

**Processing Potato Trial
Larimore, North Dakota
2013**

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In order to meet the objectives of the North Dakota State University potato improvement team, yield and evaluation trials were grown at eight locations in North Dakota and Minnesota in 2013, five irrigated (Larimore, Oakes, Inkster, Williston, and Park Rapids) and three non-irrigated locations (Hoople, Crystal and Grand Forks). This report summarizes the results from the Larimore processing trial. Twenty-four advancing dual-purpose russet selections and commercially acceptable cultivars were included in the trial planted on June 15. The field plot design was a randomized complete block with four replicates; cultural practices typical of the growing area were used during the growing season, including sprinkler irrigation. The plot was flailed on October 1 and harvested on October 2. Days to vine kill were 107 and to 108 days to harvest.

Agronomic and quality evaluations, yield and grade, and French fry quality are summarized Tables 1, 2 and 3, respectively. Percentage stand ranged from 76 to 100%. Bannock Russet and Dakota Trailblazer both had reduced stand when field notes were taken in early July; both tend to have strong dormancy. Vine sizes appeared normal, despite the late planting date. ND071078B-1Russ had the largest vine size. Vine maturity ranged from 3.0 (medium) to 4.3 (medium late) for Dakota Trailblazer. Stems per plant is indicative of seed quality (physiological age), tuber eye number, and length of dormancy (genetic). Stem numbers ranged from 1.5 to 4.5. Total yield ranged from 280 cwt./acre for ND050105C-1Russ to 523 cwt./acre for Russet Norkotah and ND081563C-2Russ. Russet Burbank produced only 67% US No. 1s. Due to the short growing season, the tuber size profile for all clones tended to be small. Several advancing selections and industry standards had outstanding French fry color when fried at harvest and after storage at 45F for 8 weeks. Many demonstrate sugar end resistance. Many clones considered resistant to sugar ends had some; most were light enough to be manageable during processing. These are attributed to chemical immaturity due to the extremely short growing season for these medium and later maturing clones. Russet Burbank had the most sugar ends as defined by the industry. Our program assesses a sugar end as any color deviation from the main fry. This is more stringent than the processing industry that requires a score of a 3 or 4 on the color chart to be called a sugar end. Clones with stem end colors 2 or less can usually be managed during processing/manufacturing.

Our research efforts are designed to identify processing (both chip and frozen) germplasm that will reliably and consistently process from long-term cold 38F and 42F (3.3C and/or 5.5C) storage. As we grade, a field (zero time) sample is collected for immediate French fry processing. French fry/frozen processing selections are also evaluated from 45F (7.2C) storage after eight weeks, and again the following June for fry color, stem end fry color, sugar ends, and other defects. All trial entries are evaluated for blackspot and shatter bruise potential.

The most promising advancing dual-purpose (frozen processing and tablestock) russet selection is ND8068-5Russ, despite its performance in this trial. ND8068-5Russ has early maturity, about

seven days earlier than Russet Norkotah. Unlike Russet Norkotah, it processes from the field and 45F storage. Fry colors were consistently light in this trial. AND00618-2RussY is also advancing and has received some interest as a dual-purpose specialty due to its beautiful yellow flesh. WND8624-2Russ, an advanced dual-purpose russet, is receiving some interest in areas with a longer growing season than eastern North Dakota. Please not the many selections with B's following their selection number. These indicate late blight resistance breeding. Several have been identified via the detached leaf assay evaluation conducted by Dr. Gary Secor's program of seedling families in the summer greenhouse. A very new clone of interest is the ND091933ABCR-2Russ. This selection has corky ringspot resistance breeding, in addition to the aphid, late blight, Colorado potato beetle and virus resistance breeding. We are planning evaluation for this emerging disease this summer in a field screening trial. Fry colors were quite good for this selection. Tuber shape is blocky, while the parent potentially passing along the corky ringspot resistance is very round russet in our environment. Like the Nesson Valley trial reported on in the last issue of the Valley Potato Grower, several cultivars and selections had lower specific gravity; we are attributing this to a lack of chemical maturity due to the very short growing season.

The potato breeding program is grateful for the opportunity to conduct cooperative and interdisciplinary research with members of the NDSU potato improvement team, the USDA-ARS programs in Fargo and East Grand Forks, the North Central group and other research programs across the globe. Our sincere thanks, to our many grower, industry, and research cooperators in North Dakota, Minnesota, and beyond; you make our challenging work fun and meaningful. I wish to express our gratitude to Hoverson Farms for hosting this research, the North Dakota Agricultural Experiment Station, the Northern Plains Potato Growers Association and MN Area II Potato Research and Promotion Council, R.D. Offutt Co., Hoverson Farms, and Johnson Foundation Seed for research funding and certified seed potatoes in support of processing research. Additionally, I am grateful for the support of Richard Nilles, Jeremy Buchman, and our hourly and graduate students in maintaining and harvesting the research trials at Larimore.

Table 1. Agronomic and quality evaluations for advanced processing selections and cultivars, full season, Larimore, 2013.

Clone	% Stand	Vine Size ¹	Vine Maturity ²	Stems per Plant	Tubers per plant	Specific Gravity ³	% Hollow Heart ⁴	Black-spot Bruise ⁵
1. AND00618-2RussY	90	3.8	3.0	2.9	9.4	1.0918	1	1.6
2. ND8068-5Russ	94	3.3	3.0	4.5	6.5	1.0883	1	2.3
3. ND8291C-2Russ	94	3.8	3.8	2.7	8.8	1.0867	1	1.8
4. ND049546B-10Russ	91	3.8	3.0	1.7	6.5	1.0800	0	1.6
5. ND050105C-1Russ	88	4.0	3.5	2.0	6.9	1.0846	0	2.7
6. ND050219B-82Russ	91	3.8	3.8	1.7	5.2	1.0851	0	2.5
7. ND071078B-1Russ	88	4.5	4.0	2.2	4.7	1.0851	0	2.3
8. ND071081-2Russ	91	3.5	3.3	3.4	9.2	1.0840	0	3.8
9. ND071081-4Russ	100	4.0	3.3	2.2	7.6	1.0823	1	3.0
10. ND081476B-3Russ	91	4.2	4.0	1.7	5.7	1.0885	0	1.5
11. ND081476B-10Russ	91	3.8	3.3	1.5	5.2	1.0889	0	2.2
12. ND081563C-2Russ	98	3.5	3.0	2.9	10.9	1.1002	1	1.9
13. ND091933ABCR-2Russ	99	3.5	3.3	3.4	8.2	1.0804	5	3.0
14. WND8624-2Russ	93	3.8	3.3	2.1	7.1	1.0872	0	2.6
15. WND8625-2Russ	85	3.8	3.3	2.8	7.4	1.0886	1	2.5
16. Alpine Russet	85	4.0	3.8	1.8	6.3	1.0844	0	2.2
17. Bannock Russet	79	4.0	4.0	3.1	6.6	1.0910	16	1.4
18. Dakota Trailblazer	80	4.3	4.3	1.8	6.0	1.0992	3	1.3
19. Dakota Russet	76	4.0	3.8	2.0	6.1	1.0832	0	1.8
20. Ranger Russet	96	4.0	4.0	2.3	8.0	1.0924	0	2.7
21. Russet Burbank	96	4.0	3.5	2.9	8.7	1.0907	15	2.3
22. Russet Norkotah	93	3.8	3.3	2.2	6.3	1.0766	0	1.6
23. Shepody	91	3.3	3.0	2.3	6.4	1.0848	0	1.6
24. Umatilla Russet	98	4.0	3.5	2.7	7.7	1.0856	0	1.7
Mean	91	3.8	3.5	2.4	7.1	1.0870	2	2.2
LSD ($\alpha=0.05$)	10	0.9	0.7	0.7	2.1	0.0100	7	1.2

¹ Vine size – scale 1-5, 1 = small, 5 = large.

² Vine maturity – scale 1-5, 1 = early, 5 = late.

³ Determined using weight-in-air, weight-in-water method.

⁴ Hollow heart includes brown center.

⁵ Blackspot bruise determined by the abrasive peel method, scale 1-5, 1=none, 5=severe.

Table 2. Yield and grade for advanced processing selections and cultivars, full season, Larimore, 2013.

Clone	Total Yield Cwt./A	US No. 1 Cwt./A	US No. 1 %	0-4 oz. %	4-6 oz. %	6-12 oz. %	>12 oz. %	US No. 2 %	Culls %
1. AND00618-2RussY	446	338	75	16	22	43	10	1	7
2. ND8068-5Russ	373	308	82	11	13	50	19	1	6
3. ND8291C-2Russ	376	284	76	22	27	42	6	1	2
4. ND049546B-10Russ	342	303	89	9	18	60	11	1	1
5. ND050105C-1Russ	280	226	81	19	27	44	10	0	0
6. ND050219B-82Russ	320	248	78	10	12	45	22	8	5
7. ND071078B-1Russ	369	318	86	3	5	34	47	1	10
8. ND071081-2Russ	456	388	85	14	20	46	19	1	0
9. ND071081-4Russ	489	432	88	8	14	49	25	2	2
10. ND081476B-3Russ	367	332	90	7	11	51	27	3	0
11. ND081476B-10Russ	297	205	69	8	15	33	20	2	22
12. ND081563C-2Russ	523	386	73	15	22	47	4	1	10
13. ND091933ABCR-2Russ	377	295	78	20	22	43	13	0	2
14. WND8624-2Russ	397	348	87	11	13	55	20	1	1
15. WND8625-2Russ	393	337	85	12	14	46	25	2	1
16. Alpine Russet	363	295	81	9	11	44	26	4	6
17. Bannock Russet	295	236	80	15	12	44	24	3	1
18. Dakota Trailblazer	321	273	84	9	11	50	23	5	2
19. Dakota Russet	322	292	89	9	14	49	27	0	1
20. Ranger Russet	459	360	78	13	18	38	22	3	5
21. Russet Burbank	492	328	67	11	19	37	10	3	19
22. Russet Norkotah	523	450	85	4	7	36	43	7	4
23. Shepody	380	300	79	8	14	42	24	5	8
24. Umatilla Russet	416	300	72	14	17	40	15	5	9
Mean	391	316	81	12	16	45	20	2	5
LSD ($\alpha=0.05$)	94	95	9	7	8	13	12	4	4

Table 3. Shatter bruise potential and French fry evaluations following harvest and after 8 weeks storage at 45F, full season trial, Larimore, 2013.

Clone	Shatter Bruise ¹	Fry Color ²	Stem-end Color	% Sugar End ³	Fry Color ²	Stem-end Color	% Sugar End ³
		Field Fry			Following 8 wks. at 45F		
1. AND00618-2RussY	2.2	1.7	1.7	0	1.7	1.8	8
2. ND8068-5Russ	2.0	0.4	1.5	67	0.3	0.5	8
3. ND8291C-2Russ	1.6	4.0	4.0	0	3.7	3.7	0
4. ND049546B-10Russ	1.7	0.9	1.8	75	0.6	1.5	67
5. ND050105C-1Russ	2.6	2.1	2.6	25	1.3	2.2	33
6. ND050219B-82Russ	2.2	2.8	2.8	0	1.6	1.7	8
7. ND071078B-1Russ	2.0	2.7	2.7	0	1.7	2.3	50
8. ND071081-2Russ	1.6	1.3	1.9	59	1.4	2.2	59
9. ND071081-4Russ	1.9	1.6	2.1	34	1.3	2.0	50
10. ND081476B-3Russ	2.1	1.0	1.3	28	1.2	1.4	35
11. ND081476B-10Russ	1.7	0.9	1.6	33	0.7	1.6	50
12. ND081563C-2Russ	2.6	2.8	2.8	8	2.1	2.2	8
13. ND091933ABCR-2Russ	2.2	1.0	1.3	17	0.7	0.7	8
14. WND8624-2Russ	2.4	2.8	2.8	0	2.0	2.1	8
15. WND8625-2Russ	2.6	1.5	1.9	17	1.1	1.3	8
16. Alpine Russet	2.2	2.3	2.3	0	2.1	2.1	0
17. Bannock Russet	2.2	2.2	2.3	8	1.7	1.9	8
18. Dakota Trailblazer	2.1	0.9	1.8	54	1.1	1.6	42
19. Dakota Russet	1.6	1.5	1.7	8	0.6	0.6	0
20. Ranger Russet	2.1	1.9	1.9	0	1.8	1.9	8
21. Russet Burbank	2.5	1.7	3.0	42	1.7	3.0	54
22. Russet Norkotah	1.7	2.9	3.1	8	3.1	3.3	17
23. Shepody	2.2	2.8	3.6	25	2.3	3.3	59
24. Umatilla Russet	1.7	2.1	2.1	0	1.9	2.0	8
Mean	2.1	1.9	2.3	21	1.6	1.9	25
LSD ($\alpha=0.05$)	1.0	1.3	1.2	50	1.1	1.0	49

¹Shatter bruise is evaluated using a bruising chamber with digger chain link baffles. Tubers are stored at 45F prior bruising. Shatter bruises are rated on a scale of 1-5, with 1 = none and 5 = many and severe.

²Fry color scores: 0.1 corresponds to 000, 0.3 corresponds to 00, 0.5 corresponds to 0, 1.0 equals 1.0 and subsequent numbers follow French fry rating scale 000 to 4.0.

³ Any stem end darker than the main fry is considered a sugar end, the worst case scenario. The processing industry defines a sugar end as a 3.0 or darker.