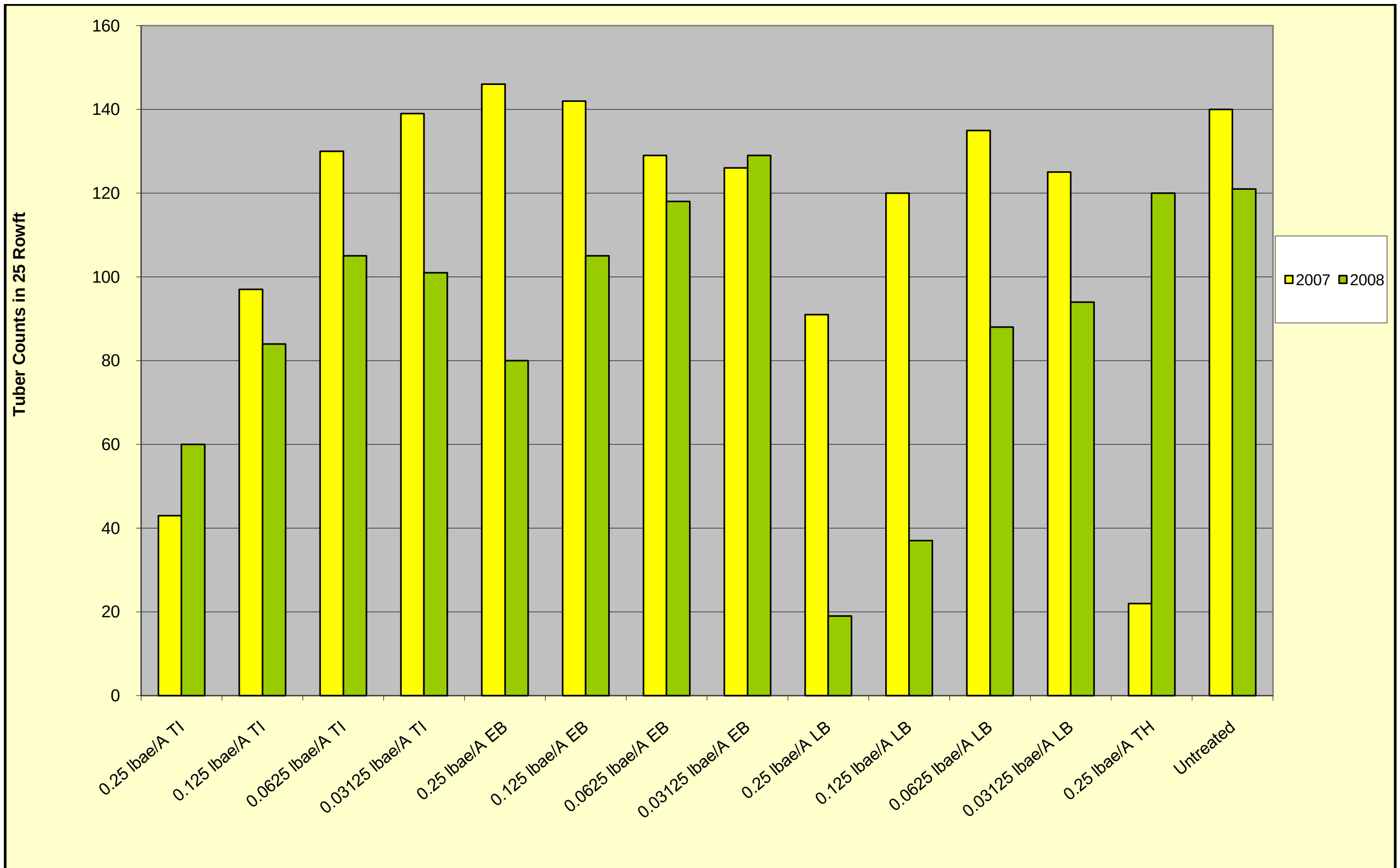


FIgure 2. 2007 vs 2008 >4 Ounce Tuber Counts

Weed control in irrigated potatoes with TriCore. Harlene Hatterman-Valenti and Collin Auwarter.

A study was initiated at the Northern Plains Potato Grower's Association Irrigation Research site near Tappen, ND to evaluate crop safety and weed control with TriCore on irrigated Russet Burbank. Application information is provided below. The experiment was a randomized complete block design with four replicates.

Sprayer: GPA	20	20
PSI	40	40
Nozzle	8002 flat-fan	8002 flat-fan
Application Date:	6/4/2008	6/26/2008
Application Timing:	PRE	POST
Air Temperature:	55 F	70 F
Rel. Humidity:	92%	60%
Wind Velocity	4	8
Soil Moisture:	Normal	Normal
% Cloud Cover:	90	50

Table 2. Weed control 20, 40, and 80 days after treatment.

Treatment	Rate	Applic		20DAA			40 DAA			80 DAA	
	lb ai/A	timing	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft	Colq	Rrpw	Yeft
Untreated			0	0	0	0	0	0	0	0	0
TriCore	0.5	A	100	100	98	100	100	92	100	100	98
TriCore+Matrix	0.375+ 0.047	A	100	100	98	100	100	95	100	100	98
TriCore+Matrix+ Prowl H2O	0.375+ 0.047 +1.0	A	100	100	99	99	100	96	100	100	98
TriCore + Outlook	0.375+ 1.0	A	100	100	100	100	100	94	100	100	96
TriCore+Matrix	0.375+ 0.047	B	0	0	0	100	100	94	100	100	98
LSD 0.05			---	---	---	2	---	7	---	---	4

Summary: No crop injury was observed and all treatments generally provided excellent season-long weed control.

Weed control in non-irrigated potatoes with V-10206. Harlene Hatterman-Valenti and Collin Auwarter.

An experiment was conducted at NDSU Fargo, ND to evaluate crop safety and weed control with V-10206 on Red Norland. The field was field cultivated prior to planting. Red Norland, was planted June 23, 2008. Fertilizer, insecticides and fungicides were applied as needed. Potatoes were hilled on July 15. Application information is provided below. The experiment was a randomized complete block design with four replicates.

Sprayer:	GPA	20
	PSI	40
	Nozzle	8002 flat-fan

Application Date:	7/15/2008
Time of Day:	12:00
Application Timing:	PRE
Air Temperature:	65 F
Rel. Humidity:	70%
Wind Velocity	0
Soil Moisture:	adequate
% Cloud Cover:	10

Table 2. Weed control 10 and 40 days after treatment.

Treatment	Rate	Injury	10 DAA			40 DAA		
	lb ai/A		Rrpw	Colq	Yeft	Rrpw	Colq	Yeft
		%						
V-10206	0.106	5	98	80	97	100	100	97
V-10206	0.213	5	96	93	100	95	100	98
Chateau	0.047	10	96	89	93	91	100	97
Dual Magnum	1.2	0	85	83	99	93	100	96
V10206+Chateau	0.106 + 0.047	19	97	96	100	96	100	99
V10206+Chateau	0.213 + 0.047	22	97	96	99	99	100	100
Untreated		0	0	0	0	0	0	0
LSD 0.05		10	14	20	9	6	---	4

Summary: Injury from V-10206 was slight stunting whereas stem necrosis occurred with Chateau. Direct herbicide contact or contact shortly after application with the emerging stems were determined to be responsible for the observed injury as the clay loam soil clumped during the hilling procedure leaving large air spaces and plants emerged shortly after hilling. All provided season-long control of the main annual broadleaf and grass species that infest potato land.

Research Report

Proposal Title: Effective Pink Rot Disease Control and Management of Mefenoxam Resistance in *Phytophthora erythroseptica*

Submitted to MN Area II Potato Growers

Principle Investigator: Neil C. Gudmestad**,** Department of Plant Pathology, North Dakota State University, Fargo, ND 58105. Neil.Gudmestad@ndsu.edu, 701.231.7547 (O); 701.231.7851 (F)

Research Objectives:

1. Determine the prevalence of mefenoxam-resistance in the *P. erythroseptica* population in Minnesota.
2. Determine the impact of an alternative fungicide, phosphorous acid, on the management of mefenoxam resistance.
3. Determine if phosphorous acid provides residual control of pink rot in storage that is not currently provided by mefenoxam.

Procedures:

Pink rot survey. P. erythroseptica isolates will be collected by transferring small pieces of infected tissue, approximately 25 mm3 in size, to culture dishes containing water agar amended with ampicillin (100 µg/ml) and incubated in the dark at 17 to 20ºC for 3 to 5 days. Colonies with mycelia resembling that of *P. erythroseptica* will be selected and purified by hyphal tipping.

Mefenoxam sensitivity testing. Mefenoxam (Ridomil Gold 4EC) sensitivity will be determined using an in vitro screening method. Tests will be conducted on modified V8 juice agar amended with fungicide in a 10-fold dilution series ranging from 0.01 to 100 µg/ml and control plates not amended with mefenoxam. A 5-mm-diameter disk containing mycelium and agar from the margin of actively growing colonies of 4- to 6-day-old cultures will be positioned in the center of a culture dish. Isolate growth will be determined by measuring colony diameters in two perpendicular directions after 6 days of incubation in the dark at 20 ± 1ºC. Measurements were averaged, the diameter of the mycelial plug will be subtracted, and relative growth reduction for each rate of fungicide will be calculated as follows: (100 – [growth with fungicide/growth in control plate] × 100). The EC_{50} relative to the control will be estimated by plotting the percentage inhibition against the log-scale of fungicide concentration.

Field plots and mefenoxam application. Fungicide application trials will be conducted under center pivot irrigation over two consecutive growing seasons. Fungicide treatments will be established each year to provide different levels of pink rot control in treated versus non-treated tubers (Table 1). At planting, a 50:50 blend of mefenoxam sensitive and insensitive isolates of the pink rot pathogen will be applied in the seed piece zone. Fungicide treatments will be applied at the recommended label rate. Mefenoxam (Ridomil Gold 4EC or Ultrafluorish) as an in-furrow application of 200 g a.i./ha at planting followed by an additional side-dress application of 100 g a.i./ha 21 days later (Table 1). This split application of mefenoxam at these rates previously has been demonstrated to provide the highest level of pink rot control (Taylor et al., 2004). Another mefenoxam treatment will be two foliar applications of 100 g a.i./ha when tubers are approximately 10 mm in diameter and 14 days later. One, two and three phosphorous acid (Phostrol) treatments will all be made at a rate of 11.65 L/ha (Table 1). No in furrow treatments will be used since these have been demonstrated to ineffective in controlling pink rot (Johnson, et al., 2004). The foliar phosphorous acid treatments will be applied when tubers are 10mm in diameter and 14 days later (2 applications) and the same treatment regime with a third application 14 days after the second application (total of three foliar applications). An additional phosphorous acid treatment will include a post-harvest application simulating tubers going into storage. Two treatments of cyazofamid (Ranman) will be used in this experiment (Table 1). The first will be an in furrow, at planting application at a rate of 450 mL/ha. The second treatment will be an in furrow treatment of 450 mL/ha followed by a sidedress application of 225 mL/ha.

Disease evaluations at harvest. Pink rot tubers will be obtained at harvest from all non-treated and all fungicide (2 treatments each of mefenoxam, 4 phosphorous acid and 2 cyazofamid) treated plots. These pink rot infected tubers will be taken to the laboratory and isolations for *P. erythroseptica* will be performed. All isolates obtained will be maintained on a treatment X replication basis and tested for their sensitivity to mefenoxam based on the methods previously described. The purpose of this portion of the proposed research is to determine the effect of non-mefenoxam fungicides on the mefenoxam sensitive and insensitive populations of *P. erythroseptica*.

Post-harvest pink rot inoculations. Plants will be killed by mechanical flailing 2 to 3 weeks prior to maturity to insure the availability of a sufficient quantity of tubers of the desired size and adequate skin set. After harvest, tubers were stored for 2 weeks at 15ºC and 90% relative humidity to facilitate wound healing. However, because levels of mefenoxam in tubers will decline over time, test tubers used in this study were stored at 10ºC for no longer than 4 months prior to testing. We do not know the length of residual control for phosphorous acid, but the experiments conducted here will provide that information and determine if this fungicide provides control of pink rot beyond harvest.

The level of residual, post-harvest control of pink rot will be determined using challenge inoculations conducted at 30 day intervals after harvest. Residual pink rot control studies will focus on the phosphorous acid treatments and comparing this to the known residual control provided by mefenoxam. We will not test the residual control potential of cyazofamid, since it is not a systemic fungicide (Table 1). Wounded and non-wounded tubers will be placed in plastic moist chamber boxes and inoculated with 10 µl of the zoospore suspension of *P. erythroseptica*. Inoculated tubers will be covered with four layers of paper towels moistened to saturation with deionized water. The chamber boxes will be sealed to establish high humidity to promote infection and incubated in the dark at ambient temperature at 20 to 22ºC for 10 days.

Disease assessment. Inoculated tubers will removed from the moist chambers and infection will be determined by cutting each tuber in half through the axis from the sites of inoculation on the apical bud end to the basal stem end. Split tubers will be covered with moist paper towels and incubated at ambient temperatures of 20 to 24ºC for approximately 30 min to enhance the development of the discoloration diagnostic of pink rot. Infected tubers will be counted and disease incidence calculated as (number of diseased tubers/number of inoculated tubers) × 100. To determine pink rot severity, the maximum width of rot (W) and the depth (D) of rot from the inoculation point will be measured and penetration (P) of rot was calculated as $P = (W/2 + [D – 5])/2$. Disease incidence will be transformed to percent disease control using the formula ([disease incidence of untreated control – disease incidence of treatment]/disease incidence of untreated control) × 100.

Results:

*Pink rot survey***.** Pink rot is still the major storage rot present in MN based on the 2008 survey (Figure 3). The frequency of mefenoxam resistance in the *P. erythroseptica* population has not changed from 2007 (Figure 4). However, we find a substantial amount of the population that possesses an intermediate level of resistance to mefenoxam indicating that the population is still in flux and likely transitioning to resistance (Figure 5 & 6). This is not true of the *P. erythroseptica* population in ND that is still largely sensitive to mefenoxam with a complete absence of an intermediately resistant population (Figure 7). We interpret this to mean that the ND population of the pink rot pathogen is largely stable and is currently not transitioning to mefenoxam resistance.

Field plots and mefenoxa/phosphorous acid application. Unfortunately, our pink rot field trials were lost in 2008 due to factors completely out of our control. These field experiments will, however, be implemented again in 2009. Data from 2007 clearly indicate that phosphorous acid provides superior control of pink rot caused by both mefenoxam-sensitive and resistant isolates of P. erythroseptica (Figure 8). In addition, the residual control of pink rot in storage provided by phosphorous acid is much better than the level of control provided by mefenoxam-based products (Figure 8). Preliminary data suggest that phosphorous acid products also prevent the pink rot pathogen from penetrating pink eye affected areas of potato tubers (data not shown). Mefenoxam-based products do not provide this type of protection, however.

Summary:

Mefenoxam resistance continues to build in the MN population of *P. erythroseptica* as evidenced by the presence of intermediately resistant isolates of this pathogen. This is not the case in ND, however, where the pink rot pathogen remains largely sensitive to mefenoxam-based fungicides. Although fungicide efficacy trials were lost in 2008, data from 2007 clearly demonstrate that phosphorous acid products provide excellent residual control of pink rot. Further studies are needed to determine the number of phosphorous acid applications are necessary to provide control of pink rot and to determine the best method of application without providing injury to the foliage.

Table 1. Fungicide treatments to determine control of pink rot in field and storage.

Treatment		Rate	Application Timing	Disease Control in Field[1]	Residual Control in Storage[2]
3101	Untreated - Inoculated	-	-	X	X
3102	Untreated - Non-inoculated	-	-	X	X
3103	Ultraflourish Ultraflourish	12.0 fl oz / a + 6.0 oz / a	2 appl. - spray in-furrow + sidedress	X	X
3104	Ultraflourish + Ridomil MZ	12.0 fl oz / a + 2.0 lb / a	2 appl. - spray at tuber set + 14 days later	X	X
3105	Phostrol	10.0 pt / a	1 appl. - spray at tuber set	X	X
3106	Phostrol Phostrol	10.0 pt / a + 10.0 pt / a	2 appl. - spray at tuber set + 14 days later	X	X
3107	Phostrol Phostrol Phostrol	10.0 pt / a + 10.0 pt / a + 10.0 pt / a	3 appl. - spray at tuber set + 14 days later + 28 days later	X	X
3108	Phostrol	12.8 fl oz / t tubers	1 appl. - post-harvest	X	X
3109	Cyazofamid	6.1 oz / a	1 appl. - spray in-furrow	X	
3110	Cyazofamid Cyazofamid	6.1 oz / a + 6.1 oz / a	2 appl. - spray in-furrow + sidedress	X	

P. erythroseptica isolations from infected tubers at harvest and 30 days after harvest, isolates tested for sensitivity to mefenoxam.

[1]Percent tuber infection at harvest and 30 days after harvest.

[2]Post harvest challenge inoculations 30, 60, 90 and 120 days post-harvest.

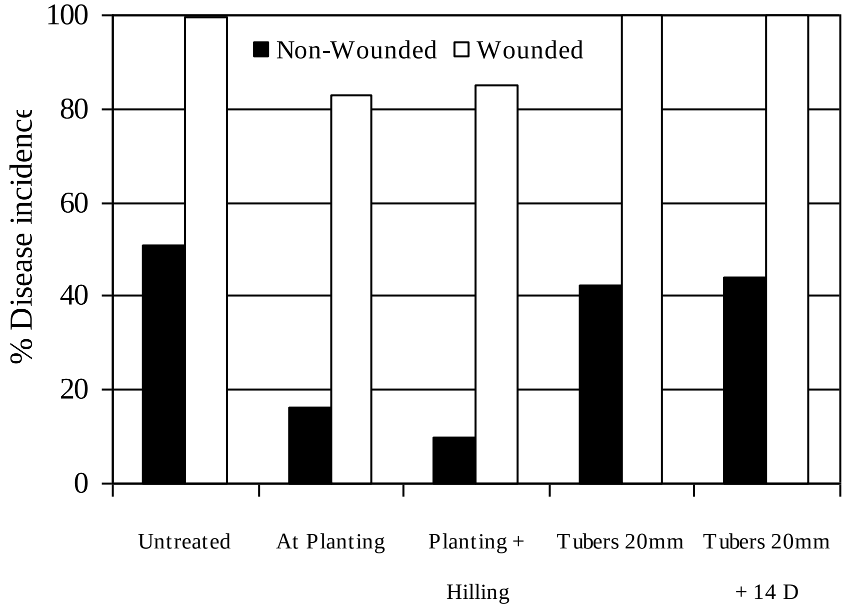


Figure 1. Pink rot disease incidence in wounded and non-wounded tubers (cv. Russet Burbank) obtained from plants nontreated and treated with mefenoxam in the soil at planting (one application), planting and hilling (two applications), to the foliage when tubers were 20 mm dia (one application), and to the foliage when tubers were 20 mm dia and 14 days later (two applications). All soil and foliar applications were made at a rate of 200 g a.i./ha.

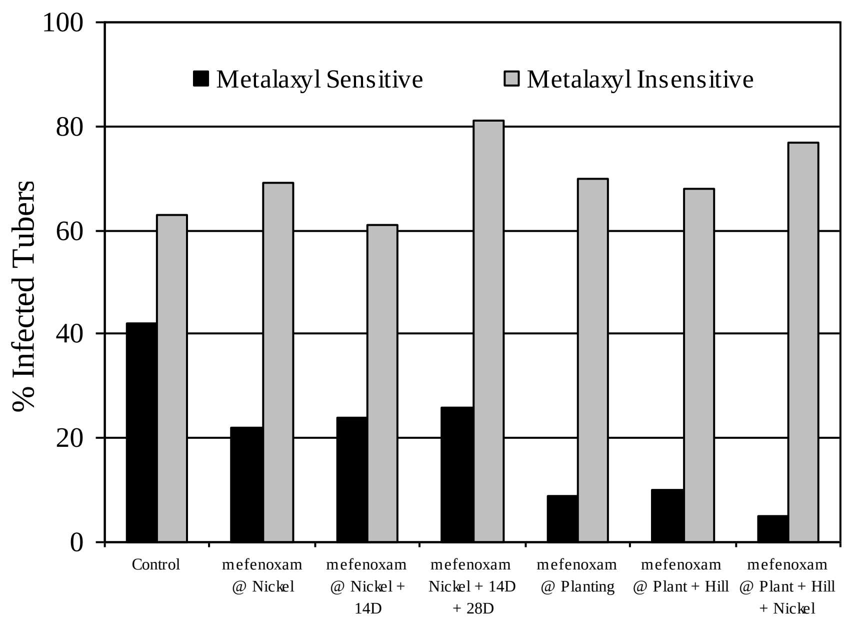


Figure 2. Pink rot disease incidence in tubers (cv. Russet Burbank) inoculated with mefenoxam sensitive and insensitive isolates of *Phytophthora erythroseptica.* Tubers were obtained from plants nontreated and treated with mefenoxam in the soil at planting (one application), planting and hilling (two applications), to the foliage when tubers were 20 mm dia (one application), and to the foliage when tubers were 20 mm dia and 14 days later (two applications). All soil and foliar applications were made at a rate of 200 g a.i./ha.

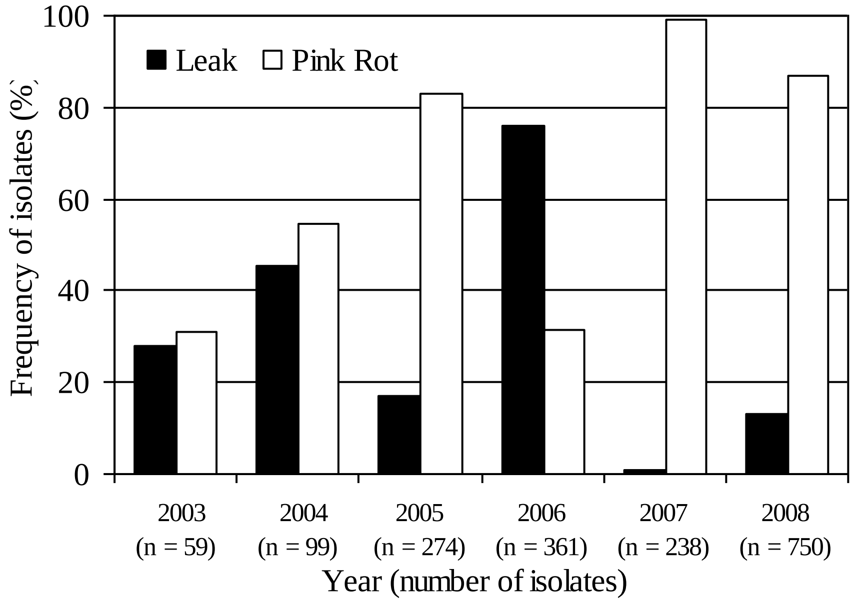


Figure 3. Frequency of Pink Rot (*Phytophthora erythroseptica*) and Leak (*Pythium ultimum*) isolates recovered from fields in MN during 2008.

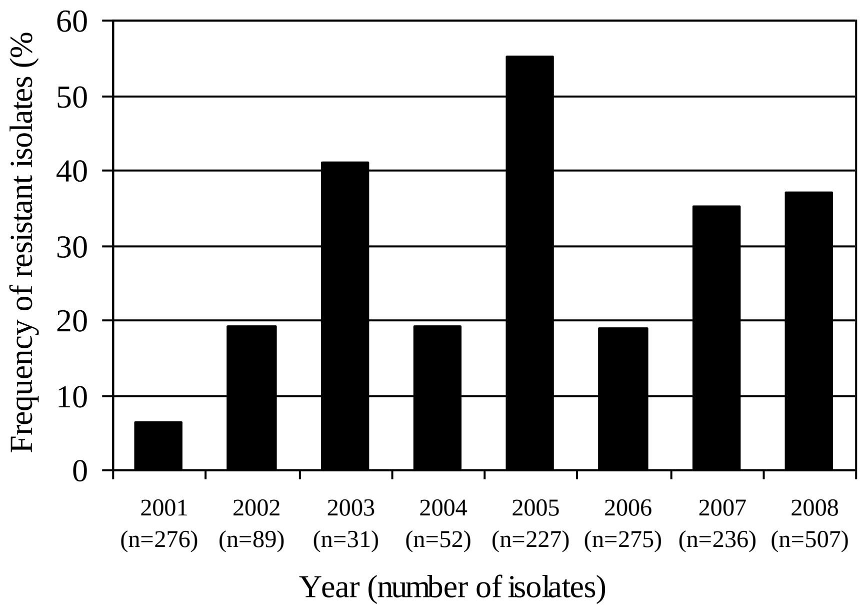


Figure 4. Frequency of mefenoxam resistant *Phytophthora erythroseptica* isolates recovered in MN from 2001 to 2008.

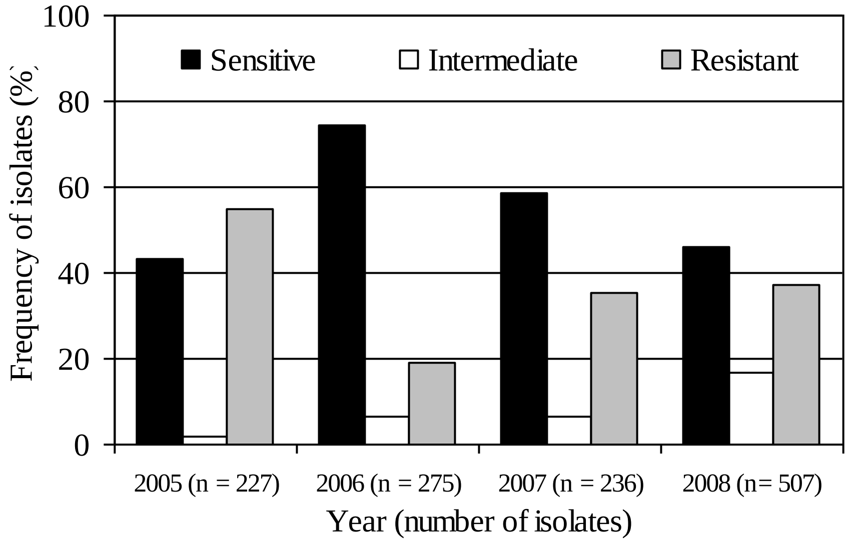


Figure 5. Frequency of *Phytophthora erythroseptica* isolates with sensitive, intermediate and resistant reactions to mefenoxam recovered in MN from 2005 to 2008.

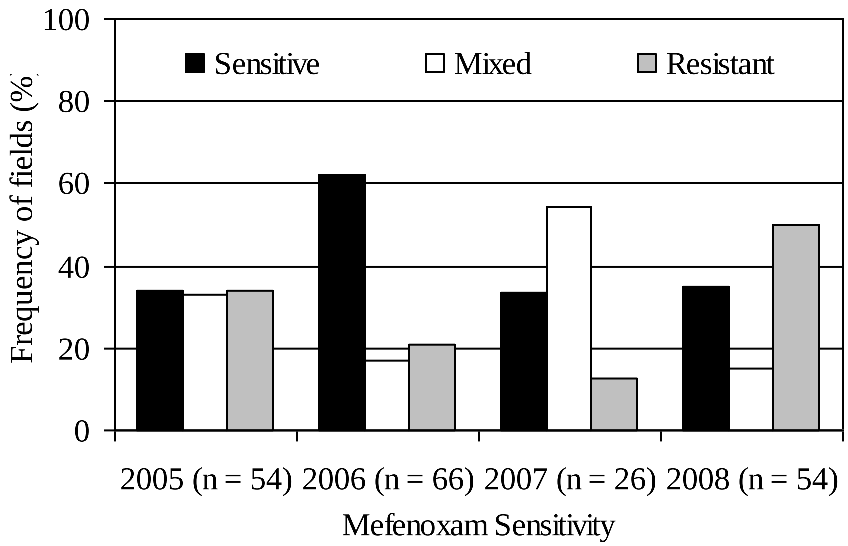


Figure 6. Frequency of MN potato fields from which mefenoxam sensitive, intermediate and resistant *Phytophthora erythroseptica* isolates were recovered between 2005 and 2008.

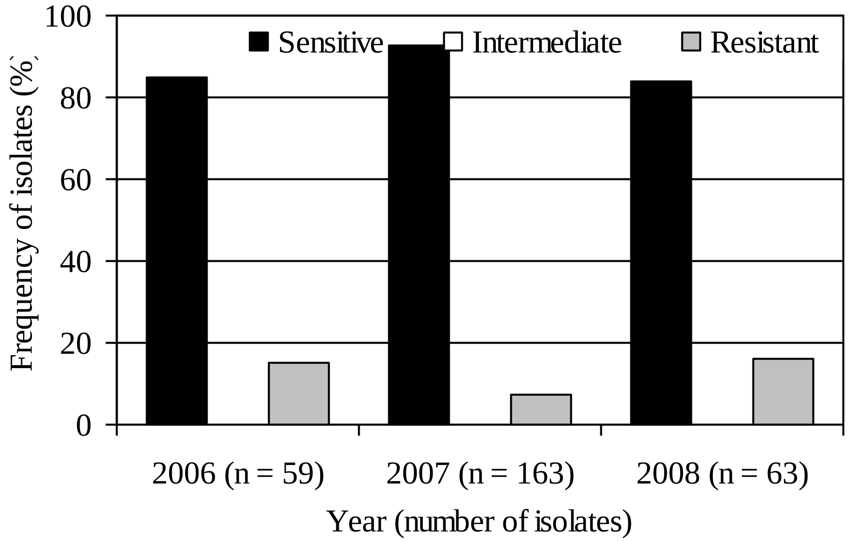
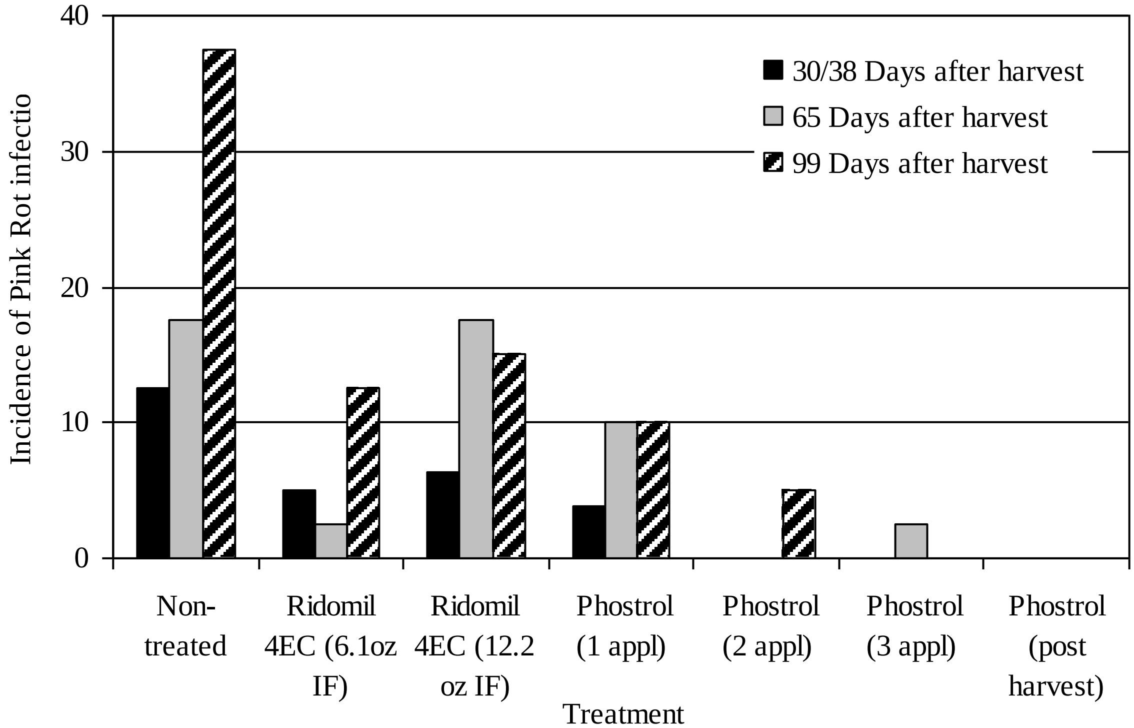


Figure 7. Frequency of *Phytophthora erythroseptica* isolates with sensitive, intermediate and resistant reactions to mefenoxam recovered in ND from 2006 to 2008.



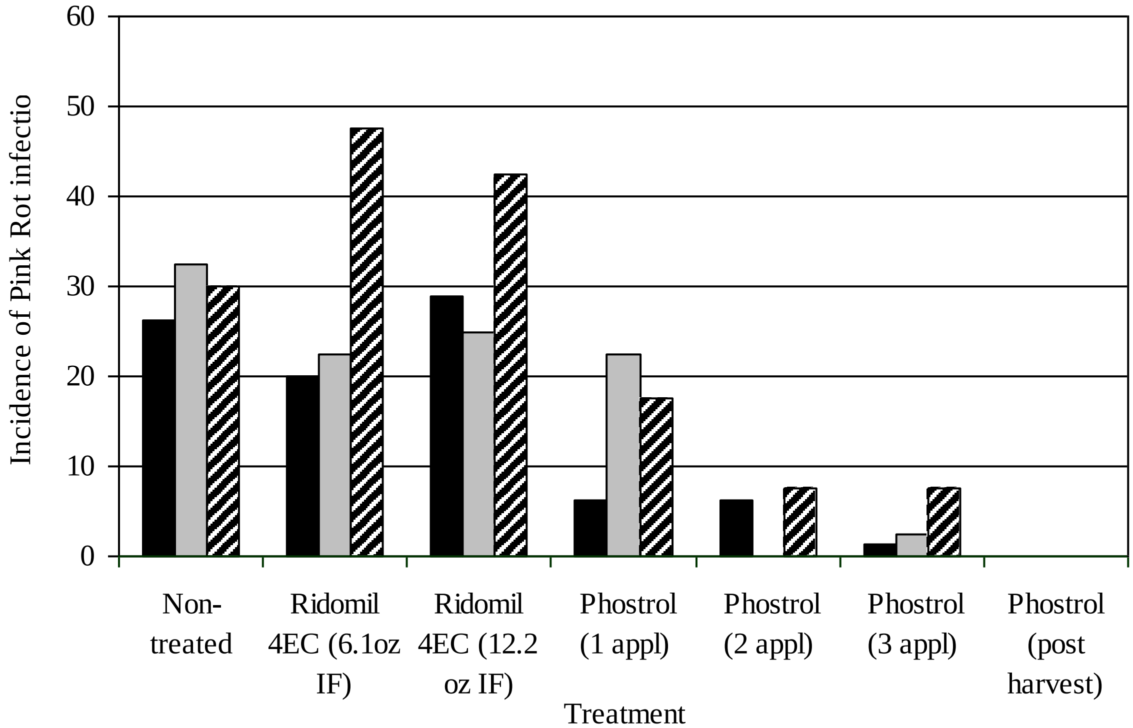


Figure 8. Incidence of pink rot caused by mefenoxam sensitive (A) and resistant (B) isolates of *Phytophthora erythrosetpica* in potato tubers treated with mefenoxam or phosphorus acid in field trials conducted in 2007..

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Research Report

Title: Quantification of soil-borne pathogens of potato using real-time PCR

Principle Investigator: Neil C. Gudmestad, Department of Plant Pathology, North Dakota State University, Fargo, ND. **Neil.Gudmestad@ndsu.edu** 701.231.7547 (O); 701.231.7851 (F)

Submitted to Minnesota Area II Potato Growers and NPPGA

Research Objectives:

1) Develop a multiplex real-time PCR method for the detection and quantification of *V. dahliae, C. coccodes,* and *S. subterranea* from field soil.
2) Develop soil sampling and soil processing procedures to optimize DNA extraction from soilborne pathogens.

Research Plan:

We have determined that the *V. dahliae* PCR primer is sensitive to 0.01 ng of DNA (Figure 2) and are ready to adapt this primer to real-time PCR method. If successful, we will combine the *C. coccodes* and *V. dahliae* PCR methods into a duplex reaction that will permit the quantification of these two pathogens in a single reaction. Further studies will be undertaken to use the powdery scab PCR method of Qu et al. (2006) with the methods already developed in our laboratory. The detailed methodology to accomplish this is discussed below.

DNA will be extracted from axenic cultures of *V. dahliae,* and *C. coccodes* grown in potato dextrose broth using the FastPrep DNA extraction kit (MoBio Inc.). DNA will be quantified with a fluorometer and diluted to 10 ng/µL in ddH$_2$O. *C. coccodes* will be amplified using the forward primer CcTqF1, reverse primer CcTqR1, and the Taqman probe CcTqP1 (Cullen et al. 2002). *R. solani* will be amplified using the forward primer RsTqF1, reverse primer RsTqR1, and the Taqman probe RQP1 (Lees et al. 2002). A real-time PCR assay for *V. dahliae* will be developed by analyzing a DNA sequence corresponding to the *V. dahliae* ITS1-5.8srDNA-ITS2 domain (GENEBANK Accession EF015891) domain with Primer Express Software. The species specificity of each real-time assay will be confirmed by amplifying target DNA and non-target DNAs including the three other fungi and purified potato DNA. Real-time PCR reactions and thermocycling conditions will be as described by Vandemark et al. (2000).

Two Taqman probes will be synthesized for each pathogen, with one being labeled at the 5' terminus with the fluorochrome 6-carboxyfluorescein (FAM), and the other labeled at the 5' terminus with the fluorochrome VIC (Applied Biosystems). Initial real-time PCR assays will include purified DNA (25 ng) of each pathogen in all six pair-wise combinations. Primer and probe limiting experiments will be performed according to manufacturer's recommendations (Applied Biosystems) to determine the minimum, most cost effective amount of primers and Taqman probe that can be used in multiplex reactions.

After verifying the sensitivity and specificity of the multiplex real-time PCR assays with purified pathogen DNAs, soil will be collected from potato fields. Mycelia of *V. dahliae* and *C. coccodes* will be added in known quantities to the soil samples. DNA will be extracted from 5 g soil samples with the MegaPrep DNA extraction kit (Mo Bio Inc.) and multiplex real-time PCR will be performed using 10 μL of the soil DNA extract in a 50 μL reaction volume. The amount of each respective pathogen detected in the soil sample will be determined based on standard curves using purified pathogen DNA as template. Serial dilutions of the DNA extracts from pathogen infested soil will be made and examined by real-time PCR to determine threshold levels for reliable detection of each pathogen. DNA extracted from the original soil sample prior to infestation by the four respective pathogens will also be amplified by real-time PCR to examine baseline levels of detection from non-infested soil.

Results:

The real-time PCR method for the black dot pathogen, *C. coccodes*, has been successfully developed by our laboratory with funding from MN Area II in 2006 and 2007 and was used on a trial basis during the last two growing seasons (see MN Area II research report submitted in November, 2006 & 2007). An excellent relationship exists between the quantity of microsclerotia of the black dot pathogen and the number of cycles required by PCR to get a positive detection (Figure 1). Similarly, there is an good relationship between the number of potato crops on a field and the population of the black dot pathogen present, indicating that the pathogen survives a long period of time and slowly builds as potatoes are planted on the field (Figure 2). We feel that this portion of the real-time PCR method is working well and can be used for further studies.

The development of a PCR assay for *V. dahliae* that will work with soil detection has been a significant challenge, one we did not face with *C. coccodes* discussed above. The detection of microorganisms in soil by PCR provides many challenges, including the presence of inhibiting compounds such as humic acids. Many researchers have developed protocols for DNA extraction from soil which have been successful for the detection of a target organism using particular primer sets, but these techniques may not work for different organisms or even different primers sets designed to the same organism. The protocol developed in this study was developed by incorporating techniques used in DNA extraction protocols for several different systems and was successful in detecting DNA of *V. dahliae* extracted from soil using a conventional PCR assay.

While there have been numerous sets of PCR primers developed for the detection of *V. dahliae*, many of these have not been evaluated for efficacy in detecting the organism in soil. Among the two primers sets developed using the TRP gene, TRP1 and TRP7/3, only TRP1 primers were effective at consistently detecting DNA extracted from microsclerotia of *V. dahliae*. Among the three primer sets developed using the VTP gene, VTP 1, VTP1-2 and VTP1-3, only VTP1-2 was effective in detecting DNA extracted from microsclerotia. The single primer set designed to the ribosomal intergenic sequences, VDITS1/2, was also successful in detecting microsclerotial DNA. While these three primer sets were found to be both sensitive and specific for *V. dahliae*, only VDITS1/2 was successful in detecting microsclerotial DNA extracted from soil. Not only was detection possible, but adequate sensitivity was achieved to make the assay useful for management decisions. DNA extracted from soil amended with 100 microsclerotia/mg was diluted 2-fold and tested with VDITS1/2 using a conventional PCR assay. This assay displayed the ability to detect down to the equivalent of 0.4 microsclerotia/mg soil, well below the threshold of 8 microsclerotia/mg established for economic justification for the use on control measures including soil fumigation (Figure 3). The next step is to convert the conventional PCR method into real-time PCR if further funding can be secured.

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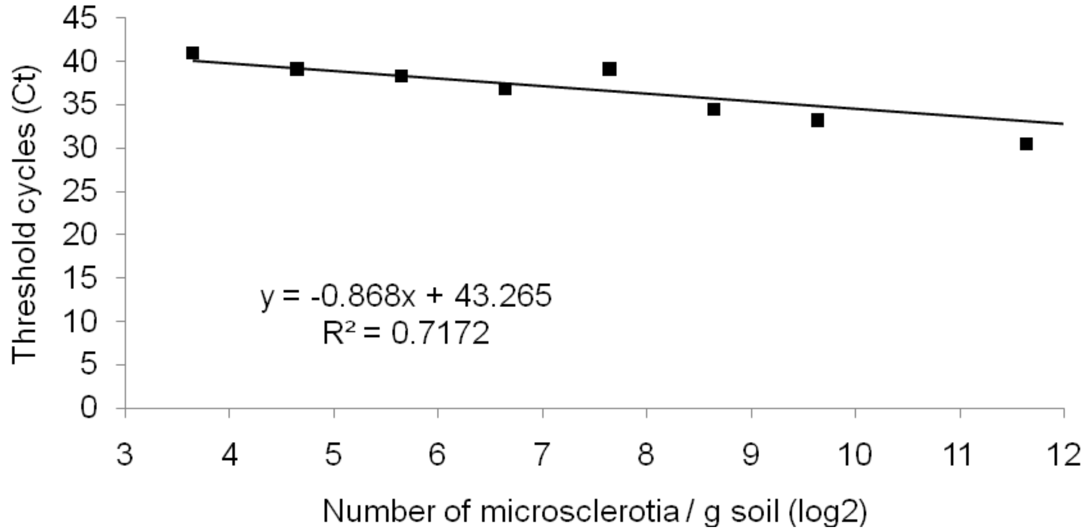

Figure 1. Relationship between microsclerotia/ g soil and the number of threshold cycles for real-time PCR amplification of *Colletotrichum coccodes* at 2-fold serial dilutions of DNA using forward primer CcTqF1, reverse primer CcTqR1 and Taqman probe CcTqP1.

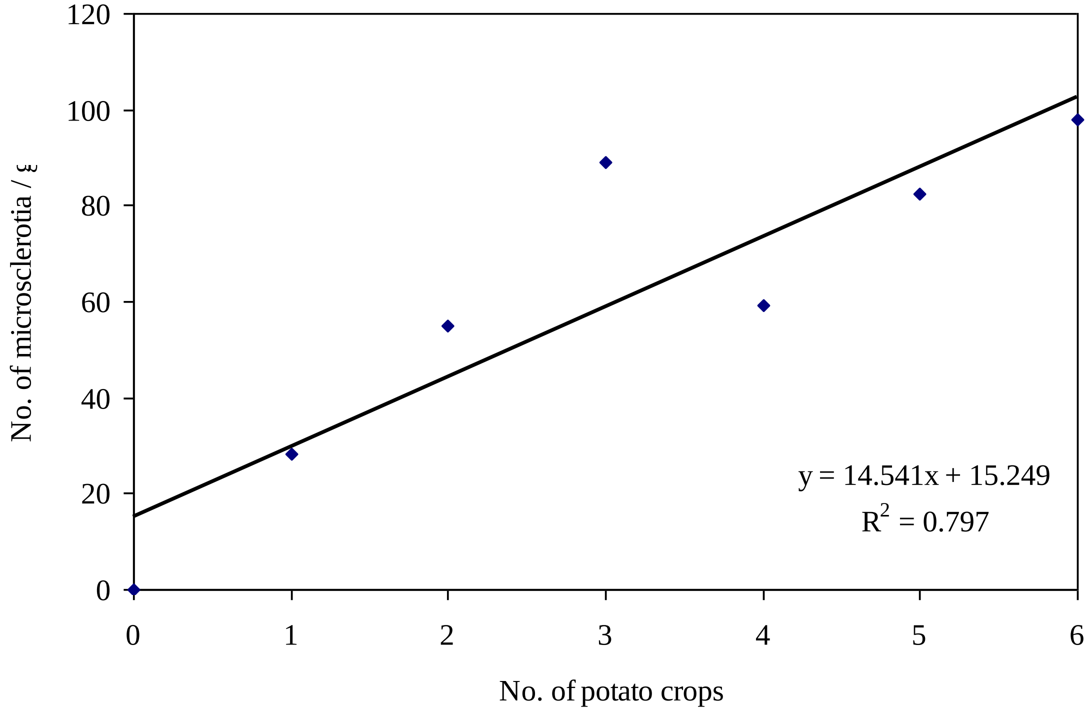

Figure 2. Relationship between the number of potato crops and population of *Colletotrichum coccodes* in fields (n=45) tested using real-time PCR.

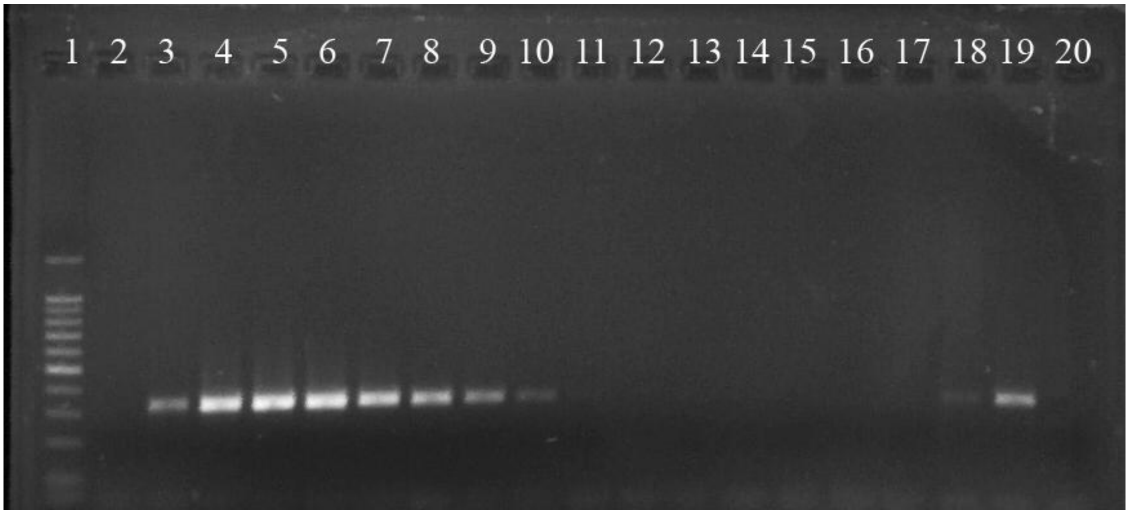

Figure 3. PCR amplification of a *Verticillium dahliae* at 2-fold serial dilutions of DNA using forward primer VDITS1 and reverse primer VDITS2. Lane 1, 100 bp DNA ladder; Lane 2, 100 microslerotia/mg; Lane 3, 50 microslerotia/mg; Lane 4, 25 microslerotia/mg; Lane 5, 12.5 microslerotia/mg; Lane 6, 6.25 microslerotia/mg; Lane 7, 3.13 microslerotia/mg Lane 8, 1.6 microslerotia/mg Lane 9, 0.8 microslerotia/mg Lane 10, 0.4 microslerotia/mg Lane 11, 0.2 microslerotia/mg Lane 12, 0.1 microslerotia/mg Lane 13, 0.05 microslerotia/mg Lane 14, 0.03 microslerotia/mg Lane 15, 0.1 microslerotia/mg Lane 16, 0.006 microslerotia/mg Lane 17, 0.003 microslerotia/mg Lane 18, *C. coccodes* Lane 19, *V. dahlia* positive control Lane 20, water blank.

Cultivar specific management profiles for red and yellow potato varieties grown in North Dakota and Minnesota – Irrigated Site

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Executive Summary: One of the main goals of the extension potato agronomy program at North Dakota State University and the University of Minnesota is to provide growers with research-based information that can be used to make well informed production decisions. The objective of this project is to evaluate red and yellow fresh-market varieties that may have potential in the irrigated sands of Minnesota. More specifically, the long-term goal is to provide management profiles for the varieties evaluated.

The objective of this trial was to evaluate the yield potential of twenty red and yellow varieties and determine the impact in-row seed spacing (6, 9, and 12") on size profile distribution and total yield for an early harvest crop (1st of August) and a late harvest crop (1st of September). Specific gravity, length:width ratios, color, and skinning potential were also evaluated on the early harvest crop.

Materials and Methods: This study was conducted at the Sand Plain Research Farm in Becker, MN on a Hubbard loamy sand soil. Treatments (potato variety and in-row seed spacing) were arranged in a randomized complete block design and replicated four times. The plots were hand planted on May 5, 2008 using a two-row assist feed planter. The crop was fertilized, irrigated, and pests controlled using commercially acceptable practices. The early and late harvest plots were dug on August 13 (100 days after planting) and September 18 (136 days after planting), respectively. Following harvest, the samples were transported to the USDA Potato Research Worksite in East Grand Forks, Minnesota, where yields and size profile distribution were determined. Potatoes were sorted into C size (< 1.5"), B size (1.5 – 2.25"), A size (2.25 – 3.5") for the early harvest date. The sorter was unavailable for the late harvest date, so the results were sorted in < 4 oz, 4-6 oz, 6-10 oz, and > 10 oz categories. Samples were taken from each plot and specific gravity, length:width ratio, color, and skinning potential were determined. Color was evaluated on a scale of 0.5 (Darkest) – 5.0 (Lightest).

The following varieties were evaluated using an in-row seed spacing of 6, 9, and 12" for both harvest dates: Cherry Red, Chieftain, Colorado Rose, Dakota Jewel, Dakota Rose, Dark Red Norland, Durango, Elfe, Mazama, Milva, Modoc, ND5002-3R, Rio Colorado, Red LaSoda, Red Norland, Red Pontiac, Sangre, Satina, Viking, and Yukon Gold.

Results: *Statistical analysis* - Acccording to the analysis of variance, potato genotype (variety) and in-row seed spacing had a significant effect upon total yield for both the early and late harvest. Furthermore, the effects of variety and in-row seed spacing on total yield were not dependent upon each other (there was no interaction between variety and spacing). As a result, the effect of variety on total yield was averaged and reported across all three in-row spacings (Tables 1 and 2). In order to examine the effects on in-row seed spacing on size class distribution (%C, %B, %A size for the early harvest) and (< 4 oz, 4-6 oz, 6-10 oz, and > 10 oz for the late harvest), the results for individual varieties are reported.

Yield potential of different genotypes – Total yields ranged from 276 – 473 cwt/a. for the early harvest date (Table 1) to 318 – 715 cwt/a. for the late harvest date (Table 2), regardless of in-row spacing. Red Lasoda (426 cwt), Elfe (408 cwt), and Milva (391 cwt) had the highest yield on the early harvest date, while Red LaSoda (715 cwt), Milva (675 cwt), and Chieftain (622 cwt) had the highest yield on the late harvest. Dark Red Norland produced 365 cwt/a. and 415 cwt/a. when harvested early and late, respectively. Red Norland produced significantly lower yields than Dark Red Norland, 279 cwt/a. and 352 cwt/a., respectively, when harvested early and late. Red Lasoda was the only red variety that had a higher total yield than Dark Red Norland on the early harvest date, but Red LaSoda, Chieftain, Viking, Colorado Rose, Rio Colorado, Red Pontiac, Cherry Red, Modoc, Dakota Jewel, and Dakota Rose all outyielded Dark Red Norland on the late harvest. Conversely, all red varieties except Durango, ND5002-3R, and Sangre had higher yields than Red Norland for both the early and late harvest. Comparison of the yellow varieties revealed, that Elfe and Milva had higher yields than Yukon Gold on the first harvest date, but Elfe, Milva, and Satina had higher yields on the late harvest date.

Effect of in-row spacing on Total Yield – Total yield was significantly influenced by in-row spacing across all cultivars for both harvest dates. In fact all three seed spacings were different from each other. On average, in-row seed spacings of 6, 9, and 12" resulted in 356, 329, and 297 cwt/a. on the early harvest date, and 572, 514, and 457 cwt/a. on the late harvest date, respectively.

Effect of harvest date on Total Yield – While the effect of harvest date could not be statistically analyzed, the average increase in total yield between the two harvest dates for each variety is presented in Table 3. Yield increase was modest for some varieties such as Red Norland and Dark Red Norland, and quite substantial for other varieties such as Chieftain, Colorado Rose, and Red LaSoda.

Effect of in-row spacing on size class distribution – Since there was a significant interaction between variety and spacing on size class distribution, data for each variety are summarized in Tables 4-23. Seed spacing influenced size class distribution and total yields on some varieties, while on others it did not.

Red Summary:

Varieties with the highest yields after the early harvest: Red LaSoda, Dakota Rose, and Viking

Varieties with the highest yields after the late harvest: Red LaSoda, Chieftain, and Viking

Varieties with the highest % of B size: Mazama, ND5002-3R, and Rio Colorado

Varieties with the darkest skin color: Colorado Rose, Durango, ND5002-3R, and Modoc

Varieties with darker skin color than Dark Red Norland: Cherry Red, Colorado Rose, Dakota Jewel, Dakota Rose, Durango, Mazama, Modoc, ND5002-3R, Rio Colorado, and Sangre

Varieties with darker skin color than Red Norland: : Cherry Red, Colorado Rose, Dakota Jewel, Dakota Rose, Dark Red Norland, Durango, Mazama, Modoc, ND5002-3R, Rio Colorado, and Sangre

Yellow Summary:

Variety with the highest yield after the early harvest: Elfe

Variety with the highest yield after the late harvest: Milva

Varieties with the highest % of B size after early harvest: Elfe and Milva

Table 1. Total Yield potential and comparison to Dark Red Norland and Red Norland of Early Harvested Red and Yellow potatoes grown in the irrigated sand of Minnesota during 2008.[1]

Variety	Total Yield cwt/acre	Rank	Compared to DRN[2]	Compared to Red Norland[3]
Red LaSoda	426	1	+	+
Elfe	408	2	+	+
Milva	391	3	=	+
Dakota Rose	377	4	=	+
Viking	376	5	=	+
Dakota Jewel	367	6	=	+
Dark Red Norland	365	7	=	+
Rio Colorado	353	8	=	+
Modoc	352	9	=	+
Yukon Gold	344	10	=	+
Satina	337	11	=	+
Red Pontiac	328	12	-	+
Mazama	324	13	-	+
Cherry Red	321	14	-	+
Chieftain	319	15	-	+
Colorado Rose	312	16	-	+
Red Norland	279	17	-	=
Durango	219	18	-	-
Sangre	216	19	-	-
ND5002-3R	118	20	-	-
LSD $\alpha = 0.10$	45[4]			

[1]Potatoes were planted on May 5, 2008 and harvested on August 13 (100 days after planting).

[2]+, =, and – describe whether the variety had a higher, equal, or lower yield than Dark Red Norland.

[3]+, =, and – describe whether the variety had a higher, equal, or lower yield than Red Norland.

[4]Represents the difference in total yield between two varieties in order to be significantly different.

Table 2. . Total Yield potential and comparison to Dark Red Norland and Red Norland of Late Harvested Red and Yellow potatoes grown in the irrigated sand of Minnesota during 2008[1].

Variety	Total Yield cwt/acre	Rank	Compared to DRN[2]	Compared to Red Norland[3]
Red LaSoda	715	1	+	+
Milva	675	2	+	+
Chieftain	622	3	+	+
Viking	594	4	+	+
Colorado Rose	584	5	+	+
Rio Colorado	576	6	+	+
Satina	574	7	+	+
Elfe	564	8	+	+
Red Pontaic	563	9	+	+
Cherry Red	519	10	+	+
Yukon Gold	513	11	+	+
Modoc	511	12	+	+
Dakota Jewel	489	13	+	+
Dakota Rose	481	14	+	+
Mazama	457	15	=	+
Dark Red Norland	415	16	=	+
Sangre	386	17	=	=
ND5002-3R	354	18	-	=
Red Norland	352	19	-	=
Durango	318	20	-	=
LSD α = 0.10	45[4]			

[1]Potatoes were planted on May 5and harvested on September 18 (136 days after planting).

[2]+, =, and – describe whether the variety had a higher, equal, or lower yield than Dark Red Norland.

[3]+, =, and – describe whether the variety had a higher, equal, or lower yield than Red Norland.

[4]Represents the difference in total yield between two varieties in order to be significantly different.

Table 3. Effect of Harvest Date on Total Yield of Red and Yellow Varieties grown in the irrigated sands of Minnesota during 2008.

Variety	Type	Early Harvest *cwt/a.*	Late Harvest *cwt/a.*	Increase *cwt/a.*
Red Lasoda	Red	426	715	289
Elfe	Yellow	408	564	156
Milva	Yellow	391	675	284
Dakota Rose	Red	377	480	103
Viking	Red	376	594	218
Dakota Jewel	Red	367	489	122
Dark Red Norland	Red	365	415	50
Rio Colorado	Red	353	576	223
Modoc	Red	352	511	159
Yukon Gold	Yellow	344	513	169
Satina	Yellow	337	574	237
Red Pontiac	Red	328	563	235
Mazama	Red	324	457	133
Cherry Red	Red	321	519	198
Chieftain	Red	319	622	303
Colorado Rose	Red	311	584	273
Red Norland	Red	279	352	73
Durango	Red	219	318	99
Sangre	Red	216	386	170
ND5002-3R	Red	118	353	235

Cherry Red

Table 4. Effect of in-row spacing on size profile distribution of Cherry Red grown near Becker, MN during 2008.

Cherry Red										
	Becker, MN Early Harvest Date					Becker, MN Late Harvest Date				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	1	35	64	350		23	27	39	11	595
9”	1	40	59	324		19	28	42	11	527
12”	1	55	44	290		13	17	39	31	437
LSD (.10)	NS	NS	NS	NS		5	8	NS	10	75
Specific Gravity	1.061	**L:W Ratio**	1.29		**Color**	1.1	**Skin**	5		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Chieftain

Table 5. Effect of in-row spacing on size profile distribution of Chieftain grown near Becker, MN during 2008.

Chieftain										
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	1	28	71	338		12	22	48	17	651
9”	0	29	71	316		11	22	45	22	626
12”	0	32	68	303		7	13	48	33	590
LSD (.10)	NS	NS	NS	NS		2	4	NS	10	NS
Specific Gravity	1.051	**L:W Ratio**	1.19		**Color**	2.3	**Skin**	10		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Colorado Rose

Table 6. Effect of in-row spacing on size profile distribution of Colorado Rose grown near Becker, MN during 2008.

Colorado Rose										
	Becker, MN Early Harvest Date					Becker, MN Late Harvest Date				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6"	1	30	69	357		15	18	38	30	580
9"	2	28	71	313		12	19	37	32	589
12"	1	23	76	250		10	16	29	45	583
LSD (.10)	NS	NS	NS	44		NS	NS	5	4	NS
Specific Gravity	1.053	**L:W Ratio**	1.28		**Color**	0.95	**Skin**	10		

C size = < 1.5"; B size = 1.5 – 2.25"; A size = 2.25 – 3.5"

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Dakota Jewel

Table 7. Effect of in-row spacing on size profile distribution of Dakota Jewel grown near Becker, MN during 2008.

	Dakota Jewel									
	Becker, MN Early Harvest Date					Becker, MN Late Harvest Date				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------*Percent of Total*------			*cwt/a.*		-------------*Percent of Total*-------------				*cwt/a.*
6"	1	38	61	348		34	38	27	2	491
9"	1	25	75	410		20	36	37	7	484
12"	1	30	70	343		15	26	47	12	491
LSD (.10)	NS	NS	NS	NS		10	6	8	7	NS
Specific Gravity	1.057	**L:W Ratio**	1.15		**Color**	1	**Skin**	11		
C size = < 1.5"; B size = 1.5 – 2.25"; A size = 2.25 – 3.5"										
NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned										

Dakota Rose

Table 8. Effect of in-row spacing on size profile distribution of Dakota Rose grown near Becker, MN during 2008.

Dakota Rose										
	Becker, MN Early Harvest Date					Becker, MN Late Harvest Date				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	1	18	82	428		9	15	31	46	547
9”	1	17	83	377		10	17	35	38	467
12”	4	14	82	326		9	16	30	46	428
LSD (.10)	NS	NS	NS	52		NS	NS	NS	NS	52
Specific Gravity	1.05	**L:W Ratio**	1.36		**Color**	1	**Skin**	19		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Dark Red Norland

Table 9. Effect of in-row spacing on size profile distribution of Dark Red Norland grown near Becker, MN during 2008.

Dark Red Norland										
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------*Percent of Total*------			*cwt/a.*		-------------*Percent of Total*-------------				*cwt/a.*
6”	1	24	76	414		33	30	32	6	460
9”	1	23	76	369		24	36	31	8	405
12”	1	28	72	312		19	26	41	14	379
LSD (.10)	NS	NS	NS	63		8	6	NS	5	NS
Specific Gravity	1.054	**L:W Ratio**	1.29		**Color**	1.5	**Skin**	6		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Durango

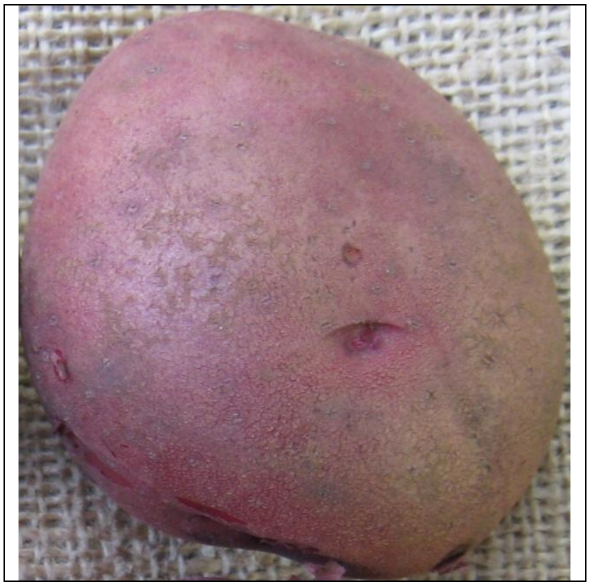

Table 10. Effect of in-row spacing on size profile distribution of Durango grown near Becker, MN during 2008.

	Durango									
	Becker, MN Early Harvest Date					Becker, MN Late Harvest Date				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	3	40	57	248		38	29	30	3	390
9”	3	47	50	200		32	25	34	9	311
12”	3	41	56	210		34	24	29	12	250
LSD (.10)	NS	NS	NS	NS		NS	NS	NS	6	68
Specific Gravity	1.046	**L:W Ratio**	1.2		**Color**	0.5	**Skin**	7		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Elfe

Table 11. Effect of in-row spacing on size profile distribution of Elfe grown near Becker, MN during 2008.

	Elfe									
	Becker, MN Early Harvest Date					Becker, MN Late Harvest Date				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	3	77	20	413		29	32	32	6	627
9”	2	75	23	398		34	33	30	3	542
12”	1	74	25	413		28	35	29	7	523
LSD (.10)	NS	NS	NS	NS		NS	NS	NS	NS	NS
Specific Gravity	1.050	**L:W Ratio**	1.56		**Color**	NA	**Skin**	5		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Mazama

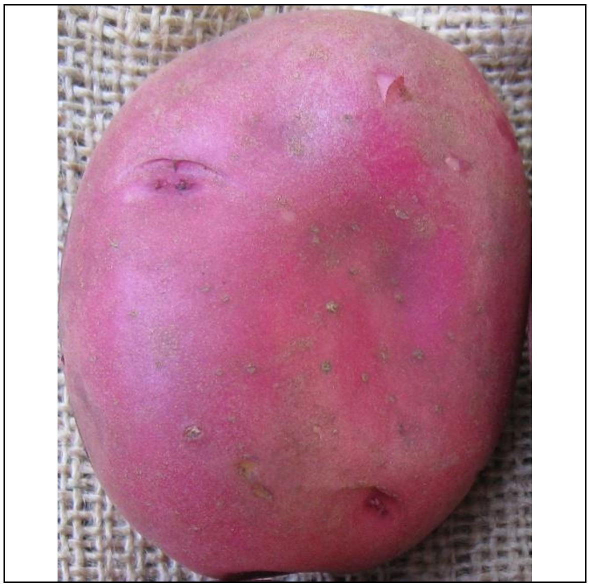

Table 12. Effect of in-row spacing on size profile distribution of Mazama grown near Becker, MN during 2008.

Mazama										
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	3	70	27	334		57	27	14	3	476
9”	2	63	34	341		42	34	22	3	483
12”	3	81	16	298		38	35	24	3	412
LSD (.10)	NS	NS	NS	NS		12	6	7	NS	NS
Specific Gravity	1.053	**L:W Ratio**	1.4		**Color**	1.3	**Skin**	15		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Milva

Table 13. Effect of in-row spacing on size profile distribution of Milva grown near Becker, MN during 2008.

					Milva					
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	3	70	27	419		42	38	19	1	758
9”	2	75	23	419		34	37	26	2	700
12”	3	75	23	337		33	33	32	3	569
LSD (.10)	NS	NS	NS	35		NS	NS	6	NS	92
Specific Gravity	1.044	**L:W Ratio**	1.39		**Color**	NA	**Skin**	9		
C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”										
NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned										

Modoc

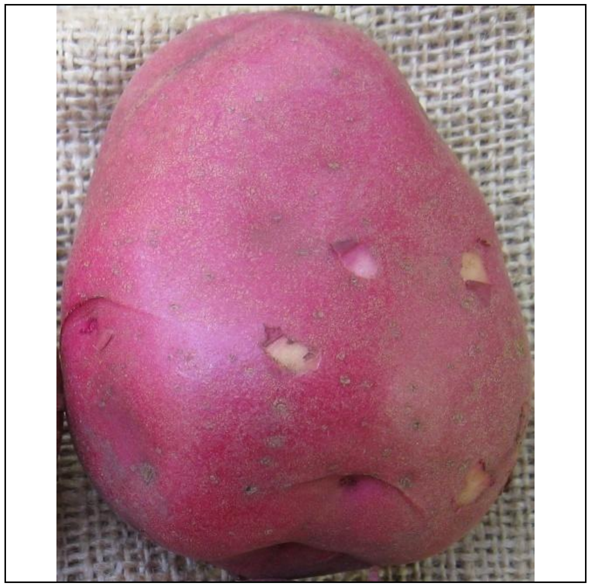

Table 14. Effect of in-row spacing on size profile distribution of Modoc grown near Becker, MN during 2008.

	Modoc									
	Becker, MN Early Harvest Date					Becker, MN Late Harvest Date				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	2	38	61	409		20	30	35	14	590
9”	13	40	47	318		17	25	41	17	503
12”	2	48	51	330		16	21	41	21	438
LSD (.10)	NS	NS	NS	47		NS	NS	NS	NS	99
Specific Gravity	1.050	**L:W Ratio**	1.25		**Color**	0.90	**Skin**	11		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

ND5002-3R

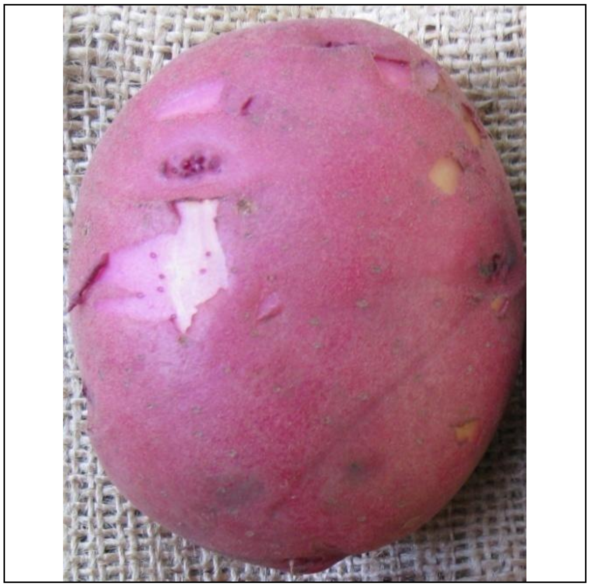

Table 15. Effect of in-row spacing on size profile distribution of ND5002-3R grown near Becker, MN during 2008.

ND5002-3R										
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	7	81	12	152		30	28	35	7	419
9”	8	69	23	98		26	23	38	13	318
12”	4	68	27	111		20	18	45	17	315
LSD (.10)	NS	NS	NS	34		NS	NS	NS	NS	NS
Specific Gravity	1.046	**L:W Ratio**	1.12		**Color**	0.80	**Skin**	15		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Rio Colorado

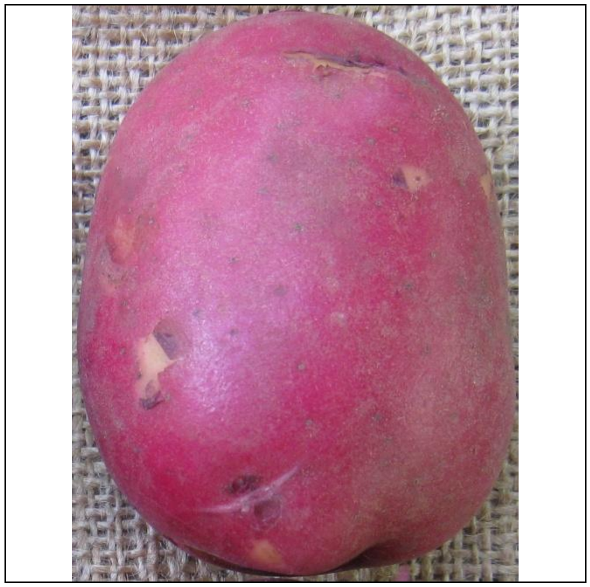

Table 16. Effect of in-row spacing on size profile distribution of Rio Colorado grown near Becker, MN during 2008.

Rio Colorado										
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	3	82	15	372		32	36	29	3	672
9”	2	73	25	351		31	33	31	4	496
12”	3	77	20	336		28	30	35	7	560
LSD (.10)	NS	NS	NS	NS		NS	NS	NS	NS	84
Specific Gravity	1.053	**L:W Ratio**	1.40		**Color**	1	**Skin**	22		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Red LaSoda

Table 17. Effect of in-row spacing on size profile distribution of Red LaSoda grown near Becker, MN during 2008.

Red LaSoda										
	Becker, MN Early Harvest Date					Becker, MN Late Harvest Date				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	<1	15	84	429		7	15	40	38	810
9”	<1	13	87	448		6	12	40	43	658
12”	<1	14	86	401		5	10	38	47	661
LSD (.10)	NS	NS	NS	NS		NS	3	NS	NS	118
Specific Gravity	1.050	**L:W Ratio**	1.15		**Color**	3.4	**Skin**	16		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Red Norland

Table 18. Effect of in-row spacing on size profile distribution of Red Norland grown near Becker, MN during 2008.

	Red Norland									
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	1	29	70	333		27	30	37	6	402
9”	0	22	77	288		18	24	41	17	421
12”	1	23	76	216		23	25	30	22	250
LSD (.10)	NS	NS	NS	39		NS	NS	NS	NS	123
Specific Gravity	1.051	**L:W Ratio**	1.28		**Color**	2.25	**Skin**	5		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Red Pontiac

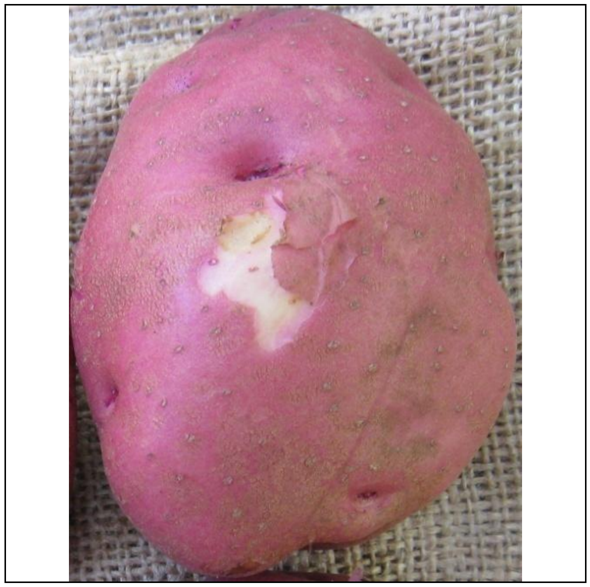

Table 19. Effect of in-row spacing on size profile distribution of Red Pontiac grown near Becker, MN during 2008.

Red Pontiac										
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	1	23	76	353		11	17	44	28	639
9”	1	20	79	345		9	17	42	32	558
12”	1	22	77	286		9	18	36	38	493
LSD (.10)	NS	NS	NS	NS		NS	NS	NS	NS	101
Specific Gravity	1.047	**L:W Ratio**	1.17		**Color**	4	**Skin**	11		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Sangre

Table 20. Effect of in-row spacing on size profile distribution of Sangre grown near Becker, MN during 2008.

Sangre										
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	2	50	48	235		27	20	34	19	400
9”	1	40	59	209		21	23	41	15	413
12”	1	43	56	206		16	21	37	26	346
LSD (.10)	NS	NS	NS	NS		7	NS	NS	NS	NS
Specific Gravity	1.047	**L:W Ratio**	1.36		**Color**	1.3	**Skin**	6		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Satina

Table 21. Effect of in-row spacing on size profile distribution of Satina grown near Becker, MN during 2008.

Satina											
	Becker, MN Early Harvest Date					Becker, MN Late Harvest Date					
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	2	33	65	345		27	24	39	10	688
9”	2	28	70	365		22	28	39	11	596
12”	1	34	65	302		22	24	40	13	436
LSD (.10)	NS	NS	NS	NS		NS	NS	NS	NS	80
Specific Gravity	1.039	**L:W Ratio**	1.20		**Color**	NA	**Skin**	1		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Viking

Table 22. Effect of in-row spacing on size profile distribution of Viking grown near Becker, MN during 2008.

Viking										
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	<1	8	92	430		7	11	31	51	656
9”	0	7	93	360		3	9	29	60	597
12”	<1	11	89	340		4	8	25	62	530
LSD (.10)	NS	NS	NS	50		NS	NS	NS	NS	73
Specific Gravity	1.055	**L:W Ratio**	1.31		**Color**	3.7	**Skin**	14		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Yukon Gold

Table 23. Effect of in-row spacing on size profile distribution of Viking grown near Becker, MN during 2008.

Yukon Gold											
	Becker, MN Early Harvest Date					**Becker, MN Late Harvest Date**				
Spacing	**C size**	**B size**	**A size**	**Total**		**< 4 oz**	**4-6 oz**	**6-10 oz**	**>10 oz**	**Total**
	------Percent of Total------			*cwt/a.*		*-------------Percent of Total-------------*				*cwt/a.*
6”	<1	18	81	366		11	14	40	34	583
9”	<1	20	80	344		9	12	40	39	503
12”	1	23	76	323		7	12	33	48	453
LSD (.10)	NS	NS	NS	NS		NS	NS	NS	NS	64
Specific Gravity	1.067	**L:W Ratio**	1.22		**Color**	NA	**Skin**	7		

C size = < 1.5”; B size = 1.5 – 2.25”; A size = 2.25 – 3.5”

NS = Not Significant; Color Scale = 0.5 (Darkest) – 5.0 (Lightest); Skin = Percent skinned

Cultivar specific management profiles for red and yellow potato varieties grown in North Dakota and Minnesota – Non-irrigated site

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Executive Summary: One of the main goals of the extension potato agronomy program at North Dakota State University and the University of Minnesota is to provide growers with research-based information that can be used to make well informed production decisions. The objective of this project is to evaluate red and yellow fresh-market varieties that may have potential in the non-irrigated Red River Valley. The long-term goal is to provide management profiles for the varieties evaluated.

The objective of this trial was to evaluate the yield potential of thirty red and yellow varieties and breeding selections and determine the impact in-row seed spacing (6, 9, and 12”) had on size profile distribution. Furthermore, specific gravity, length:width ratios, skin color, and bruise potential will be evaluated following long-term storage. Those samples are still in storage and are not reported here.

Materials and Methods: This study was conducted in a commercial potato field near Crystal, ND. Treatments (potato variety and in-row seed spacing) were arranged in a randomized complete block design and replicated four times. Certified potato seed from each variety was hand cut into 2.0 – 2.5 ounce pieces. Immediately following cutting, the seed was treated with Maxim 4FS and suberized for 10 days at 55F and 95% humidity. The plots were hand planted on May 23, 2008 using a two-row assist feed planter. The planter plugged multiple times while planting the 9” treatments, and as a result, only the 6 and 12” data are reported here. The crop was fertilized with 300 lb/a. of 16-16-16 on May 8. Insects were controlled with an at-planting application of Admire Pro. Weed control was achieved with 1 oz/a. Matrix on June 24 and ½ oz/a. on July 14. Foliar fungal diseases were controlled with 8 oz/a. Headline (June 24), 32 oz/a. Manzate (July 14), 48 oz/a. Manzate on (August1), and 24 oz/a. of Echo ZN on August 14. 2,4-D was applied at a rate of 1.5 oz/a. on July 14to enhance red color. Potato vines were dessicated with 23 oz/a. Reglone on August 29 and plots were harvested on October 9 and 10. Immediately following harvest, a 30 – 50 pound sample from each variety was collected and placed in the middle of the pile in a grower-storage to evaluate shrink, pressure bruise, and color retention following long-term storage. All other samples were transported to the USDA Potato Research Worksite in East Grand Forks, Minnesota, where yields and size profile distribution were determined. Potatoes were sorted into C size (< 1.5”), B size (1.5 – 2.25”), A size (2.25 – 3.5”), and Jumbo size (> 3.5”) for all plots. Following data collection, analysis of variance was performed to determine if the interaction between variety and seed spacing was significant. If the interaction was significant, the data were sorted and reported at each level of the other variable. However, if the interaction was not significant, the main effect (across all levels of the other variable) of each variable was reported.

The following varieties and breeding lines were evaluated using an in-row seed spacing of 6, and 12”: AND00272-1R, ATND98458-1R/Y; ATTX961014-1R/Y; ATTX98500-2P/Y; Cal Red; Cherry Red; Chieftain; Colorado Rose; Dakota Jewel; Dakota Rose; Dark Red Norland; Dark Red Norland – Nebraska Strain; Durango; Elfe; Mazama; Milva; Modoc; ND5002-3R; ND8555-8R; NDTX4271-5R; NDTX731-1R; Red LaSoda; Red Norland; Red Pontiac; Rio Colorado; Rio Rojo; Sangre; Satina; Viking, and Yukon Gold.

Results

Statistical analysis – The interaction between potato genotype (variety) and in-row spacing was not significant for C size, A size, or total yield, but was significant for the yield of B size potatoes. This indicates that the effect of in-row seed spacing on the yield of B size potatoes was dependent upon the variety, but C size, A size, and total yield was not. More simply, decreasing the spacing on some varieties increased the percentage of B size, while in others it did not. Since there was no interaction between variety and in-row spacing on total yield, the yield potential for each variety is averaged across both spacings. However, the effect of in-row spacing on size class distribution (%C, %B, %A size, and Jumbo size) is reported for each variety.

Yield potential of different genotypes – Total yields were very good this year and ranged from 276 – 473 cwt/a (Table 1). In fact, nearly 75% and 25% of the entries yielded more than 300 and 350 cwt/acre, respectively. Red Lasoda and Milva were the highest yielding red and yellow entries, respectively, while Durango and Elfe were the lowest. Dark Red Norland, Red Norland, and Yukon Gold varieties produced 325, 308, and 296 cwt/acre, respectively. Red Lasoda, Red Pontiac, and Dark Red Norland-Nebraska all had significantly higher yield potentials than Dark Red Norland, while Dakota Rose and Durango had lower yield potentials. Red Lasoda, Red Pontiac, Dark Red Norland-Nebraska, ATND98459-1R/Y, Colorado Rose, Viking, and NDTX731-1R had significantly higher yield potentials than Red Norland. Comparison of the yellow varieties indicated that Milva and Satina yielded significantly more than Yukon Gold, but Elfe did not.

Effect of in-row spacing on Total Yield – Total yield was significantly influenced by in-row spacing across all cultivars. On average, decreasing in-row seed spacing from twelve to six inches increased yields from 299 to 361 cwt/acre, an increase of nearly 25%.

Effect of in-row spacing on size profile – Analysis of variance clearly indicates that the effect of seed spacing on tuber size profile is dependent upon the variety. As a result, data for each variety are summarized in Tables 2-31. When seed spacing was reduced from 12 to 6”, the total yield of ATND98458-1R/Y, ATTX 961014-1R/Y, ATTX98500-2P/Y, Cal Red, Dakota Rose, Dark Red Norland – Nebraska Strain, Elfe, Milva, NDTX4271-5R, Red Norland, Sangre, Satina, and Viking significantly increased but there was **no change** in the size profile distribution. Conversely, both total yield and size profile distribution changed on Colorado Rose, Dark Red Norland, Modoc, ND 5002-3R, ND8555-8R, Rio Rojo, and Yukon Gold. Practically speaking, reducing seed spacing from 12 to 6” on a variety like Dakota Rose wil increase total yield but will not change the size profile distribution, while total yield and size profile distribution will both change on a variety like Colorado Rose.

Summary of Red Varieties:

Varieties with the highest yield: Red LaSoda, Red Pontiac, Dark Red Norland – Nebraska strain

Varieties with the lowest yield: Rio Colorado, Dakota Rose, Durango

Varieties with over 50% B size: ATTX 961014-1R/Y, Mazama, Rio Colorado

Varieties with over 30% B size: AND00272-1R, ATND98458-1R/Y, ATTX98500-2P/Y, Modoc, ND5002-3R, and ND8555-5R

Summary of Yellow Varieties:

Variety with the highest yield: Milva

Variety with the lowest yield: Elfe

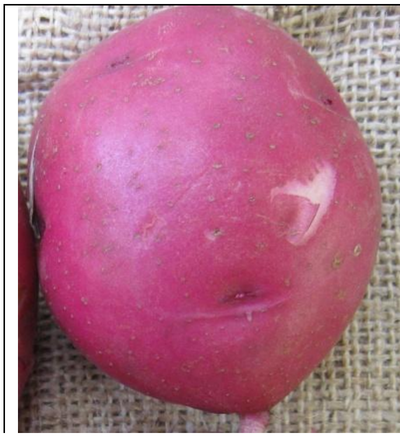
Variety with over 50% B size: Elfe

Table 1. Total Yield potential and comparison to Dark Red Norland and Red Norland of Red and Yellow potatoes grown near Crystal, ND during 2008.[1]

Variety	Total Yield cwt/acre	Rank	Compared to DRN[2]	Compared to Red Norland[3]
Red Lasoda	473	1	+	+
Red Pontiac	396	2	+	+
Milva	369	3	+	+
Dark Red Norland – Nebraska	368	4	+	+
ATND98459-1R/Y	362	5	=	+
Colorado Rose	357	6	=	+
Viking	355	7	=	+
NDTX731-1R	349	8	=	+
Satina	349	8	=	+
ATTX98500-2P/Y	346	10	=	=
Rio Rojo	342	11	=	=
Cal Red	340	12	=	=
ND8555-8R	340	13	=	=
Chieftain	325	14	=	=
Dark Red Norland	325	14	=	=
ND5002-3R	323	16	=	=
AND00272-1R	322	17	=	=
ATTX961014-1R/Y	322	17	=	=
Sangre	314	19	=	=
Cherry Red	309	20	=	=
Red Norland	308	21	=	=
Mazama	304	22	=	=
Modoc	299	23	=	=
Dakota Jewel	297	24	=	=
Yukon Gold	296	25	=	=
NDTX4271-5R	295	26	=	=
Rio Colorado	295	26	=	=
Dakota Rose	281	28	-	=
Durango	276	29	-	=
Elfe	276	29	-	=
LSD α = 0.10	39[4]			

[1]Potatoes were planted on May 23 and harvested on October 9 – 10.
[2]+, =, and – describe whether the variety had a higher, equal, or lower yield than Dark Red Norland.
[3]+, =, and – describe whether the variety had a higher, equal, or lower yield than Red Norland.
[4]Represents the difference in total yield between two varieties necessary to be significantly different.

Table 2. Performance of AND00272-1R near Crystal, ND during 2008.



AND00272-1R
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------*Percent of Total*---------------------				*cwt/a.*
6”	2	36	62	0	301
12”	1	25	74	0	342
	NS	S	S		NS

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: AND00272-1R is a red skin, white flesh potato that had equal yield potential to both Red Norland and Dark Red Norland. Decreasing the seed spacing increased B size, decreased A size, and had no effect on C size, Jumbo size, or total yield.

Table 3. Performance of ATND9845-1R/Y near Crystal, ND during 2008.

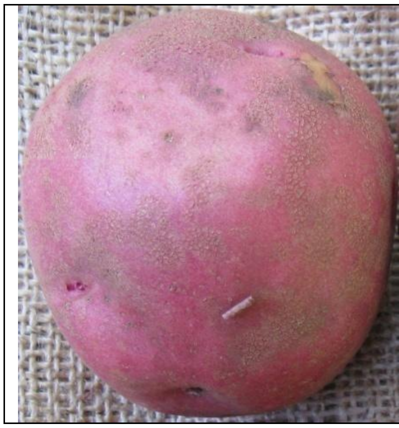
ATND98458-1R/Y
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------*Percent of Total*---------------------				*cwt/a.*
6”	2	33	65	0	423
12”	2	34	65	0	300
	NS	NS	NS		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: ATND98458-1R/Y is a red skin, yellow flesh potato that had higher yield potential than Red Norland and was equal to Dark Red Norland. Decreasing the seed spacing did not increase C size, B size, or A size, but did increase total yield by 123 cwt/a.

Table 4. Performance of ATTX961014-1R/Y near Crystal, ND during 2008.



ATTX961014-1R/Y Crystal, North Dakota					
Spacing	**C size**	**B size**	**A size**	**Jumbo**	**Total**
	Percent of Total				*cwt/a.*
6”	2	61	37	0	372
12”	2	68	29	0	273
	NS	NS	NS		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: ATTX961014-1R/Y is a red skin, yellow flesh potato that had equal yield potential to Red Norland and Dark Red Norland. Decreasing the seed spacing did not affect the percentage of C size, B size, A size, or Jumbo size, but did significantly increase total yield by 99 cwt/a.

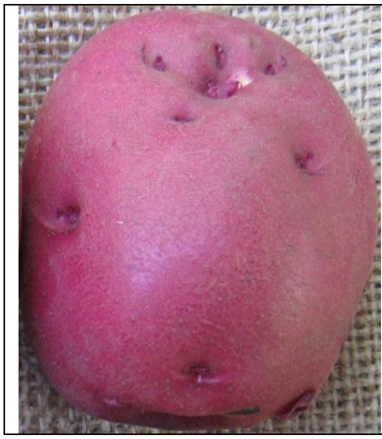
Table 5. Performance of ATTX98500-2P/Y near Crystal, ND during 2008.

ATTX98500-2P/Y Crystal, North Dakota					
Spacing	**C size**	**B size**	**A size**	**Jumbo**	**Total**
	Percent of Total				*cwt/a.*
6”	2	35	63	0	381
12”	2	32	67	0	312
	NS	NS	NS		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: ATTX98500-2P/Y is a purple skin, yellow flesh potato that had equal yield potential to Red Norland and Dark Red Norland. Decreasing the seed spacing did not increase the percentage of C size, B size, A size, or Jumbo size, but did increase the total yield by 69 cwt/a.

Table 6. Performance of Cal Red near Crystal, ND during 2008.



Cal Red
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------*Percent of Total*---------------------				*cwt/a.*
6”	2	29	69	0	394
12”	1	24	75	0	286
	NS	NS	NS		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Cal Red is red skin, white flesh potato that had equal yield potential to Red Norland and Dark Red Norland. Decreasing the seed spacing increased total yield by 108 cwt/a. but did not increase C size, B size, or A size.

Table 7. Performance of Cherry Red near Crystal, ND during 2008.

Cherry Red
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------*Percent of Total*---------------------				*cwt/a.*
6”	1	24	75	0	347
12”	<1	12	87	0	271
	NS	S	S		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Cherry Red is a red skin, white flesh potato that had equal yield potential to Red Norland and Dark Red Norland. Decreasing the seed spacing increased B size, decreased A size, and increased total yield by 76 cwt/a.

Table 8. Performance of Chieftain near Crystal, ND during 2008

Chieftain
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6”	<1	18	82	0	357
12”	<1	12	87	0	293
	NS	S	S		NS

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Chieftain is a red skin, white flesh potato that had equal yield potential to Red Norland and Dark Red Norland. Decreasing seed spacing increased B size and decreased A size, but had no effect on C size or total yield.

Table 9. Performance of Colorado Rose near Crystal, ND during 2008.

Colorado Rose
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6”	1	32	66	0	398
12”	1	24	75	0	316
	NS	S	S		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Colorado Rose is a red skin, white flesh potato that had higher yield potential than Red Norland and was equal to Dark Red Norland. Decreasing seed spacing, increased B size, decreased A size, and increased total yield by 82 cwt/a.

Table 10. Performance evaluation of Dakota Jewel near Crystal, ND during 2008.

Dakota Jewel
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6”	<1	27	72	0	305
12”	<1	17	83	0	290
	NS	S	S		NS

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Dakota Jewel is a red skin, white flesh potato that had equal yield potential to Red Norland and Dark Red Norland. Decreasing the seed spacing increased B size, decreased A size, and had no effect on total yield.

Table 11. Performance evaluation of Dakota Rose near Crystal, ND during 2008.

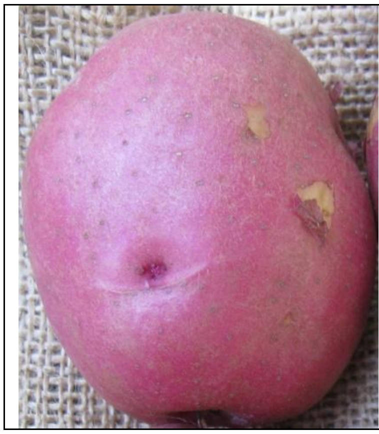
Dakota Rose
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6”	<1	29	70	0	323
12”	<1	23	76	0	239
	NS	NS	NS		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Dakota Rose is a red skin, white flesh potato that had a lower yield potential than Dark Red Norland and was equal to Red Norland. Decreasing the seed spacing did not increase the percentage of C size, B size, or A size, but did increase total yield by 84 cwt/a.

Table 12. Performance evaluation of Dark Red Norland near Crystal, ND during 2008.



Dark Red Norland
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------Percent of Total---------------------				*cwt/a.*
6"	1	19	80	0	351
12"	1	13	86	0	299
	NS	S	S		S

C size = <1.5", B size = 1.5 – 2.25", A size = 2.25 – 3.5", Jumbo = > 3.5"
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Dark Red Norland is red skin, white flesh potato that ranked 14th of out 30 entries for total yield. Decreasing seed spacing did not increase the percentage of C size, but increased the percentage of B size, decreased A size, and increased the total yield by 52 cwt/a.

Table 13. Performance evaluation of Dark Red Norland – Nebraska near Crystal, ND during 2008.

Dark Red Norland - Nebraska
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------Percent of Total---------------------				*cwt/a.*
6"	1	17	82	0	415
12"	1	12	87	0	332
	NS	NS	NS		S

C size = <1.5", B size = 1.5 – 2.25", A size = 2.25 – 3.5", Jumbo = > 3.5"
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Dark Red Norland – Nebraska strain is a red skin, white flesh potato that had higher yield potential than Dark Red Norland and Red Norland. Decreasing the seed spacing did not increase the percentage of C size, B size, or A size, but did increase the total yield by 83 cwt/a.

Table 14. Performance evaluation of Durango near Crystal, ND during 2008.

Durango
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6”	3	32	65	0	293
12”	3	26	71	0	253
	NS	NS	NS		NS

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Durango is a red skin, white flesh potato that had lower yield potential than Dark Red Norland and was equal to Red Norland. This entry had the darkest skin color. Decreasing the seed spacing did not increase the percentage of C size, B size, A size, or the total yield.

Table 15. Performance evaluation of Elfe near Crystal, ND during 2008.

Elfe
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6”	3	81	16	0	327
12”	3	78	19	0	226
	NS	NS	NS		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Elfe is a yellow skin, yellow flesh potato that had equal yield potential to Yukon Gold. Decreasing the seed spacing did not increase the percentage of C size, B size, or A size, but did increase the total yield by 101 cwt/a.

Table 16. Performance evaluation of Mazama near Crystal, ND during 2008.

Mazama
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------*Percent of Total*---------------------				*cwt/a.*
6”	2	63	35		326
12”	2	49	50		275
	NS	S	S		NS

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Mazama is a red skin, white flesh potato with a total yield similar to Red Norland and Dark Red Norland. Decreasing seed spacing increased (49 to 63%) B size and decreased (50 to 35%) A size potatoes, but had no effect on total yield.

Table 27. Performance evaluation of Milva near Crystal, ND during 2008.

Milva
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------*Percent of Total*---------------------				*cwt/a.*
6”	2	45	53	0	418
12”	1	42	56	0	320
	S	NS	NS		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Milva is a yellow skin, yellow flesh potato with a higher yield potential than Yukon Gold. Decreasing seed spacing had no effect on B size or A size potatoes, but it did increase total yield by 98 cwt/a.

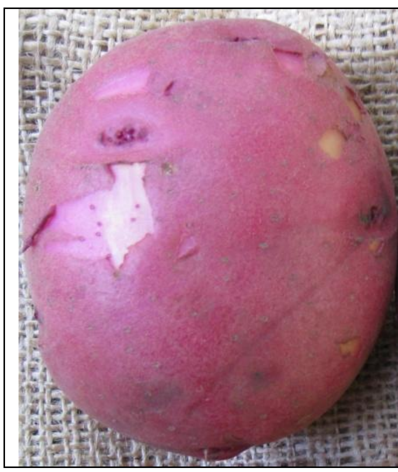
Table 18. Performance Evaluation of Modoc near Crystal, ND during 2008.

Modoc Crystal, North Dakota					
Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6”	3	50	47	0	355
12”	1	37	62	0	243
	NS	S	S		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Modoc is a red skin, white flesh potato with a similar yield potential to Dark Red Norland and Red Norland. Decreasing seed spacing increased (37 to 50%) B size and decreased (62 to 47%) A size potatoes, as well as increased total yield by 112 cwt/a.

Table 19. Performance evaluation of ND5002-3R near Crystal, ND during 2008.



ND5002-3R Crystal, North Dakota					
Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6”	1	41	58	0	357
12”	1	30	69	0	288
	NS	S	S		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: ND5002-3R is a red skin, white flesh potato with a similar yield potential to Dark Red Norland and Red Norland. Decreasing seed spacing increased (30 to 41%) B size and decreased (69 to 58%) A size potatoes. Total yield also increased by 69 cwt/a.

Table 20. Performance evaluation of ND8555-8R near Crystal, ND during 2008.

ND8555-8R
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------*Percent of Total*---------------------				*cwt/a.*
6”	2	55	43	0	383
12”	1	42	56	0	297
	NS	S	S		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: ND8555-8R is a red skin, white flesh potato with yields similar to Dark Red Norland and Red Norland. Decreasing seed spacing increased (42 to 55%) B size and decreased (56 to 43%) A size, as well as increased total yield by 86 cwt/a.

Table 21. Performance evaluation of NDTX4271-5R near Cyrstal, ND during 2008.

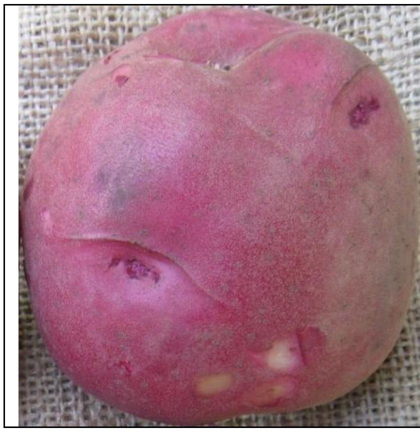
NDTX4271-5R
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------*Percent of Total*---------------------				*cwt/a.*
6”	1	21	78	0	343
12”	1	19	80	0	247
	NS	NS	NS		S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: NDTX4271-5R is a red skin, white flesh potato with a similar yield potential to Dark Red Norland and Red Norland. Decreasing seed spacing increased total yield by 96 cwt/a., but had no impact on size profile distribution.

Table 22. Performance evaluation of NDTX731-1R near Crystal, ND during 2008.



NDTX731-1R
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	--------------------Percent of Total--------------------				*cwt/a.*
6”	1	24	75	0	363
12”	<1	15	85	0	336
	S	NS	NS		NS

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: NDTX731-1R is a red skin, white flesh potato. NDTX731-1R has a higher yield potential than Red Norland, and a similar yield potential to Dark Red Norland. Decreasing seed spacing had no effect on total yield or size profile distribution.

Table 23. Peformance evaluation of Red LaSoda near Crystal, ND during 2008.

Red LaSoda
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	--------------------Percent of Total--------------------				*cwt/a.*
6”	<1	9	87	3	482
12”	<1	8	86	5	465
	NS	NS	NS		NS

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Red LaSoda is a red skin, white flesh potato that yields more than both Dark Red Norland and Red Norland. In fact, Red LaSoda was the highest yielding entry. Decreasing seed spacing had no effect on total yield or size profile distribution.

Table 24. Performance evaluation of Red Norland near Crystal, ND during 2008.

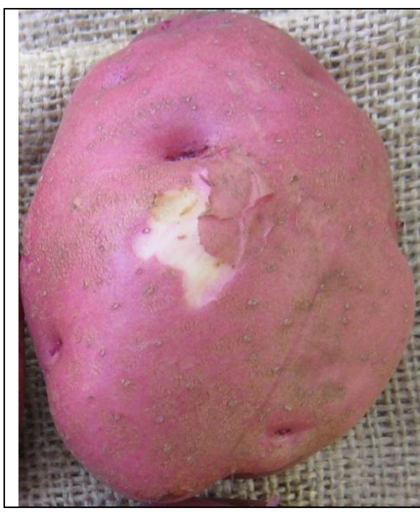
Red Norland
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6"	1	19	80	0	344
12"	1	16	83	0	273
	NS	NS	NS		S

C size = <1.5", B size = 1.5 – 2.25", A size = 2.25 – 3.5", Jumbo = > 3.5"
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Red Norland is a red skin, white flesh potato with similar yields to Dark Red Norland. Decreasing the seed spacing increased total yield by 71 cwt/a., but had no impact on size profile distribution.

Table 25. Performance evaluation of Red Pontiac near Crystal, ND during 2008.



Red Pontiac
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6"	1	14	84	1	418
12"	<1	14	85	0	373
	NS	NS	NS		NS

C size = <1.5", B size = 1.5 – 2.25", A size = 2.25 – 3.5", Jumbo = > 3.5"
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: red Pontiac is a red skin, white flesh potato with higher yield potential than both Dark Red Norland and Red Norland. Decreasing the seed spacing did not increase total yield or size profile distribution.

Table 26. Performance evaluation of Rio Colorado near Crystal, ND during 2008.

Rio Colorado
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------*Percent of Total*			---------------------	*cwt/a.*
6”	2	60	38	0	282
12”	2	50	49	0	308
	NS	S	S		NS

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Rio Colorado is a red skin, white flesh potato with a similar yield potential to Dark Red Norland and Red Norland. Decreasing the seed spacing increased (50 to 60%) B size and decreased (49 to 38%) A size, but had no effect on total yield.

Table 27. Peformance evaluation of Rio Rojo near Crystal, ND during 2008.

Rio Rojo
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------*Percent of Total*			---------------------	*cwt/a.*
6”	<1	19	78	1	365
12”	<1	14	86	0	318
	NS	NS	S	s	S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Rio Rojo is a red skin, white flesh potato with a similar yield potential to Dark Red Norland and Red Norland. Decreasing the seed spacing decreased (86 to 78%) A size and increased total yield by 47 cwt/a.

Table 28. Peformance evaluation of Sangre near Crystal, ND during 2008.

Sangre
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------Percent of Total---------------------				*cwt/a.*
6"	1	30	69	0	353
12"	1	22	76	1	276
	NS	NS	NS	NS	S

C size = <1.5", B size = 1.5 – 2.25", A size = 2.25 – 3.5", Jumbo = > 3.5"
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Sangre is a red skin, white flesh potato with similar yield potential to Dark Red Norland and Red Norland. Decreasing the seed spacing increased total yield by 77 cwt/a., but had no effect on size profile distribution.

Table 29. Performance evaluation of Satina near Crystal, ND during 2008.

Satina
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	---------------------Percent of Total---------------------				*cwt/a.*
6"	1	30	69	0	353
12"	1	22	76	1	276
	NS	NS	NS	NS	S

C size = <1.5", B size = 1.5 – 2.25", A size = 2.25 – 3.5", Jumbo = > 3.5"
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Satina is a yellow skin, yellow flesh potato with a higher yield potential than Yukon Gold. Decreasing the seed spacing had no effect on total yield or size profile distribution.

Table 30. Performance evaluation of Viking near Crystal, ND during 2008.

Viking
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6”	<1	7	84	9	386
12”	<1	5	79	16	323
	NS	NS	NS	NS	S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Viking is a red skin, white flesh potato with a higher yield potential than Red Norland and a similar yield potential to Dark Red Norland. Decreasing the seed spacing increased the total yield by 63 cwt/a., but had no effect on size profile distribution.

Table 31. Peformance evaluationof Yukon Gold near Crystal, ND during 2008.

Yukon Gold
Crystal, North Dakota

Spacing	C size	B size	A size	Jumbo	Total
	Percent of Total				*cwt/a.*
6”	1	14	86	0	324
12”	0	7	92	1	269
	S	S	S	NS	S

C size = <1.5”, B size = 1.5 – 2.25”, A size = 2.25 – 3.5”, Jumbo = > 3.5”
NS = Values within a column are not different. S = Values wthin a column are different.

Summary: Yukon Gold is a yellow skin, yellow flesh potato. Decreasing seed spacing increased (7 to 14%) B size, decreased (92 to 86%) A size, and increased total yield by 55 cwt/a.

Managing Corky Ringspot with Vydate C-LV & Screening for Resistance

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Drs Neil Gudmestad (Plant Pathologist) and Susie Thompson (Potato Breeder) – NDSU

Introduction Corky Ringspot (CRS) is a tuber disease of potato that is caused by Tobacco Rattle Virus (TRV) and is transmitted between plants by stubby-root nematodes. can cause significant quality loss when left untreated. CRS develops when potatoes are infected with Tobacco Rattle Virus (TRV). Stubby-root nematodes transmit TRV between plants by feeding on the roots.

Tobacco Rattle Virus (TRV) TRV is the type virus of the *Tobravirus* genus and can cause both foliar and tuber symptoms on potato. Foliar symptoms of TRV (Fig 3) are rare in the U.S., but tuber symptoms (Corky Ringspot) are common. External symptoms include misshapen tubers (Figs 4 is very common and can result in both external and internal CRS symptoms, including misshapen tubers (Figs 4 & 7), concentric rings (Figs 1 & 5), and internal brown spots (Fig 5). This virus has a wide host range, including many crops that are common in a potato rotation such as, beans, beets, corn, onions, sunflowers, soybeans, and wheat. Weeds including lambs-quarters, red-root pigweed, and nightshade are also hosts for the virus. Interestingly, researchers in the Pacific Northwest have determined that certain cultivars of alfalfa and spearmint are not hosts for the virus.

Stubby-Root Nematode Stubby-root nematodes are microscopic plant-pathogenic roundworms that live in the soil and parasitize a wide range of crops. The two most common species that feed on potato are *Paratrichodorus minor* and *Paratrichodorus allius.* These nematodes spend their entire lifecycle in the soil (ectoparasites) and **do not** enter roots or tubers. They thrive in sandy soils and certain species (*P. minor*) can migrate up to 3 feet. They appear to prefer wet, cool soil conditions in the spring and produce additional generations in as little as 2 – 3 weeks at 30C. When feeding, they congregate just behind the root tip near the zone of elongation. Once aligned on the root, they rapidly pierce root cells using their solid stylet (mouthpart) which severely damages the root. During feeding, the nematode is able to transmit TRV directly into potato plants. It is worth noting that stubby root-nematodes reduce the quality of tubers, but yield is not impacted.

Figure 1. Yukon Gold tubers infected with TRV and expressing CRS symptoms (B. Charlton, OSU).

Soil Sampling – How, When, Where, and Why? The how, when, and where really depend on the why. Soil samples should be collected to determine 1) the presence of stubby-root nematodes and 2) if they are carrying TRV (viruliferous). If they are present and they are viruliferous, the crop is at risk from CRS. However, if the nematodes are not viruliferous, there is probably little risk to the crop.

How and Where– Soil samples should be collected using a soil probe instead of a shovel. Since all root parasitizing nematodes congregate around their food source, samples should be taken from the rhizosphere (12 – 18") of the previous crop. Soil should be sealed in a plastic bag, labeled, and kept cool until shipped to a lab for nematode extraction and identification. **Never** leave soil samples in the sun for an extended period because this may result in false negatives from nematode mortality.

How Many Samples per field? - A minimum of 1 core per acre should be taken and combined into a 'composite' sample representing a particular part of the field. Generally, 125 acre fields are split into quadrants. It should be noted that the likelihood of detection increases as the number of cores and composites per field increases.

When –Samples should be taken the fall prior to potato planting when soil moisture is near field capacity and prior to crop maturity. Spring sampling may be done as long as enough time is allowed for management decisions to be made once the results are known.

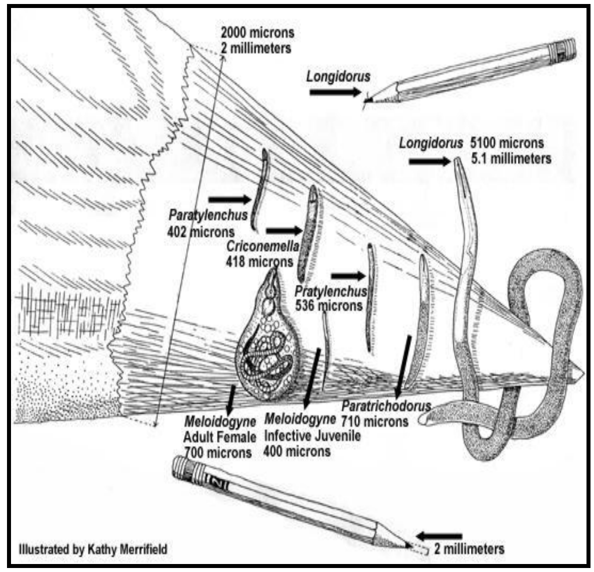

Figure 2. Relative size of several plant-parasitic nematodes (K. Merrifield, OSU)

Management

While potato breeders are incorporating host plant resistance to TRV and the use of green-manure cover crops are being investigated, CRS is currently managed with chemicals. The soil fumigant, 1,3-dichloropropene (Telone II), and the nematostat, oxamyl (Vydate C-LV), are the most common choices. Telone II must be applied at least two weeks prior to planting in order to avoid phytotoxicity concerns, while Vydate C-LV can be applied during the growing season with no crop damage. However, because Vydate C-LV has a relatively short half-life in the soil, multiple applications are often necessary to control plant parasitic nematodes. While research in the western United States suggests CRS can be reduced with chemigation applications, the efficacy of ground-rig or air applications of Vydate C-LV is not known.

Table 1. Rate and timing of Vydate C-LV treatments evaluated during 2008 in Minnesota[1]

Trt Code	IF[2]	Emerg[3]	3 wks[4]	6 wks[4]
	Treatment Timing			
UTC	-	-	-	-
IF(2X)+3	4.2	-	2.1	-
IF+3+6	2.1	2.1	2.1	-
E+3+6		2.1	2.1	2.1
IF+E+3+6	2.1	2.1	2.1	2.1

[1]Rates are pints/acre of Vydate C-LV.

[2]IF = Vydate applied in-furrow at planting in 7 gpa.

[3]E = Vydate applied at crop emergence in 10 gpa.

[4]Vydate applied 3 and 6 weeks after crop emergence in 10 gpa water

Current Research

In order to determine if foliar applications of Vydate C-LV reduce the incidence and severity of CRS, six Vydate treatments (Table 1) were arranged in a randomized complete block design and replicated four times. The plot was established in an irrigated field in Minnesota with a history of CRS. A second replicated trial was also established to investigate the susceptibility of fifty-eight potato genotypes to CRS.

Figure 3. Foliar symptoms of TRV on Russet Norkotah

Figure 4. CRS symptoms on Shepody

Vydate Trial Results Analysis of variance indicated that all Vydate treatments significantly reduced the incidence and severity of CRS when compared to the untreated control (Table 2). Applying Vydate in-furrow at planting followed by foliar applications at crop emergence and three and six weeks later was the only treatment that reduced disease severity below 5%.

Figure 5. CRS symptoms on Snowden

Table 2. Effects of Vydate on Corky Ringspot Disease of Russet Burbank.

Trt Code	Incidence[1]	Damage[2]	Serious Damage[3]
UTC	90 a[4]	88 a	76 a
IF(2X)+3	42 b	26 b	12 b
IF+3+6	33 b	18 b	9 b
E+3+6	29 bc	22 b	10 b
IF+E+3+6	8 c	1 c	1 b

[1]Percent tubers with any CRS
[2 and 3]Percent tubers with 5% or 10% loss from CRS, respectively.
[4]Values followed by different letters in a column are significantly different according to Duncans test (α = 0.05).

Figure 5. Tubers from Vydate treated plants on top and from untreated plants below.

Genotype Trial Results Six of the genotypes evaluated did not express internal or external symptoms consistent with CRS in potato (Table 3), while 52 did (Table 4). PA99N2-1, PA99N82-4, and PA00N14-2 (Fig 7), are known to have resistance to CRS, but this is the first report of possible resistance in the other genotypes. Further tests are needed to confirm whether these genotypes are resistant or are asymptomatic (infected, but don't express symptoms) carriers.

Table 3. Genotypes with no CRS symptoms.

Genotype	Type
AOND95292-3Russ	Russet
J138-A12	White
PA99N2-1	Russet
PA99N82-4	Russet
PA00N14-2	Russet
R89063-83(*Patagonia*)	Red

Table 4. Genotypes with CRS symptoms.

Breeding Lines	
J101-K6	ND6959B-11
J103-K7	ND6961B-1P
ND6953B-34	ND7402B-38
ND6956B-13	ND2858-1
	ND2861-2
Russet Genotypes	
AOND95249-1Russ	Ranger Russet
Bannock Russet	Russet Burbank
Gemstar Russet	Silverton Russet
Russet Norkotah	Umatilla Russet
Premier Russet	
White Genotypes	
Atlantic	Beacon
Dakota Crisp	Dakota Diamond
Dakota Pearl	FL1533
FL1879	Ivory Crisp
ND7519-1	Shepody
Snowden	
Red and Yellow Genotypes	
Cherry Red	Chieftain
Colorado Rose	Dakota Jewel
Dakota Rose	Dark Red Norland
Durango	Elfe
Mazama	Modoc
ND4659-5R	ND5002-3R
ND8555-8R	NDTX4271-5R
Red Lasoda	Red Norland
Rio Colorado	Rio Rojo
Sangre	Satina
Viking	Yukon Gold

Figure 6. The CRS resistant genotype, PA00N14-2

Summary Corky Ringspot has been detected in many irrigated growing regions in the United States, including the upper Midwest. Left untreated, this disease can significantly reduce the quality of a potato crop. Soil samples should be collected from fields the summer or fall prior to potato production, allowing management decisions to be made in a timely manner. Sampling when the soil is above 40F and near field capacity is ideal.

While potato breeders are developing resistant genotypes (Table 3), chemical (Telone II and Vydate C-LV) control is the most common management tool. One year of research in Minnesota suggests that foliar applications of Vydate can reduce CRS damage (Table 2 and Fig 6). The results indicate that Vydate applications must begin at planting and continue until 6 weeks after crop emergence to achieve acceptable CRS levels. Waiting until crop emergence to begin treatment does not appear to provide adequate protection.

Future Research Research in the Pacific Northwest has demonstrated that in-furrow Vydate applications alone or in combination with Admire Pro (imidacloprid), Quadris (azoxystrobin), and Ridomil Gold (mefenoxam) have not delayed crop emergence. However, other tank-mix partners commonly used in the upper Midwest should be evaluated to establish crop safety. Furthermore, while the results from the Vydate trial are promising, this experiment should be repeated with additional genotypes. The Vydate program needs to be repeatable over several years using different genotypes to ensure product performance and grower confidence.

We would like to thank Mr. Rick Schlichting, Dr. Christian Thill, Dr. Chuck Brown, Mr. Jeff Miller, Mr. Dick Nilles, Mr. Bryce Farnsworth,and Mr. Steve James for their assistance and collaboration conducting the research that was reported above.

Figure 7. External CRS Symptoms on Red Lasoda

Evaluation of Kingenta and ESN Controlled Release Fertilizers for Irrigated Russet Burbank Potato Production

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Summary: This was the second year for field experiments conducted at the Sand Plain Research Farm in Becker, MN comparing two controlled release fertilizers made by Kingenta (a Chinese company) with ESN and conventional N sources. Treatments compared differences between N sources at 160 lb N/A and 240 lb N/A. Preplant and planting applications of the controlled release fertilizers were also compared. Nitrogen release rates from the two Kingenta controlled release fertilizers (K2 and KB) were slower and less complete than from ESN. Early season N release from ESN was greater than found in previous studies with this product. Slower N release from K2 and KB led to lower petiole nitrate-N concentrations for K2 and KB than for ESN and conventional fertilizer treatments. Despite this apparent difference in N uptake, tuber yields for K2 and KB were comparable to ESN and conventional N sources. All N source had higher yields at 240 lb N/A than at 160 lb N/A, but application timing for the two controlled release fertilizers had no effect on yield. Specific gravities were similar for all N treatments, but K2 had the highest amounts of small tubers, KB had lower amounts of small tubers and the highest percentage of large tubers, and KB had the highest incidence of hollow heart.

Background: Studies with ESN, a controlled release N fertilizer have been conducted for the past three years. The main findings have shown that the fertilizer can be used as a substitute for many split applications of 28-0-0. The best results indicate an early sidedress application provides the best yield and quality. However, growers would be more likely to adopt the fertilizer if it could be used preplant. In this study we compared two controlled release fertilizers (CRF's): one manufactured by Agrium called ESN and the other manufactured by Kingenta (a fertilizer company in China). The objectives of this study were to 1) evaluate the effects of ESN and Kingenta applications on yield and quality of 'Russet Burbank' potato, 2) compare various N rates, sources, and timing on Russet Burbank yield and quality, and 3) determine if nitrate leaching can be reduced with use of CRF's. This study is in its second year.

Materials and Methods

The study was conducted at the Sand Plain Research Farm in Becker, Minnesota on a Hubbard loamy sand using the cultivar Russet Burbank. The previous crop was rye, followed by a mustard green manure that was plowed down in the fall of 2007. Selected soil chemical properties before planting were as follows (0-6"): pH, 6.2; organic matter, 2.0%; Bray P1, 32 ppm; ammonium acetate extractable K, Ca, and Mg, 114, 813, and 137 ppm, respectively; hot water extractable B, 0.2 ppm; Ca-phosphate extractable SO_4-S, 2.0 ppm; and DTPA extractable Zn, Cu, Fe, and Mn, 0.7, 0.4, 28.6, and 7.2 ppm, respectively. Extractable nitrate-N and ammonium-N in the top 2 ft prior to planting were 17.5 and 19.8 lb/A, respectively.

Four, 20 ft rows were planted for each plot with the middle two rows used for sampling and harvest. Whole "B" seed was hand planted in furrows on April 29, 2008. Spacing was 36 inches between rows and 12 inches within each row. Each treatment was replicated four times in a randomized complete block design. Admire Pro was applied in-furrow for beetle control, along with the systemic fungicides Moncut 70DF and Ultra Flourish. Weeds, diseases, and other insects were controlled using standard practices. Rainfall was supplemented with sprinkler irrigation using the checkbook method of irrigation scheduling.

Three types of CRF's were tested in this study, along with uncoated urea (46-0-0). Shandong Kingenta Ecological Engineering Co., Ltd manufactures a polymer coated urea (K2, 42-0-0) and a polymer coated, blended fertilizer (KB, 20-8-10). Agrium, Inc. produces Environmentally Smart Nitrogen (ESN, 44-0-0), which is also a polymer coated urea. Twelve treatments were tested and are listed in Table 1.

Table 1. Nitrogen treatments tested in the controlled release fertilizer study.

Treatment	Preplant	Planting	Emergence	Post-hilling**	Total
	----------------------- N sources* and rates (lb N/A) -----------------------				
1	0	0	0	0	0
2	0	40 D	60 U	15 UAN x 4	160
3	0	40 D	100 U	25 UAN x 4	240
4	120 K2	40 D	0	0	160
5	200 K2	40 D	0	0	240
6	0	40 D + 200 K2	0	0	240
7	160 KB	0	0	0	160
8	240 KB	0	0	0	240
9	0	240 KB	0	0	240
10	120 E	40 D	0	0	160
11	200 E	40 D	0	0	240
12	0	40 D + 200 E	0	0	240

*K2 = Kingenta 42-0-0, KB = Kingenta 20-8-10, E = ESN 44-0-0, D = diammonium phosphate (DAP), U = urea, UAN = a combination of granular urea and ammonium nitrate.
**Post-hilling N was applied 4 times at 10-12 day intervals.

Preplant CRF's were applied the day before planting on April 28 and disked in. Controlled release fertilizer at planting was banded 3 inches to each side and 2 inches below the seed piece using a belt type applicator. The same starter fertilizer was band-applied to all plots, except for the 0 N control and the three KB treatments. It consisted of 40 lb N/A and 100 lb P_2O_5/A as diammonium phosphate (DAP), 200 lb K_2O/A as potassium chloride and potassium magnesium sulfate, 30 lb Mg/A and 60 lb S/A as potassium magnesium sulfate, 2 lb Zn/A as zinc oxide, and 0.5 lb B/A as boric acid. For the control plots and the KB treatments, a modified starter without the N and P from DAP was used. It consisted of the same amounts and sources of K_2O, Mg, S, B, and Zn, but equivalent P_2O_5 rates were supplied to the control by triple superphosphate (TSP) and to the KB treatments by the P contained in the KB fertilizer. Treatments 7 and 8, therefore, received their P preplant when the KB was applied.

Plant emergence N applications were sidedressed as urea on May 28 and mechanically incorporated. Post-hilling N was applied by hand as 50% granular urea and 50% granular ammonium nitrate and watered-in with overhead irrigation to simulate fertigation with 28% N. The four post-hilling applications took place on June 13, June 23, July 2, and July 14.

Stand counts were done on June 2 and stem counts on June 19. Petiole samples were collected from the 4th leaf from the terminal on June 24, July 8, and July 22. Petioles were analyzed for nitrate-N on a dry weight basis. Vines were harvested from two, 10-ft sections of row on September 15, followed by mechanically beating the vines over the entire plot area. On September 16, plots were machine-harvested and total tuber yield, graded yield, tuber specific gravity, and the incidence of hollow heart and brown center were measured. Subsamples of vines and tubers were collected to determine moisture percentage and N concentrations, which were then used to calculate N uptake and distribution. Uptake results were not available at the time of this report.

Measured amounts of K2 and ESN fertilizer were placed in plastic mesh bags, buried at the depth of fertilizer placement when both the preplant and planting applications were made, and removed at regular intervals to track N release over time. Soil samples from the 0-2 ft depth were collected after harvest on Sept 19 to measure residual inorganic N levels. Each sample consisted of six soil cores that were composited, air dried, extracted with 2 N KCl, and analyzed for nitrate-N and ammonium-N. Soil inorganic N results were not available at the time of this report. A WatchDog weather station from Spectrum Technologies was used to monitor rainfall, air temperature, and soil temperature and moisture at the fertilizer band depth (10 inches below the top of the hill). Rainfall and irrigation amounts are shown in Fig. 1 and air temperature, soil temperature, and soil moisture in Fig. 2.

Suction cup lysimeters were installed at the 4-ft soil depth on May 20 to measure the amount of inorganic N leaching below the crop root zone. Three plots per treatment in treatments 3, 5, 8, and 11 were monitored (Table 1). These treatments all received total N applications of 240 lb N/A. They included a conventional treatment and the K2, KB, and ESN treatments where the controlled release fertilizer was applied preplant. Water samples were collected on a weekly basis, or more often when a leaching rainfall event occurred, and analyzed for nitrate-N and ammonium-N. Sampling continued after harvest until the ground was frozen. Leaching results were not available at the time of this report.

Results

Nitrogen release: Release curves for the ESN and K2 controlled release fertilizers are presented in Fig. 3. Preplant and planting applications had similar release curves, which is not surprising since they were applied only one day apart. The largest difference was 45 days after planting when preplant K2 had released 40% of its N and K2 at planting had only released about 22%, but differences on other dates were small. Nitrogen release from ESN was more rapid and more complete than from K2 and more closely matched the N uptake pattern of Russet Burbank potatoes. Russet Burbank takes up the majority of its N between 40 and 80 days after planting. ESN had released about 85% of its N by 60 days after planting, while K2 had released only 54% by 80 days after planting. ESN had a greater early release of N in 2008 than in previous years. At 25 days after planting, both planting and preplant applications had released about 45% of their N compared with only 15-25% in 2007. The release pattern for K2 was similar to 2007. In both years, only about 60% of total N was released by 140 days after planting, which means there is a potential for leaching of N released after the growing season.

Tuber yield: Total yields were greatest for the planting and preplant applications of K2 at 240 lb N/A, although they were only significantly greater than the control and KB at 160 lb N/A (Table 1). As expected, all treatments receiving N fertilizer had significantly greater total yields than the control. KB at 160 lb N/A was numerically lower than the other 160 lb N/A treatments and significantly lower than all of the 240 lb N/A treatments. Applications of 240 lb N/A had consistently higher yields than 160 lb N/A for all N sources, but the differences were not significant. For all three CRF's, there were no significant differences in total yield between preplant and planting applications.

Preplant KB and planting ESN at 240 lb N/A had the greatest marketable yields and both were significantly greater than ESN and K2 at 160 lb N/A. The K2 treatments at 240 lb N/A that had the highest total yields still had relatively high marketable yields, but all three K2 treatments had more small, unmarketable tubers than any of the other treatments except ESN at 160 lb N/A. The three KB treatments had the lowest amounts of small tubers and the highest amounts of 10-14 oz tubers. Their percentages of tubers larger than 10 oz were also higher than any other treatment. The six Kingenta treatments all had greater amounts of #2 tubers than the control and all of the conventional and ESN treatments.

Tuber yields for the Kingenta CRF's were higher than might be expected from their N release rates. Total and marketable yields were comparable to conventional and ESN treatments, even though it appears from the release curves that they might supply insufficient N throughout the main N uptake period. However, relative yields and N release for K2 were similar in 2007 and 2008.

Plant stand, stems per plant, and tuber quality: Plant stands ranged from 94 to 99%, but there were no significant differences between treatments (Table 2). ESN at 240 lb N/A preplant had significantly more stems per plant than any of the other treatments. Urea at 240 lb N/A and K2 at 240 lb N/A preplant had significantly more stems per plant than KB at 160 lb N/A and ESN at 240 lb N/A applied at planting. Specific gravity was similar for all treatments. KB at 160 lb N/A and at 240 lb N/A at planting had the highest incidence of hollow heart and numerically the three KB treatments had more hollow heart than K2 and ESN. This is consistent with the larger tuber size for KB.

Petiole nitrate-N concentrations: For all three N sources and on all three sampling dates, nitrate-N was lower with 160 lb N/A than with 240 lb N/A (Table 3). Similarly, at equivalent N rates the K2 and KB treatments were lower than urea and ESN, except for one of the KB treatments on the third sampling date. KB was higher than ESN on that date when both were applied at 160 lb N/A, and ESN appeared to be running out of N. Lower petiole N for the Kingenta treatments is consistent with their slow rate of N release (Fig. 3). ESN had petiole nitrate-N levels comparable to urea on the first sampling date, but the post hilling applications of urea/ammonium nitrate maintained higher levels than ESN on the second and third dates.

Conclusions:

Results from the second year of this study were similar to the results obtained the first year, except for the fact that release of N from ESN was faster in 2008 than in 2007. Release rates of N from the two Kingenta CRF's were slower and less complete than from ESN. This was reflected in lower petiole nitrate-N concentrations for K2 and KB than for ESN and conventional fertilizer treatments. Tuber yields for K2 and KB were comparable to ESN and conventional N sources, but there were some quality differences. K2 had the largest amounts of small tubers, KB had lower amounts of small tubers but the highest percentage of large tubers, and KB had the highest incidence of hollow heart.

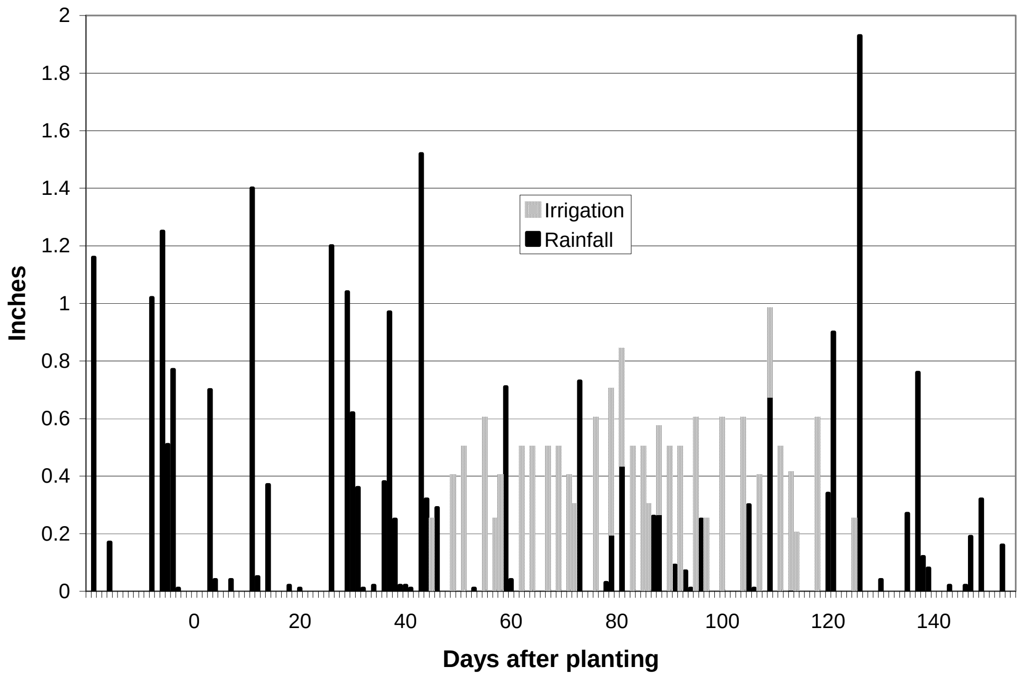

Figure 1. Rainfall and irrigation amounts during the 2008 growing season.

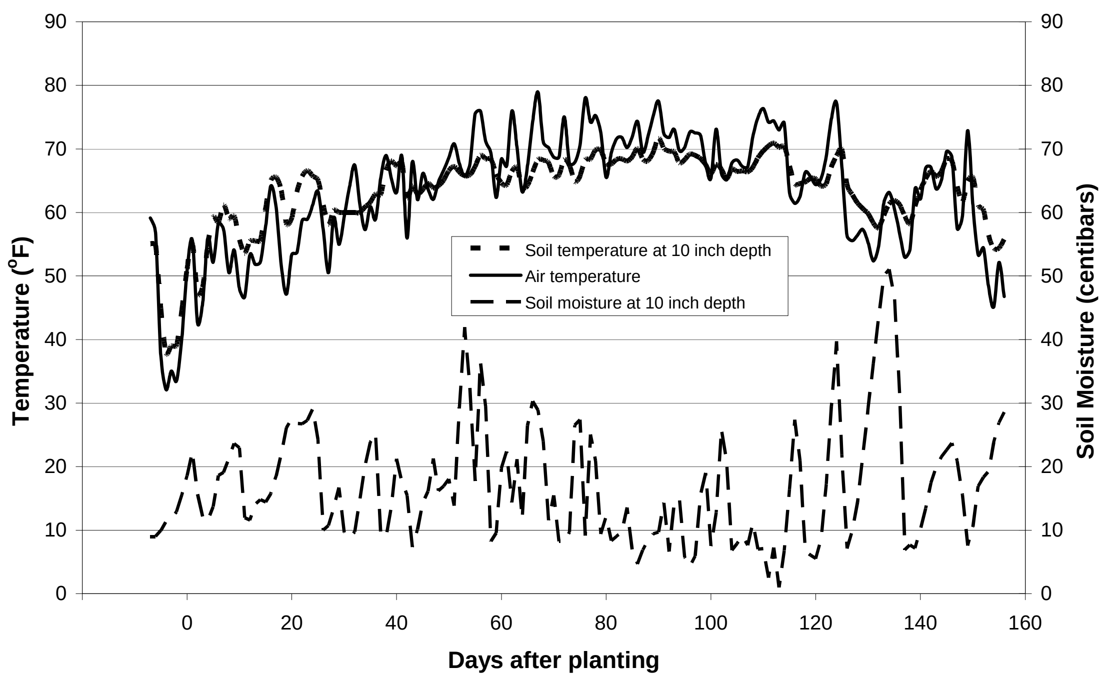

Figure 2. Soil temperature, air temperature, and soil moisture during the 2008 growing season.

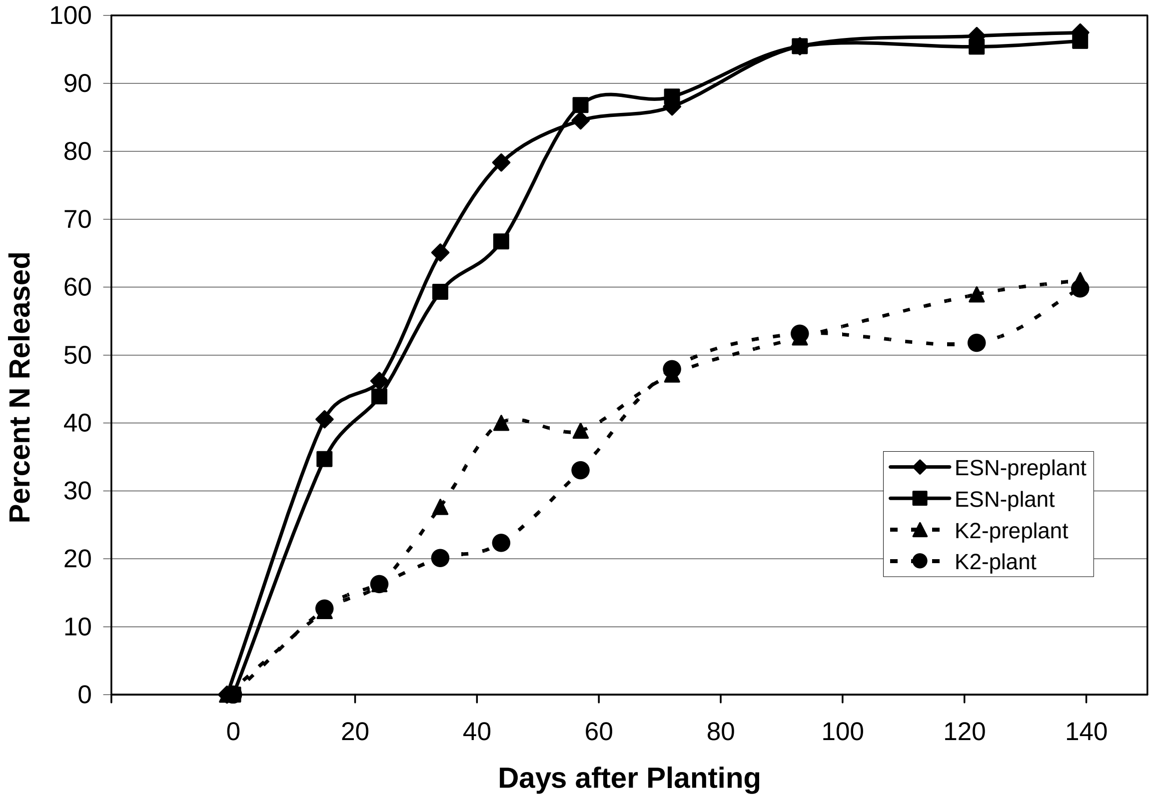

Figure 3. Nitrogen release from controlled release fertilizers during the 2008 growing season.

Table 1. Effects of N source, rate, and timing on Russet Burbank tuber yield and size distribution.

			Tuber Yield										
Treatment #	Nitrogen Source	N Rate/Timing lb N/A	0-4 oz	4-6 oz	6-10 oz	10-14 oz	>14 oz	Total	#1 > 4 oz	# 2 > 4 oz	Total marketable	> 6oz %	> 10 oz %
			cwt/A										
1	Control	0	64.0	154.7	178.8	77.6	10.8	486.0	257.7	164.4	422.0	54.7	17.6
2	Urea	160	101.8	180.9	259.2	94.1	29.5	664.4	421.0	142.3	563.7	57.4	18.6
3	Urea	240	93.6	166.1	270.9	104.3	51.7	686.5	509.5	83.4	592.9	62.2	22.8
4	Kingenta 42-0-0 (K2)	160 pre	125.9	222.8	233.6	64.7	19.5	666.2	343.9	196.6	540.4	47.5	12.6
5	Kingenta 42-0-0 (K2)	240 pre	117.3	211.4	269.6	83.3	31.3	712.8	407.2	188.4	595.5	53.9	16.2
6	Kingenta 42-0-0 (K2)	240 plt	121.4	228.1	267.6	74.8	26.7	718.6	358.8	238.5	597.3	51.5	14.2
7	Kingenta 20-8-10 (KB)	160 pre	46.5	134.6	196.8	153.4	96.2	627.5	411.2	169.8	581.0	71.1	39.9
8	Kingenta 20-8-10 (KB)	240 pre	62.1	151.7	225.8	126.7	106.9	673.1	407.0	204.1	611.1	68.1	34.6
9	Kingenta 20-8-10 (KB)	240 plt	71.5	159.2	186.6	153.9	81.5	652.7	339.6	241.6	581.2	64.6	35.9
10	ESN 44-0-0	160 pre	162.5	234.1	210.0	51.8	10.9	669.1	401.7	105.0	506.7	40.5	9.3
11	ESN 44-0-0	240 pre	113.4	167.7	242.1	102.8	57.5	683.6	478.1	92.1	570.1	58.5	23.1
12	ESN 44-0-0	240 plt	71.5	144.1	243.4	132.5	90.8	682.3	533.4	77.3	610.8	68.2	32.5
		Significance[1]	**	**	**	**	**	**	**	**	**	**	**
		LSD (0.1)	23.2	40.4	32.1	35.9	28.7	53.9	77.0	63.2	53.8	8.6	7.6

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively

Table 2. Effects of N source, rate, and timing on plant stand, number of stems per plant, and tuber quality.

Treatment #	Nitrogen Source	N Rate/Timing lb N/A	% Stand	# Stems per plant	Specific gravity	HH %
1	Control	0	96.5	3.0	1.0812	3.0
2	Urea	160	97.2	3.0	1.0875	4.9
3	Urea	240	95.1	3.4	1.0867	2.0
4	Kingenta 42-0-0 (K2)	160 pre	97.2	3.3	1.0875	2.0
5	Kingenta 42-0-0 (K2)	240 pre	95.8	3.4	1.0874	4.0
6	Kingenta 42-0-0 (K2)	240 plt	94.4	3.3	1.0917	1.0
7	Kingenta 20-8-10 (KB)	160 pre	95.8	2.9	1.0892	9.1
8	Kingenta 20-8-10 (KB)	240 pre	97.9	3.2	1.0862	5.0
9	Kingenta 20-8-10 (KB)	240 plt	97.2	3.0	1.0870	8.0
10	ESN 44-0-0	160 pre	99.3	3.2	1.0877	0.0
11	ESN 44-0-0	240 pre	99.3	3.9	1.0845	2.0
12	ESN 44-0-0	240 plt	98.6	2.9	1.0897	3.2
		Significance[1]	NS	**	NS	*
		LSD (0.1)	---	0.5	---	6.2

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 3. Effects of N source, rate, and timing on nitrate-N concentrations in petioles on three sampling dates.

Treatment #	Nitrogen Source	N Rate/Timing lb N/A	Petiole Nitrate - N		
			24-Jun	**7-Jul**	**22-Jul**
			------------------ ppm ----------------		
1	Control	0	1,575	427	106
2	Urea	160	10,566	8,682	4,562
3	Urea	240	15,677	14,350	11,504
4	Kingenta 42-0-0 (K2)	160 pre	4,821	1,465	388
5	Kingenta 42-0-0 (K2)	240 pre	11,812	5,744	2,439
6	Kingenta 42-0-0 (K2)	240 plt	7,556	1,917	975
7	Kingenta 20-8-10 (KB)	160 pre	4,778	2,859	2,017
8	Kingenta 20-8-10 (KB)	240 pre	7,166	5,010	4,215
9	Kingenta 20-8-10 (KB)	240 plt	5,163	4,634	4,116
10	ESN 44-0-0	160 pre	11,872	3,236	593
11	ESN 44-0-0	240 pre	17,220	8,200	5,602
12	ESN 44-0-0	240 plt	19,247	10,941	5,564
		Significance[1]	**	**	**
		LSD (0.1)	1,953	1,502	1,709

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Evaluation of Liquid Fertilizer Sources on Potato Yield and Quality

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Summary: A field experiment at the Sand Plain Research Farm in Becker was conducted in 2008 to evaluate the effects of several liquid fertilizer formulations on yield and quality of Russet Burbank potato. Treatments compared various combinations of Agro Liquid Culture specialty formulations (ACLF) with conventional liquid formulations including a zero P control. Reduced rates of N (145 lb N/A) in liquid fertilizers resulted in equivalent yields, but with a trend towards reduced tuber size compared with standard rates (195-240 lb N/A) of N fertilizer during the growing conditions of 2008. Phosphorus application, regardless of source, tended to reduce the yield of tubers greater than 14 oz. In general, the ACLF fertilizers performed as well as conventional liquid fertilizers in terms of tuber yield and quality. Petiole nitrate-N increased with increasing N rate regardless of fertilizer source on the first three sampling dates and petiole P increased with increasing P rate regardless of source on the first sampling date. Addition of ACLF micronutrients tended to increase petiole B and Zn, particularly early in the growing season.

Background: Liquid fertilizers such as 10-34-0 have become more popular as a starter fertilizer for potato production in recent years. In addition, new types of liquid formulations are being promoted by various companies with claims of increased fertilizer use efficiency, suggesting that they can be used at lower rates compared with conventional liquid sources. Studies comparing conventional liquid fertilizers with the various specialty liquid fertilizers for potato production are lacking. These types of studies are needed to allow growers to make informed decisions about their use. The objective of this study was to determine the effects of various liquid specialty fertilizers on potato yield and quality.

Materials and Methods

This study was conducted at the Sand Plain Research Farm in Becker on a Hubbard loamy sand soil. The previous crop was rye and selected soil chemical properties before planting were as follows (0-6"): pH, 6.5; organic matter, 2.0%; Bray P1, 60 ppm; ammonium acetate extractable K, Ca, and Mg, 135, 860, and 162 ppm, respectively; hot water extractable B, 0.2 ppm; Ca-phosphate extractable SO_4-S, 1.0 ppm; and DTPA extractable Zn, Cu, Fe, and Mn, 1.0, 0.8, 25.9, and 7.9 ppm, respectively. Extractable nitrate-N and ammonium-N in the top 2-ft of soil were 11.0 and 22.5 lb/A, respectively.

Three, 30-ft rows were planted for each plot with the middle row used for sampling and harvest. 'Russet Burbank' "B" seed was hand planted in furrows on April 21, 2008. Spacing was 12 inches within each row and 36 inches between rows. Each treatment was replicated 4 times in a randomized complete block design. Admire was applied in-furrow for beetle control. Weeds, diseases, and other insects were controlled using standard practices. Rainfall was supplemented with sprinkler irrigation using the checkbook method of irrigation scheduling.

Seven treatments compared conventional liquid 10-34-0 and 28% UAN with newer types of liquid formulations at two P rates and three N rates as described in Table 1. Several liquid products manufactured by Agro-Culture (St. Johns, Michigan) were evaluated. NRG-N and Pro-Germinator have chelating compounds and slower release N formulations, which theoretically allow the use of lower nutrient rates. Additional Agro-Culture compounds tested included eNhance, a urease inhibitor which was added to 28% UAN, a liquid micronutrient fertilizer, and a liquid calcium supplement.

Table 1. Treatments used in the liquid fertilizer study.

Treatment*	Total N	N Timing (lb N/A)			Total P
	lb N/A	Planting	Emergence	Post-hilling†	lb P_2O_5/A
0 P control with conventional N rate (28%)	240	39	100	33.6 x 3	0
Conventional N & P rates 10-34-0 and 28%	240	35	100	35 x 3	120
ACLF: 28% w/eNhance + Pro-germ + micros, midrate N	195	39	75	27 x 3	32
Conventional, reduced P & midrate N, 28% and 10-34-0	195	39	75	27 x 3	32
ACLF: NRG-N + Pro-germ + micros, low N rate	145	26.5	58	20.3 x 3	32
ACLF: NRG-N + Pro-germ + micros + Ca, low N rate	145	26.5	58	20.3 x 3	32
Conventional, reduced P & low N rate, 10-34-0 and 28%	145	24	58.4	21 x 3	32

* Conventional = P supplied as 10-34-0 @ 30 or 8 gal/A.
ACLF = Agro-Culture Liquid Fertilizers.
eNhance = N fertilizer supplement.
Pro-Germ = Pro-Germinator 9-24-3 @ 12 gal/A.
NRG-N = liquid N fertilizer + 1% sulfur @ 5 gal/A.
Micros = Micro 500 micronutrient mix @ 0.5 gal/A.
Ca = Premium Calcium @ 1 gal/A.
† Post-hilling N was applied 3 times at 7-10 day intervals.

All plots received preplant applications of 180 lb K_2O/A as 0-0-60 plus 37 lb K_2O/A, 30 lb S/A, and 18 lb Mg/A as 0-0-22-18-11 that were broadcast and disked in the day of planting. Liquid fertilizer at planting was metered through drop hoses and place in a band 3 inches to each side and 2 inches below the seed piece. Emergence fertilizer was sidedressed on June 2 and mechanically incorporated in the hilling operation. Post-hilling treatments were applied using a CO_2 backpack sprayer connected to a boom spanning the width of three rows. The boom was held by two people, one person at each end. Treatments were applied to the foliage of each plot by calibrating a walk to deliver the appropriate amounts. Applications were made during an irrigation event to simulate fertigation and to prevent foliar burn. The post-hilling applications were made on June 16, June 26, and July 3.

Stand counts were taken on June 6 and stem counts on June 23. Petiole samples were collected from the 4th leaf from the terminal on four dates: June 24, July 8, July 22, and July 24. Petioles were analyzed for nitrate-N and multiple ICP elements on a dry weight basis. Vines were killed by chopping on September 15 and plots were machine harvested on September 16. Total tuber yield, graded yield, tuber specific gravity, and incidence of hollow heart and brown center were measured after harvest.

Results:

Stand and Stem Count and Tuber Yield and Size Distribution: Table 2 shows the effects of fertilizer source and rate stand count and number of stems per plant. In general, treatments did not significantly affect stem numbers or stand, although there was a trend for fewer stems per plant with conventional fertilizers compared with ACLF fertilizers. This corresponds to a slightly lower stand count with the ACLF fertilizers compared with the conventional fertilizers.

Tuber yield and size distribution is presented in Table 3. Surprisingly treatments had minimal effects on tuber yield. The only significant effect was a higher yield of tubers greater than 14 oz when P fertilizer was not applied (treatment 1). This corresponds with studies conducted in previous years showing that P fertilizer increases tuber set and consequently tends to reduce the yield of larger sized tubers. In general, N rate effects did not significantly affect yield regardless of fertilizer source. There was trend for higher yields of tubers greater than 10 oz with the 195 lb N rate than with the 145 lb N rate as well as an increase in the yield of smaller tubers (4-6 oz) with decreasing N rate. There was also a trend for ACLF fertilizers at the low N rate to produce more tubers in the 6-10 oz category compared with conventional fertilizers at the same N rate and ACLF and conventional fertilizers at higher N rates.

Tuber quality: Table 4 shows the effects of fertilizer source and rate on tuber quality. There was no significant difference among treatments in the incidence of hollow heart, although the 0 P control had numerically the highest hollow heart incidence, which is consistent with the trend towards larger tuber size with this treatment. Specific gravity was excellent and was not significantly affected by treatment. There was a trend for lower specific gravity with ACLF treatments (treatments 3 and 5) than with conventional treatments (treatments 4 and 7).

Petiole nutrient concentrations: Tables 5-10 show the effects of fertilizer source and rate on petiole nitrate-N, P, Ca, S, B and Zn concentrations on four sampling dates from late June to the second week in September.

On the first three sampling dates, petiole nitrate-N increased with increasing N rate regardless of fertilizer source (Table 5). Petiole nitrate-N tended to be higher with the 0 P control than with the other treatments, but this was because the 0 P control also had the highest N rate applied while the other treatments varied form low to high N rate. By the end of the growing season, petiole nitrate-N was not affected by treatment.

On the first sampling date, petiole P was lowest in the 0 P control and highest in the 120 lb P_2O_5 rate treatment (Table 6). There was no difference among treatments for petiole P at any of the other sampling dates. This is consistent with studies conducted in previous years on high P testing soils showing that petiole P tends to be lower at the lower P rates early in the season, but as roots grow during the season they are able to access more P. Petiole P with the conventional low N rate treatment tended to have higher petiole P than ACLF treatments at the same N rate on sampling dates 2 and 3. Reasons for this difference are not entirely clear.

Petiole S was affected most by N rate regardless of source (Table 7). In general, petiole S decreased with increasing N rate. On the first sampling date, the NRG-N treatments with S (treatments 5 and 6) tended to result in higher petiole S than the other treatments without S.

Petiole Ca tended to decrease with increasing N rate on the first two sampling dates (Table 8). The ACLF treat with Ca (treatment 6) did not affect petiole Ca on the first three sampling dates, but did result in higher petiole Ca at the last sampling date. However, the ACLF treatment without Ca (treatment 5) also resulted in higher petiole Ca so it is unclear if the added Ca in treatment 6 was making any difference.

For the micronutrients B, Cu, Fe, Mn, and Zn, the ACLF + micronutrients treatments (treatments 3, 5and 6) had higher concentrations of some micronutrients on some dates, but the results were inconsistent, therefore only petiole B and Zn concentrations are presented where trends appeared to be more related to treatment. On the first sampling date petiole B was significantly higher with ACLF + micros than the conventional treatments with out micros (Table 9). At the other sampling dates the effect was less consistent, but in general there was still a trend of higher petiole B with ACLF micros than without. Petiole Zn followed similar trends to petiole B with higher concentrations when micros were applied, particularly on the first sampling date (Table 10).

Conclusions

Reduced rates of N in liquid fertilizers resulted in equivalent yields, but with a trend towards reduced tuber size compared with standard rates of N fertilizer during the growing conditions of 2008. Phosphorus application regardless of source tended to reduce the yield of tubers greater than 14 oz. In general, the ACLF fertilizers performed as well as conventional liquid fertilizers in terms of tuber yield and quality. Petiole nitrate-N increased with increasing N rate regardless of fertilizer source on the first three sampling dates and petiole P increased with increasing P rate regardless of source on the first sampling date. Addition of micronutrients increased petiole B and Zn, particularly early in the growing season.

Table 2. Effects of liquid fertilizers on stand and stem count.

Treatment #	Fertilizer Source	P_2O_5 Rate lb/A	N Rate lb/A	# Stems per plant	Stand %
1	0 P control	0	240	3.5	99.1
2	conventional	120	240	3.2	98.2
3	ACLF w/ eNhance	32	195	3.5	97.3
4	conv. @ mid rate	32	195	3.1	99.1
5	ACLF NRG-N	32	145.4	3.4	97.3
6	ACLF NRG-N + Ca	32	145.4	3.2	99.1
7	conv. @ low rate	32	145.4	3.1	100.0
			Significance[2]	NS	NS
			LSD (0.1)		
			Contrasts		
			0 P Control vs. Rest trmt 1 vs 2-7	NS	NS
			Linear N, Coventional trmt 2,4,7	NS	NS
			Conventional vs. ACLF trmt 4,7 vs. 3,5	*	*
			Low rate vs. Mid rate 5,7 vs. 3,4	NS	NS
			Conv. low rate vs ACLF+Ca low rate trmt 7 vs. 6	NS	NS
			Conv. low rate vs ACLF low rate trmt 7 vs. 5	NS	++
			Conv. Low rate vs. ACLF low rates trmt 7 vs 5,6	NS	NS
			Conv. Mid rate vs. ACLF mid rate trmt 4 vs. 3	NS	NS

[2]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively

Table 3. Effects of liquid fertilizer sources on potato yield and size distribution

				Tuber Yield										
Treatment #	Fertilizer Source	P2O5 Rate lb/A	N Rate lb/A	0-4 oz	4-6 oz	6-10 oz	10-14 oz	>14 oz	Total	#1 > 4 oz	# 2 > 4 oz	Total marketable	> 6oz %	> 10 oz %
				cwt/A										
1	0 P control	0	240	75.7	101.9	210.7	149.6	140.0	677.9	554.9	47.4	602.2	73.8	42.7
2	conventional	120	240	77.1	98.0	227.5	147.7	100.9	651.2	520.8	53.3	574.1	73.4	38.6
3	ACLF w/ eNhance	32	195	60.2	92.3	217.4	178.0	99.0	646.8	529.2	57.4	586.7	76.5	42.9
4	conv. @ mid rate	32	195	80.6	115.4	226.1	157.3	103.9	683.2	565.3	37.4	602.6	71.4	38.2
5	ACLF NRG-N	32	145.4	76.1	110.5	258.4	138.7	84.3	668.0	538.5	53.3	591.8	72.1	33.4
6	ACLF NRG-N + Ca	32	145.4	68.9	125.5	254.2	149.1	79.3	677.0	550.4	57.7	608.2	71.2	33.7
7	conv. @ low rate	32	145.4	73.3	125.9	221.6	152.2	79.1	652.0	516.4	62.4	578.7	69.2	35.2
			Significance[2]	NS	NS	NS	NS	++	NS	NS	NS	NS	NS	NS
			LSD (0.1)					41.9						
			Contrasts											
			0 P Control vs. Rest trmt 1 vs 2-7	NS	NS	NS	NS	**	NS	NS	NS	NS	NS	NS
			Linear N, Coventional trmt 2,4,7	NS	++	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Conventional vs. ACLF trmt 4,7 vs. 3,5	NS	++	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Low rate vs. Mid rate 5,7 vs. 3,4	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	++
			Conv. low rate vs ACLF+Ca low rate trmt 7 vs. 6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Conv. low rate vs ACLF low rate trmt 7 vs. 5	NS	NS	++	NS	NS	NS	NS	NS	NS	NS	NS
			Conv. Low rate vs. ACLF low rates trmt 7 vs 5,6	NS	NS	++	NS	NS	NS	NS	NS	NS	NS	NS
			Conv. Mid rate vs. ACLF mid rate trmt 4 vs. 3	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 4. Effect of liquid fertilizers on tuber specific gravity and hollow heart.

Treatment #	Fertilizer Source	P2O5 Rate lb/A	N Rate lb/A	Specific gravity	HH %
1	0 P control	0	240	1.0884	10.0
2	conventional	120	240	1.0882	9.0
3	ACLF w/ eNhance	32	195	1.0853	5.0
4	conv. @ mid rate	32	195	1.0889	4.0
5	ACLF NRG-N	32	145.4	1.0843	7.0
6	ACLF NRG-N + Ca	32	145.4	1.0907	2.0
7	conv. @ low rate	32	145.4	1.0878	5.0
			Significance[2]	NS	NS
			LSD (0.1)		
			Contrasts		
	0 P Control vs. Rest trmt 1 vs 2-7			NS	NS
	Linear N, Coventional trmt 2,4,7			NS	NS
	Conventional vs. ACLF trmt 4,7 vs. 3,5			++	NS
	Low rate vs. Mid rate 5,7 vs. 3,4			NS	NS
	Conv. low rate vs ACLF+Ca low rate trmt 7 vs. 6			NS	NS
	Conv. low rate vs ACLF low rate trmt 7 vs. 5			NS	NS
	Conv. Low rate vs. ACLF low rates trmt 7 vs 5,6			NS	NS
	Conv. Mid rate vs. ACLF mid rate trmt 4 vs. 3			NS	NS

[2]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively

Table 5. Effect of liquid fertilizers on petiole nitrate-N.

Treatment #	Fertilizer Source	P_2O_5 Rate lb/A	N Rate lb/A	Sampling Date 24-Jun	8-Jul	22-Jul	12-Sep
				ppm NO_3-N			
1	0 P control	0	240	20423	19309	12724	53
2	conventional	120	240	20490	18695	14465	191
3	ACLF w/ eNhance	32	195	15823	10748	6043	199
4	conv. @ mid rate	32	195	15902	12192	7554	82
5	ACLF NRG-N	32	145.4	12963	8900	5053	154
6	ACLF NRG-N + Ca	32	145.4	12248	6982	4304	265
7	conv. @ low rate	32	145.4	12563	6625	3847	317
			Significance[2]	**	**	**	NS
			LSD (0.1)	1963	2712	2131	
			Contrasts				
	0 P Control vs. Rest trmt 1 vs 2-7			**	**	**	NS
	Linear N, Coventional trmt 2,4,7			**	**	**	NS
	Conventional vs. ACLF trmt 4,7 vs. 3,5			NS	NS	NS	NS
	Low rate vs. Mid rate 5,7 vs. 3,4			**	**	*	NS
	Conv. low rate vs ACLF+Ca low rate trmt 7 vs. 6			NS	NS	NS	NS
	Conv. low rate vs ACLF low rate trmt 7 vs. 5			NS	NS	NS	NS
	Conv. Low rate vs. ACLF low rates trmt 7 vs 5,6			NS	NS	NS	NS
	Conv. Mid rate vs. ACLF mid rate trmt 4 vs. 3			NS	NS	NS	NS

[2]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively

Table 6. Effect of liquid fertilizers on petiole phosphorus.

Treatment	Fertilizer Source	P_2O_5 Rate	N Rate	Sampling Date 24-Jun	8-Jul	22-Jul	12-Sep
#		lb/A	lb/A	% P			
1	0 P control	0	240	0.39	0.39	0.30	0.14
2	conventional	120	240	0.51	0.38	0.32	0.16
3	ACLF w/ eNhance	32	195	0.47	0.38	0.35	0.15
4	conv. @ mid rate	32	195	0.45	0.33	0.30	0.14
5	ACLF NRG-N	32	145.4	0.47	0.32	0.21	0.15
6	ACLF NRG-N + Ca	32	145.4	0.43	0.32	0.29	0.15
7	conv. @ low rate	32	145.4	0.46	0.43	0.40	0.17
		Significance[z]		++	NS	NS	NS
		LSD (0.1)		0.07			
		Contrasts					
	0 P Control vs. Rest trmt 1 vs 2-7			**	NS	NS	NS
	Linear N, Coventional trmt 2,4,7			NS	NS	NS	NS
	Conventional vs. ACLF trmt 4,7 vs. 3,5			NS	NS	NS	NS
	Low rate vs. Mid rate 5,7 vs. 3,4			NS	NS	NS	NS
Conv. low rate vs ACLF+Ca low rate trmt 7 vs. 6				NS	*	++	NS
	Conv. low rate vs ACLF low rate trmt 7 vs. 5			NS	*	**	NS
Conv. Low rate vs. ACLF low rates trmt 7 vs 5,6				NS	*	*	NS
	Conv. Mid rate vs. ACLF mid rate trmt 4 vs. 3			NS	NS	NS	NS

[z]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively

Table 7. Effect of liquid fertilizers on petiole sulfur.

Treatment	Fertilizer Source	P_2O_5 Rate	N Rate	Sampling Date 24-Jun	8-Jul	22-Jul	12-Sep
#		lb/A	lb/A	% S			
1	0 P control	0	240	0.18	0.21	0.19	0.11
2	conventional	120	240	0.17	0.21	0.18	0.11
3	ACLF w/ eNhance	32	195	0.20	0.23	0.19	0.13
4	conv. @ mid rate	32	195	0.20	0.21	0.18	0.12
5	ACLF NRG-N	32	145.4	0.23	0.23	0.19	0.14
6	ACLF NRG-N + Ca	32	145.4	0.21	0.23	0.19	0.14
7	conv. @ low rate	32	145.4	0.20	0.24	0.19	0.14
		Significance[z]		**	++	NS	**
		LSD (0.1)		0.01	0.03		0.02
		Contrasts					
	0 P Control vs. Rest trmt 1 vs 2-7			**	NS	NS	**
	Linear N, Coventional trmt 2,4,7			**	*	NS	**
	Conventional vs. ACLF trmt 4,7 vs. 3,5			*	NS	NS	NS
	Low rate vs. Mid rate 5,7 vs. 3,4			**	++	NS	**
Conv. low rate vs ACLF+Ca low rate trmt 7 vs. 6				NS	NS	NS	NS
	Conv. low rate vs ACLF low rate trmt 7 vs. 5			**	NS	NS	NS
Conv. Low rate vs. ACLF low rates trmt 7 vs 5,6				**	NS	NS	NS
	Conv. Mid rate vs. ACLF mid rate trmt 4 vs. 3			NS	NS	NS	NS

[z]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively

Table 8. Effect of liquid fertilizers on petiole calcium.

Treatment	Fertilizer Source	P_2O_5 Rate	N Rate	Sampling Date 24-Jun	8-Jul	22-Jul	12-Sep
#		lb/A	lb/A	% Ca			
1	0 P control	0	240	0.89	1.01	1.04	1.29
2	conventional	120	240	1.02	1.07	0.95	1.26
3	ACLF w/ eNhance	32	195	0.92	0.87	0.85	1.39
4	conv. @ mid rate	32	195	0.92	0.99	0.98	1.33
5	ACLF NRG-N	32	145.4	0.83	0.80	1.09	1.63
6	ACLF NRG-N + Ca	32	145.4	0.81	0.86	0.98	1.62
7	conv. @ low rate	32	145.4	0.82	0.79	0.80	1.36
			Significance[z]	**	*	NS	*
			LSD (0.1)	0.08	0.16		0.24
			Contrasts				
	0 P Control vs. Rest trmt 1 vs 2-7			NS	++	NS	NS
	Linear N, Coventional trmt 2,4,7			**	**	NS	NS
	Conventional vs. ACLF trmt 4,7 vs. 3,5			NS	NS	NS	++
	Low rate vs. Mid rate 5,7 vs. 3,4			**	*	NS	NS
	Conv. low rate vs ACLF+Ca low rate trmt 7 vs. 6			NS	NS	NS	*
	Conv. low rate vs ACLF low rate trmt 7 vs. 5			NS	NS	++	*
	Conv. Low rate vs. ACLF low rates trmt 7 vs 5,6			NS	NS	++	*
	Conv. Mid rate vs. ACLF mid rate trmt 4 vs. 3			NS	NS	NS	NS

[z]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively

Table 9. Effect of liquid fertilizers on petiole boron.

Treatment	Fertilizer Source	P_2O_5 Rate	N Rate	Sampling Date 24-Jun	8-Jul	22-Jul	12-Sep
#		lb/A	lb/A	ppm B			
1	0 P control	0	240	67	88	81	53
2	conventional	120	240	67	82	84	52
3	ACLF w/ eNhance	32	195	81	100	106	55
4	conv. @ mid rate	32	195	69	90	107	54
5	ACLF NRG-N	32	145.4	81	90	81	60
6	ACLF NRG-N + Ca	32	145.4	80	102	102	59
7	conv. @ low rate	32	145.4	75	101	115	58
			Significance[z]	*	*	++	*
			LSD (0.1)	10	13	27	5
			Contrasts				
	0 P Control vs. Rest trmt 1 vs 2-7			*	NS	++	NS
	Linear N, Coventional trmt 2,4,7			NS	**	*	*
	Conventional vs. ACLF trmt 4,7 vs. 3,5			*	NS	++	NS
	Low rate vs. Mid rate 5,7 vs. 3,4			NS	NS	NS	*
	Conv. low rate vs ACLF+Ca low rate trmt 7 vs. 6			NS	NS	NS	NS
	Conv. low rate vs ACLF low rate trmt 7 vs. 5			NS	++	*	NS
	Conv. Low rate vs. ACLF low rates trmt 7 vs 5,6			NS	NS	*	NS
	Conv. Mid rate vs. ACLF mid rate trmt 4 vs. 3			*	NS	NS	NS

[z]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively

Table 10. Effect of liquid fertilizers on petiole zinc.

Treatment	Fertilizer Source	P_2O_5 Rate	N Rate	Sampling Date 24-Jun	8-Jul	22-Jul	12-Sep
#		lb/A	lb/A	ppm Zn			
1	0 P control	0	240	41	44	19	55
2	conventional	120	240	36	44	20	58
3	ACLF w/ eNhance	32	195	48	53	20	83
4	conv. @ mid rate	32	195	39	45	18	65
5	ACLF NRG-N	32	145.4	45	46	17	80
6	ACLF NRG-N + Ca	32	145.4	44	42	17	72
7	conv. @ low rate	32	145.4	40	62	18	81
		Significance[z]		NS	NS	NS	NS
		LSD (0.1)					
		Contrasts					
	0 P Control vs. Rest trmt 1 vs 2-7			NS	NS	NS	NS
	Linear N, Coventional trmt 2,4,7			NS	++	NS	NS
	Conventional vs. ACLF trmt 4,7 vs. 3,5			*	NS	NS	NS
	Low rate vs. Mid rate 5,7 vs. 3,4			NS	NS	NS	NS
	Conv. low rate vs ACLF+Ca low rate trmt 7 vs. 6			NS	++	NS	NS
	Conv. low rate vs ACLF low rate trmt 7 vs. 5			NS	NS	NS	NS
	Conv. Low rate vs. ACLF low rates trmt 7 vs 5,6			NS	*	NS	NS
	Conv. Mid rate vs. ACLF mid rate trmt 4 vs. 3			++	NS	NS	NS

Evaluation of Specialty Phosphorus Fertilizer Sources for Potato

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Summary: Field experiments were conducted at the Sand Plain Research Farm in Becker, Minn. to evaluate the effects of specialty P fertilizer formulations manufactured by Mosaic Co. on yield, quality, and P nutrition of Russet Burbank potato. Treatments included a zero P control and MAP, MES15, MESZ, ACTMAPA, and ACT62E fertilizers applied at 60 and 120 lb P_2O_5/A. There was also an MESZ + magnesium treatment at 60 lb P_2O_5/A. Total and marketable tuber yield; petiole, vine, and tuber P concentrations; tuber and vine dry matter accumulation; and tuber and vine P uptake were not affected by the application of conventional or specialty P fertilizers. This was in contrast to the P responses that did occur in the first year of the study in 2007. The absence of responses to specialty P fertilizers was probably due to the high soil test P level of 34 ppm at the site in 2008, compared with 19 ppm in 2007. Phosphorus application did affect tuber size. The zero P control had fewer small tubers and more large tubers than treatments receiving P. The control also had reduced tuber set compared with any other treatment, although the reduction was not statistically significant. These results are consistent with P effects on tuber size and set found in previous studies.

Background: One of the challenges associated with improving P use efficiency in plants is maintaining an available form of P following application of P fertilizer. Acid and high pH soil will tend to adsorb or precipitate soluble P. Use of elemental sulfur in the formulation has an acidifying effect and may help keep P in solution for a longer period of time, particularly on neutral to alkaline soils. Specialties fertilizers have recently been developed (US patent #6544313) that blend sulfur and zinc into a MAP-based product. MicroEssentials S15 (MES15) is a 13-33-0 product that contains 7.5% elemental S and 7.5% sulfate-S as ammonium sulfate. MicroEssentials SZ is a 12-40-0 product that contains 5% elemental S, 5% sulfate-S as ammonium sulfate, and 1% Zn as Zn oxide. The overall objective of this study was to determine potato response to specialty P products (MES15 and MESZ) manufactured by The Mosaic Company. Results from a field study with potatoes in 2007 showed yield increases with specialty P fertilizers compared with conventional sources. Other P specialty fertilizers, ACTMAPA and ACT62E, were also of interest. The overall objective of this study was to follow up on the 2007 study and determine the effects of several specialty P products on growth and yield of irrigated potato.

Materials and Methods

This study was conducted at the Sand Plain Research Farm in Becker, Minnesota on a Hubbard loamy sand soil. The previous crop was rye and selected soil chemical properties before planting were as follows (0-6"): pH, 6.4; organic matter, 1.4%; Bray P1, 34 ppm; ammonium acetate extractable K, Ca, and Mg, 73, 614, and 122 ppm, respectively; hot water extractable B, 0.2 ppm; Ca-phosphate extractable SO_4-S, 1.0 ppm; and DTPA extractable Zn, Cu, Fe, and Mn, 0.8, 0.5, 19.9, and 5.4 ppm, respectively.

Extractable nitrate-N and ammonium-N in the top 2 ft prior to planting were 7.8 and 19.3 lb/A, respectively.

Four, 20-ft rows were planted for each plot with the middle two rows used for sampling and harvest. Whole "B" Russet Burbank potato seed was hand planted in furrows on May 12, 2008. Row spacing was 12 inches within each row and 36 inches between rows. Each treatment was replicated 4 times in a randomized complete block design. Admire Pro was applied in-furrow for beetle control, along with the systemic fungicides Moncut 70DF and Ultra Flourish. Weeds, diseases, and other insects were controlled using standard practices. Rainfall was supplemented with sprinkler irrigation using the checkbook method of irrigation scheduling. Rainfall and irrigation amounts were recorded and are shown in Fig. 1.

The following twelve fertilizer treatments were tested:

1. Control (N, K & 15S; no P applied)
2. Uncoated MAP (11-52-0) + 15S - 60 lb P_2O_5/A
3. Uncoated MAP (11-52-0) + 15S - 120 lb P_2O_5/A
4. MicroEssentials S15 (MES15, 13-33-0, 15S) - 60 lb P_2O_5/A
5. MicroEssentials S15 (MES15, 13-33-0, 15S) - 120 lb P_2O_5/A
6. MicroEssentials SZ (MESZ, 12-40-0, 10S, 1Zn) - 60 lb P_2O_5/A
7. MicroEssentials SZ (MESZ, 12-40-0, 10S, 1Zn) - 120 lb P_2O_5/A
8. ACTMAPA – 11-52-0 - 60 lb P_2O_5/A
9. ACTMAPA – 11-52-0 -120 lb P_2O_5/A
10. ACT62E – 8-37-4-11S-1Zn-2Mg - 60 lb P_2O_5/A
11. ACT62E – 8-37-4-11S-1Zn-2Mg - 120 lb P_2O_5/A
12. MESZ + K-Mag - 60 lb P_2O_5/A

Treatments 1-7 were the same treatments used in last year's study. They included the specialty P fertilizer products MES15, containing elemental S and ammonium sulfate, and MESZ, containing elemental S, ammonium sulfate, and Zn. Treatments 8-12 were new and included the specialty P formulations ACTMAPA, derived from MAP, and ACT62E, which contains S, Zn, and Mg in addition to P. These four products are all manufactured by The Mosaic Company. They were tested at rates of 60 and 120 lb P_2O_5/A and compared with conventional MAP at the same rates, a zero P control, and an MESZ + Mg treatment applied at 60 lb P_2O_5/A.

Phosphorus fertilizer treatments were applied at planting in a band 3 inches to the side and 2 inches below the seed piece using a belt type applicator. Potassium was broadcast applied as 0-0-60 (potassium chloride) at a rate of 150 lbs K_2O/A before planting to all plots. An additional 150 lb K_2O/A was applied in the band at planting as either 0-0-60 or a combination of 0-0-60 and 0-0-50 (potassium sulfate) to equalize the S rate to all treatments at 55 lb S/A. This was the amount of S applied with the high rate of MES15. For Treatment 12, which received Mg, all of the Mg, part of the K, and part of the S were applied as 0-0-22-11Mg-22S (potassium-magnesium sulfate). Total N applied was 247 lb N/A. The rate of N applied at planting was adjusted with urea to be equivalent to the amount applied with the high rate of MES15 (47 lb N/A). Sidedress N applications were made with urea at the rate of 100 lb N/A at emergence on June 2 and two post-hilling applications as urea-ammonium nitrate at 50 lb N/A on June 26 and July 14. Plots were irrigated immediately after post-hilling N application to minimize volatilization.

Plant stands were measured on June 6 and the number of stems per plant was counted on June 23. Petiole samples were collected at early (July 8) and mid tuber bulking (July 22). Petioles were analyzed for nitrate-N, P, S, Mg, and Zn on a dry weight basis. Vines were harvested on Sept 22 from two, 10-ft sections of row, followed by mechanically beating the vines over the entire plot area. Tuber numbers in treatments 1-7 were measured by hand-digging five plants before machine harvest on September 29 and separating them into size categories before counting. Total tuber yield, graded yield, tuber specific gravity, and internal disorders were recorded at final harvest. Subsamples of vines and tubers were collected for moisture determination. Dried tissues were weighed and then ground to pass through a 1 mm screen. Phosphorus, N, S, Mg, and Zn concentrations in plant tissue were determined by AgVise laboratories. Phosphorus uptake was calculated by multiplying vine and tuber P concentrations by the amounts of tuber and vine dry matter.

Each treatment was replicated 4 times in a randomized complete block design giving a total of 48 plots for the study (4x12). The experiment was statistically analyzed using ANOVA procedures on SAS and means were separated using a Waller-Duncan LSD test at $P = 0.10$.

Results

Tuber yield: There were no significant differences in total or marketable yield between treatments, including the zero P control. The absence of a yield response to P or differences among P sources may have been due to high soil test P at this site (34 ppm). Differences did occur in 2007, but soil test P was lower (19 ppm). The control had significantly less small, unmarketable tubers than any other treatment, but a higher percentage of tubers greater than 10 oz in size. These size differences were similar to results in 2007.

Plant stand, stems and tubers per plant, and tuber quality: ACT62E at 120 lb P_2O_5/A had the lowest plant stand (Table 2). The same product at 60 lb P_2O_5/A had the highest stand. The two MAP and the two ACTMAPA treatments had significantly lower plant stands than ACT62E at 60 lb P_2O_5/A. There were no significant differences between treatments in number of stems or tubers per plant and tuber specific gravity. In 2007, an increase in tuber size for the control was associated with significantly lower tuber set than for all the treatments receiving P. This effect of P on tuber set and size has been found in other studies and in 2008 the control did have a numerically lower tuber set. There were some significant treatment differences in hollow heart incidence, but they were not consistently associated with differences in P source or rate

Petiole nutrient concentrations: Despite differences in P application rate, there were no significant differences in petiole P concentrations for either sampling date (Tables 3 and 4). As with tuber yield, the absence of differences was likely due to high soil test P at the site. There were also no significant differences in nitrate-N, K, S, or Mg concentrations in petioles on either date. Treatments receiving Zn (MESZ and ACT62E) tended to have elevated petiole Zn concentrations on the second sampling date, although the results were not completely consistent.

Tuber and vine nutrient concentrations: There were no significant differences in tuber or vine P concentrations (Table 5). As with tuber yield and petiole P, the absence of differences was likely due to high soil test P at the site. There were also no significant differences in N, K, S, Mg, or Zn concentrations in tubers or vines.

Tuber and vine dry matter accumulation and P uptake: There were no significant differences in tuber or vine dry matter accumulation and tuber or vine P uptake. As with yield and tissue P concentrations, the absence of P fertilizer responses was likely due to high soil test P at the site.

Conclusions: In the second year of this study, tuber yield, tissue P concentrations, tuber and vine dry matter accumulation, and tuber and vine P uptake were not affected by the application of specialty P fertilizers. This was probably due to a soil test P level of 34 ppm at the site, compared with 19 ppm in 2007 when responses to specialty P fertilizers did occur. Phosphorus application did affect tuber size. The zero P control had fewer small tubers and more large tubers than treatments receiving P. The control also had reduced tuber set compared with any other treatment, although the reduction was not statistically significant.

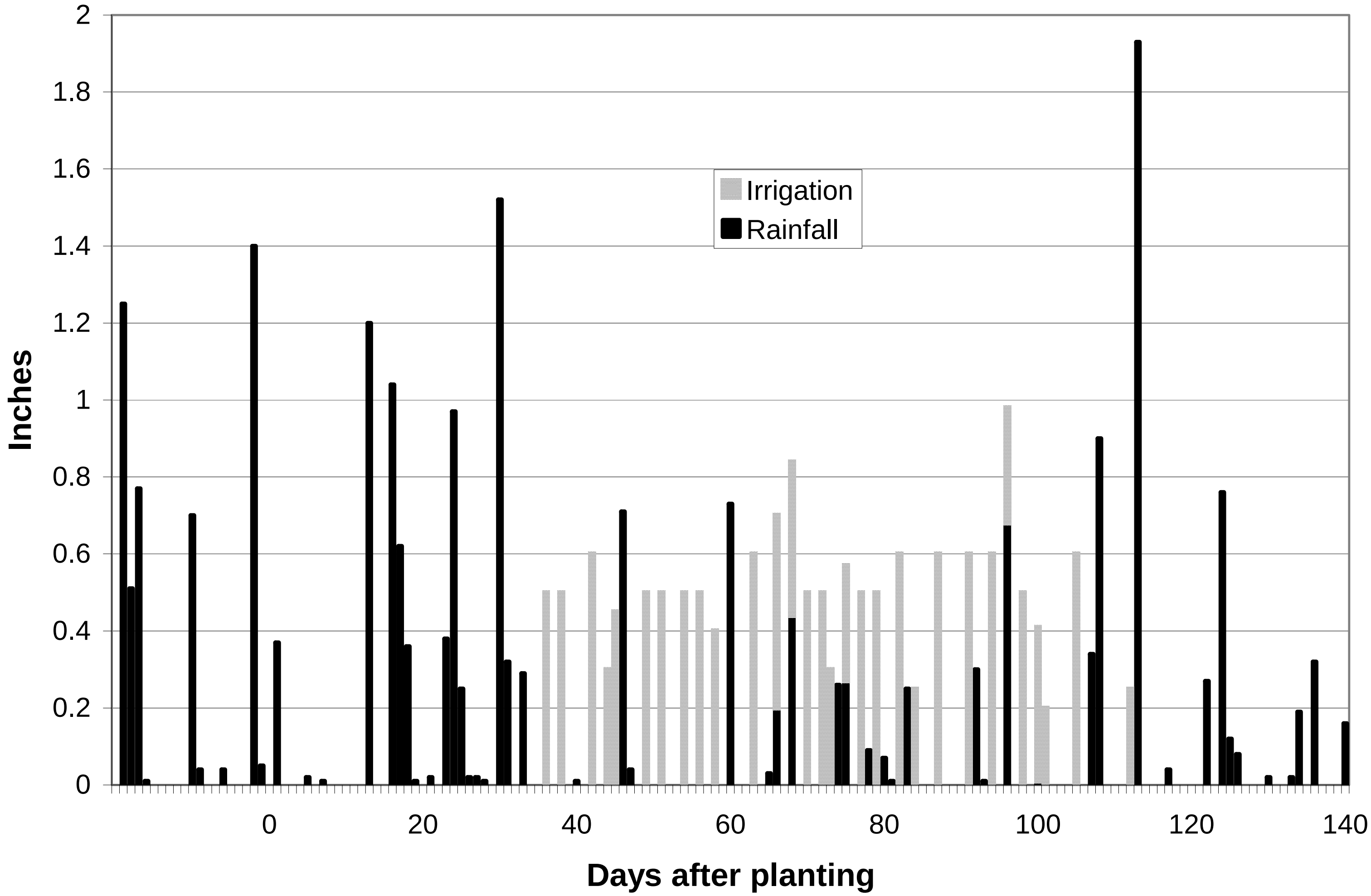

Figure 1. Rainfall and irrigation amounts during the 2008 growing season.

Table 1. Effects of specialty P fertilizers on tuber yield and size distribution of Russet Burbank potatoes.

Treatment #	P Source	P_2O_5 Rate lb/A	Tuber Yield 0-4 oz	4-6 oz	6-10 oz	10-14 oz	>14 oz	Total	#1 > 4 oz	# 2 > 4 oz	Total marketable	> 6oz %	> 10 oz %
			cwt/A										
1	Control	0	42.8	67.8	192.1	193.0	118.6	614.2	475.0	96.4	571.4	82.0	50.6
2	MAP	60	61.0	93.1	214.1	152.0	84.9	605.0	460.6	83.4	544.0	74.5	39.2
3	MAP	120	78.5	109.2	240.1	135.0	81.2	644.0	470.2	95.3	565.5	70.8	33.6
4	MES15	60	74.6	99.2	235.6	151.8	79.2	640.4	477.3	88.4	565.8	73.0	36.3
5	MES15	120	82.1	112.9	228.3	133.0	49.2	605.5	434.5	88.9	523.4	67.9	30.3
6	MESZ	60	63.5	111.9	224.3	160.2	90.4	650.5	491.7	95.3	587.0	73.0	38.5
7	MESZ	120	72.9	108.0	242.8	156.3	55.8	635.8	507.0	55.9	562.9	71.6	33.3
8	ACTMAPA	60	72.8	95.3	246.8	143.3	71.9	630.1	474.5	82.8	557.3	73.2	33.9
9	ACTMAPA	120	73.7	95.0	221.8	151.7	74.3	616.5	477.1	65.6	542.8	72.5	36.5
10	ACT62E	60	79.4	99.5	237.3	164.5	57.3	637.9	481.7	76.8	558.5	71.9	34.8
11	ACT62E	120	61.0	87.0	246.0	148.8	84.0	626.9	502.3	63.6	565.9	76.3	37.0
12	MESZ + KMAG	60	74.8	113.9	209.2	132.2	80.0	610.1	479.5	55.9	535.3	69.0	34.7
		Significance[1]	*	++	*	*	**	NS	NS	++	NS	**	**
		LSD (0.1)	18.8	30.4	33.2	33.5	26.7	---	---	35.6	---	5.9	7.7

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 2. Effects of specialty P fertilizers on plant stand, number of stems and tubers per plant, and tuber quality.

Treatment #	P Source	P_2O_5 Rate lb/A	Stand %	Stems per plant	Tubers per plant	SG	HH %
1	Control	0	97.2	3.4	10.8	1.0858	12.0
2	MAP	60	93.7	3.8	11.9	1.0873	6.0
3	MAP	120	93.1	3.4	14.1	1.0893	4.0
4	MES15	60	97.2	3.2	12.5	1.0860	3.0
5	MES15	120	97.2	3.3	12.5	1.0862	7.1
6	MESZ	60	97.2	3.6	11.9	1.0866	4.0
7	MESZ	120	97.9	3.4	14.1	1.0883	11.5
8	ACTMAPA	60	92.3	3.6	ND[1]	1.0855	6.0
9	ACTMAPA	120	92.3	3.4	ND	1.0873	2.9
10	ACT62E	60	99.3	3.5	ND	1.0867	8.0
11	ACT62E	120	88.9	3.7	ND	1.0866	4.1
12	MESZ + KMAG	60	97.2	3.8	ND	1.0842	9.0
		Significance[2]	**	NS	NS	NS	++
		LSD (0.1)	5.1	---	---	---	6.8

[1]ND = Not determined.

[2]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 3. Effects of specialty P fertilizers on petiole nutrient concentrations at early tuber bulking (July 8).

Treatment	P Source	P_2O_5 Rate	NO_3-N	P	K	S	Mg	Zn
			ppm	%	%	%	%	ppm
1	Control	0	18,989	0.37	7.65	0.20	0.65	49.8
2	MAP	60	18,129	0.35	8.58	0.22	0.67	37.8
3	MAP	120	14,177	0.38	8.48	0.22	0.61	37.8
4	MES15	60	15,152	0.38	8.50	0.22	0.57	43.5
5	MES15	120	14,413	0.42	8.45	0.23	0.62	42.3
6	MESZ	60	17,209	0.34	8.90	0.21	0.66	44.5
7	MESZ	120	17,283	0.37	8.90	0.22	0.69	42.8
8	ACTMAPA	60	18,792	0.35	9.13	0.22	0.66	39.3
9	ACTMAPA	120	17,158	0.46	8.88	0.24	0.66	51.5
10	ACT62E	60	16,565	0.39	8.45	0.22	0.59	40.5
11	ACT62E	120	15,124	0.40	8.53	0.20	0.73	47.3
12	MESZ + KMAG	60	17,205	0.36	8.63	0.22	0.66	39.5
		Significance[1]	NS	NS	NS	NS	NS	NS
		LSD (0.1)	--	--	--	--	--	--

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively

Table 4. Effects of specialty P fertilizers on petiole nutrient concentrations at mid tuber bulking (July 22).

Treatment	P Source	P_2O_5 Rate	NO_3-N	P	K	S	Mg	Zn
			ppm	%	%	%	%	ppm
1	Control	0	16,801	0.27	7.93	0.18	0.92	23.8
2	MAP	60	17,971	0.23	8.13	0.17	1.07	13.5
3	MAP	120	14,671	0.24	7.75	0.17	0.97	15.8
4	MES15	60	17,286	0.32	8.53	0.17	0.87	13.8
5	MES15	120	19,396	0.25	8.63	0.18	1.00	16.0
6	MESZ	60	17,397	0.28	8.20	0.18	0.98	27.0
7	MESZ	120	19,434	0.26	8.23	0.18	1.00	15.8
8	ACTMAPA	60	18,536	0.40	8.65	0.18	0.87	23.3
9	ACTMAPA	120	20,798	0.29	8.80	0.19	0.92	16.0
10	ACT62E	60	19,874	0.26	8.48	0.17	0.89	20.5
11	ACT62E	120	15,899	0.33	8.38	0.19	0.75	23.0
12	MESZ + KMAG	60	17,710	0.26	8.55	0.17	0.93	16.0
		Significance[1]	NS	NS	NS	NS	NS	*
		LSD (0.1)	--	--	--	--	--	7.7

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 5. Effects of specialty P fertilizers on tuber and vine nutrient concentrations.

Treatment #	P Source	P_2O_5 Rate lb/A	Elemental concentration									
			% P		%N		%S		%Mg		ppm Zn	
			Tubers	Vines	Tubers	Vines	Tubers	Vines	Tubers	Vines	Tubers	Vines
1	Control	0	0.22	0.09	1.23	1.08	0.12	0.15	0.10	0.77	12.5	83.8
2	MAP	60	0.22	0.09	1.15	1.23	0.12	0.16	0.10	0.80	11.5	72.5
3	MAP	120	0.22	0.09	1.15	1.08	0.12	0.15	0.10	0.82	11.0	64.0
4	MES15	60	0.21	0.09	1.20	1.10	0.12	0.14	0.10	0.73	12.0	75.5
5	MES15	120	0.22	0.10	1.15	1.25	0.11	0.16	0.10	0.78	11.8	68.0
6	MESZ	60	0.23	0.09	1.25	1.10	0.12	0.14	0.10	0.84	13.0	74.8
7	MESZ	120	0.24	0.08	1.33	1.18	0.13	0.13	0.10	0.87	13.5	77.8
8	ACTMAPA	60	0.23	0.10	1.18	1.25	0.13	0.14	0.10	0.78	12.3	60.0
9	ACTMAPA	120	0.23	0.12	1.20	1.45	0.13	0.16	0.10	0.78	12.8	77.5
10	ACT62E	60	0.24	0.09	1.23	1.15	0.14	0.17	0.11	0.79	13.5	88.0
11	ACT62E	120	0.24	0.09	1.13	1.18	0.13	0.15	0.10	0.67	13.0	75.8
12	MESZ + KMAG	60	0.24	0.09	1.55	1.33	0.13	0.14	0.10	0.69	12.8	70.3
Significance[1]			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
LSD (0.1)			--	--	--	--	--	--	--	--	--	--

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 6. Effects of specialty P fertilizers on tuber and vine dry matter accumulation.

Treatment #	P Source	P_2O_5 Rate lb/A	Dry Matter lbs. / A			P Uptake lbs. / A		
			Tubers	Vines	Total	Tubers	Vines	Total
1	Control	0	13,932	2,357	16,289	31.1	2.1	33.2
2	MAP	60	13,950	2,471	16,421	29.9	2.3	32.2
3	MAP	120	15,326	2,361	17,687	33.9	2.2	36.1
4	MES15	60	14,764	2,652	17,417	31.2	2.3	33.5
5	MES15	120	13,943	2,711	16,654	30.2	2.8	33.0
6	MESZ	60	14,318	2,332	16,650	32.1	2.0	34.1
7	MESZ	120	14,264	2,894	17,158	33.7	2.2	35.9
8	ACTMAPA	60	13,808	2,814	16,622	31.3	2.7	34.0
9	ACTMAPA	120	14,295	2,903	17,199	33.2	3.3	36.6
10	ACT62E	60	13,848	2,341	16,189	33.4	2.0	35.4
11	ACT62E	120	14,806	2,960	17,766	36.0	2.6	38.5
12	MESZ + KMAG	60	13,215	2,601	15,816	31.1	2.4	33.5
Significance[1]			NS	NS	NS	NS	NS	NS
LSD (0.1)			--	--	--	--	--	--

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Red Norland and Russet Norkotah Response to Nitrogen Source, Timing, and Rate

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Summary: A field experiment was conducted at the Sand Plain Research Farm in Becker, Minn. to evaluate the effects of nitrogen source, timing, and rate on yield and quality of Red Norland and Russet Norkotah potato. For each variety, seven N treatments were evaluated, which included a zero N control. Two of the seven treatments were conventional N sources with the following N rates (lb/A): 160 and 220 for Red Norland and 180 and 240 for Russet Norkotah. Four of the seven treatments were ESN: 160 and 220 lb N/A preplant and 160 and 220 lb N/A banded at planting for Red Norland and 180 and 240 lb N/A preplant and 180 and 240 lb N/A banded at planting for Russet Norkotah. A starter N rate of 40 lb N/A as diammonium phosphate was included in the total N rate applied. Release of N from ESN tended to be 20-30 days faster than that recorded in previous years, suggesting that the coating was either different or perhaps damaged. For Norland, total yields increased with increasing N rate with the highest yield at 220 lb N/A. Tuber size distribution was dramatically affected by source with ESN producing more, but smaller (less than 2¼") sized tubers. At equivalent N rates, there were no significant differences in total yield between urea and ESN. Yield of Norkotah increased with N compared with the control, but effects at higher N rates depended on N source. For urea and planting applied ESN, yield with 180 lb N/A was similar to yield with 240 lb N/A. For preplant ESN, yields with 240 lb N/A were greater than those with 180 lbs N/A. In contrast to Norland, Norkotah yields with ESN were greater than those with urea regardless of N rate. Because of the faster N release from ESN in 2008, further research is necessary to determine if this release rate is consistent over years.

Previous studies with ESN have focused on late maturing processing cultivars. Preliminary ESN demonstrations have shown some promise with early and mid season maturing cultivars such as 'Red Norland' and 'Russet Norkotah' if the application is applied at planting or earlier. As with late maturing cultivars, the advantage of using ESN is that multiple N fertilizer applications can be reduced or eliminated. In addition, the potential for N losses with early season rainfall may be minimized. The overall objective of this study is to evaluate the effects of ESN applications on yield and quality of Red Norland and Russet Norkotah potato.

Materials and Methods

This study was conducted at the Sand Plain Research Farm in Becker, Minnesota on a Hubbard loamy sand soil. The previous crop was rye, followed by a mustard green manure that was plowed down in the fall of 2007. Selected soil chemical properties before planting in the plot area planted to Red Norland were as follows (0-6"): pH, 6.2; organic matter, 1.9%; Bray P1, 37 ppm; ammonium acetate extractable K, Ca, and Mg, 120, 697, and 114 ppm, respectively; hot water extractable B, 0.2 ppm; Ca-phosphate extractable SO_4-S, 1.0 ppm; and DTPA extractable Zn, Cu, Fe, and Mn, 1.2, 0.4, 29.8, and 9.8 ppm, respectively. Extractable nitrate-N and ammonium-N in the top 2 ft prior to planting were 23.6 and 13.6 lb/A, respectively.

Selected soil chemical properties before planting in the Russet Norkotah plot area were as follows (0-6"): pH, 6.3; organic matter, 2.1%; Bray P1, 37 ppm; ammonium acetate extractable K, Ca, and Mg, 117, 753, and 130 ppm, respectively; hot water extractable B, 0.2 ppm; Ca-phosphate extractable SO_4-S, 1.0 ppm; and DTPA extractable Zn, Cu, Fe, and Mn, 1.2, 0.6, 30.2, and 9.5

ppm, respectively. Extractable nitrate-N and ammonium-N in the top 2 ft prior to planting were 19.5 and 23.6 lb/A, respectively.

Four, 20-ft rows were planted for each plot with the middle two rows used for sampling and harvest. Cut "A" Russet Norkotah seed and "B" Red Norland seed were hand planted in furrows on April 23, 2008. Row spacing was 12 inches within each row and 36 inches between rows. The two cultivars were planted as separate experiments and each treatment was replicated four times for each cultivar in a randomized complete block design. Admire Pro was applied in-furrow for beetle control. Weeds, diseases, and other insects were controlled using standard practices. Rainfall was supplemented with sprinkler irrigation using the checkbook method of irrigation scheduling.

Each cultivar was subjected to seven N treatments with different N sources, rates, and application timing as described in Tables 1 and 2. Comparisons among N sources and application timing were the same for the two cultivars, but total N rates were 0, 160, and 220 lb N/A for Red Norland and 0, 180, and 240 lb N/A for Russet Norkotah.

Table 1. Nitrogen fertilizer treatments for Red Norland.

Treatment	**Preplant**	**Planting**	**Emergence**	**Posthilling**	**Total**
	---------------------------N sources* and rates (lb N/A) -----------------------				
1	0	0	0	0	0
2	0	40 D	90 U	30 UAN	160
3	0	40 D	120 U	60 UAN	220
4	120 E	40 D	0	0	160
5	180 E	40 D	0	0	220
6	0	40 D + 120 E	0	0	160
7	0	40 D + 180 E	0	0	220

*E = ESN, D = diammonium phosphate (DAP), U = urea, UAN = a combination of granular urea and ammonium nitrate.

Table 2. Nitrogen fertilizer treatments for Russet Norkotah.

Treatment	**Preplant**	**Planting**	**Emergence**	**Post-hilling**	**Total**
	---------------------------N sources* and rates (lb N/A) -----------------------				
1	0	0	0	0	0
2	0	40 D	90 U	50 UAN	180
3	0	40 D	120 U	80 UAN	240
4	140 E	40 D	0	0	180
5	200 E	40 D	0	0	240
6	0	40 D + 140 E	0	0	180
7	0	40 D + 200 E	0	0	240

*E = ESN, D = diammonium phosphate (DAP), U = urea, UAN = a combination of granular urea and ammonium nitrate.

Preplant ESN fertilizer was applied the day before planting on April 22 and disked in. Nitrogen applications at planting were banded 3 inches to each side and 2 inches below the seed piece using a belt type applicator. For all treatments, banded fertilizer at planting included 100 lb P_2O_5/A as diammonium phosphate or triple superphosphate (for the 0 N control), 200 lb K_2O/A as potassium chloride and potassium magnesium sulfate, 30 lb Mg/A and 55 lb S/A as potassium magnesium sulfate, 2 lb Zn/A as zinc oxide, and 0.5 lb B/A as boric acid. Emergence N applications were supplied as urea and mechanically incorporated. Post-hilling N was applied by hand as 50% granular urea and 50% ammonium nitrate, which was watered-in with overhead irrigation to simulate fertigation with a 28% UAN solution. For both cultivars, emergence fertilizer was applied on May 28 and post-hilling N was applied on June 13.

Plant stands were measured on June 2 and the number of stems per plant was counted on June 18. Petiole samples were collected from the 4th leaf from the terminal on four dates: June 18, July 2, and July 14 for Red Norland and June 24, July 8, and July 22 for Russet Norkotah. Petioles were analyzed for nitrate-N on a dry weight basis. Vines were harvested from two, 10-ft sections of row on July 28 for Red Norland (96 days after planting) and Aug. 6 for Russet Norkotah (105 days after planting), followed by mechanically beating the vines over the entire plot area. Plots were machine harvested on Aug. 18 for Red Norland and Aug. 26 for Russet Norkotah and total tuber yield and graded yield were measured. Sub-samples of vines and tubers were collected to determine moisture percentage and N concentrations, which were then used to calculate N uptake and distribution within the plant. Nitrogen uptake results were not available at the time of this report. Tuber sub-samples were also used to determine tuber specific gravity and the incidence of hollow heart and brown center.

A WatchDog weather station from Spectrum Technologies was used to monitor rainfall, air temperature, and soil temperature at the fertilizer band depth. Measured amounts of ESN fertilizer were placed in plastic mesh bags, buried at the depth of fertilizer placement when both the preplant and planting applications were made, and removed at regular intervals to track N release over time. Soil samples from the 0-1 ft depth were collected after harvest on Sept 3 for Red Norland and Sept 4 for Russet Norkotah to measure residual inorganic N levels. Each sample consisted of six soil cores that were composited, air dried, extracted with 2 N KCl, and analyzed for nitrate-N and ammonium-N. Soil sample results were not available at the time of this report.

RESULTS

Weather

Rainfall and irrigation for the 2008 growing season are provided in Figure 1. From April 20 to Aug. 26, approximately 17.3 inches of rainfall was supplemented with 10.7 inches of irrigation. In general, there were many small leaching events early in the season. Leaching events (greater than 1 inch of water) occurred at 10, 26, 37, and 43 days after planting. Air temperature measurements and soil temperature and moisture measurements at the fertilizer band depth (10 inches below the top of the hill) are provided in Figure 2.

Nitrogen Release from ESN

Figures 3 and 4 show release of N from ESN applied preplant and at emergence for the Norland and Norkotah plots respectively. The shape of the cures was similar for both plots. Release of N from ESN tended to be faster than that recorded in previous years. In 2007, approximately 90% of N was released by 80 days after planting for preplanted fertilizer and by 90 days after planting for ESN applied at planting and emergence. In 2008, 90% has been released by 50 days after planting for the preplant application and by about 60 days for the emergence application. Given the apparent need for early season N for these potato varieties, the shorter release time may have been advantageous. It is unclear why release rates were faster in 2008 as soil temperatures were actually cooler early in the season than in 2007.

Stand Count and Stems per Plant

The stand of both Norland and Norkotah crops ranged from 97 to 100% and was not affected by treatment (Table 3 and 4). For Norland, stem number per plant ranged for 4.0 to 5.5 while for Norkotah, stem number per plant ranged from 2.8 to 3.4. The higher stems per plant for Norland were likely due to the use of "B" seed as compared with cut "A" seed for Norkotah. Nitrogen treatments did not significantly affect stem number, although the control treatment had numerically the lowest stem number per plant for both varieties.

Tuber Yield and Size Distribution

The effects of N application rate, source, and timing on tuber yield and size distribution for both varieties are shown in Tables 5 and 6. For Norland (Table 5), total yields increased with increasing N rate with the highest yield at 220 lb N/A. Tuber size distribution was dramatically affected by source with ESN producing more, but smaller (less than 2¼") sized tubers. At equivalent N rates, there were no significant differences between urea and ESN. At the 220 lb N/A rate, prelant urea tended to result in higher yields than ESN applied at planting, but the opposite was found at the 160 lb N/A rate. Yield of Norkotah increased with N compared with the control, but effects at higher N rates depended on N source (Table 6). For urea and planting applied ESN, yield with 180 lb N/A was similar to yield with 240 lb N/A. For preplant ESN, yields with 240 lb N/A were greater than those with 180 lb N/A. In contrast to Norland, Norkotah yields with ESN were greater than those with urea regardless of N rate. ESN resulted in smaller tubers at the 180 lb N/A rate, but N source had no effect on tuber size at the 240 lb N/A rate.

Tuber Quality

Tables 7 and 8 show the effects of N application source, timing, and rate on tuber quality. For Norland (Table 7), Incidence of hollow heart was low and occurred in tubers from plants in the control plots. Scab incidence was very high in the plot but was not affected by N treatments. Red color was not consistently affected by N treatment. The best red color was found with in tubers receiving preplant ESN. Poorest color was in tubers from plants grown in the control plots and those receiving 220 lb N/A ESN at planting. For Norkotah (Table 8), specific gravity tended to be highest with the 180 lb N/A rate with N source having inconsistent effects. Hollow heart ewas generally low with no differences due to N treatment.

<u>Petiole Nitrate-N Concentrations</u>

Nitrogen rate, source, and timing comparisons

Petiole NO_3-N concentrations on three dates as affected by N source, timing, and rate are presented in Table 9 for Norland and Table 10 for Norkotah. As expected, petiole NO_3-N increased with increasing N rate for both varieties and decreased as the season progressed. Within equivalent N rates, ESN applied at planting resulted in higher petiole nitrate than ESN applied preplant. Differences between petiole nitrate with urea and ESN depended on variety. For Norkotah, petiole nitrate with urea was intermediate between the two ESN timings. For Norland, petiole nitrate was generally higher with urea.

CONCLUSIONS

Release of N from ESN was 20-30 days faster than that recorded in previous years, suggesting that the coating was either different or perhaps damaged. For Norland, total yields increased with increasing N rate with the highest yield at 220 lb N/A. Tuber size distribution was dramatically affected by source with ESN producing more, but smaller (less than 2¼”) sized tubers. At equivalent N rates, there were no significant differences in total yield between urea and ESN. Yield of Norkotah increased with N compared with the control, but effects at higher N rates depended on N source. For urea and planting applied ESN, yield with 180 lb N/A was similar to yield with 240 lb N/A. For preplant ESN, yields with 240 lb N/A were greater than those with 180 lb N/A. In contrast to Norland, Norkotah yields with ESN were greater than those with urea regardless of N rate. Because of the faster N release from ESN in 2008, further research is necessary to determine if this release rate is consistent over years.

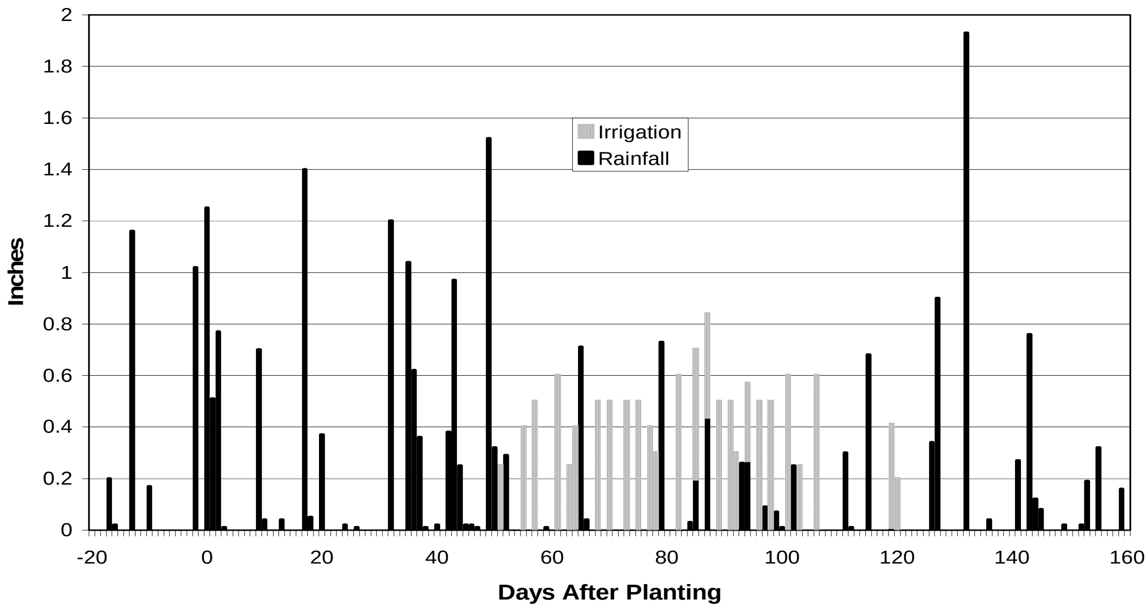

Figure 1. Rainfall and irrigation over the 2008 growing season.

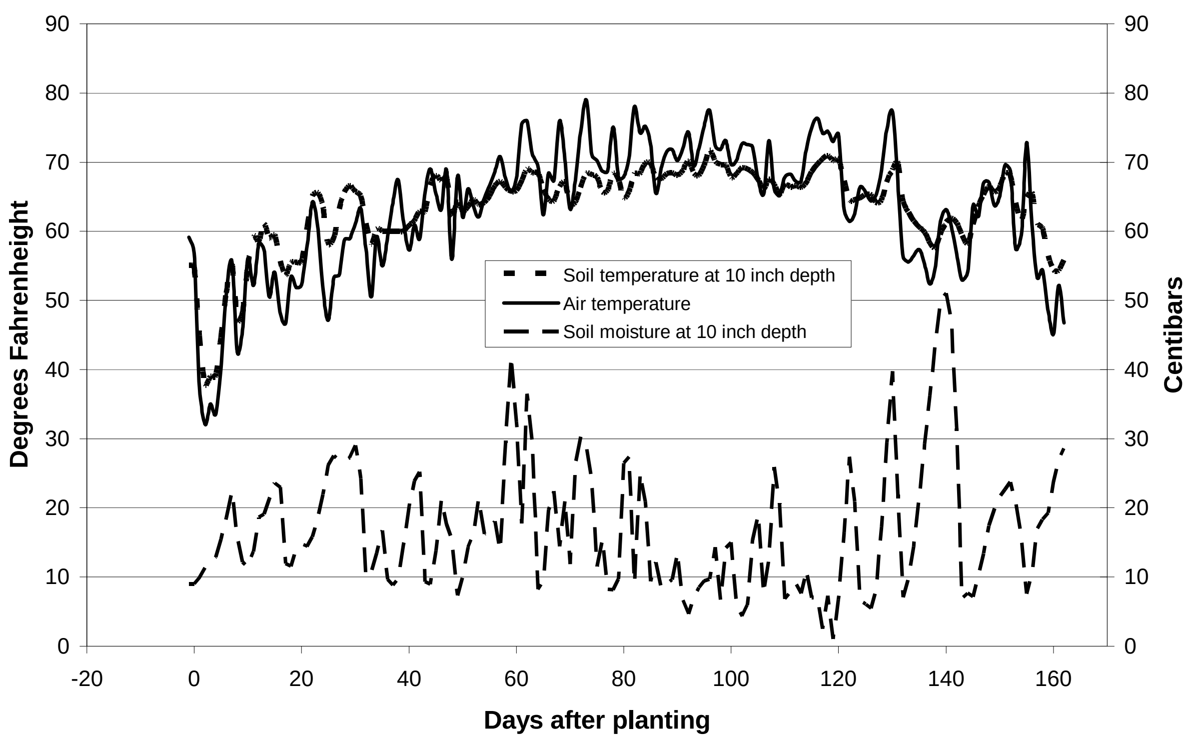

Figure 2. Average daily air and soil temperature and moisture at 10 inch depth below the top of the hill over the growing season.

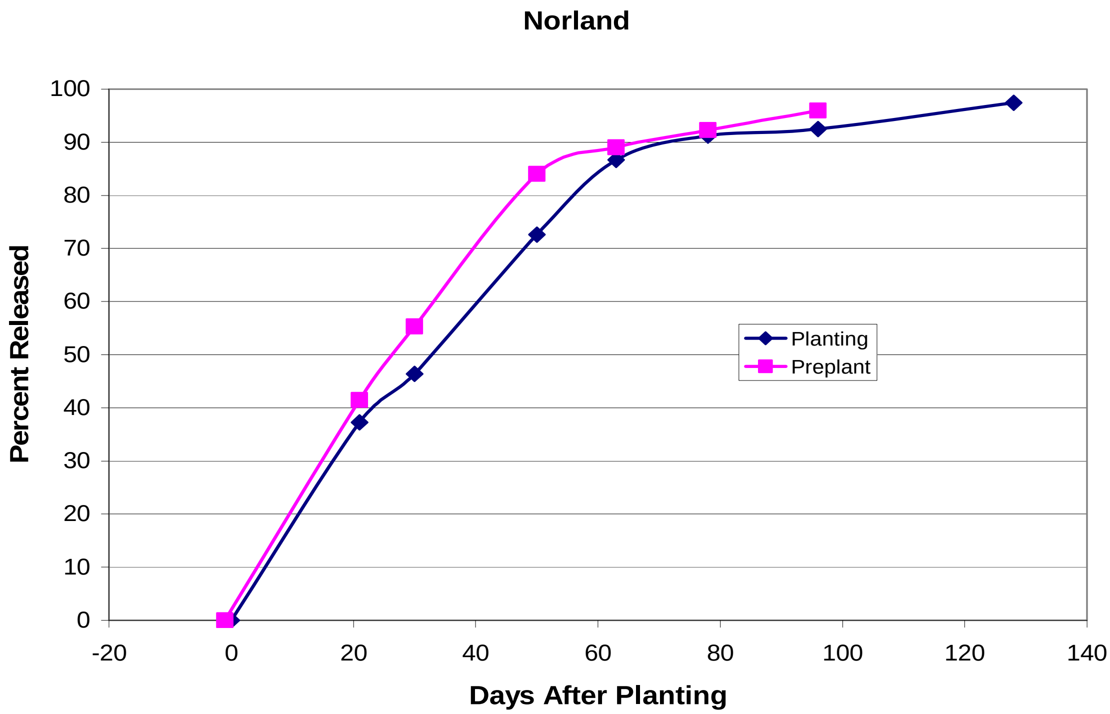

Figure 3. N released from ESN applied preplant and at planting for Norland potato in 2008.

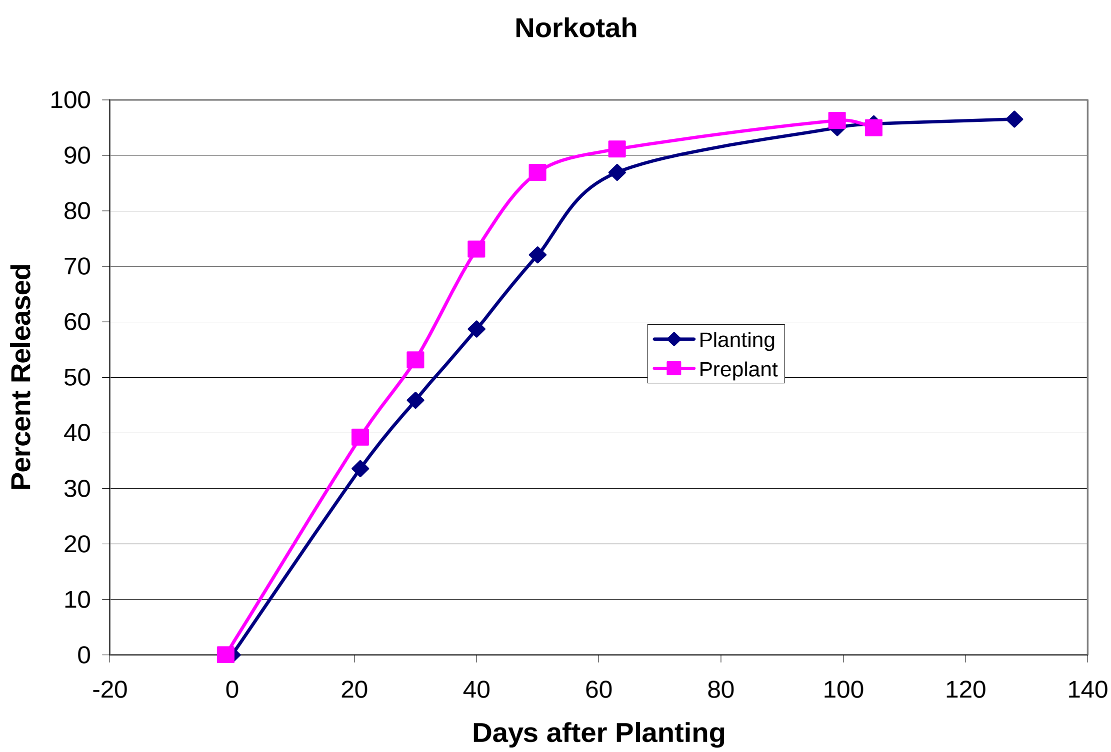

Figure 4. N released from ESN applied preplant and at planting for Norkotah potato in 2008.

Table 3. Effect of N source, timing, and rate on Norland stand and number of stems per plant.

Treatment #	N Source	Rate lb N/A	Stand %	Number of Stems per plant
1	Control	0	99.3	4.0
2	Urea	160	100.0	4.7
3	Urea	220	99.3	5.0
4	ESN	160 pre	100.0	4.6
5	ESN	220 pre	98.6	5.5
6	ESN	160 plt	99.3	4.9
7	ESN	220 plt	99.3	5.1
		Significance[1]	NS	NS
		LSD (0.1)		

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 4. Effect of N source, timing, and rate on Norkotah stand and number of stems per plant.

Treatment #	N Source	Rate lb N/A	Stand %	Number of Stems per plant
1	Control	0	99.3	2.8
2	Urea	180	97.2	3.0
3	Urea	240	99.3	2.9
4	ESN	180 pre	100.0	3.4
5	ESN	240 pre	99.3	3.4
6	ESN	180 plt	99.3	3.4
7	ESN	240 plt	98.6	3.2
		Significance[1]	NS	NS
		LSD (0.1)		

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 5. Effect of N source, timing, and rate on Norland tuber yield and size distribution.

Treatment #	N Source	Rate lb N/A	Tuber Yield < 1.75"	1.75-2.25"	2.25-3.00"	> 3.00"	Total
			---------- cwt/A				----------
1	Control	0	17.0	117.5	62.5	0.4	197.4
2	Urea	160	14.8	147.9	310.8	1.2	474.7
3	Urea	220	13.2	120.2	386.1	1.3	520.8
4	ESN	160 pre	24.1	243.9	200.7	0.0	468.7
5	ESN	220 pre	26.8	242.6	257.9	0.0	527.4
6	ESN	160 plt	12.6	165.5	308.1	0.6	486.8
7	ESN	220 plt	12.0	154.5	331.7	1.5	499.7
		Significance[1]	**	**	**	NS	**
		LSD (0.1)	5.8	32.0	34.9		32.4

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 6. Effect of N source, timing and rate on Norkotah tuber yield and size distribution.

Treatment #	N Source	Rate lb N/A	Tuber Yield 0-3oz	3-6oz	6-10 oz	10-12oz	12-14oz	>14oz	Total	#1 > 3oz	# 2 >3oz	Total marketable	> 6oz %	> 10 oz %
			---------- cwt/A									----------		
1	Control	0	46.3	137.2	69.4	6.0	1.4	0.0	260.3	212.4	1.6	214.0	29.4	2.8
2	Urea	180	56.6	162.8	196.3	49.9	20.4	8.2	494.2	432.8	4.9	437.6	55.7	16.0
3	Urea	240	59.5	177.1	189.9	41.0	14.8	5.5	487.7	425.3	2.9	428.3	51.8	12.9
4	ESN	180 pre	68.2	229.1	209.0	27.5	16.7	0.9	551.2	481.1	2.0	483.1	46.0	8.1
5	ESN	240 pre	69.9	199.0	232.7	44.7	22.4	10.3	578.9	506.3	2.7	509.0	53.4	13.2
6	ESN	180 plt	73.6	216.7	197.3	39.7	18.7	3.8	549.8	473.6	2.5	476.1	47.2	11.2
7	ESN	240 plt	49.9	169.6	194.0	54.9	32.1	23.2	523.7	470.8	2.9	473.7	58.2	21.2
		Significance[2]	**	**	**	**	*	**	**	**	NS	**	**	**
		LSD (0.1)	14.2	22.8	20.2	19.1	16.7	8.3	25.4	25.8		24.7	6.5	6.7

[2]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively

Table 7. Effect of N source, timing, and rate on Norland tuber quality.

Treatment #	Source	Rate lb N/A	Visual red[2]	Scab %	HH %
1	Control	0	2.6	67.2	1.6
2	Urea	160	2.8	70.1	0.0
3	Urea	220	2.8	48.8	0.0
4	ESN	160 pre	3.0	27.3	0.0
5	ESN	220 pre	3.0	46.5	0.0
6	ESN	160 plt	2.8	63.3	0.0
7	ESN	220 plt	2.6	49.9	0.0
		Significance[1]	**	NS	*
		LSD (0.1)	0.3		1.1

[1]NS= Non significant; ++, *, ** = Significant at 10%, 5% and 1% respectively.
[2]Visual red color rating: 1(pale red/pink) to 5 (dark red).

Table 8. Effect of N source, timing, and rate on Norkotah tuber quality.

Treatment #	N Source	Rate lb N/A	Specific gravity	HH %
1	Control	0	1.0728	0.0
2	Urea	180	1.0772	1.7
3	Urea	240	1.0715	4.2
4	ESN	180 pre	1.0758	0.0
5	ESN	240 pre	1.0739	0.0
6	ESN	180 plt	1.0735	0.0
7	ESN	240 plt	1.0705	0.8
		Significance[1]	*	NS
		LSD (0.1)	0.0043	

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 9. Effect of N source, timing, and rate on Norland petiole nitrate-N.

Treatment #	N Source	Rate lb N/A	Petiole Nitrate-N		
			18-Jun	2-Jul	14-Jul
			---------------- ppm ------------------		
1	Control	0	367	238	103
2	Urea	160	13686	6493	1604
3	Urea	220	17845	16211	7580
4	ESN	160 pre	9089	3564	538
5	ESN	220 pre	16656	6432	3384
6	ESN	160 plt	13184	9526	1496
7	ESN	220 plt	16921	14681	5283
		Significance[1]	**	**	**
		LSD (0.1)	1987	2402	2072

[1]NS = Non significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 10. Effect of N source, timing, and rate on Norkotah petiole nitrate-N.

Treatment #	N Source	Rate lb N/A	Petiole Nitrate-N		
			24-Jun	8-Jul	22-Jul
			------------------ ppm ------------------		
1	Control	0	2447	489	187
2	Urea	180	18755	10833	2247
3	Urea	240	19440	14282	6676
4	ESN	180 pre	16543	8260	2062
5	ESN	240 pre	19546	12582	6069
6	ESN	180 plt	18455	9584	3108
7	ESN	240 plt	19293	15869	10278
		Significance[1]	**	**	**
		LSD (0.1)	1959	2008	2309

Response of Processing Potato Varieties to Nitrogen and Enhanced Efficiency Fertilizers

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Summary: A field experiment was conducted at the Sand Plain Research Farm in Becker, Minn. to evaluate the effects of nitrogen rate, source and timing on yield and quality of four processing potato varieties/selections: Russet Burbank, Umatilla, Premier, and AOND95249-1Rus, a selection from NDSU potato breeding program. Ten N treatments were evaluated. Six of the ten treatments were conventional N sources with the following N rates (lb/A): 30, 120, 180, 240 (early), 240 (late) and 300. Four of the ten treatments were ESN: 180 and 240 lb N/A preplant and 180 and 240 lb N/A at emergence. A starter N rate of 30 lb N/A as monoammonium phosphate was included in the total N rate applied. Release of N from ESN tended to be 20-30 days faster than that recorded in previous years, suggesting that the coating was either different or perhaps damaged. In general, marketable and total yields of all varieties increased with increasing N rate with optimum yield between 180 and 240 lb N/A depending on timing and source. For conventional N at the 240 lb N/A rate more up front N was optimum for Russet Burbank, Premier, and AOND95249-1Rus, while late season N was optimum for Umatilla. Yields with ESN applied preplant were generally higher than ESN applied at emergence. Russet Burbank and Premier tended to be the highest yielding varieties followed by AOND95249-1Rus and then Umatilla. Premier, AOND95249-1Rus, and Umatilla all had fewer misshaped potatoes than Russet Burbank with AOND95249-1Rus having the fewest #2 potatoes. Tubers greater than 6 and 10 oz were highest for AOND95249-1Rus and lowest for Umatilla. Hollow heart incidence was highest in Russet Burbank followed by Premier, AOND95249-1Rus and then Umatilla. Specific gravity was highest in AOND95249-1Rus followed by Premier, Umatilla and then Russet Burbank. Chip color was darkest for Russet Burbank. Stem and bud end glucose concentrations were highest for Russet Burbank followed by Umatilla, Premier, and then AOND95249-1Rus.

Studies with ESN, a controlled release N fertilizer, have been conducted for the past four years using only 'Russet Burbank' as the test cultivar. The main findings have shown that the fertilizer can be used as a substitute for many split applications of UAN with fertigation. There is strong interest in evaluating new cultivars such as 'Umatilla', 'Preimer' from the northwest breeding program and a new selection, AOND95249-1Rus, from the NDSU breeding program that produce better quality potatoes. Specific advantages of the new cultivars/selection include better tuber uniformity and less susceptibility to sugar ends. The best results with ESN indicate an early sidedress application provides the best yield and quality. However, there is interest in using ESN as a preplant fertilizer. In previous studies, use of ESN shows the greatest advantage of reducing nitrate leaching when excessive rainfall occurs in May and June. Because the release characteristics of ESN can affect tuber set and bulking of potatoes, evaluation this new technology is essential for adoption. The use of newer cultivars in combination with newer cost effective urea coated fertilizer technology has the potential to greatly improve N use efficiency in potato and reduce nitrate losses. Research over different growing seasons is needed to evaluate the N response and use efficiency characteristics of new cultivars in comparison with Russet Burbank, as well as to estimate an N budget (inputs vs. outputs). These data will be useful for growers to more efficiently manage N for these cultivars.

The overall goal of this research is to optimize N fertilizer management for new processing potato cultivars under Minnesota growing conditions. Specific objectives include: a) Determine the effect of N rate and source on tuber yield and quality of new cultivars/selections potato cultivars and b) Evaluate the effectiveness of a cost-effective coated urea product on tuber yield and quality of the potato cultivars/selections. This is the first year of a three year study.

Materials and Methods

This study was conducted at the Sand Plain Research Farm in Becker, Minnesota on a Hubbard loamy sand soil. . The previous crop was rye, followed by a mustard green manure that was plowed down in the fall of 2007. Selected soil chemical properties before planting were as follows (0-6"): pH, 6.4; organic matter, 2.0%; Bray P1, 33 ppm; ammonium acetate extractable K, Ca, and Mg, 124, 766, and 143 ppm, respectively; hot water extractable B, 0.2 ppm; Ca-phosphate extractable SO_4-S, 1.5 ppm; and DTPA extractable Zn, Cu, Fe, and Mn, 1.2, 0.5, 23.2, and 5.9 ppm, respectively. Extractable nitrate-N and ammonium-N in the top 2 ft of soil were 17.8 and 16.8 lb/A, respectively.

Four, 23-ft rows were planted for each plot with the middle two rows used for sampling and harvest. Cut "A" Russet Burbank, Umatilla, Premier, and AOND95249-1Rus seed were hand planted in furrows on May 8, 2008. The Umatilla, Premier, and AOND95249-1Rus seed were treated with NuBark, while the Russet Burbank seed was untreated. Row spacing was 12 inches within each row and 36 inches between rows. Each treatment was replicated four times for each variety in a randomized complete block design. Admire Pro was applied in-furrow for beetle control, along with the systemic fungicides Moncut 70DF and Ultra Flourish. Weeds, diseases, and other insects were controlled using standard practices. Rainfall was supplemented with sprinkler irrigation using the checkbook method of irrigation scheduling.

Each cultivar was subjected to 10 N treatments with different N sources, rates, and application timing as described in Table 1 below. A complete factorial arrangement was used with cultivar and N treatment as main effects.

Preplant ESN fertilizer was applied 9 days before planting on April 28 and disked in. The 30-lb N/A application at planting as MAP was banded 3 inches to each side and 2 inches below the seed piece using a belt type applicator. For all treatments, banded fertilizer at planting included 130 lb P_2O_5/A as monommonium phosphate or triple superphosphate (for the 0 N control), 180 lb K_2O/A as potassium chloride and potassium magnesium sulfate, and 20 lb Mg/A and 45 lb S/A as potassium magnesium sulfate. Emergence N applications were supplied as urea and mechanically incorporated during hilling. Post-hilling N was applied by hand as 50% granular urea-N and 50% ammonium nitrate-N, which was watered-in with overhead irrigation to simulate fertigation with a 28% UAN solution. Emergence fertilizer was applied on May 21 and post-hilling N was applied on June 13, June 23, July 7, and July 21.

A WatchDog weather station from Spectrum Technologies was used to monitor rainfall, air temperature, and soil temperature at the fertilizer band depth. Measured amounts of ESN fertilizer were placed in plastic mesh bags, buried at the depth of fertilizer placement both at the time of preplant application and at emergence, and removed at regular intervals to track N release over time. Plant stands were measured on June 19 and the number of stems per plant was counted on June 24. Tuber set was measured June 30 (for 3 blocks) and July 1 (for the 4th

block). Petiole samples were collected from the 4th leaf from the terminal on three dates: June 25, July 9, and July 29. Petioles were analyzed for nitrate-N on a dry weight basis.

Table 1. Nitrogen treatments tested on processing potato varieties.

Treatment	Preplant	Planting	Emergence	Post-hilling**	Total
	------------------------ N sources* and rates (lb N/A) ------------------------				
1	0	0	0	0	0
2	0	30 MAP	50 Urea	10 UAN x 4	120
3	0	30 MAP	70 Urea	15 UAN x 4	180
4	0	30 MAP	90 Urea	30 UAN x 4	240
5	0	30 MAP	50 Urea	40 UAN x 4	240
6	0	30 MAP	90 Urea	45 UAN x 4	300
7	150 ESN	30 MAP	0	0	180
8	210 ESN	30 MAP	0	0	240
9	0	30 MAP	140 ESN	0	180
10	0	30 MAP	200 ESN	0	240

*ESN = Environmentally Smart Nitrogen (44-0-0), MAP = monoammonium phosphate urea = 46-0-0, UAN = a combination of granular urea and ammonium nitrate.
**Post-hilling N was applied 4 times at 10-14 day intervals.

Vines were harvested on Sept 24 (from 3 blocks) and Sept 26 (from the 4th block) from two, 10-ft sections of row, followed by mechanically beating the vines over the entire plot area. Plots were machine harvested on Sept 30 and total tuber yield and graded yield were measured. Sub-samples of vines and tubers were collected to determine moisture percentage and N concentrations, which were then used to calculate N uptake and distribution within the plant (Note: all the data for N uptake were not available at the time of this report and therefore will be presented at a later time). Tuber sub-samples were also used to determine tuber specific gravity and the incidence of hollow heart and brown center. Stem and bud end sugar contents after frying were determined after harvest. Additional fry tests will be made after six months of storage at about 45 F.

RESULTS

Weather

Rainfall and irrigation for the 2008 growing season are provided in Figure 1. From April 20 to Sept 23, approximately 20 inches of rainfall was supplemented with 13 inches of irrigation. In general, there were many small leaching events throughout the season, with one large event near the end of the growing season. Leaching events (greater than 1 inch of water) occurred at 10, 26, 37, 43 and 126 days after planting. Air and soil temperature measurements are provided in Figure 2.

Nitrogen Release from ESN

Figure 3 shows release of N from ESN applied preplant and at emergence. Release of N from ESN tended to be faster than that recorded in previous years. In 2007, approximately 90% of N was released by 80 days after planting for preplanted fertilizer and by 90 days after planting for ESN applied at planting and emergence. In 2008, 90% has been released by 50 days after planting for the preplant application and by about 60 days for the emergence application. Given the later planting date in 2008 compared with 2007, the shorter release time may have been advantageous. It is unclear why release rates were faster in 2008 as soil temperatures were actually cooler early in the season than in 2007.

Tuber Yield

Nitrogen rate, source, and timing comparisons

Tables 2-5 show the effects of N application rate, source, and timing on tuber yield and size distribution for the four processing varieties. For Russet Burbank (Table 2), marketable and total yields increased with increasing N rate with optimum yield between 180 and 240 lb N/A depending on timing and source. Numerically highest total, marketable and #1 yields were with ESN applied preplant at the 240 lb N/A rate. Yields with preplant ESN tended to be higher than those with emergence applied ESN. Within conventional N sources at the 240 lb N/A rate, N applied earlier (treatment 4) tended to result in higher yields than N applied later in the season (treatment 5), although differences were not statistically significant. At equivalent N rates, N source did not significantly affect yield. For Umatilla (Table 3), marketable and total yields increased with increasing N rate with optimum yield at about 240 lb N/A depending on timing and source. Numerically highest marketable yields were with conventional N applied later in the season at the 240 lb N/A rate, while numerically highest total yields were with ESN applied preplant at the 240 lb N/A rate. Yields with preplant ESN tended to be higher than those with emergence applied ESN. At the 240 lb N/A rate, yields with emergence applied ESN were significantly lower than prelant applied ESN and late applied conventional N. Within conventional N sources at the 240 lb N/A rate, N applied later (treatment 5) tended to result in higher yields than N applied earlier in the season (treatment 4), although differences were not statistically significant. At equivalent N rates, N source did not significantly affect yield. For Premier, (Table 4), marketable and total yields increased with increasing N rate with optimum yield between 180 and 240 lb N/A depending on timing and source. Numerically highest total, marketable and #1 yields were with ESN applied preplant at the 180 lb N/A rate. Yields with preplant ESN tended to be higher than those with emergence applied ESN at the 180 lb N/A rate, but no differences due to timing were observed at the 240 lb N/A rate with ESN. Within conventional N sources at the 240 lb N/A rate, N applied earlier (treatment 4) tended to result in higher yields than N applied later in the season (treatment 5), although differences were not statistically significant. At equivalent N rates, N source did not significantly affect marketable yield. For AOND95249-1Rus (Table 5), marketable and total yields increased with increasing N rate with optimum yield between 180 and 240 lb N/A depending on timing and source. Numerically highest total, marketable and #1 yields were with ESN applied preplant at the 180 or 240lb N/A rates. Yields with preplant ESN tended to be higher than those with emergence applied ESN. Within conventional N sources at the 240 lb N/A rate, N applied earlier (treatment 4) tended to result in higher yields than N applied later in the season (treatment 5), although differences were not statistically significant. At the 240 lb N/A, N source did not significantly affect yield, but at the 180 lb N/A rate, ESN applied preplant resulted in higher yields than conventional N and ESN applied at emergence.

General varietal comparisons

Russet Burbank and Premier tended to be the highest yielding varieties followed by AOND95249-1Rus and then Umatilla. Premier, AOND95249-1Rus, and Umatilla all had fewer misshaped potatoes than Russet Burbank with AOND95249-1Rus having the fewest #2 potatoes. Tubers greater than 6 and 10 oz were highest for AOND95249-1Rus and lowest for Umatilla.

Stand Count, Stem Number and Tuber Quality

Nitrogen rate, source, and timing comparisons

Tables 6-9 show the effects of N application rate, source, and timing on stand count, stems per plant hollow heart, specific gravity and frying quality for the four processing varieties. For Russet Burbank (Table 6), stand ranged from 97 to 100% and was not affected by treatment. Stems per plant ranged from 3.1 to 4.3 per plant and was not affected by treatment. Incidence of hollow heart was quite high ranging from 10 to 26% with inconsistent effects of N treatment. The control treatment had a high incidence while ESN applied preplant at 180 lb N/A had the lowest incidence. Late season applied N (treatment 5) resulted in the highest incidence of hollow heart. Specific gravity was not affected by treatment and generally high for all treatments. Chip color, AGT score, stem and bud sucrose were not affected by treatment. Stem and bud end glucose were affected by treatment. Increasing N rate tended to decrease glucose in the stem and bud ends. Late season N (treatment 5) tended to increase stem and bud glucose compared with early season N (treatment 4). For Umatilla (Table 7), stand ranged from 93 to 99% and was not affected by treatment. Stems per plant ranged form 3.1 to 4.5 per plant and was affected by treatment, but not consistently by N rate, source or timing. Reasons for the effects on stem count are not clear. Incidence of hollow heart was quite low ranging from 0 to 10% with inconsistent effects of N treatment. ESN applied preplant at 180 lb N/A resulted in a 10% hollow heart incidence, while there was no hollow heart with the other three ESN treatments. Specific gravity was not affected by treatment and generally high for all treatments. Chip color, AGT score, stem and bud end sucrose, and stem end glucose were not affected by treatment. Bud end glucose was affected by treatment with the early season N (treatment 4) resulting in the highest glucose concentrations. Premier (Table 8), stand ranged from 97 to 100% and was not affected by treatment. Stems per plant ranged form 3.9 to 4.5 per plant and was not affected by treatment. Incidence of hollow heart ranged from 5 to 16% and was not significantly affected by treatment. Specific gravity was not affected by treatment and generally high for all treatments. Frying quality was also not affected by treatment. For AOND95249-1Rus (Table 9), stand ranged from 83% to 93% and was not affected by treatment. Stems per plant ranged form 1.9 to 2.4 per plant and was not affected by treatment. Incidence of hollow heart was ranged from 3 to 9% and was not affected by treatment. Specific gravity was quite high. Highest specific gravity was in the control plots while lowest specific gravity was found in early season conventional N plots (treatment 4). Chip color, and stem and bud end glucose were not affected by treatment. AGT score and stem and bud end sucrose were affected by treatment, but were not consistently related to N rate, timing, or source.

General varietal comparisons

AOND95249-1Rus tended to have the lowest stand count and lowest number of stems per plant than the other varieties, which may have resulted in larger tubers. This selection likely has fewer eyes per tuber, which could result in more blanks and fewer stems per plant. Hollow heart incidence was highest in Russet Burbank followed by Premier, AOND95249-1Rus and then Umatilla. Specific gravity was highest in AOND95249-1Rus followed by Premier, Umatilla and then Russet Burbank. Chip color was darkest for Russet Burbank. Stem and bud end glucose concentrations were highest for Russet Burbank followed by Umatilla, Premier, and then AOND95249-1Rus.

Petiole Nitrate-N Concentrations

Nitrogen rate, source, and timing comparisons

Petiole NO_3-N concentrations on three dates as affected by N rate, N source, and N timing are presented in Tables 10-13. As expected, petiole NO_3-N generally increased with increasing N rate for all varieties and decreased as the season progressed. Petiole NO_3-N levels with the 300 lb N/A rate applied at planting were generally the highest of any treatment, especially later in the season, and may explain the decrease in yield at this rate compared with lower rates if they stimulated vine growth at the expense of tuber bulking.

Differences between urea and ESN treatments were significant throughout the sampling dates, but the differences depended on the time of the season. In contrast to previous years, petiole NO_3-N was significantly higher with ESN than with urea on the first sampling date and lower than urea on the last sampling date. In previous years, ESN was usually lower than urea on the first sampling data and higher than urea on the last sampling date. These results are consistent with the quicker release pattern observed for ESN early in the growing season. The fertilizer used in 2008 was farmer grade ESN, which may have more cracks in the coating than the research grade that we have used in the past. The cracks in the coating would likely cause a quicker release regardless of temperature.

General varietal comparisons

At the June 25 sampling date, petiole nitrate levels were higher for Umatilla and AOND95249-1Rus than Russet Burbank and Premier. Difference became less distinct towards the July 29 sampling date. Based on yield responses to N, petiole nitrate levels should be higher for Umatilla early in the growing season and during later bulking stages than for the other varieties. Further research is needed to determine more precise levels required for this variety in the Midwest.

CONCLUSIONS

Release of N from ESN was 20-30 days faster than that recorded in previous years, suggesting that the coating was either different or perhaps damaged. In general, marketable and total yields of all varieties increased with increasing N rate with optimum yield between 180 and 240 lb N/A depending on timing and source. For conventional N at the 240 lb N/A rate more up front N was optimum for Russet Burbank, Premier, and AOND95249-1Rus, while late season N was optimum for Umatilla. Yields with ESN applied preplant were generally higher than ESN applied at emergence. Russet Burbank and Premier tended to be the highest yielding varieties followed by AOND95249-1Rus and then Umatilla. Premier, AOND95249-1Rus, and Umatilla all had fewer misshaped potatoes than Russet Burbank with AOND95249-1Rus having the fewest #2 potatoes. Tubers greater than 6 and 10 oz were highest for AOND95249-1Rus and lowest for Umatilla. Hollow heart incidence was highest in Russet Burbank followed by Premier, AOND95249-1Rus and then Umatilla. Specific gravity was highest in AOND95249-1Rus followed by Premier, Umatilla and then Russet Burbank. Chip color was darkest for Russet Burbank. Stem and bud end glucose concentrations were highest for Russet Burbank followed by Umatilla, Premier and then AOND95249-1Rus.

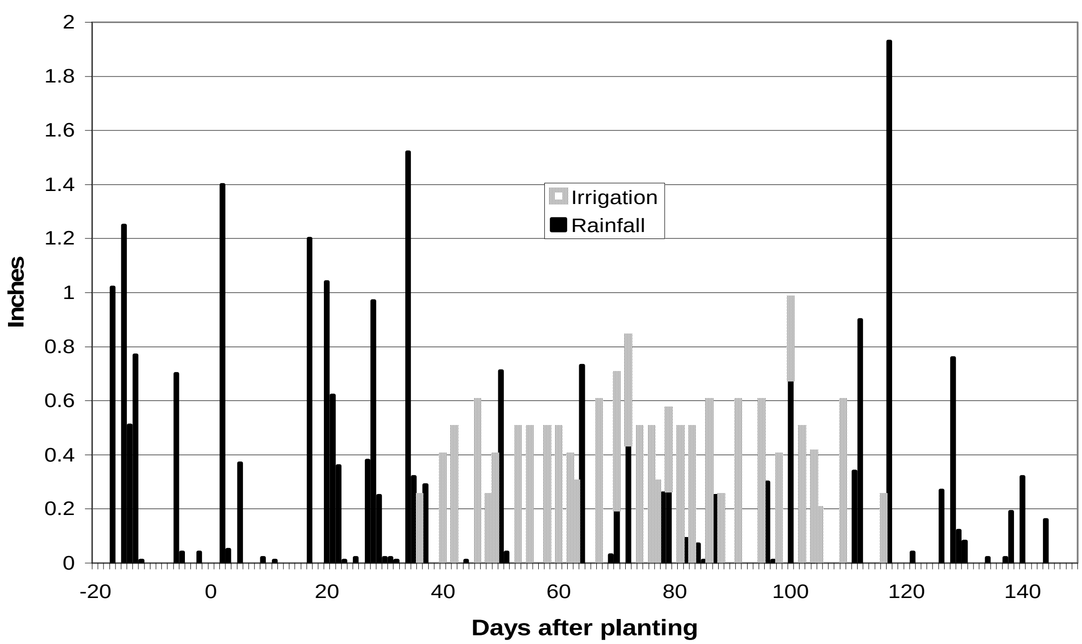


Figure 1. Rainfall and irrigation over the 2008 growing season.

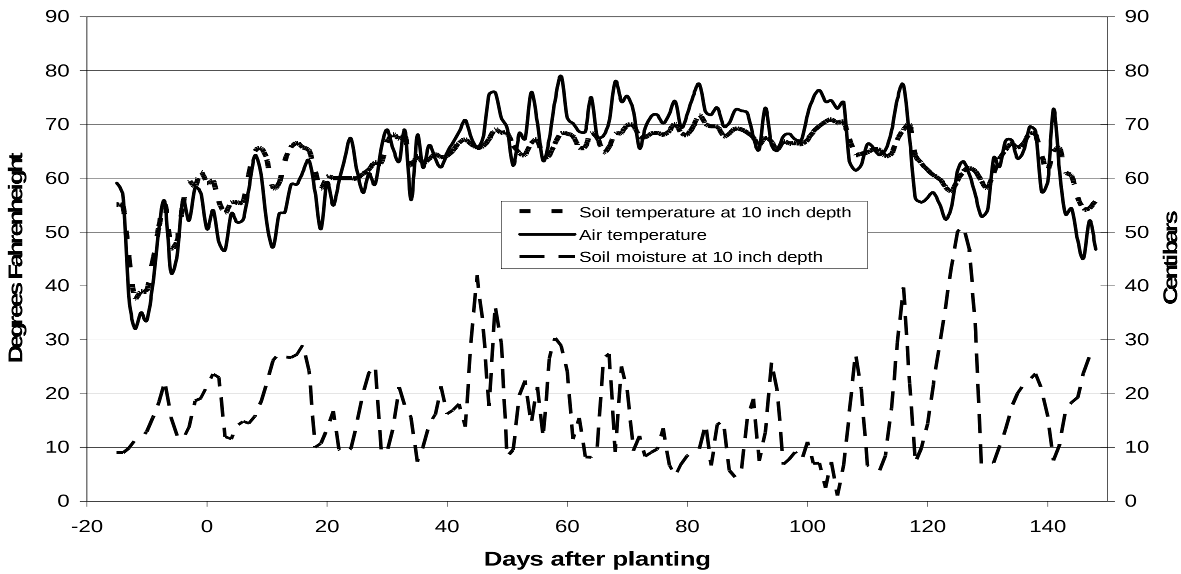


Figure 2. Average daily air and soil temperature and moisture at 10 inch depth below the top of the hill over the growing season.

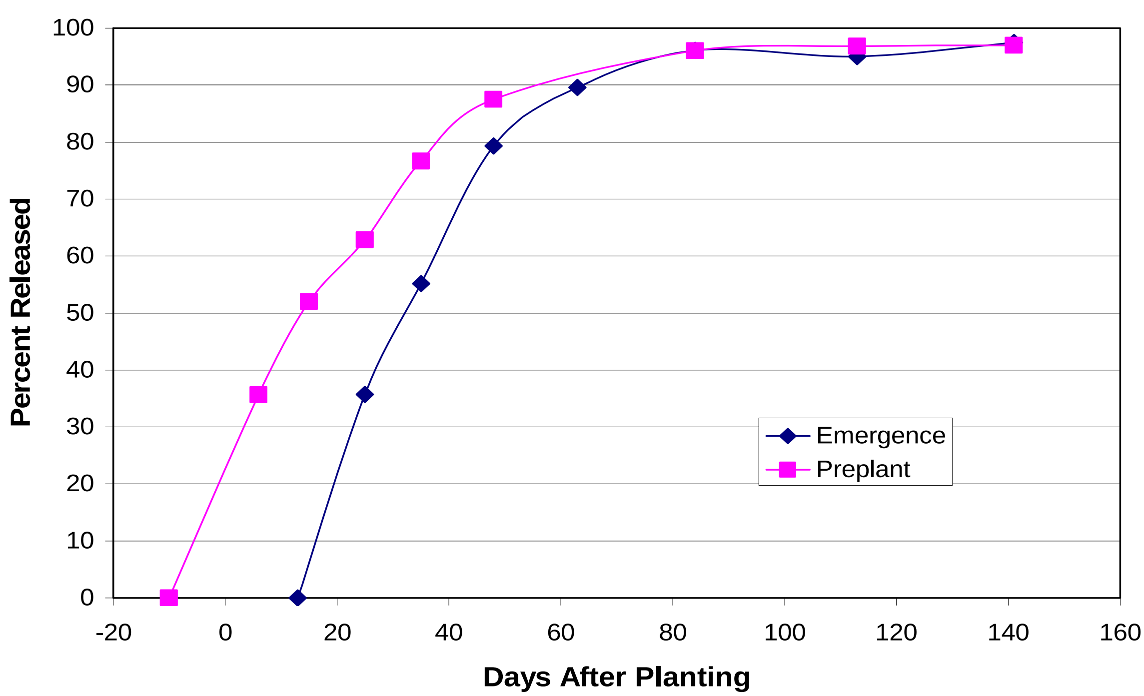


Figure 3. N released from ESN applied preplant and at emergence in 2008.

Table 2. Effect of N rate, source, and timing on Russet Burbank tuber yield and size distribution.

Nitrogen Treatments				Tuber Yield										
Trtmt #	N Source	N Rate	N Timing[1]	0-4 oz	4-6 oz	6-10 oz	10-14 oz	> 14 oz	Total	#1 > 4 oz	# 2 > 4 oz	Total marketable	> 6 oz	> 10 oz
		lb N / A	PP, P, E, PH	cwt / A									%	
1	control	30	0, 30, 0, 0	96.5	213.1	195.6	63.1	18.9	587.2	215.6	275.1	490.6	47.3	14.0
2	urea	120	0, 30, 50, 40	83.0	156.3	278.2	88.3	37.4	643.1	386.7	173.4	560.2	62.6	19.4
3	urea	180	0, 30, 70, 60	72.7	133.1	316.3	128.7	45.6	696.3	506.4	117.2	623.6	70.4	25.1
4	urea	240	0, 30, 90, 120	82.8	126.1	295.8	147.6	43.7	695.8	532.0	81.1	613.1	69.8	27.3
5	urea	240	0, 30, 50, 160	72.0	97.7	265.9	158.5	73.9	668.0	494.2	101.9	596.0	74.5	34.7
6	urea	300	0, 30, 90, 180	86.0	101.0	258.3	154.9	62.9	663.1	460.8	116.3	577.1	71.9	32.9
7	ESN	180	150, 30, 0, 0	88.4	194.1	309.8	75.8	21.4	689.5	490.8	110.3	601.1	59.1	14.2
8	ESN	240	210, 30, 0, 0	66.5	127.6	322.1	125.9	58.8	700.8	553.3	81.1	634.4	72.3	26.4
9	ESN	180	0, 30, 150, 0	68.9	127.0	288.6	123.4	50.0	657.8	454.7	134.2	589.0	70.3	26.4
10	ESN	240	0, 30, 210, 0	80.0	115.9	314.5	125.1	33.2	668.7	529.9	58.8	588.7	70.7	23.7
			Significance[2]	NS	**	**	**	*	**	**	**	**	**	**
			LSD (0.10)	---	35.3	38.6	39.0	31.3	35.4	52.7	36.3	40.5	8.0	8.5

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively; 4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.

[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 3. Effect of N rate, source, and timing on Umatilla tuber yield and size distribution.

Nitrogen Treatments				Tuber Yield										
Trtmt #	N Source	N Rate	N Timing[1]	0-4 oz	4-6 oz	6-10 oz	10-14 oz	> 14 oz	Total	#1 > 4 oz	# 2 > 4 oz	Total marketable	> 6 oz	> 10 oz
		lb N / A	PP, P, E, PH	cwt / A									%	
1	control	30	0, 30, 0, 0	126.1	124.8	176.6	17.5	3.7	448.5	309.4	13.1	322.5	44.1	4.8
2	Urea	120	0, 30, 50, 40	135.5	167.0	207.2	30.1	8.4	548.2	395.6	17.0	412.6	44.7	6.9
3	Urea	180	0, 30, 70, 60	133.1	147.6	251.4	46.1	8.7	586.9	442.5	11.3	453.8	52.2	9.3
4	Urea	240	0, 30, 90, 120	135.8	135.9	254.3	61.9	25.5	613.5	457.8	19.9	477.6	55.6	14.2
5	Urea	240	0, 30, 50, 160	112.9	138.7	281.7	73.7	26.4	633.4	480.5	40.1	520.5	60.3	15.9
6	Urea	300	0, 30, 90, 180	135.2	158.7	253.6	68.5	25.5	641.5	488.6	17.7	506.3	54.1	14.6
7	ESN	180	150, 30, 0, 0	159.1	191.6	230.0	30.1	6.5	617.3	442.9	15.2	458.2	43.1	6.0
8	ESN	240	210, 30, 0, 0	143.1	176.5	259.7	47.2	27.7	654.1	494.5	16.6	511.1	51.2	11.4
9	ESN	180	0, 30, 150, 0	94.5	122.7	263.9	77.1	32.0	590.2	480.0	15.7	495.7	63.2	18.4
10	ESN	240	0, 30, 210, 0	104.6	135.1	221.8	82.3	21.1	564.9	438.0	22.3	460.3	55.1	16.9
			Significance[2]	**	**	**	**	**	**	**	*	**	**	**
			LSD (0.10)	19.8	19.3	48.7	28.5	16.2	57.2	71.4	13.6	73.3	8.7	5.9

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively; 4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.

[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 4. Effect of N rate, source, and timing on Premier tuber yield and size distribution.

Nitrogen Treatments				Tuber Yield										
Trtmt #	N Source	N Rate	N Timing[1]	0-4 oz	4-6 oz	6-10 oz	10-14 oz	> 14 oz	Total	#1 > 4 oz	# 2 > 4 oz	Total marketable	> 6 oz	> 10 oz
		lb N / A	PP, P, E, PH	cwt / A									%	
1	control	30	0, 30, 0, 0	46.8	86.2	252.6	83.5	14.7	483.8	419.0	17.9	437.0	72.4	20.3
2	Urea	120	0, 30, 50, 40	51.5	110.8	286.4	106.8	29.5	585.1	510.9	22.7	533.6	72.3	23.4
3	Urea	180	0, 30, 70, 60	58.1	107.8	304.4	136.9	31.1	638.3	552.4	27.8	580.2	73.9	26.1
4	Urea	240	0, 30, 90, 120	55.2	91.2	292.1	146.8	64.1	649.3	570.7	23.4	594.1	77.4	32.5
5	Urea	240	0, 30, 50, 160	43.4	75.1	270.2	159.2	69.8	617.7	529.2	45.1	574.3	80.8	37.1
6	Urea	300	0, 30, 90, 180	52.0	86.3	279.5	155.9	73.5	647.3	558.1	37.2	595.3	78.8	35.5
7	ESN	180	150, 30, 0, 0	50.9	119.4	311.1	144.8	36.2	662.3	591.2	20.2	611.4	74.0	27.0
8	ESN	240	210, 30, 0, 0	43.9	77.3	274.6	166.4	85.5	647.6	574.5	29.2	603.7	81.3	39.0
9	ESN	180	0, 30, 150, 0	44.9	73.3	289.2	158.3	60.2	625.9	558.3	22.8	581.0	81.1	34.9
10	ESN	240	0, 30, 210, 0	52.7	85.6	279.5	166.8	62.8	647.5	577.0	17.8	594.8	78.5	35.4
			Significance[2]	NS	*	NS	**	**	**	**	++	**	*	**
			LSD (0.10)	---	26.1	---	37.2	26.3	37.6	40.9	18.2	39.4	6.3	7.2

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively; 4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.

[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 5. Effect of N rate, source, and timing on AOND95249-1Rus tuber yield and size distribution.

Nitrogen Treatments				Tuber Yield										
Trtmt #	N Source	N Rate	N Timing[1]	0-4 oz	4-6 oz	6-10 oz	10-14 oz	> 14 oz	Total	#1 > 4 oz	# 2 > 4 oz	Total marketable	> 6 oz	> 10 oz
		lb N / A	PP, P, E, PH	cwt / A									%	
1	control	30	0, 30, 0, 0	22.7	71.5	230.5	54.0	19.9	398.5	372.8	3.0	375.8	76.1	18.0
2	urea	120	0, 30, 50, 40	14.6	70.1	253.7	113.0	38.6	490.1	474.9	0.6	475.5	82.7	30.9
3	urea	180	0, 30, 70, 60	20.2	74.4	284.0	96.8	40.4	515.7	494.2	1.3	495.5	81.8	26.9
4	urea	240	0, 30, 90, 120	22.1	58.0	249.1	139.1	85.9	554.2	529.6	2.5	532.1	85.6	40.5
5	urea	240	0, 30, 50, 160	19.1	59.5	221.8	138.1	105.5	544.0	520.6	4.2	524.9	85.6	44.8
6	urea	300	0, 30, 90, 180	25.5	56.4	222.8	166.4	84.0	555.0	526.6	2.9	529.5	85.2	45.1
7	ESN	180	150, 30, 0, 0	22.5	78.1	261.3	137.3	83.9	583.0	557.4	3.1	560.5	82.8	38.1
8	ESN	240	210, 30, 0, 0	25.8	61.4	228.5	148.1	121.5	585.4	556.2	3.3	559.5	85.2	46.1
9	ESN	180	0, 30, 150, 0	15.4	48.4	234.7	122.7	75.9	497.1	480.0	1.7	481.7	87.5	41.4
10	ESN	240	0, 30, 210, 0	20.9	58.7	252.3	136.7	103.1	571.6	549.2	1.5	550.7	86.1	42.1
			Significance[2]	++	NS	NS	**	**	**	**	NS	**	**	**
			LSD (0.10)	8.4	---	---	22.8	44.1	38.6	36.3	---	37.8	4.0	10.4

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively; 4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.

[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 6. Effect of N rate, source, and timing on Russet Burbank stand count, stems per plant, and tuber quality.

Nitrogen Treatments				Tuber Quality		Frying Quality							
	N	N	N	Hollow	Specific	Chip	AGT	Stem		Bud			
Trtmt	Source	Rate	Timing[1]	Heart	Gravity	Color	Score	Sucrose	Glucose	Sucrose	Glucose	Stand	Stems
#		lb N / A	PP, P, E, PH	%								%	per Plant
1	control	30	0, 30, 0, 0	22.5	1.0821	3.0	50.5	0.454	8.172	2.229	0.730	97.9	3.65
2	urea	120	0, 30, 50, 40	16.9	1.0867	3.0	50.8	0.265	6.998	2.066	0.432	97.2	3.25
3	urea	180	0, 30, 70, 60	18.0	1.0895	2.5	53.5	0.298	4.840	1.693	0.372	99.3	3.70
4	urea	240	0, 30, 90, 120	15.0	1.0882	2.8	52.0	0.204	4.102	1.513	0.336	97.9	4.00
5	urea	240	0, 30, 50, 160	26.3	1.0873	3.0	52.8	0.269	5.033	1.886	0.469	97.9	4.00
6	urea	300	0, 30, 90, 180	19.0	1.0907	2.5	53.3	0.418	3.698	1.508	0.302	99.3	3.80
7	ESN	180	150, 30, 0, 0	10.0	1.0926	3.0	52.3	0.295	4.410	1.763	0.372	97.9	4.35
8	ESN	240	210, 30, 0, 0	19.8	1.0888	2.5	53.3	0.260	3.737	1.586	0.334	97.9	3.95
9	ESN	180	0, 30, 150, 0	21.3	1.0885	3.0	51.3	0.250	4.428	2.047	0.436	99.3	3.10
10	ESN	240	0, 30, 210, 0	13.2	1.0931	2.5	53.8	0.321	4.322	2.015	0.502	100.0	3.90
Significance[2]				*	NS	NS	NS	NS	**	NS	*	NS	NS
LSD (0.10)				8.6	---	---	---	---	1.493	---	0.235	---	---

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively; 4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.

[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 7. Effect of N rate, source, and timing on Umatilla stand count, stems per plant, and tuber quality.

Nitrogen Treatments				Tuber Quality		Frying Quality							
	N	N	N	Hollow	Specific	Chip	AGT	Stem		Bud			
Trtmt	Source	Rate	Timing[1]	Heart	Gravity	Color	Score	Sucrose	Glucose	Sucrose	Glucose	Stand	Stems
#		lb N / A	PP, P, E, PH	%								%	per Plant
1	control	30	0, 30, 0, 0	0.0	1.0919	2.8	52.8	0.864	1.505	1.602	0.292	95.1	4.00
2	urea	120	0, 30, 50, 40	1.0	1.0924	2.8	53.5	1.116	1.049	1.738	0.298	99.3	3.45
3	urea	180	0, 30, 70, 60	0.0	1.0949	2.5	54.5	0.962	1.191	1.824	0.289	97.2	4.15
4	urea	240	0, 30, 90, 120	1.0	1.0922	2.5	54.0	1.111	1.410	2.184	0.560	96.5	3.80
5	urea	240	0, 30, 50, 160	0.0	1.0939	2.0	55.8	1.160	1.050	1.603	0.294	97.9	3.35
6	urea	300	0, 30, 90, 180	2.0	1.0945	2.5	54.0	1.313	1.297	2.086	0.402	97.2	4.35
7	ESN	180	150, 30, 0, 0	10.0	1.0911	2.8	52.5	0.867	1.267	1.606	0.243	99.3	4.20
8	ESN	240	210, 30, 0, 0	0.0	1.0900	2.8	52.5	0.882	1.129	1.757	0.323	97.9	4.45
9	ESN	180	0, 30, 150, 0	0.0	1.0935	2.8	54.3	1.015	1.295	1.712	0.441	95.1	3.10
10	ESN	240	0, 30, 210, 0	0.0	1.0880	3.0	52.3	0.956	1.174	1.869	0.224	93.1	4.10
Significance[2]				*	NS	NS	NS	NS	NS	NS	++	NS	*
LSD (0.10)				5.8	---	---	---	---	---	---	0.223	---	0.71

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively; 4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.

[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 8. Effect of N rate, source, and timing on Premier stand count, stems per plant, and tuber quality.

Nitrogen Treatments				Tuber Quality		Frying Quality							
	N	N	N	Hollow	Specific	Chip	AGT	Stem		Bud			
Trtmt	Source	Rate	Timing[1]	Heart	Gravity	Color	Score	Sucrose	Glucose	Sucrose	Glucose	Stand	Stems
#		lb N / A	PP, P, E, PH	%								%	per Plant
1	control	30	0, 30, 0, 0	6.0	1.0960	2.5	54.8	1.315	1.275	1.791	0.203	99.3	4.10
2	urea	120	0, 30, 50, 40	8.0	1.0940	2.5	57.8	1.284	1.183	1.696	0.158	99.3	4.15
3	urea	180	0, 30, 70, 60	7.0	1.0906	2.0	58.3	1.357	1.140	2.108	0.205	98.6	4.00
4	urea	240	0, 30, 90, 120	7.1	1.0911	2.0	56.5	1.432	0.838	2.102	0.188	98.6	4.45
5	urea	240	0, 30, 50, 160	5.0	1.0894	2.3	57.3	1.728	0.984	2.372	0.233	99.3	4.15
6	urea	300	0, 30, 90, 180	13.1	1.0918	2.3	56.0	1.754	0.730	2.435	0.235	97.9	4.20
7	ESN	180	150, 30, 0, 0	8.9	1.0974	2.0	58.8	1.230	0.861	1.928	0.247	100.0	4.25
8	ESN	240	210, 30, 0, 0	16.0	1.0897	2.3	55.3	1.493	0.783	2.177	0.189	97.2	4.30
9	ESN	180	0, 30, 150, 0	10.1	1.0915	2.0	56.5	1.384	1.006	2.262	0.255	99.3	3.90
10	ESN	240	0, 30, 210, 0	14.0	1.0914	2.3	57.5	1.413	0.630	1.777	0.270	100.0	4.35
			Significance[2]	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			LSD (0.10)	---	---	---	---	---	---	---	---	---	---

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively; 4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.

[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 9. Effect of N rate, source, and timing on AOND95249-1Rus stand count, stems per plant, and tuber quality.

Nitrogen Treatments				Tuber Quality		Frying Quality							
	N	N	N	Hollow	Specific	Chip	AGT	Stem		Bud			
Trtmt	Source	Rate	Timing[1]	Heart	Gravity	Color	Score	Sucrose	Glucose	Sucrose	Glucose	Stand	Stems
#		lb N / A	PP, P, E, PH	%								%	per Plant
1	control	30	0, 30, 0, 0	4.0	1.1117	2.0	56.5	1.859	0.534	2.000	0.234	91.7	2.05
2	urea	120	0, 30, 50, 40	5.0	1.1081	2.5	56.5	1.540	0.491	1.522	0.188	93.7	2.10
3	urea	180	0, 30, 70, 60	7.0	1.1093	2.0	57.0	1.624	0.510	1.716	0.171	87.5	2.40
4	urea	240	0, 30, 90, 120	9.0	1.0969	2.5	54.5	1.299	0.431	1.746	0.206	91.7	2.10
5	urea	240	0, 30, 50, 160	3.0	1.1069	2.3	55.5	1.392	0.347	1.972	0.255	92.4	2.25
6	urea	300	0, 30, 90, 180	5.0	1.1045	2.0	58.5	1.503	0.238	2.002	0.178	93.0	1.85
7	ESN	180	150, 30, 0, 0	6.0	1.1038	2.5	53.8	1.117	0.392	1.490	0.202	91.0	2.20
8	ESN	240	210, 30, 0, 0	9.0	1.1037	2.3	56.0	1.686	0.509	2.236	0.174	92.4	2.35
9	ESN	180	0, 30, 150, 0	9.0	1.1068	2.5	53.8	1.259	0.419	1.541	0.243	82.7	1.95
10	ESN	240	0, 30, 210, 0	9.0	1.1081	2.0	58.0	1.860	0.578	2.215	0.229	93.1	2.40
			Significance[2]	NS	**	NS	++	++	NS	*	NS	NS	NS
			LSD (0.10)	---	0.0033	---	3.5	0.530	---	0.495	---	---	---

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively; 4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.

[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 10. Effect of N rate, source, and timing on Russet Burbank petiole nitrate-N levels.

Nitrogen Treatments				NO_3-N, ppm		
Trtmt #	N Source	N Rate	N Timing[1]			
		lb N / A	PP, P, E, PH	June 25	July 9	July 29
1	control	30	0, 30, 0, 0	4378	852	673
2	urea	120	0, 30, 50, 40	12436	4669	1442
3	urea	180	0, 30, 70, 60	12330	8339	4034
4	urea	240	0, 30, 90, 120	16177	11619	8073
5	urea	240	0, 30, 50, 160	16926	12749	12248
6	urea	300	0, 30, 90, 180	19341	14868	13966
7	ESN	180	150, 30, 0, 0	19006	7826	3311
8	ESN	240	210, 30, 0, 0	21033	13528	4105
9	ESN	180	0, 30, 150, 0	17222	6010	2341
10	ESN	240	0, 30, 210, 0	18565	10802	3759
			Significance[2]	**	**	**
			LSD (0.10)	2346	1729	2500

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively;
4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.
[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 11. Effect of N rate, source, and timing on Umatilla petiole nitrate-N levels.

Nitrogen Treatments				NO_3-N, ppm		
Trtmt #	N Source	N Rate	N Timing[1]			
		lb N / A	PP, P, E, PH	June 25	July 9	July 29
1	control	30	0, 30, 0, 0	9897	1512	116
2	urea	120	0, 30, 50, 40	17481	7753	1254
3	urea	180	0, 30, 70, 60	18253	10112	2812
4	urea	240	0, 30, 90, 120	19190	13362	9060
5	urea	240	0, 30, 50, 160	18122	15342	16185
6	urea	300	0, 30, 90, 180	20856	15676	17424
7	ESN	180	150, 30, 0, 0	22513	8894	1318
8	ESN	240	210, 30, 0, 0	25214	14361	3282
9	ESN	180	0, 30, 150, 0	22448	12507	2113
10	ESN	240	0, 30, 210, 0	17482	9605	2794
			Significance[2]	**	**	**
			LSD (0.10)	5177	4604	2616

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively;
4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.
[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 12. Effect of N rate, source, and timing on Premier petiole nitrate-N levels.

Nitrogen Treatments				NO_3-N, ppm		
Trtmt #	N Source	N Rate	N Timing[1]			
		lb N / A	PP, P, E, PH	June 25	July 9	July 29
1	control	30	0, 30, 0, 0	8328	908	88
2	urea	120	0, 30, 50, 40	12614	4559	716
3	urea	180	0, 30, 70, 60	18497	9356	3356
4	urea	240	0, 30, 90, 120	22708	13525	7634
5	urea	240	0, 30, 50, 160	17781	14363	12716
6	urea	300	0, 30, 90, 180	19303	15671	14398
7	ESN	180	150, 30, 0, 0	24068	6800	1870
8	ESN	240	210, 30, 0, 0	27112	11782	5274
9	ESN	180	0, 30, 150, 0	22821	9825	1926
10	ESN	240	0, 30, 210, 0	21238	12901	2869
			Significance[2]	**	**	**
			LSD (0.10)	5202	2513	2759

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively;
4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.
[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Table 13. Effect of N rate, source, and timing on AOND95249-1 Rus petiole nitrate-N levels.

Nitrogen Treatments				NO_3-N, ppm		
Trtmt #	N Source	N Rate	N Timing[1]			
		lb N / A	PP, P, E, PH	June 25	July 9	July 29
1	control	30	0, 30, 0, 0	11858	4468	342
2	urea	120	0, 30, 50, 40	18120	8325	2730
3	urea	180	0, 30, 70, 60	18915	11129	4869
4	urea	240	0, 30, 90, 120	24204	17094	11394
5	urea	240	0, 30, 50, 160	21547	15486	13726
6	urea	300	0, 30, 90, 180	23648	19562	16056
7	ESN	180	150, 30, 0, 0	23776	11425	4740
8	ESN	240	210, 30, 0, 0	24763	18369	4259
9	ESN	180	0, 30, 150, 0	21772	13856	2838
10	ESN	240	0, 30, 210, 0	22751	18455	3817
			Significance[2]	**	**	**
			LSD (0.10)	2177	3035	1709

[1]PP, P, E, PH = Preplant, Planting, Emergence, and Post-Hilling, respectively;
4 post-hilling applications were as follows: 20%, 20%, 30%, 30%.
[2]NS = Non-significant; ++, *, ** = Significant at 10%, 5%, and 1%, respectively.

Post-harvest difenoconazole for silver scurf and dry rot control in storage

Investigator: Gary Secor, North Dakota State University

Objective: To evaluate the effects of post-harvest applied difenoconazole (DFZ) 3FS on silver scurf and dry rot control in potatoes (July 2008-September 2008).

Materials and Methods:
Treatments:

1. Untreated control (water applied only)
2. DFZ (0.3 fl oz/ton)
3. DFZ (0.6 fl oz/ton)
4. DFZ (1.2 fl oz/ton)

Naturally infected 'Atlantic' tubers were harvested in Indiana (Black Gold Farms) in late July shipped to University of Idaho Kimberly Potato Storage Research Facility and North Dakota State University were used for this trial. This trial was sponsored by Syngenta Crop Protection.

Silver scurf. The trial was not inoculated with *H. solani*, but relied on natural infection for silver scurf disease. Tubers were treated with low volumes of DFZ (0.5 gal/ton) to simulate an application with a low-pressure boom sprayer as potatoes are being loaded into the storage. The untreated control received an application of tap water. The trial consisted of 25 tubers/treatment replicated four times. Tubers were incubated in plastic tubs and stored in the dark at room temperature for 34 days prior to evaluation.

Dry rot. Unwashed Atlantic tubers were dropped through a potato wounding apparatus to simulate wounding at harvest that contributes to increased tuber susceptibility to dry rot development. Tubers were then inoculated by spraying to wetness with a TBZ sensitive isolate of *Fusarium sambucinum*, the primary cause of dry rot in storage, at a concentration of 4×10^4 conidia/ml. Inoculated tubers were treated by spraying the wounded, inoculated tubers with a hand pump sprayer at a rate of 0.5 gal/ton. The trial consisted of 25 tubers/replication with 4 replications. Tubers were stored in mesh bags for 34 days at 55-60ºF with 95% RH prior to evaluation. Tubers were hand peeled and the number of dry rot sites of infection counted/tuber. Analysis of variance (ANOVA) was performed on percent incidence and severity and means separated by LSD at α=0.05.

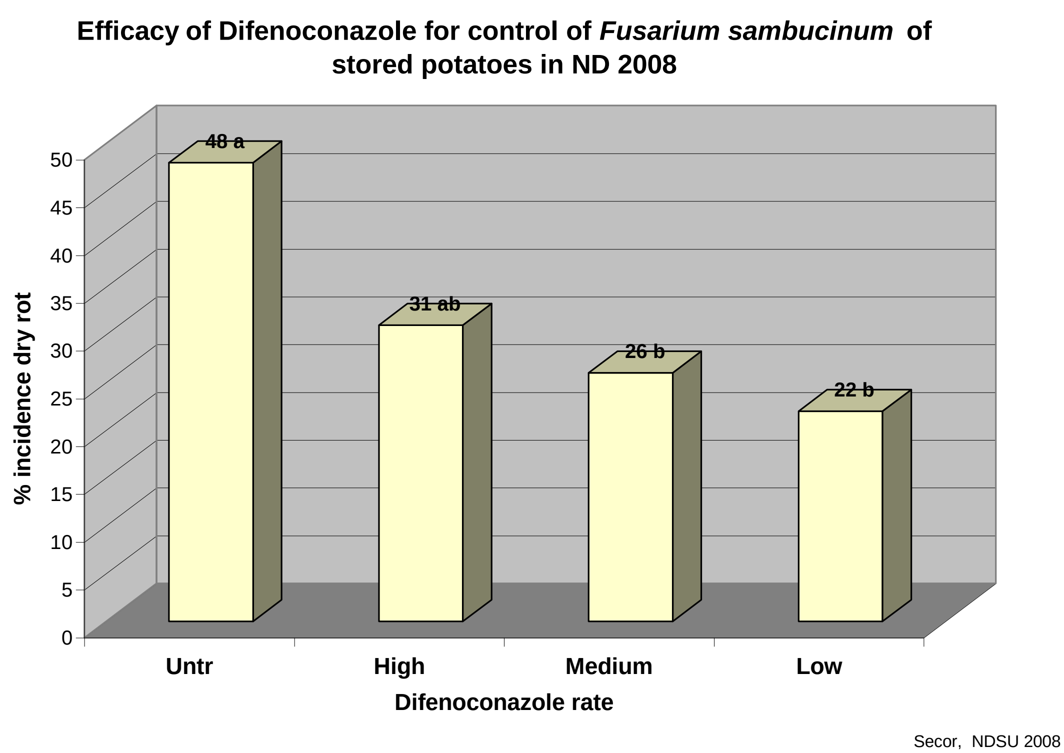
Results and Discussion:

Silver scurf. No silver scurf was evident in the untreated control tubers after incubation and no data was collected due to the lack of silver scurf.

Dry rot. There was moderate disease pressure in this test as indicated by the incidence (48.0%%) of dry rot in the untreated control even though tubers were stored for only a relatively short amount of time (34 days). Under this moderate level of disease development, there was a significant reduction in the incidence of dry rot decay with an application of DFZ compared to the untreated control (Figure 1). There was no significant difference between the high rate of DFZ and the untreated control, but the medium and low rates or DFZ resulted in a significant decrease in dry rot compared to the untreated control. There was a rate effect, with lower rates resulting in less dry rot. There was no significant difference between the untreated control and any of the DFZ treatments for severity of dry rot.

Summary:

It appears that DFZ has efficacy against Fusarium dry rot at the rates applied in this study. Additional studies are ongoing to validate these findings, identify most efficacious rate, compare potato varietal response, and investigate the potential of tank mixing DFZ with azoxystrobin for both silver scurf and dry rot control. It would also be beneficial to evaluate the efficacy of DFZ on a combination mixture of TBZ resistant and sensitive isolates of *Fusarium*. Unfortunately this study did not adequately demonstrate DFZ efficacy on silver scurf control and additional studies are warranted to address this question. There is a paucity of products available for dry rot control in the US potato industry and it is encouraging to see DFZ as a potential product for the industry to help combat Fusarium dry rot development in storage.



Standard Seed Treatment (2700 Series)

Location:	Tappen, ND	
Plot design:	2 rows X 30 ft. X 4 reps; RCBD	
Planting date:	May 22, 2008	
Row width:	36 inches	
Plant spacing:	14 inches	
Cultivar:	Ranger Russet	
50% Emergence:	June 18	
Fertilizer:	Broadcast:	209#N, 52#P, 200#K, 1#B; May 7
	Starter:	25#N, 40#P, 28#S, 1#Zn; May 22
Herbicide:	Prowl (2.0 pt/a) + Matrix (1.0 oz/a); Pre-June 10	
Insecticide:	Belay in-furrow (12.0 oz/a); May 22	

Fungicide application dates:	July 10	Bravo Zn (2.0 pt/a)
	July 15	Manzate (2.0 lb/a)
	July 24	Bravo Zn (2.0 pt/a)
	July 30	Manzate (2.0 lb/a)
	August 5	Bravo Zn (2.0 pt/a)
	August 13	Manzate (2.0 lb/a) + Headline (9 oz/a)
	August 19	Bravo Zn (2.0 pt/a)

Vine Kill: September 25

Harvest: October 1

Data: Field ratings July 18 (47 DAP) and August 12 (72 DAP)
Stand: Number of emerged plants of 40 planted; rated 45 DAP
Vigor: 1-4; 1 = low, 4 = high
Decay: Percent decay of seed piece; 0 = no decay, 100 = complete decay
Stems: total number of stems
Stems with Rhizoctonia: number of stems with visible lesions due to Rhizoctonia
Stolons: total number of stolons
Stolons with Rhizoctonia: number of stolons with visible lesions due to Rhizoctonia
Yield: total yield in hundredweight (cwt)
Grade: Commercial grade by Ag World Support Systems October 6
Post harvest disease: percent incidence and severity of blemish (silver scurf plus black dot 60 DAH. To be rated.

Standard Seed Treatment - Tappen Series 2700

Treatment		Rate	Application
2701	Untreated		
2702	Maxim 4FS	0.08 fl/oz/cwt	Seed
2703	Maxim Mz	0.5 lb/cwt	Seed
2704	Tops Mz	0.75 lb/cwt	Seed
2705	Moncoat Mz	0.75 lb/cwt	Seed
2706	6% Moncozeb (WE1044-1)	1.0 lb/cwt	Seed
2707	Quadris	0.4 fl.oz/1000 Row ft	In-furrow
2708	Moncut 70DF	17 oz/a	In-furrow
2709	Confidential		
2710	Confidential		
2711	Confidential		
2712	Confidential		
2713	Confidential		
2714	Confidential		
2715	Confidential		
2716	Confidential		
2717	Confidential		
2718	Confidential		
2719	Confidential		
2720	Confidential		
2721	Evito	3.8 fl.oz/a	In-furrow
2722	Polyoxin D	8 oz/a	In-furrow
2723	Polyoxin D	12 oz/a	In-furrow
2724	Evito + Polyoxin D	3.8 fl.oz/a + 8 oz/a	In-furrow
2725	Confidential		
2726	Dakota Peat	1 lb/cwt	Seed
2727	Douglas Fir Bark	1 lb/cwt	Seed
2728	WE-1042-1	1 lb/cwt	Seed
2729	WE-1043-1	1 lb/cwt	Seed
2730	Bleach (ph adjusted)	200:1:0.5 H_20:bleach:vinegar	Seed Dip

Standard Seed Treatment - Tappen Series 2700

								1st reading				2nd reading					
Treatment		**Rate**	**Stand**	**vigor**	**stem**	**stolon**	**Decay**	**% stem Rhizoc**	**% stem girdled**	**% stolon Rhizoc**	**% stolon girdled**	**tubers > 3oz**	**%stem Rhizoc**	**% stem girdled**	**%stolon Rhizoc**	**% stolon girdled**	**Vigor**
2701	Untreated		86.0	2.4	2.6	8.3	9.5	0.0	0.0	10.4	2.0	3.2	16.7	4.4	29.3	10.5	2.5
2702	Maxim 4FS	0.08 fl/oz/cwt	80.0	2.2	2.5	10.9	9.8	1.3	0.0	5.0	0.6	6.3	6.7	0.0	3.9	2.0	3.7
2703	Maxim Mz	0.5 lb/cwt	72.5	2.8	2.6	9.9	10.0	4.9	0.0	14.9	2.4	3.8	17.8	0.0	13.2	3.0	2.7
2704	Tops Mz	0.75 lb/cwt	78.0	2.5	2.4	10.1	5.7	17.5	4.4	17.6	6.0	4.7	3.3	0.0	2.1	0.0	3.5
2705	Moncoat Mz	0.75 lb/cwt	79.0	2.7	2.5	11.0	21.0	0.0	0.0	7.9	0.9	2.2	20.6	3.3	30.7	9.6	2.5
2706	6% Moncozeb (WE1044-1)	1.0 lb/cwt	82.5	2.3	2.1	10.3	8.5	5.0	0.0	25.6	6.6	4.3	6.7	0.0	7.2	0.0	2.9
2707	Quadris	0.4 fl.oz/1000 Row ft	83.0	2.5	2.6	10.2	26.5	21.7	5.0	20.7	5.0	3.7	18.3	2.2	15.4	4.7	2.5
2708	Moncut 70DF	17 oz/a	83.0	2.3	2.6	10.5	4.0	2.9	1.3	8.6	1.0	5.1	3.3	0.0	4.8	1.2	3.4
2709	Confidential		68.5	2.6	2.3	9.2	30.8	22.9	0.0	18.3	2.9	4.5	13.3	0.0	7.8	1.7	3.1
2710	Confidential		68.5	1.5	2.1	8.7	8.3	5.4	0.0	11.0	2.4	2.7	3.3	0.0	8.3	1.3	2.9
2711	Confidential		66.0	2.1	1.7	9.0	36.6	7.0	0.0	9.1	0.5	4.3	5.6	0.0	11.0	3.3	3.3
2712	Confidential		69.0	2.3	2.3	8.6	18.5	10.0	0.0	19.6	5.7	3.0	24.4	0.0	4.4	0.0	2.9
2713	Confidential		65.0	2.4	2.0	8.0	16.8	8.3	1.7	17.7	3.3	3.4	3.9	0.0	2.9	0.0	3.1
2714	Confidential		68.0	2.6	2.5	10.0	31.0	11.7	0.0	10.6	2.5	4.4	0.0	0.0	2.8	1.1	2.8
2715	Confidential		66.5	2.3	1.9	10.6	28.8	5.0	5.0	11.0	0.0	4.6	0.0	0.0	5.1	1.0	3.1
2716	Confidential		76.0	2.5	2.3	9.0	29.5	8.8	0.0	15.7	2.8	2.7	17.8	0.0	19.5	6.0	2.4
2717	Confidential		81.0	3.0	2.3	10.0	6.0	6.7	0.0	14.4	0.8	3.1	11.7	0.0	9.9	1.7	2.3
2718	Confidential		81.5	3.1	2.2	9.8	11.0	10.8	0.0	14.1	3.5	3.3	12.4	4.4	19.2	5.6	2.3
2719	Confidential		81.0	2.3	2.1	9.8	7.3	14.2	1.7	11.0	3.0	4.5	23.7	1.3	28.4	7.0	2.9
2720	Confidential		82.0	2.4	2.4	10.0	22.5	13.1	0.0	21.1	3.9	4.3	12.2	0.0	6.5	0.0	2.9
2721	Evito	3.8 fl.oz/a	79.5	2.3	2.3	10.4	8.8	8.3	0.0	15.8	3.5	5.2	4.4	0.0	3.2	0.0	3.4
2722	Polyoxin D	8 oz/a	84.5	2.4	2.2	10.0	5.5	26.7	3.3	22.0	7.1	3.8	13.3	0.0	18.8	6.1	3.2
2723	Polyoxin D	12 oz/a	69.5	2.5	2.6	9.0	21.3	18.8	6.7	22.5	8.0	4.3	10.0	3.3	1.9	0.0	2.9
2724	Evito + Polyoxin D	3.8 fl.oz/a + 8 oz/a	80.5	2.7	2.4	11.0	2.8	5.4	0.0	19.7	2.6	3.3	17.2	0.0	9.2	1.7	2.7
2725	Confidential		88.0	2.5	2.5	11.3	4.8	12.3	3.0	20.1	3.1	3.4	6.7	0.0	9.6	1.4	2.9
2726	Dakota Peat	1 lb/cwt	75.0	2.4	2.1	9.9	17.0	17.9	7.5	18.1	1.6	4.2	40.0	6.7	25.8	8.8	2.4
2727	Douglas Fir Bark	1 lb/cwt	75.0	2.6	2.1	9.0	11.3	5.0	0.0	9.9	3.4	4.9	11.3	5.6	12.6	5.0	3.3
2728	WE-1042-1	1 lb/cwt	70.5	2.5	2.2	9.3	7.9	18.3	7.1	24.9	10.9	4.0	0.0	0.0	2.8	0.8	3.1
2729	WE-1043-1	1 lb/cwt	80.5	2.5	2.8	10.6	21.0	6.3	0.0	11.5	1.9	4.5	14.4	2.2	2.5	0.0	3.2
2730	Bleach (ph adjusted)	200:1:0.5 H_20:bleach:vinegar	80.5	2.2	2.5	10.4	9.5	8.3	0.0	11.7	5.7	5.7	10.6	0.0	10.4	0.0	3.2
LSD $_{p= 0.05}$			9.53	0.49	NS	NS	17.22	14.94	NS	10.15	5.25	1.59	16.67	NS	10.16	4.42	0.68

Standard Seed Treatment - Tappen Series 2700

Treatment		Rate	Application	Tuber grade						Yield
				Graded Weight	Unusable	Under Size	4 oz.	6 oz.	10 oz+	cwt/a
2701	Untreated			208.4	1.5	25.8	47.9	74.8	58.4	399.5
2702	Maxim 4FS	0.08 fl/oz/cwt	Seed	212.5	3.7	17.3	36.6	87.3	67.6	407.8
2703	Maxim Mz	0.5 lb/cwt	Seed	194.9	3.6	26	41.6	70.9	52.8	376.6
2704	Tops Mz	0.75 lb/cwt	Seed	217.7	3.8	24.3	39.9	83.8	65.9	436.6
2705	Moncoat Mz	0.75 lb/cwt	Seed	166.4	4.5	29.3	25.7	67.7	39.2	363.9
2706	6% Moncozeb (WE1044-1)	1.0 lb/cwt	Seed	225.6	3.1	24.2	50.2	83.3	64.8	427.0
2707	Quadris	0.4 fl.oz/1000 Row ft	In-furrow	225.1	7	21.5	38.1	89.2	69.3	428.6
2708	Moncut 70DF	17 oz/a	In-furrow	204.4	4.3	20.1	34	74.5	71.5	424.3
2709	Confidential			205	4.3	21.8	34.5	69.5	74.9	390.8
2710	Confidential			202.4	6.5	22.4	35.5	68.2	69.8	378.7
2711	Confidential			180.3	2.7	21.3	30.7	54.9	70.7	369.7
2712	Confidential			181.1	2	22.9	33.4	71.4	51.4	396.0
2713	Confidential			172.8	2.1	17	35.9	52.4	65.4	350.4
2714	Confidential			204.5	0.8	19.5	32.3	96.5	55.4	391.3
2715	Confidential			197.4	1	26.8	39.2	76.4	54	395.2
2716	Confidential			191.8	0.6	20.9	42.3	70.2	57.8	391.4
2717	Confidential			180.9	1	30.7	46	63.3	39.9	394.1
2718	Confidential			210.3	1.1	25.7	45.5	79.4	58.6	418.2
2719	Confidential			195.3	2.8	23.6	37.5	66.2	65.4	403.4
2720	Confidential			201.2	1.2	32.4	55	72.2	40.4	401.4
2721	Evito	3.8 fl.oz/a	In-furrow	195.1	2.2	26.2	39.3	78.9	48.5	358.2
2722	Polyoxin D	8 oz/a	In-furrow	196.7	1.7	20.5	37.9	73.5	63.1	376.0
2723	Polyoxin D	12 oz/a	In-furrow	208.9	1.5	16	38.5	103.9	49	392.2
2724	Evito + Polyoxin D	3.8 fl.oz/a + 8 oz/a	In-furrow	185.1	5.1	18.7	35.8	67.6	57.9	357.0
2725	Confidential			198.6	3	21.6	34.2	79.2	60.6	377.4
2726	Dakota Peat	1 lb/cwt	Seed	175.3	1.5	22	29.7	70.8	51.3	361.4
2727	Douglas Fir Bark	1 lb/cwt	Seed	189.3	4.3	21.3	28.3	67.5	67.9	371.0
2728	WE-1042-1	1 lb/cwt	Seed	193.4	1.8	23	33.3	65.6	69.7	362.6
2729	WE-1043-1	1 lb/cwt	Seed	198	3.1	25	37.9	78.9	53.1	391.7
2730	Bleach (ph adjusted)	200:1:0.5 H_20:bleach:vinegar	Seed Dip	208.6	5.4	14	34.1	84.4	70.7	408.1
$LSD_{p=0.05}$										46.88

Standard Foliar Fungicides-Late Blight (1300 Series)
Gary Secor and Neil Gudmestad, NDSU

Location: Prosper, ND
Plot design: 4 rows X 25 ft. X 4 reps; RCBD
All four rows sprayed
All data collected from center two rows

Planting date: May 28, 2008
Row width: 36 inches
Plant spacing: 12 inches

Cultivar: Red LaSoda

Fertilizer: 240 lb/a, 32-10-10, banded at planting

Herbicide: Treflan (1.5 pt/a); pre-plant incorporated May 17
Prowl (2 pt/a) + Matrix (1.5 oz/a) June 24

Insecticide: Belay (12 oz/a) in-furrow at planting

Inoculation Dates: July 30, August 4, 10

Inoculation Method: Using a hand sprayer (garden type), a suspension of late blight inoculum ($1X10^4$ zoospores/ml) was sprayed onto the foliage in the center of each 8 row block in each replication.

Late Blight observed: August 13

Fungicide application dates: July 24
August 1
August 6
August 14
August 24
August 28
September 4
September 16

Fungicide application method: Fungicides were applied using a converted ATV, (55 psi; 73 gpa; 11005XR nozzles).

Vinekill: None

Harvest: October 9, 2008

Late Blight Foliar Fungicides- Prosper Series 1300

0.0275 A/Trt

	Treatment	Rate	Schedule	Interval
1301	Untreated	-	-	-
1302	Penncozeb 75 DF Super Tin 80 WP + Penncozeb 75 DF	2 lb/ac 3.75 oz/ac + 2 lb/ac	1-5 6-8	7 day
1303	Penncozeb 75 DF	2 lb/ac	1-8	7 day
1304	TD-2368-01 76DF	3 lb/ac	1-8	7 day
1305	TD-2368-01 76DF	4 lb/ac	1-8	7 day
1306	VZP + Vigor-Manganese-Phos (add Endura if EB appears)	1 pt/ac + 1 pt/ac	1-8	7 day
1307	VZP + Vigor-Manganese-Phos Dithane	1 pt/ac + 1 pt/ac 2 lb/ac	1,3,5,7 2,4,6,8	7 day
1308	VZP + Vigor-Manganese-Phos Bravo WS	1 pt/ac + 1 pt/ac 1.5 pt/ac	1,3,5,7 2,4,6,8	7 day
1309	VZP + Vigor-Manganese-Phos VZP + Vigor-Manganese-Phos Bravo WS Dithane Agro-K-Phos + Vigor-Cal-Phos	2 qt/ac + 1 qt/ac 2 qt/ac + 1 qt/ac 1.5 pt/a 2 lb/ac 1 qt/a + 1 qt/a	prior to hooking hooking + 14 days 1-4 5,8 6,7	7 day
1310	Confidential			
1311	Confidential			
1312	Confidential			
1313	Bravo WS	1.5 pt/a	1-8	7 day
1314	Dithane Gavel	2 lb/ac 2 lb/ac	1-4 5-8	7 day

1310-1312 are confidential

1st late blight application July 30, 2008

Late Blight Foliar Fungicides- Prosper Series 1300

0.0275 A/Trt

	Treatment	Rate	Schedule	Interval	5-Aug	13-Aug	19-Aug	27-Aug	5-Sep	12-Sep	19-Sep	26-Sep	AUDPC	Yield cwt/a	Rot cwt/a
1301	Untreated	-	-	-	0.0	0.5	3.3	21.3	46.3	63.8	96.3	100.0	1360	337	74
1302	Penncozeb 75 DF Super Tin 80 WP + Penncozeb 75 DF	2 lb/ac 3.75 oz/ac + 2 lb/ac	1-5 6-8	7 day	0.0	0.0	0.0	1.3	6.3	7.5	11.3	40.0	87	633	3
1303	Penncozeb 75 DF	2 lb/ac	1-8	7 day	0.0	0.0	0.0	1.0	10.0	12.5	13.8	52.5	132	568	12
1304	TD-2368-01 76DF	3 lb/ac	1-8	7 day	0.0	0.0	0.0	3.5	20.0	21.3	86.3	99.5	264	428	83
1305	TD-2368-01 76DF	4 lb/ac	1-8	7 day	0.0	0.0	0.0	6.8	18.8	23.8	77.5	99.5	291	354	107
1306	VZP + Vigor-Manganese-Phos (add Endura if EB appears)	1 pt/ac + 1 pt/ac	1-8	7 day	0.0	0.0	0.0	7.0	17.5	25.0	80.0	98.3	287	458	44
1307	VZP + Vigor-Manganese-Phos Dithane	1 pt/ac + 1 pt/ac 2 lb/ac	1,3,5,7 2,4,6,8	7 day	0.0	0.0	0.0	2.8	13.8	16.3	38.8	85.8	190	494	30
1308	VZP + Vigor-Manganese-Phos Bravo WS	1 pt/ac + 1 pt/ac 1.5 pt/ac	1,3,5,7 2,4,6,8	7 day	0.0	0.0	0.0	2.5	6.8	11.3	23.8	91.3	115	480	28
1309	VZP + Vigor-Manganese-Phos VZP + Vigor-Manganese-Phos Bravo WS Dithane Agro-K-Phos + Vigor-Cal-Phos	2 qt/ac + 1 qt/ac 2 qt/ac + 1 qt/ac 1.5 pt/a 2 lb/ac 1 qt/a + 1 qt/a	prior to hooking hooking + 14 days 1-4 5,8 6,7	7 day	0.0	0.0	0.0	1.3	4.3	6.3	13.8	78.8	67	569	4
1310	Confidential				0.0	0.0	0.0	3.8	20.0	27.5	55.0	100.0	288	477	22
1311	Confidential				0.0	0.0	0.0	2.0	11.3	18.8	30.0	91.3	173	560	12
1312	Confidential				0.0	0.0	0.0	1.5	8.8	15.0	23.8	81.3	135	581	13
1313	Bravo WS	1.5 pt/a	1-8	7 day	0.0	0.0	0.0	1.3	6.8	10.0	16.3	67.5	100	534	46
1314	Dithane Gavel	2 lb/ac 2 lb/ac	1-4 5-8	7 day	0.0	0.0	0.0	1.3	8.8	10.0	13.8	47.5	116	619	15
					NS	NS	0.79	3.03	8.05	8.41	16.08	10.98		69.62	29.6

Red Norland Seed Treatment – Grand Forks (2600 Series)
Gary Secor and Neil Gudmestad, NDSU

Location: Grand Forks, ND
Plot design: 2 rows X 25 ft. X 4 reps; RCBD

Planting date: June 4, 2008
Row width: 36 inches
Plant spacing: 12 inches

Cultivar: Red Norland

Fertilizer: Starter: 25#N, 40#P, 28#S, 1#Zn; June 4

Herbicide: Prowl (2.0 pt / a) + Matrix (1.0 oz / a) PRE; June 19

Insecticide: Belay in-furrow (12.0 oz/a); June 4

Fungicide application dates:

July 31	Penncozeb (2.0 lb/a)
August 6	Bravo WS (1.5 pt/a)
August 15	Penncozeb (2.0 lb/a)
August 28	Bravo WS (1.5 pt/a)

Data collection dates: Rhizoctonia Evaluation: Aug. 4, 61 DAP

Vine Kill: Rotobeat; October 21

Harvest: October 23

Grade: December 10; (50 DAH)

Post Harvest Tuber Evaluation: January 9–15, 2009; (78-84 DAH)

Stand: Number of emerged plants of 50 planted; rated 21, 27 and 43 DAP
Data: Field rating August 4 (61 DAP)
Vigor: 1-4; 1 = low, 4 = high
Decay: Percent decay of seed piece; 0 = no decay, 100 = complete decay
Stems: total number of stems
Stems with Rhizoctonia: number of stems with visible lesions due to Rhizoctonia
Stolons: total number of stolons
Stolons with Rhizoctonia: number of stolons with visible lesions due to Rhizoctonia
Grade: NDSU grade, Hagan Photosizer
Post harvest disease: percent incidence and severity of blemish (silver scurf plus black dot).

Red Norland Seed Treatment - Grand Forks Series 2600

2608, 2609 are confidential

Treatment		Rate	Stand			reading @ 61 DAP							
			6/25/08	7/1/08	7/17/08	Vigor	% Decay	# stem	% stem Rhizoc	% stem girdled	# stolons	% stolon Rhizoc	% stolon girdled
2601	Untreated		30.0	46.0	46.3	1.6	70.3	3.6	13.5	0.8	18.7	12.3	2.3
2602	Maxim MZ	0.5 lb/cwt	27.5	44.3	44.5	1.8	63.5	4.3	13.3	0.0	20.0	8.9	1.0
2603	Tops MZ	0.75 lb/cwt	27.0	43.3	42.8	1.7	57.3	5.7	29.5	4.7	26.5	13.0	2.3
2604	Moncoat MZ	0.75 lb/cwt	22.5	43.3	43.0	1.7	23.3	4.0	8.7	1.3	19.3	9.0	0.9
2605	6% Manozeb (WE)	0.75 lb/cwt	20.0	40.3	43.0	2.0	67.8	4.2	17.3	1.3	22.0	13.0	3.4
2606	Quadris	0.8 fl.oz/1000 Row ft	40.0	46.3	44.8	2.0	53.0	5.7	15.9	0.6	25.1	13.5	3.7
2607	Moncut 70DF	1.1 lb/a	31.0	42.8	46.0	1.9	54.8	5.6	13.0	0.0	24.9	7.1	0.6
2608	Confidential		44.5	46.3	45.5	1.6	36.1	4.4	12.0	2.9	20.3	13.3	2.0
2609	Confidential		14.0	28.3	29.8	1.7	60.5	3.5	10.0	0.0	16.7	12.2	0.6
2610	Evito	3 oz/a	36.5	46.0	45.0	1.9	52.0	4.4	18.3	6.7	21.5	12.1	1.7
2611	Cruiser Maxx + Maxim 4FS	0.12 fl.oz/cwt + 0.04 fl.oz/cwt	23.5	37.8	37.3	1.9	79.3	5.4	16.5	0.0	24.4	9.2	1.1
2612	Douglas Fir Bark	1.0 lb/cwt	23.0	40.8	38.0	1.7	71.5	3.2	22.9	3.5	15.6	14.9	4.4
2613	Dakota Peat	1.0 lb/cwt	29.0	42.8	42.5	1.8	65.5	4.6	34.2	3.8	21.2	25.0	7.2
$LSD_{p=0.05}$			10.26	5.13	4.29	NS	23.88	1.12	14.56	NS	4.84	7.26	3.92

Red Norland Seed Treatment - Grand Forks Series 2600

2608, 2609 are confidential

Treatment		Rate	Total yield cwt/a	Total tuber number	0-4 oz cwt/a	0-4 oz tuber #	4-6 oz cwt/a	4-6 oz tuber #	6-8 oz cwt/a	6-8 oz tuber #	8-10 oz cwt/a	8-10 oz tuber #	10-12 oz cwt/a	10-12 oz tuber #	> 12 oz cwt/a	>12 oz tuber #	rot weigth cwt/a	rot # tubers	cull weight cwt/a	cull # tubers
2601	Untreated		265.4	98.0	31.8	29.5	59.0	26.0	63.6	19.8	37.5	9.3	25.8	5.3	43.3	6.8	0.0	0.0	4.5	1.5
2602	Maxim MZ	0.5 lb/cwt	296.0	112.8	39.1	39.3	54.6	24.0	63.8	20.0	50.3	12.5	40.3	8.3	42.8	6.3	0.4	0.3	4.9	2.3
2603	Tops MZ	0.75 lb/cwt	296.2	122.8	49.0	48.0	57.6	25.3	75.3	24.0	55.4	13.8	18.1	3.8	37.1	5.8	0.0	0.0	3.6	2.3
2604	Moncoat MZ	0.75 lb/cwt	291.4	114.3	41.5	40.5	50.2	22.0	68.7	22.0	54.9	13.5	27.3	5.5	42.9	7.0	0.0	0.0	6.0	3.8
2605	6% Manozeb (WE)	0.75 lb/cwt	272.7	106.5	38.8	39.5	49.2	21.3	59.5	19.0	39.7	9.8	30.7	6.3	49.8	7.5	0.0	0.0	5.1	3.3
2606	Quadris	0.8 fl.oz/1000 Row ft	307.7	128.5	52.7	53.3	58.7	25.8	65.3	21.0	50.3	12.3	37.9	7.8	38.8	5.8	0.0	0.0	4.0	2.8
2607	Moncut 70DF	1.1 lb/a	314.8	125.5	43.0	44.3	66.9	29.3	79.3	25.0	47.6	11.8	43.6	8.8	26.1	3.8	0.6	0.3	7.8	2.5
2608	Confidential		319.8	131.0	50.1	47.5	79.3	35.0	69.0	21.8	55.4	13.8	28.5	5.8	34.9	5.3	0.4	0.5	2.4	1.5
2609	Confidential		190.2	70.3	21.6	24.3	38.9	17.0	29.7	9.3	25.9	6.3	30.6	6.0	41.2	6.3	0.0	0.0	2.4	1.3
2610	Evito	3 oz/a	297.4	119.5	49.6	45.0	62.0	27.3	68.2	21.5	51.8	12.8	35.9	7.3	28.8	4.5	0.0	0.0	1.3	1.3
2611	Cruiser Maxx + Maxim 4FS	0.12 fl.oz/cwt + 0.04 fl.oz/cwt	258.9	108.8	41.0	43.8	60.1	26.3	56.4	17.8	36.7	9.0	21.9	4.5	38.1	5.8	0.0	0.0	4.7	1.8
2612	Douglas Fir Bark	1.0 lb/cwt	282.7	109.8	36.7	39.8	56.5	25.0	55.7	17.5	50.5	12.3	35.3	7.0	44.3	6.5	0.0	0.0	3.8	1.8
2613	Dakota Peat	1.0 lb/cwt	284.9	108.0	35.3	36.3	48.9	21.0	71.6	22.5	56.7	14.0	31.0	6.3	38.5	6.0	0.0	0.0	3.1	2.0
$LSD_{p=0.05}$			NS	26.7	15.1	14.2	NS	NS	24.5	9.3	18.9	4.6	NS	NS	NS	NS	NS	NS	NS	NS

Research to Increase the Long-Term Storage Quality of Potatoes
(Summary of Research – 2008)

P.I. Joe Sowokinos[1]
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Summary: Over one hundred advanced breeding selections from the U.S. and Canada were evaluated for their storage and marketing potential for fresh, fry, or chip markets. In 2008, efforts were made to develop techniques that potato breeders could use to rapidly screen their breeding materials for superior chipping traits. Sixteen intragenic (ITG) lines of Dakota Pearl (DP), cloned with the 'anti-sweetening gene' (*Ugp*A) from the (cv.) Snowden, were analyzed for their horticultural properties and their ability to resist 'cold-induced-sweetening' (CIS) compared to 'non-transformed' DP potatoes. A new anti-sweetening protein was found a few New Zealand potato clones and its role in regulating sugar levels in potatoes is being investigated. In a cooperative project with Dr. Susie Thompson (NDSU), microtubers of russeted selections AOND95292-3 and ND7882b-7 were transformed with the anti-sweetening gene (*Ugp*A) from the cultivar Snowden. Seventy-two and twenty-four distinct genotypes of AOND95292-3 and ND7882b-7, respectively, were generated. It is anticipated that enough seed will be available to conduct replicated field trials in the spring of 2009. Acid invertase activity was measured in potato breeding clones as a marker for low sugar potential in storage.

Introduction: Presently, all commercially used processing potatoes require warm storage temperatures (9^{o}-12^{o} C) (49^{o}-52^{o} F) to prevent the onset of the phenomenon known as cold-induced-sweetening (CIS). Benefits from processing potatoes directly from cold storage (3^{o}-5^{o} C) (38^{o} - 40^{o} F) include less chemical input (i.e., for disease and sprout management), less respiration and shrinkage (i.e., solids and cell turgor are retained), decreased heating costs, negligible acrylamide formation during frying, and an extended marketing window. The identification of unique markers for genes, specific proteins, and other constituents that contribute to CIS resistance, would enable breeders to rapidly select clones from large populations that are more likely to have the traits desired.

Major Accomplishments in 2008:

- **<u>Evaluation of intragenic (ITG) lines of the cv. Dakota Pearl (DP) with an 'anti-sweetening gene (*Ugp*A) from the cv. Snowden</u>**
  Sixteen ITG lines of Dakota Pearl (DP) were grown in replicated field trials at two locations (Larimore and Williston, ND) and evaluated for stand count, rate of emergence, canopy closure, tuber size distribution, maturity, total solids, specific gravity, total and marketable yield compared to untransformed DP. Following harvest in October, tubers were suberized and placed into 3^{o} C (38^{o} F), 4.5^{o} C (40^{o} F), and 6^{o} C (42^{o} F) storage. At zero-time and at 3- and 6-months storage at each temperature, tubers will be analyzed for sugar content (sucrose and glucose), chip color and enzyme activities [i.e., UDP-Glucose pyrophosphorylase (UGPase) and vacuolar acid invertase (VAcInv)]. The top five clones will be placed in tissue culture for eradication of viruses during the fall and winter of 2009. Minitubers for grower

tested should be available in the spring of 2010.

- **<u>Transfer of the anti-sweetening gene (UgpA) from the cultivar Snowden into two dual purpose russeted potatoes</u>**
  In a cooperative project with Dr. Susie Thompson (NDSU), microtubers of russeted selections AOND95292-3 and ND7882b-7 were transformed with the anti-sweetening gene (*Ugp*A) from the cultivar Snowden using the well-known Agrobacterium t. system. Seventy-two and twenty-four distinct genotypes of AOND95292-3 and ND7882b-7, respectively, were generated. In the spring of 2008, minitubers of each line were planted at Wyndmere, ND. Tubers were harvested in mid-October and placed into 6^{o} C (42^{o} F) storage. Following 3 months storage, each of the ninety-six russeted ITG lines will be analyzed for the presence of the *Ugp*A gene and the anti-sweetening protein (UGPase-UGP5). Invertase activity will also be conducted and compared to the respective non-transformed lines. It is anticipated that enough seed will be available to conduct replicated field trials in the spring of 2009.

- **<u>Screening of U.S. potato breeding for processing directly from cold temperature storage</u>**
  In cooperation with Martin Glynn (USDA/ARS), over one hundred advanced breeding clones from nine states (New York, Texas, Oregon, Maine, Michigan, Wisconsin, Maryland, North Dakota, and Minnesota) and Alberta, Canada were evaluated for their ability to chip directly from cold storage. Clones were evaluated for their storage ability and processing quality following 7 month storage interval at 3^{o} C (38^{o} F), 4.5^{o} C (40^{o} F), and 6^{o} C (42^{o} F) with or without a 2 week 'reconditioning period' at 12.5^{o} C (55^{o} F). Depending on their concentration of sugar (sucrose and glucose) and chip color, clones were rated from high to low in relation to their cold-sweetening-resistance in storage. Results were rapidly disseminated to each of the contributing potato breeders and published in the local *Valley Grower Magazine*.

- **<u>Identification and characterization of a new anti-sweetening protein found in New Zealand potato clones</u>**
  Trypsin digestion of protein extracts of New Zealand (NZ) potato clones revealed a new subunit of the anti-sweetening protein UGPase. North American potatoes have repeatedly demonstrated only one subunit size for UGPase of 53 kDa using SDS-PAGE. Seven of the fifteen NZ clones developed by potato breeder John Anderson (Auckland, NZ) showed an additional subunit at 55 kDa. The explanation for its 2 kDa larger size from the typical UGPase subunit, has not yet been explained. In 2008, both the upper and lower subunit bands were isolated from the NZ lines Kaimai and V394 and digested with trypsin. Digested samples were sent to Mr. Bruse on the St. Paul Campus and Mr. Patric at ABI, Canada for mass-spec analysis. Following MALDI-TOF analysis, Mr. Bruse confirmed that each band was UGPase. Mr. Patric at ABI using LC-MS/MS reported multiple sites for phosphorylation on the lower band of each NZ potato clone. The UGPase proteins from Kaimai and V394 were partially purified using hydrophobic chromatography, anion exchange on DEAE and treatment with ConA. Affinoblotting for glucosyl units revealed that the upper subunit of both NZ clones may be glycosylated. This is the first evidence for the possibility for post-translational-modification (PTM) of UGPase which is ubiquitous in plants. Participation of PTM and its role in regulating sugar levels in potatoes needs to be confirmed using a more purified form of the protein. This investigation is currently underway.

- **<u>Large scale evaluation of vacuolar acid invertase (VAcInv) activity in potatoes</u>**
  VAcInv activity of approximately two hundred genetically diverse potato clones was determined using a recently developed, 'rapid micro-plate' reader assay method. Basal VAcInv activity (assayed in the presence of endogenous inhibitor) correlated well with the concentration of glucose formed following 6-months storage at 4.5^{o} C (40^{o} F). Relative

VAcInv activity appears to be a tool/marker that potato breeders can use to select clones that demonstrate superior processing characteristics, rapidly from large potato populations.

- **Evaluation of Premier Russet and other russeted potatoes used by J.R. Simplot Co.**
  In Cooperation of Dr. Rich Novy, USDA & University of Idaho, we agreed to evaluate the culture and processing performance of a newly named potato variety, Premier Russet. Premier was found to have a high respiration rate and was very susceptible to hollow heart in our area. Although it has a short dormancy in storage, it demonstrated the lowest VAcInv activity and the best color related to other russeted lines presently being used by J.R. Simplot Co.

- **Serial chipping of advanced potato breeding clones**
  In cooperation with Martin Glynn (USDA/ARS), over one hundred advanced breeding clones from several potato breeding programs were evaluated for their storage ability and processing quality following 7-month storage at 8.9^{o} C (48^{o} F). Depending on their relative concentration of sugar (sucrose and glucose) and chip color, each clone was categorized has having the most potential for chip, French fry, or fresh market utilization. Results are rapidly disseminated to each of the contributing potato breeders and published in the local *Valley Grower Magazine.*

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tPotato Breeding and Cultivar Development for the Northern Plains
North Dakota State University
2008 Summary

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Potato Breeding, Selection, Cultivar Development, and Germplasm Enhancement

The potato breeding program at North Dakota State University (NDSU) was established more than 75 years ago as part of the North Dakota Agricultural Experiment Station (NDAES). Since 1930, 23 cultivars have been named and released by the NDAES, in cooperation with the USDA-ARS, and others (please see attachment). Many additional collaborative releases with state Agricultural Experiment Stations and Agriculture Canada have also occurred. Traditionally, NDSU potato cultivar releases have been widely adapted and accepted and have significantly impacted potato production in North Dakota, Minnesota, the Northern Plains, and across North America. Our objective, as a leader in potato breeding, selection and cultivar development, is to identify and release exceptional, multi-purpose cultivars that are high yielding, possess multiple resistances to diseases, insect pests, and environmental stresses, exhibit excellent consumer quality for chip and/or frozen processing and the tablestock industry. Additionally, new releases should be adapted to production conditions in North Dakota, Minnesota and the North Plains. Our program emphasizes late blight, cold-sweetening, Colorado potato beetle, aphid, pink rot and *Pythium* leak, silver scurf, and sugar end resistance breeding. In order to develop durable and long-term resistance to these pests, stresses and diseases, breeding efforts continue to include germplasm enhancement to incorporate important pest resistances and quality traits via exploitation of wild species and wild species hybrids, in addition to the use of released cultivars and advanced germplasm from around the globe. Breeding, evaluation, and screening efforts are successful because of the cooperative and interdisciplinary efforts amongst the NDSU potato improvement team, the North Dakota State Seed Department (NDSSD), and with potato producers, research and industry personnel in ND, the Northern Plains, and North America.

In order to address specific needs of producers and industry in the Northern Plains, the NDSU potato breeding program has established the following research objectives:

1. Develop potato (*Solanum tuberosum* L.) cultivars that are genetically superior for yield, disease and pest resistance, marketing, processing ability and consumer quality adapted to North Dakota, the Northern Plains and other areas, through the use of traditional and molecular techniques.

2. Screen and develop germplasm incorporating genetic resistance to major diseases, pests and environmental stresses that cause economic losses in potato production in North Dakota and North America.
3. Evaluate advanced selections and cultivars for improved culinary quality.

Research activities in 2008 ranged from Langdon, Tappen and Wyndmere in North Dakota to Park Rapids in Minnesota. Procedures used by the NDSU potato breeding program in breeding, selection and cultivar development are summarized in the attached schematic. Potato cultivar development is a long process requiring 10 to 20 years from hybridizing through naming and release. It involves interdisciplinary teams which evaluate multiple facets required to make a potential release suitable for producers and the industry, and to provide opportunity for success. The potato crop is influenced by seed quality, cultural practices, and the environment. The NDSU potato improvement team works with the North Dakota State Seed Department, and is certifying production from greenhouse seedling production through advancing field generations. The following narrative summarizes our 2008 research efforts.

In 2008, 368 families were created in the greenhouse. Of these 73%, 44%, 21% and 7% included late blight, Colorado Potato Beetle (CPB), aphid and virus, and Verticillium wilt resistance breeding. Seedlings (97,476) from true botanical seed were planted in summer and fall greenhouse crops. Primary areas of concentration continue to be cold processing ability (chip and frozen products), late blight, CPB, sugar end, pink rot and *Pythium* leak, and aphid resistance, and emerging areas addressing regional producer and industry needs, including *Verticillium* wilt, PVY and *Fusarium* resistance, and enhanced nutritional quality. Germplasm enhancement is used to develop durable and long-term resistance to disease and insect pests and environmental stresses; wild species, wild species hybrids, released cultivars and advanced germplasm from around the globe, are exploited to introgress these important traits. At Langdon, 82,111 ND seedlings, representing 469 families were evaluated. Unselected seedling tubers from cooperating programs in CO, ID, TX, and ME were grown at several sites. Unselected seedling tubers, totaling 78,473, were shared with breeding programs in CO, ID, ME, MI, MN, TX and WI. In 2008, 1,538 second, 421 third year, and 324 fourth year and older selections, were maintained and/or increased; additional selections with late blight resistance and for genetic studies were also maintained/increased. Yield and evaluation trials were grown at four irrigated and two non-irrigated sites in ND and MN. Seventy-six advancing selections and named cultivars were evaluated in replicated yield trials at Hoople in the ND state fresh market and chip trials and North Central Regional Potato Variety Trial (NCRPVT) red and chip trials. Irrigated sites were at Park Rapids, MN, Larimore, Oakes, and Tappen, ND, with 16, 21, 15, and 118 genotypes evaluated, respectively, in replicated trials. Second year (291) and third and fourth year (38) selections from out-of-state programs were maintained/increased at Tappen. Five entries from the NDSU program were evaluated in the NCRPVT including, bright red skinned selections suitable for the fresh market, AND00272-1R and ATND98459-1RY; the latter has yellow flesh. AOND95292-3Russ, a dual-purpose russet suitable for tablestock and frozen processing was included in the russet/long white trial. ND8304-2 and ND8307C-3 were entries in the NCPRVT chip trial. We continue our efforts to identify germplasm for cultivar release that will reliably and consistently process from long term cold storage. Chip selections were sampled and stored at 42F (5.5C) and 38F (3.3C) for eight weeks; additional samples from 42F

(5.5C) will be processed after seven months. Frozen processing selections were sampled and stored at 45F (37.2C) for eight weeks; additional samples will be processed after seven months. Trial entries were evaluated for blackspot and shatter bruise potential.

Collaborative disease resistance breeding and screening trials focused on foliar and tuber late blight, bacterial ring rot expression, pink rot and *Pythium* leak, *Fusarium* dry rot, and tuber blemish diseases including black dot and silver scurf. Dr. Gary Secor's program evaluated seedling families using a detach leaf assay in the greenhouse. Resistant selections were retained for field evaluation in 2009. Several field trials were grown at Prosper, ND to evaluate field resistance of advancing selections identified in previous years as being resistant. In 2008 we had several selections with commercial potential (ie. appearance and processing/tablestock quality) in our red and processing trials. Fifteen selections were evaluated for disease reaction to bacterial ring rot in the field by Dr. Neil Gudmestad's research group. All clones exhibited typical foliar and tuber symptoms. Drs. Neil Gudmestad and Ray Taylor continued evaluating clones for resistance to pink rot, *Pythium* leak, and in 2008 also included evaluations for resistance to *P. nicotianae*. Several parental genotypes express resistance or moderate resistance to one or more of the disease pathogens. Dr. Secor's program is evaluating selections for resistance to tuber blemish diseases. Seedling families were evaluated for defoliation in a CPB resistance screening nursery by Dr. Janet Knodel and Don Carey. Defoliation data was used in determining selection intensity of these same families at Langdon. A replicated trial included advancing selections which previously demonstrated resistance to feeding by CPB. Additional collaboration includes sucrose rating and serial chipping of chip and frozen processing selections. Additional collaboration includes sucrose rating and serial chipping of chip and frozen processing selections by Dr. Joseph Sowokinos (UMN) and Marty Glynn (USDA-ARS) at the USDA-ARS Potato Worksite in East Grand Forks, MN. Dr. Nicholas David evaluated several advancing red selections in a seed piece spacing study at Hoople. He looked at several parental genotypes and advancing selections in a corky ringspot trial in MN and found potential resistance in at least two lines. Finally, Dr. David conducted nitrogen fertility trials in collaboration with Dr. Carl Rosen. A few of the NDSU advancing processing selections were included in those efforts. A collaborative trial was conducted with Dr. Harlene Hatterman-Valenti to evaluate sensitivity to the widely used herbicide metribuzin. Fourteen entries (5 NDSU, 4 MSU and 5 UWI) were grown with the resistant check, Russet Norkotah, and the susceptible check, Shepody. In the replicated study, treated plots (1 lb./acre applied post-emergence when plants are 8 to 12 inches tall) were compared to untreated plots (no metribuzin) for plant damage, plant height, and total yield. ND submitted entries in cooperative trials in FL, MI, MN, NC, TX and WI amongst others. These trials included collaborations with producers, industry, and research groups.

Promising advanced selections include red tablestock selections ND4659-5R, ND8555-8R, and ND6002-1R. Dual-purpose russet selections, AOND95249-1Russ, ND8229-3, ND8068-5Russ and AOND95292-3Russ possess excellent processing quality and appearance, in addition to the need for reduced inputs. Several cold chipping selections continue to look promising, including ND5775-3, ND7519-1, ND8304-2, and ND8305-1. Information for plant variety protection and cultivar release was collected for several selections, with anticipation of release consideration in 2009. Tissue culture plantlets of ND6002-1R were deposited with the North Dakota State Seed Department for multiplication for producer and industry evaluation.

Goals for 2009 include continued breeding, selection, evaluation and development efforts of superior genotypes with multiple resistances, high yield potential and important quality attributes; to continue to improve our seed increase procedures and certified seed production efforts working with the NDSSD; and, to further expand the long-term storage and cultural management evaluations. We are excited by the opportunity to conduct cooperative and interdisciplinary research projects with members of the NDSU potato improvement team, the NDSSD, the USDA-ARS programs in Fargo and East Grand Forks, and other U.S. and Canadian research programs. These relationships permit us to evaluate new and advancing selections for adaptation, yield stability, appearance, quality, and resistance to pests in many environments. We are extremely grateful for the support of potato producers and industry personnel in North Dakota and Minnesota, the Northern Plains, and around North America, without whom our work would be very difficult and without meaning.

Cultivar Releases

North Dakota State University
Potato Breeding Program

Cultivar	Year	Type
Nordak	1957	Tablestock, round-oval white
Norgleam	1957	Tablestock, round-oval white
Norland	1957	Tablestock, round-oval red
Snowflake	1961	Tablestock, round-oval white
Viking	1963	Tablestock, oblong-round red
Norgold Russet	1964	Tablestock, russet
Norchip	1968	Chip processing, round white
Norchief	1968	Tablestock, round-oblong red
Bison	1974	Tablestock, round-oblong red
Dakchip	1979	Chip processing, round-oval white
Crystal	1980	Chip processing, oval
Redsen	1983	Tablestock, round-oval red
NorKing Russet	1985	Dual-purpose (tablestock and frozen processing), russet
Russet Norkotah	1987	Tablestock, russet
Goldrush	1992	Tablestock, russet
Norqueen	1992	Tablestock, russet
NorDonna	1995	Tablestock, round-oval red
NorValley	1997	Chip processing, round-oval white
Dakota Pearl	1999	Chip processing, round white
Dakota Rose	2000	Tablestock, round-oblong red
Dakota Jewel	2004	Tablestock, round-oblong red
Dakota Crisp	2005	Chip processing, round white
Dakota Diamond	2005	Chip processing, round white

February 2008

Potato Breeding and Cultivar Development
Breeding, Selection and Development Schematic

North Dakota State University

Year	Procedure
1	Parental selection, crossing and true seed production in the greenhouse. Produce seedling tubers from true seed in the greenhouse. Initiate late blight screening of seedling families.
2	100,000+ North Dakota seedlings are planted in the field (Langdon, ND) as single hills. Up to 100,000 from out-of state programs are also planted at ND and MN locations. Initial selection takes place at harvest; 1,000-2,100 genotypes are typically retained. This is the first cycle of field selection. Decisions regarding seed increase are initiated.
3	Two-four hill units are planted at Absaraka for seed maintenance. Typically 200-250 selections are retained at harvest based primarily on phenotypic selection. This is the second cycle of field selection. Colorado potato beetle (CPB) resistant (potential) selections are entered into replicated trials and evaluated for defoliation. Selections are evaluated for specific gravity and internal defects. Chipping and russet selections are evaluated for sucrose rating and are chipped (38 and 42F)/fried (42 and 45F) from storage. Replicated late blight field screening evaluations begin.
4 and/or 5	Two-four hill units are planted at Absaraka and 10 hills are planted at Wyndmere for seed maintenance. Decisions regarding increase are made at harvest and following quality evaluations during the winter. This is the third cycle of field selection. Selections are evaluated for specific gravity and internal defects. Chipping evaluations, late blight and CPB resistance screenings continue. Cleanup and micropropagation are initiated for exceptional genotypes. Selected lines are increased for trial seed. Entry into state yield trials for up to three years may occur. Sensory evaluations are initiated. Decision is made following grading, or during the winter evaluations, determining which selections to continue with.
6	Second year of state trials. Promising selections continue to be increased. Additional selections may be entered into micropropagation. Cultural management and disease/pest (field and post-harvest reaction) evaluation trials begin. Promising selections continue to be increased. To growers for evaluation and increase.
7	Third year in State Trials or exceptional selections to North Central Regional Potato Variety Trial. Cultural management and disease/pest evaluation trials continue. Processing selections are evaluated for flake production.
8-11	Enter in Regional Trial for up to 3 years and Snack Food Association Trial if it is a chipper. Grower evaluation and increase continue. Cultural management and disease/pest reaction evaluations continue.
10-15+	Consider for release as a named cultivar.

Revised: January 2009

AOND95249-1Russ

A89163-3LS x A8914-4

- Medium-late maturity
- High yield potential
- Good storability and low sugar accumulation in storage.
- High specific gravity
- Resistance to late blight, *Vertillium* wilt, and sugar ends in field evaluations. Moderately resistant to pink rot. Hollow heart and blackspot bruise occasionally noted.
- Tolerant of metribuzin applications.

ND8229-3

- Marcy x AH66-4
- Medium maturity
- Medium vine size
- High yield potential
- Good storability and excellent fry color from 45F storage
- High specific gravity
- Resistance to sugar ends
- Tolerant of metribuzin applications

AND97279-5Russ

- A92001-2 x Ranger Russet
- Medium to large vine size
- Medium to late vine maturity
- High yield potential
- High specific gravity
- Good storability with low sugar accumulation
- Early in evaluation process

ND8068-5Russ

- ND2667-9Russ x ND4233-1Russ
- Medium vine size
- Early vine maturity
- Medium to high yield potential
- High specific gravity
- Good storability with low sugar accumulation
- Early in evaluation process

ND4659-5R

- NorDonna x ND2842-3R
- Tablestock, medium specific gravity
- Medium vine with red-purple flowers
- Medium maturity
- Medium yield potential
- Bright red, round, smooth tubers with white flesh and shallow eyes.
- No outstanding disease or pest susceptibilities
- Stores well

ND8555-8R

- ND7188-4R x ND5256-7R
- Tablestock, medium specific gravity
- Early maturity
- Medium sized vine
- Medium yield potential
- Bright red, round, smooth tubers with white flesh and shallow eyes
- Stores well
- Early in the evaluation process for cultivar specific information

ND6002-1R

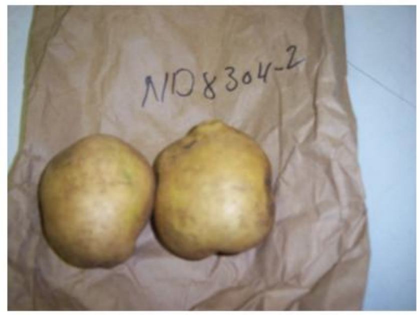
- NorDonna x Bison
- Medium sized vine
- Medium maturity
- Medium yield potential
- Round, smooth, bright red tubers with smooth eyes and bright white flesh
- Medium specific gravity
- Early in evaluation process

ND7519-1

- ND3828-15 x W1353
- Medium sized vine
- Medium maturity
- Medium to high yield potential
- High specific gravity
- Chips from 42F storage
- Early in evaluation process for cultivar specific management information

ND8304-2

- ND860-2 x ND7083-1
- Medium early maturity
- Medium sized vine
- Medium yield potential
- High specific gravity
- Chips from 42F storage
- Early in the evaluation process



University of Minnesota
Department of Plant Pathology

2008
Potato Disease Report

Potato Pathology and Genomics
http://ppg.cfans.umn.edu/

James Bradeen

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The financial support of the Minnesota Area II Potato Research and Promotion Council is gratefully acknowledged.

Section I. Evaluating Potato Germplasm for Disease Resistance

SUMMARY: Late blight resistance screening plots were established at UMore Park, Rosemount, MN in 2008. (Common scab resistance screening plots were established at the Sand Plain Research Farm, Becker, MN in 2008 by the UM Potato Breeding Program. Common scab resistance data are not presented in this report.) In total, 934 potato breeding lines originating from the UM Potato Breeding Program, the North Central Region potato breeding programs, and from the National Late Blight trial were surveyed. As in previous years, tested materials varied greatly in disease resistance levels and lines ranked as susceptible, moderately susceptible, moderately resistant, and resistant were identified. Our results demonstrate the effectiveness of resistance breeding.

Table 1. Source and number of entries screened for late blight resistance in 2008.

Source	**Late Blight** (UMore Park, Rosemount, MN)
UMN Potato Breeding	734
North Central Trial	30
National Late Blight and Scab Trial	132
Joe Sowokinos, UM Hort Sci	38

Late Blight – Rosemount, MN

Late blight, caused by the fungus *Phytophthora infestans*, was responsible for the Irish Potato Famine of the mid-1800's. The disease is characterized by brown to black water-soaked lesions on potato leaves and stems. Under cool, humid conditions, late blight can destroy an entire field within 10-14 days. When sporangia or zoospores are washed into the soil, they can infect potato tubers. Tuber infection is characterized by a dry, brown, granular rot. Secondary pathogens, such as *Erwinia carotovora* (soft rot), *Phytophthora erythroseptica* (pink rot), and *Pythium* spp. (leak) frequently follow. Late blight is currently managed by intensive fungicide applications. This approach is expensive and not environmentally sustainable. Genetic resistance derived from cultivated or wild potato is a promising means to reduce pesticide dependency, risk to the environment, and costs to potato growers.

Resistance to late blight is evaluated at UMore Park (Rosemount, MN) in cooperation with James Rowe (Administrative Professional), Jim Karelis (Sr. Research Plot Technician) and Kimon Karelis (Research Plot Coordinator). The UMore Park is geographically isolated from commercial potato farms allowing intentional inoculation with the late blight pathogen. Because the spores of the pathogen are air-borne, inoculations and late blight screening is restricted to non-production areas. To further protect regional growers, the Late Blight Nursery is planted 4 to 8 weeks later than commercial production fields in Minnesota and Wisconsin.

Disease screening methods are detailed in Appendix A. Complete results for individual entries from the University of Minnesota Potato Breeding Program, National Late Blight, and North Central Region for 2008 are listed in Appendix B. Table 2 summarizes our findings.

Table 2. Number of entries in each late blight resistance class based on infection 39 days after inoculation with the potato late blight pathogen at Rosemount, MN 2007

Sources of entries	No. (percent) of entries 28 DAI
UM Potato Breeding	
Resistant	0 (0%)
Moderately Resistant	1 (0.14%)
Moderately Susceptible	12 (1.7%)
Susceptible	689 (98.15%)
National Late Blight Trial	
Resistant	7 (5.3%)
Moderately Resistant	11 (8.3%)
Moderately Susceptible	27 (20.5%)
Susceptible	87 (65.9%)
North Central Trial	
Resistant	0 (0%)
Moderately Resistant	0 (0%)
Moderately Susceptible	3 (10.3%)
Susceptible	26 (89.7%)
All Entries	
Resistant	7 (0.07%)
Moderately Resistant	12 (1.28%)
Moderately Susceptible	44 (4.71%)
Susceptible	871 (93.25%)

References

Henfling, J. W. 1987 Late blight of potato: *Phytophthora infestans*. Technical Information Bulletin 4. International Potato Center, Lima, Peru.

Appendix A: Late Blight Disease Screening Methods

Tubers were planted on June 10. Entries were submitted by the University of Minnesota Potato Pathology and Genomics Program, the University of Minnesota Potato Breeding Program, the National Late Blight Trial (conducted by Dr. Kathleen Haynes, USDA/ARS, Beltsville, MD), the North Central Region trials, and Dr. Joe Sowokinos (UM Horticultural Science). Admire 2F insecticide was applied in furrow at a rate of 16 fl. oz./acre to all planted potatoes. No fungicides were applied to the field at any time during the season.

All experimental were directly inoculated with a suspension of *P. infestans* (US-8 strain) zoospores and sporangia at a concentration of 1000 sporangia /ml in the late evening of August 18. Inoculum was applied with a CO_2 sprayer at 20 psi using a single nozzle (6502 tip) wand. Plots were irrigated for 2 hours prior to inoculation. Sprinkler irrigation was applied the next morning and thereafter, 4 to 6 times per week depending upon weather conditions for 1 hour to prolong natural dew periods. All irrigation was accomplished using a low-volume, overhead mist-type sprinkler system.

Evaluations were initiated 18 days after inoculation and were made approximately every 3 to 5 days until 39 days after inoculation (6 readings total). Each entry was visually scored for disease severity using the CIP scale (Henfling, 1987). The CIP rating system is as follows:

CIP	% Late Blight	
Rating	Mean	Limits
1	0	0
2	2.5	Trace to 5
3	10	5 to <15
4	25	15 to <35
5	50	35 to <65
6	75	65 to <85
7	90	85 to <95
8	97.5	95 to <100
9	100	100

After all disease ratings were made, the CIP ratings were categorized based on readings taken 40 DAI as follows:

Resistance Class	Score
Resistant	<2.5
Moderately Resistant	2.5-4.99
Moderately Susceptible	5-7.49
Susceptible	>7.5

Appendix B. Field Plot Data

Late Blight: Disease resistance scores for entries in the (1) University of Minnesota Potato Breeding Program, (2) the North Central Region, and (3) the National Late Blight Trial.

1. UM Potato Breeding Program (Dr. Christian Thill)

Genotype	Score 09/05	Score 09/12	Score 09/19	Score 09/27	Resistance Phenotype
AOMN 03178-2	3	3	6	9	S
AOMN 03178-2	3	4	7	9	S
AOMN 041027-01	3	4	8	9	S
AOMN 041027-01	3	6	8	9	S
AOMN 041050-02	3	3	8	9	S
AOMN 041050-02	2	4	6	9	S
AOMN 041070-01	3	4	9	9	S
AOMN 041070-01	4	5	8	9	S
AOMN 041093-01	5	8	9	9	S
AOMN 041093-01	4	5	8	9	S
AOMN 041101-01	2	2	4	9	S
AOMN 041101-01	3	4	6	9	S
AOMN 041115-02	3	5	9	9	S
AOMN 041115-02	4	7	9	9	S
AOMN 041127-01	2	2	5	9	S
AOMN 041127-01	2	3	8	9	S
AOMN 041138-01	5	8	9	9	S
AOMN 041138-01	4	7	9	9	S
AOMN 06070-01	2	2	3	9	S
AOMN 06070-01	4	5	8	9	S
AOMN 06077-01	2	3	8	9	S
AOMN 06077-01	3	4	7	9	S
AOMN 06077-03	3	3	7	9	S
AOMN 06077-03	3	5	8	9	S
AOMN 06085-01	4	5	8	9	S
AOMN 06085-01	4	6	9	9	S
AOMN 06087-01	4	6	8	9	S
AOMN 06087-01	3	4	9	9	S
AOMN 06091-01	4	5	8	9	S
AOMN 06091-01	3	4	8	9	S
AOMN 06098-02	4	6	8	9	S
AOMN 06098-02	5	5	8	9	S
AOMN 06100-03	2	3	7	9	S
AOMN 06100-03	3	4	6	9	S
AOMN 06100-05	2	3	7	9	S
AOMN 06100-05	5	5	8	9	S

AOMN 06100-06	3	5	8	9	S
AOMN 06100-06	3	5	9	9	S
AOMN 06107-01	2	2	4	9	S
AOMN 06107-01	3	4	8	9	S
AOMN 06108-01	3	3	7	9	S
AOMN 06108-01	4	5	8	9	S
AOMN 06118-01	2	2	6	9	S
AOMN 06118-01	3	3	7	9	S
AOMN 06120-01	6	7	9	9	S
AOMN 06120-01	4	7	9	9	S
AOMN 06126-02	2	2	6	9	S
AOMN 06126-02	2	2	7	9	S
AOMN 06129-02	3	3	5	9	S
AOMN 06129-02	2	2	4	8	S
AOMN 06131-01	3	6	9	9	S
AOMN 06131-01	4	5	9	9	S
AOMN 06131-02	5	8	9	9	S
AOMN 06131-02	4	6	8	9	S
AOMN 06134-02	3	5	8	9	S
AOMN 06134-02	3	5	9	9	S
AOMN 06135-01SD	3	3	6	9	S
AOMN 06135-01SD	5	5	6	9	S
AOMN 06135-02SD	5	9	8	9	S
AOMN 06135-02SD	3	6	9	9	S
AOMN 06135-03	2	3	7	9	S
AOMN 06135-03	2	4	7	9	S
AOMN 06136-05	3	5	8	9	S
AOMN 06136-05	5	6	8	9	S
AOMN 06136-10	2	3	4	9	S
AOMN 06136-10	2	3	6	9	S
AOMN 06136-11	3	3	5	8	S
AOMN 06136-11	2	2	4	9	S
AOMN 06136-13	3	3	8	9	S
AOMN 06136-13	4	6	9	9	S
AOMN 06140-02	2	3	6	9	S
AOMN 06140-02	2	3	4	9	S
AOMN 06142-01	3	4	8	9	S
AOMN 06142-01	4	6	8	9	S
AOMN 06147-03	2	2	2	4	MR
AOMN 06147-03	2	2	4	7	MS
AOMN 06147-05	3	3	6	9	S
AOMN 06147-05	3	3	6	9	S
AOMN 06149-01	3	5	4	8	S
AOMN 06149-01	4	4	7	9	S
AOMN 06149-04	3	3	5	9	S
AOMN 06149-04	3	4	5	9	S
AOMN 06150-02	3	4	7	9	S
AOMN 06150-02	4	4	7	9	S
AOMN 06150-03	2	2	3	9	S

AOMN 06150-03	2	4	8	9	S
AOMN 06153-01	2	4	4	7	MS
AOMN 06153-01	3	4	6	9	S
AOMN 06153-01SD	4	5	9	9	S
AOMN 06153-01SD	4	6	8	9	S
AOMN 06153-03	4	5	9	9	S
AOMN 06153-03	4	5	8	9	S
AOMN 06153-05	2	2	3	5	MS
AOMN 06153-05	2	2	4	9	S
AOMN 06153-07	2	2	4	8	S
AOMN 06153-07	3	5	8	9	S
AOMN 06153-08	3	3	6	9	S
AOMN 06153-08	2	2	5	8	S
AOMN 06154-06	4	6	7	9	S
AOMN 06154-06	2	4	5	8	S
AOMN 06156-02	3	4	7	9	S
AOMN 06156-02	2	2	6	9	S
AOMN 06156-03	3	3	6	9	S
AOMN 06156-03	2	3	7	9	S
AOMN 06156-04	2	2	5	9	S
AOMN 06156-04	4	5	8	9	S
AOMN 06161-01	3	5	9	9	S
AOMN 06161-01	3	4	8	9	S
AOMN 06162-02	2	3	4	9	S
AOMN 06162-02	4	6	6	9	S
AOMN 06166-01	4	5	7	9	S
AOMN 06166-01	3	5	8	9	S
AOMN 06167-01	3	4	8	9	S
AOMN 06167-01	4	6	8	9	S
AOMN 06171-03	3	5	7	9	S
AOMN 06171-03	2	4	9	9	S
AOMN 06174-01	3	2	4	9	S
AOMN 06174-01	2	3	5	9	S
AOMN 06174-01SD	2	2	4	9	S
AOMN 06174-01SD	2	2	3	8	S
Atlantic	4	4	9	9	S
Atlantic	3	5	9	9	S
ATMN 03505-3	6	7	9	9	S
ATMN 03505-3	5	7	9	9	S
COMN 03019-4	8	8	9	9	S
COMN 03019-4	5	7	9	9	S
COMN 03020-3	6	3	8	9	S
COMN 03020-3	3	3	7	9	S
COMN 03021-1	7	6	9	9	S
COMN 03021-1	8	9	9	9	S
COMN 03024-6	7	8	9	9	S
COMN 03024-6	6	7	9	9	S
COMN 03027-1	3	4	7	9	S
COMN 03027-1	3	4	6	9	S

COMN 03030-1	6	7	9	9	S
COMN 03030-1	4	7	9	9	S
COMN 03035-5	7	8	9	9	S
COMN 03035-5	7	8	9	9	S
COMN 03049-5	4	5	6	9	S
COMN 03049-5	3	5	6	8	S
COMN 03051-1	4	7	9	9	S
COMN 03051-1	3	5	9	9	S
COMN 04651-03	4	6	9	9	S
COMN 04651-03	3	5	8	9	S
COMN 04654-03	4	5	8	9	S
COMN 04654-03	4	5	8	9	S
COMN 04659-02	4	5	7	9	S
COMN 04659-02	3	5	7	9	S
COMN 04659-05	2	3	4	9	S
COMN 04659-05	3	3	6	9	S
COMN 04659-06	m	m	m	m	m
COMN 04659-06	3	4	5	9	S
COMN 04668-01	4	5	9	9	S
COMN 04668-01	3	6	8	9	S
COMN 04670-02	7	9	9	9	S
COMN 04670-02	9	9	9	9	S
COMN 04674-02	3	3	7	9	S
COMN 04674-02	2	4	7	9	S
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COMN 04713-03	4	6	8	9	S
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COMN 06355-03	2	2	4	7	MS
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NorValley	5	6	8	9	S
R. Burbank	2	3	6	9	S
R. Burbank	3	4	7	9	S
R. Norkotah	3	4	7	9	S
R. Norkotah	5	7	8	9	S
Red Norland	7	8	9	9	S
Red Norland	7	8	9	9	S
Red Pontiac	3	4	8	9	S
Red Pontiac	3	5	8	9	S
Shepody	4	4	7	9	S
Shepody	2	4	7	9	S
Snowden	2	3	4	9	S
Snowden	3	3	4	7	MS
USDAWIMN 04060-1	4	6	9	9	S
USDAWIMN 04060-1	3	5	8	9	S

W2253-5rus	3	5	7	9	S
W2253-5rus	3	3	6	7	MS
W2609-1R	4	6	9	9	S
W2609-1R	5	8	9	9	S
W3160-5rus	2	2	4	9	S
W3160-5rus	3	4	6	8	S
W3186-2	3	3	7	9	S
W3186-2	3	5	6	9	S
W3743-5rus	2	3	6	9	S
W3743-5rus	3	5	8	9	S
W3952-3rus	3	4	8	9	S
W3952-3rus	5	7	8	9	S
WIMN 04836-01	6	9	9	9	S
WIMN 04836-01	7	8	8	9	S
WIMN 04836-02	3	4	7	9	S
WIMN 04836-02	3	5	7	9	S
WIMN 04837-01	8	8	9	8	S
WIMN 04837-01	5	7	8	9	S
WIMN 04844-01	3	5	5	9	S
WIMN 04844-01	2	4	6	9	S
WIMN 04844-03	4	5	7	9	S
WIMN 04844-03	3	3	7	9	S
WIMN 04844-06	3	4	8	9	S
WIMN 04844-06	4	5	8	9	S
WIMN 04844-07	7	7	9	9	S
WIMN 04844-07	8	9	9	9	S
WIMN 04844-12	3	5	8	9	S
WIMN 04844-12	3	5	9	9	S
WIMN 04854-07	4	6	9	9	S
WIMN 04854-07	3	5	9	9	S
WIMN 04855-02	3	4	8	9	S
WIMN 04855-02	3	4	7	9	S
WIMN 04860-01	3	3	5	7	MS
WIMN 04860-01	1	2	4	8	S
WIMN 04866-02	6	8	9	9	S
WIMN 04866-02	4	6	8	9	S
WIMN 06002-02	2	4	8	9	S
WIMN 06002-02	2	3	9	9	S
WIMN 06004-02	3	7	8	9	S
WIMN 06004-02	2	6	9	9	S
WIMN 06006-02	4	5	8	9	S
WIMN 06006-02	2	4	7	9	S
WIMN 06010-01	4	5	8	9	S
WIMN 06010-01	3	4	7	9	S
WIMN 06010-04	3	5	9	9	S
WIMN 06010-04	4	6	8	9	S
WIMN 06014-01	3	5	7	9	S
WIMN 06014-01	2	4	8	9	S
WIMN 06014-02	2	2	7	9	S

WIMN 06014-02	4	6	8	9	S
WIMN 06014-03	3	5	8	9	S
WIMN 06014-03	5	6	9	9	S
WIMN 06018-01	m	m	m	m	m
WIMN 06018-01	4	5	8	9	S
WIMN 06022-03	2	2	5	9	S
WIMN 06022-03	2	2	5	9	S
WIMN 06024-03	4	6	9	9	S
WIMN 06024-03	4	6	8	9	S
WIMN 06030-01	3	5	8	9	S
WIMN 06030-01	6	8	8	9	S
WIMN 06030-02	2	3	6	9	S
WIMN 06030-02	3	5	8	9	S
WIMN 06031-01	2	4	3	9	S
WIMN 06031-01	2	3	6	9	S
WIMN 06031-03	4	6	8	9	S
WIMN 06031-03	5	7	8	9	S
WIMN 06031-04	5	6	9	9	S
WIMN 06031-04	4	7	9	9	S
WIMN 06035-01	4	6	8	9	S
WIMN 06035-01	3	3	7	9	S
WIMN 06035-06	2	2	6	9	S
WIMN 06035-06	2	3	5	9	S
WIMN 06036-01	3	3	4	9	S
WIMN 06036-01	3	4	5	8	S
WIMN 06036-03	4	6	8	9	S
WIMN 06036-03	4	6	8	9	S
WIMN 06040-02	4	5	8	9	S
WIMN 06040-02	4	5	8	9	S
WIMN 06041-01	8	9	9	9	S
WIMN 06041-01	5	8	9	9	S
WIMN 06041-03	4	4	8	9	S
WIMN 06041-03	5	7	9	9	S
WIMN 06041-05	4	7	9	9	S
WIMN 06041-05	6	7	9	9	S
WIMN 06041-06	8	9	9	9	S
WIMN 06041-06	6	8	9	9	S
WIMN 06041-07	3	3	8	9	S
WIMN 06041-07	3	5	9	9	S
WIMN 06042-01	2	3	4	8	S
WIMN 06042-01	2	3	4	9	S
WIMN 06042-02	3	4	8	9	S
WIMN 06042-02	3	5	6	9	S
WIMN 06042-03	3	3	4	9	S
WIMN 06042-03	3	4	8	9	S
WIMN 06046-02	8	7	9	9	S
WIMN 06046-02	4	5	8	9	S
WIMN 06057-03	5	5	8	9	S
WIMN 06057-03	5	8	9	9	S

WIMN 06057-04	5	8	9	9	S
WIMN 06057-04	3	6	9	9	S
WIMN 06061-02	3	6	9	9	S
WIMN 06061-02	5	5	9	9	S
WIMN 06063-04	3	4	9	9	S
WIMN 06063-04	3	5	9	9	S
WIMN 06063-06	3	5	7	9	S
WIMN 06063-06	4	5	7	9	S
WIMN 06064-06	5	6	9	9	S
WIMN 06064-06	8	9	9	9	S
Y. Gold	3	4	7	9	S
Y. Gold	7	8	9	9	S

2. North Central Region (University of Minnesota, North Dakota State University, University of Wisconsin, and Michigan State University)

Genotype	Score 09/05	Score 09/12	Score 09/19	Score 09/27	Resistance Phenotype
AND00272-1R	3	4	7	9	S
AND00272-1R	3	4	8	9	S
AOND95292-3Russ	3	3	6	8	S
AOND95292-3Russ	4	5	8	9	S
ATND98459-1RY	3	5	8	9	S
ATND98459-1RY	4	5	7	9	S
MSI005-20Y	2	4	6	9	S
MSI005-20Y	3	5	8	9	S
MSJ316-A	m	m	m	m	m
MSJ316-A	2	3	4	7	MS
MSJ461-1	3	4	5	6	MS
MSJ461-1	3	3	6	7	MS
MSM171-A	3	4	8	9	S
MSM171-A	4	5	8	9	S
ND7132-1R	4	5	9	9	S
ND7132-1R	2	5	9	9	S
ND8304-2	4	5	9	9	S
ND8304-2	6	8	9	9	S
ND8307C-3	3	5	8	9	S
ND8307C-3	2	3	7	9	S
W2133-1	4	4	6	9	S
W2133-1	4	4	7	9	S
W2310-3	3	5	8	9	S
W2310-3	2	4	8	9	S
W2683-2rus	3	4	7	9	S
W2683-2rus	2	4	9	9	S
W5716-1rus	2	2	6	9	S
W5716-1rus	3	4	8	9	S
W5767-1R	3	4	8	9	S
W5767-1R	3	4	8	9	S

3. National Late Blight Trial

Genotype	Score 09/05	Score 09/12	Score 09/19	Score 09/27	Resistance Phenotype
A0008-1TE	3	4	8	9	S
A0008-1TE	3	5	9	9	S
A0008-1TE	4	6	8	9	S
A95109-1	2	2	4	9	S
A95109-1	2	3	6	9	S
A95109-1	3	3	6	9	S
A96814-65LB	2	2	2	3	MR
A96814-65LB	2	2	2	5	MS
A96814-65LB	3	3	5	7	MS
A97066-42LB	2	2	3	4	MR
A97066-42LB	2	3	4	4	MR
A97066-42LB	2	2	3	5	MS
AF2376-5	2	2	3	6	MS
AF2376-5	2	3	4	6	MS
AF2376-5	2	3	5	6	MS
AF2574-1	3	4	5	6	MS
AF2574-1	3	3	4	6	MS
AF2574-1	2	6	4	8	S
AO96141-3	3	5	7	9	S
AO96141-3	2	3	6	9	S
AO96141-3	2	3	6	8	S
AO96160-3	3	5	8	9	S
AO96160-3	4	4	7	9	S
AO96160-3	3	3	7	9	S
AO96164-1	3	5	9	9	S
AO96164-1	3	4	7	9	S
AO96164-1	4	5	7	9	S
AOND95249-1Russ	4	5	7	9	S
AOND95249-1Russ	2	2	6	8	S
AOND95249-1Russ	3	4	7	8	S
AWn86514-2	2	2	2	2	R
AWn86514-2	2	2	2	2	R
AWn86514-2	2	2	2	2	R
B0692-4	3	3	3	4	MR
B0692-4	1	1	2	3	MR
B0692-4	2	2	3	5	MS
B0718-3	2	2	2	3	MR
B0718-3	2	2	3	3	MR
B0718-3	2	2	2	2	R
B1992-106	3	3	5	9	S
B1992-106	4	4	7	9	S
B1992-106	3	5	8	9	S
B2424-82	2	3	3	6	MS
B2424-82	3	4	6	7	MS

B2424-82	3	4	6	6	MS
B2430-4	4	3	4	7	MS
B2430-4	2	3	7	9	S
B2430-4	3	4	7	8	S
B2432-33	2	2	2	3	MR
B2432-33	3	4	5	7	MS
B2432-33	3	4	4	6	MS
B2460-23	2	3	3	5	MS
B2460-23	4	5	6	7	MS
B2460-23	3	3	3	6	MS
BNC48-1	6	8	9	9	S
BNC48-1	5	7	9	9	S
BNC48-1	4	7	8	9	S
Canela Russet (AC92009-4RU)	2	2	5	9	S
Canela Russet (AC92009-4RU)	3	3	6	9	S
Canela Russet (AC92009-4RU)	3	4	6	8	S
CO95051-7W	2	4	6	9	S
CO95051-7W	3	4	7	9	S
CO95051-7W	3	4	6	9	S
CO96141-4W	3	6	8	9	S
CO96141-4W	5	7	9	9	S
CO96141-4W	4	6	8	9	S
LBR1R2R3R4	2	3	7	9	S
LBR1R2R3R4	4	4	8	9	S
LBR1R2R3R4	3	3	6	8	S
LBR5	4	7	8	9	S
LBR5	4	5	8	9	S
LBR5	4	5	8	9	S
LBR7	2	3	5	8	S
LBR7	2	3	8	9	S
LBR7	3	3	7	8	S
LBR9	4	5	7	9	S
LBR9	5	7	9	9	S
LBR9	4	5	8	9	S
MSL268-D	3	6	5	9	S
MSL268-D	4	4	6	9	S
MSL268-D	4	5	8	9	S
MSM171-A	2	3	4	9	S
MSM171-A	4	6	9	9	S
MSM171-A	4	5	7	9	S
MSM182-1	2	2	3	4	MR
MSM182-1	2	3	3	5	MS
MSM182-1	3	4	5	6	MS
MSP459-5	4	6	8	9	S
MSP459-5	5	6	8	9	S
MSP459-5	4	6	8	9	S
MSQ070-1	3	3	4	7	MS

MSQ070-1	1	2	2	2	R
MSQ070-1	2	2	2	2	R
ND8229-3	3	3	4	9	S
ND8229-3	3	4	7	9	S
ND8229-3	3	3	6	8	S
OR03029-2	3	3	3	4	MR
OR03029-2	2	2	4	6	MS
OR03029-2	3	3	6	6	MS
Premier Russet	2	3	3	7	MS
Premier Russet	3	3	6	7	MS
Premier Russet	2	2	4	9	S
Rio Colorado (NDC5281-2R)	3	6	8	9	S
Rio Colorado (NDC5281-2R)	4	6	8	9	S
Rio Colorado (NDC5281-2R)	3	4	8	9	S
Rio Grande Russet (AC89536-5RU)	3	5	6	9	S
Rio Grande Russet (AC89536-5RU)	2	3	7	9	S
Rio Grande Russet (AC89536-5RU)	2	2	7	8	S
W1836-3Rus	3	5	9	9	S
W1836-3Rus	4	5	7	9	S
W1836-3Rus	3	4	8	9	S
W2133-1	3	4	6	9	S
W2133-1	4	6	6	8	S
W2133-1	3	4	7	8	S
W2324-1	3	3	7	9	S
W2324-1	4	6	7	9	S
W2324-1	3	4	7	9	S
W2683-2rus	3	4	7	9	S
W2683-2rus	4	5	8	9	S
W2683-2rus	3	3	5	9	S
W5015-5	4	4	6	7	MS
W5015-5	5	6	6	8	S
W5015-5	4	5	8	9	S
W6360-1	2	3	2	3	MR
W6360-1	2	3	3	5	MS
W6360-1	3	2	2	2	R
Yukon Gem (NDA5507-3Y)	3	4	6	9	S
Yukon Gem (NDA5507-3Y)	5	6	7	9	S
Yukon Gem (NDA5507-3Y)	5	6	8	9	S