

Tater Talk

2019 Growing Season



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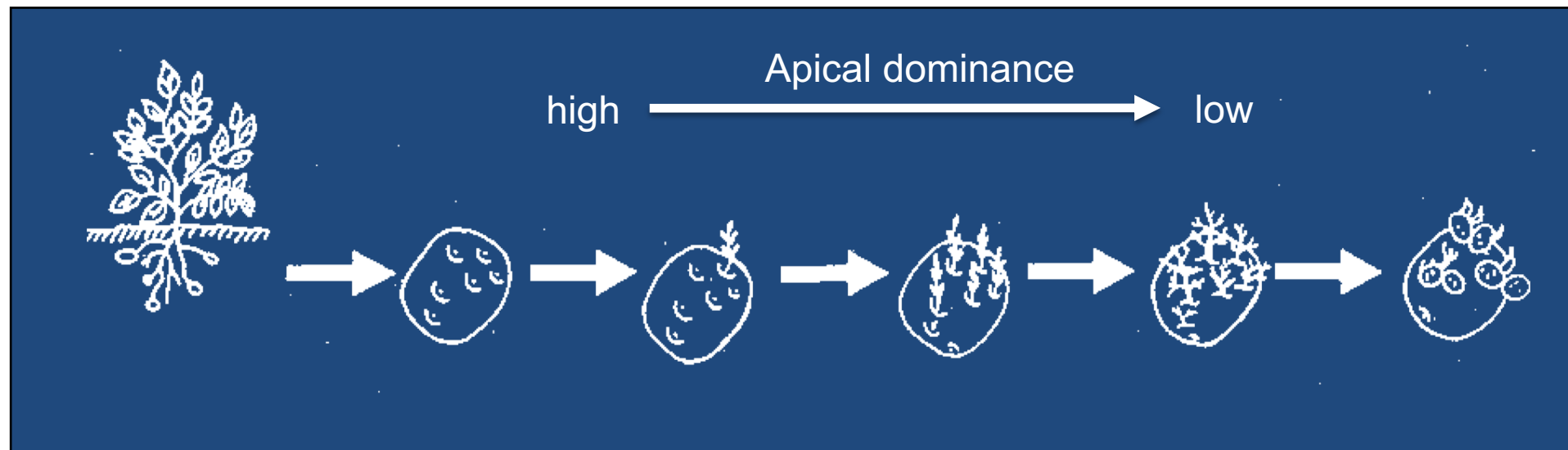
Successful potato production

1. Build the factory quicker
 2. Run the factory longer
 3. Run it more efficiently
- Potato plant is basically a starch factory
 - Over 90% of tuber dry matter comes from photosynthesis



(Mike Thornton, 2014)

Physiologic age and stages of sprouting



**Tuber
Initiation**

**Dormant
Tuber**

**Apical
Sprouting**

**Multiple
Sprouting**

**Hairy
Sprout**

**Little
Tuber**

No Plant

**Single Stem
Plant**

**Multi-Stem
Plant**

**Weak, Bushy
Plant**

No Plant

**Produces
A Few
Large Tubers**

**Large Set
of Smaller
Tubers**

Low Yield

Seed age effects

Younger seed

- Slower emergence
- Fewer stems
- More foliar production
- Later tuber initiation
- Fewer tubers per plant
- Larger tuber size
- Later plant senescence

Older seed

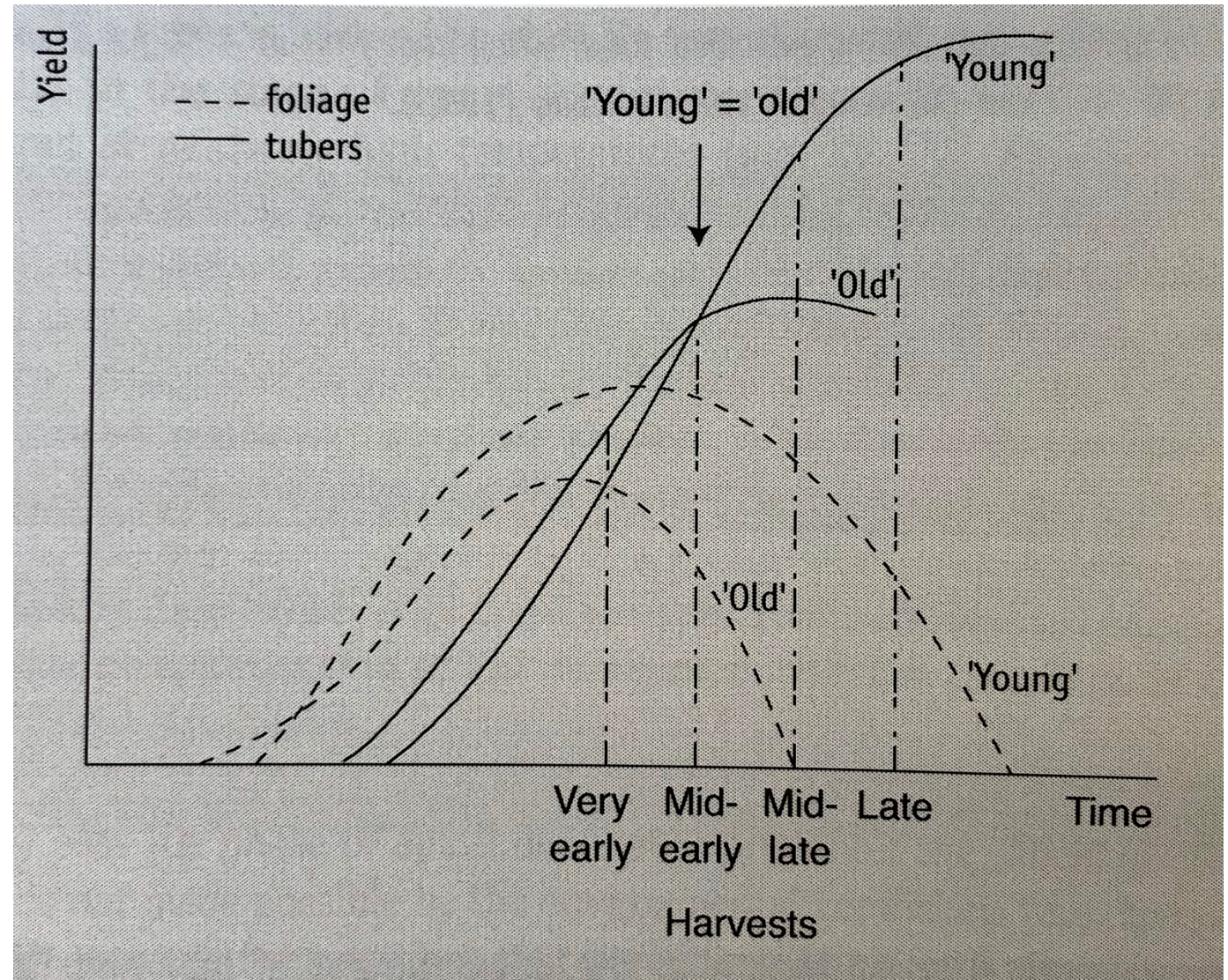
- Faster emergence
- Multiple stems
- Less foliar production
- Earlier tuber initiation (at lower leaf index)
- More tubers per plant
- Smaller sized tubers
- Earlier plant senescence

Effects of old seed

Old seed can lead to:

- Early emergence
- Earlier tuberization
- Reduced foliage
- Reduced yield
- Earlier maturity

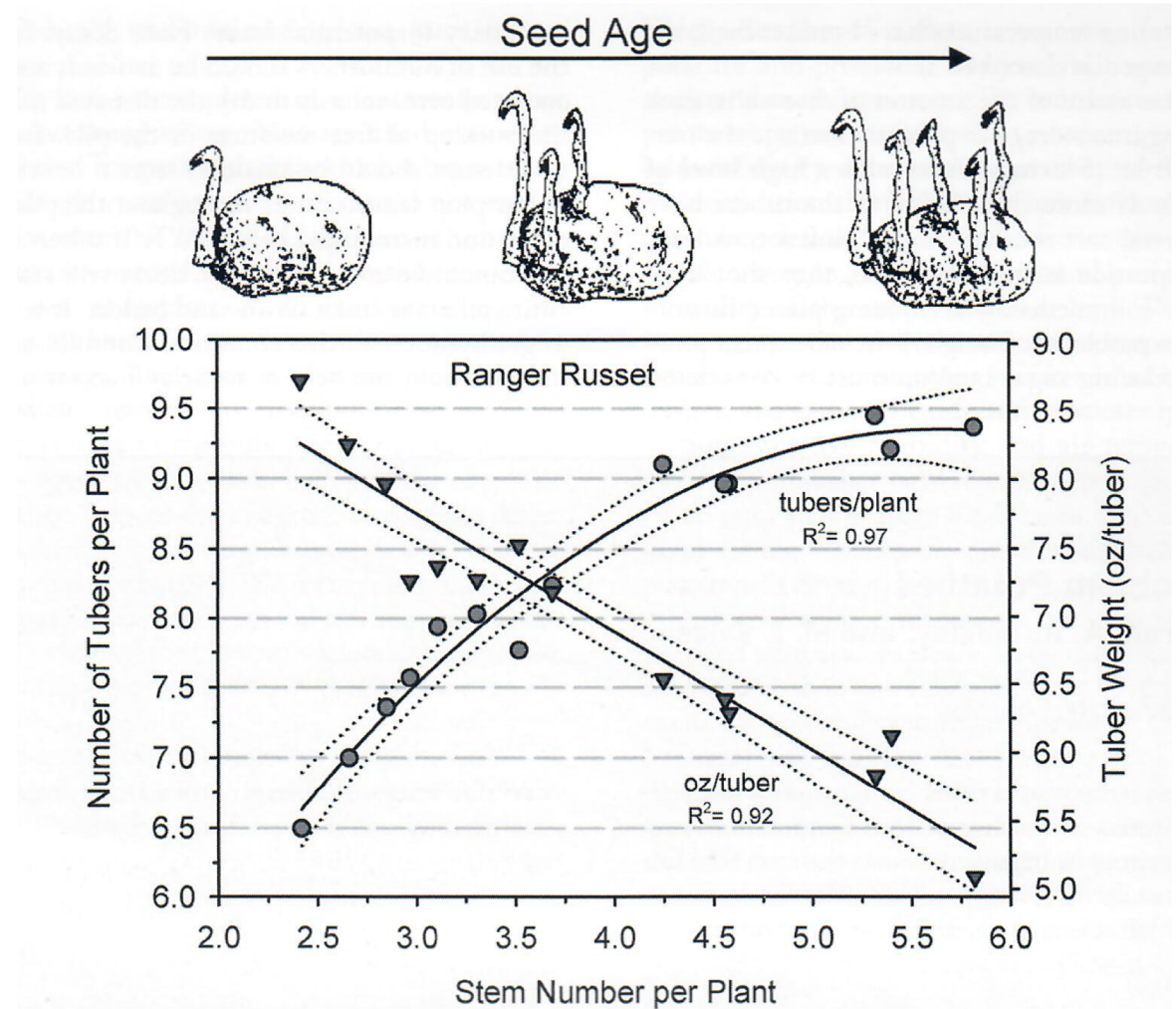
(Struik and Wiersema, 1999)



Stem numbers effects

- Aged seed = more stems = higher tuber count
- Increased tuber competition = smaller tubers

(Knowles and Knowles, 2006)



Stem number x tuber number & size



Determine stem number



Seed Piece Size & Physiological Age on Stem Number

Treatment	Spacing (in)	Seed cwt/acre	Stems/hill	Stems/acre
2 oz	9	24	3.1	60,016
2 oz aged	12	18	4.1	59,532
3 oz	12	27	3.9	56,628
3 oz aged	15	22	5.1	59,160
4 oz	12	36	4.2	60,980
4 oz aged	18	24	6.2	60,016

(Kleinkopf and Barta, 1991)

Determining planting density

$$\frac{\textit{Desired stems/acre}}{\textit{Stem number/seed}} = \text{Seed number/acre}$$

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$$\frac{60,000 \textit{ stems/a}}{4.1 \textit{ stems/seed}} = 14,634 \textit{ seed pieces/acre}$$

$$\frac{60,000 \textit{ stems/a}}{3.1 \textit{ stems/seed}} = 19,355 \textit{ seed pieces/acre}$$

Seed planting rate calculator

Seed potatoes required to plant one acre in cwt/a

Row spacing	Within-row spacing	Seed piece size (oz)				
		1.5	1.75	2	2.25	2.5
cwt/acre of seed						
34	6	28.8	33.6	38.4	43.2	48.0
34	7	24.7	28.8	32.9	37.1	41.2
34	8	21.6	25.2	28.8	32.4	36.0
34	9	19.2	22.4	25.6	28.8	32.0
34	10	17.3	20.2	23.1	25.9	28.8
34	12	14.4	16.8	19.2	21.6	24.0
34	14	12.4	14.4	16.5	18.5	20.6
36	6	27.2	31.8	36.3	40.8	45.4
36	7	23.3	27.2	31.1	35.0	38.9
36	8	20.4	23.8	27.2	30.6	34.0
36	9	18.2	21.2	24.2	27.2	30.3
36	10	16.3	19.1	21.8	24.5	27.2
36	12	13.6	15.9	18.2	20.4	22.7
36	14	11.7	13.6	15.6	17.5	19.4
38	6	25.8	30.1	34.4	38.7	43.0
38	7	22.1	25.8	29.5	33.2	36.8
38	8	19.3	22.6	25.8	29.0	32.2
38	9	17.2	20.1	22.9	25.8	28.7
38	10	15.5	18.1	20.6	23.2	25.8
38	12	12.9	15.0	17.2	19.3	21.5
38	14	11.1	12.9	14.7	16.6	18.4

Plant population based on row and within-row spacing

Row spacing	Within-row spacing (inch)						
	6	7	8	9	10	12	14
Plant population (number)							
34	30,748	26,356	23,061	20,499	18,449	15,374	13,178
36	29,040	24,891	21,780	19,360	17,424	14,520	12,446
38	27,512	23,581	20,634	18,341	16,507	13,756	11,791

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Download sheet:
z.umn.edu/seed



What to do if seed is physiologically old

- Ensure seed is stored properly.
- Increase spacing between seed pieces.
 - Determine average stem number and calculate seed/acre based on this information.
- Treat seed with NAA to reduce stem number
 - If using NAA only applied as seed treatment closing to planting.

Preemergence modes of action

Mode of Action	Group	Herbicide(s)	Year reported or registered	Water solubility (mg/L)	Half life (days)
Lipid synthesis inhibition	1 / A	clethodim / Select sethoxydim / Poast	1987 1978	- 257	- -
ALS inhibitors	2 / B	rimsulfuron / Matrix	1992	<10	3
Microtubule assembly inhibition	3 / K1	trifluralin / Treflan ethalfluralin / Sonalan pendimethalin / Prowl	1960 1974 1974	0.3 0.3 0.3	164 34 44
Lipid synthesis inhibition	8 / N	EPTC / Eptam	1957	370	9
PS II inhibitors	5 / C1 C2	metribuzin / Metribuzin linuron / Linex	1964 1962	1100 75	21 60
PPO inhibitors	14 / E	flumioxazin / Chateau fomesafen / Reflex Sulfentrazone	1989 1983 1998	2 50 780	15 100 211
Inhibition of VLCFAs	15 / K3	dimethenamid / Outlook metolachlor / Dual	1993 1972	1174 488	20 40

Postemergence modes of action

Mode of Action	Group	Herbicide(s)
Lipid synthesis inhibition	1 / A	clethodim / Select sethoxydim / Poast
ALS inhibitors	2 / B	rimsulfuron / Matrix
PS II inhibitors	5 / C1, C2	metribuzin / Sencor
Microtubule assembly inhibition	3 / K1	pendimethalin / Prowl
Inhibition of VLCFAs	15 / K3	metolachlor / Dual
Lipid synthesis inhibition	8 / N	EPTC / Eptam

Selection herbicides

- Variety sensitivity
 - Minituber/NFT sensitivity
- Weed spectrum
- Timing
- Cost of herbicide and application
- Rotation restrictions



Preemergence weed control (p.114-115)

SOIL- APPLIED HERBICIDES*	Mode of Action**	Grasses							Broadleaves				
		Barnyardgrass	Brome, Downy	Foxtail, Green	Foxtail, Yellow	Quackgrass	Volunteer Cereals	Wild Oat	Buckwheat, Wild	Cocklebur, Common	Horseweed (Marestail)	Kochia	Lambsquarters
Boundary* (Pre)	5,15	F-G	-	F-E	F-E	N	P	P	F-G	P	F	F-G	G
Chateau* (Pre)	14	N	F-G	P	P	N	N	N	P-F	N	F-E	F-G	G-E
Dual* (PPI/Pre)	15	P-E	P-F	F-E	F-E	N	P	P-F	N-P	N	N	N-P	P-F
Linex* (Pre)	7	F	-	F	F	P	P	P	G	P	-	F	E
Rimsulfuron (Pre)	2	G	-	G	F-G	N	G	F	P	F	P ¹	G ¹	F
Metribuzin* (PPI/Pre)	5	P-F	F-G	P-F	P-F	N-P	P-G	N	F-G	P-F	F	F-G	P-F
Outlook* (PPI/Pre)	15	G-E	P-G	G-E	G-E	N	F-G	P	N	N	N	N	F-G
Prowl* (PPI)	3	E	F-G	G-E ¹	E	N	N	P-F	P	N	N	P	F-G
Reflex* (PRE)	14	P-F	-	P	P	N	N	N	P	P	-	F	F
Sonalan (PPI)	3	E	F	E ¹	E	N	P	P	P	P	N	P	G
Treflan* (PPI)	3	E	F-G	E ¹	E	N	N	P-F	N	N	N	P	F-G

Preemergence weed control (p.114-115)

SOIL- APPLIED HERBICIDES*	Mode of Action**	Broadleaves											Crop Safety***
		Lanceleaf Sage	Mustard, Wild	Mustard, Winter Annual	Nightshade, E Black	Nightshade, Hairy	Pigweed, Redroot	Waterhemp (ALS-R)	Prickly Lettuce	Ragweed, Common	Smartweed, Annual	Thistle, Russian	
Boundary* (Pre)	5,15	F	G-E	G-E	P	P	G-E	G-E	G-E	P-F	G	G-E	S-M
Chateau* (Pre)	14	N	G	G	E	G-E	G-E	G-E	F-G	N-P	F	F-G	S-M
Dual* (PPI/Pre)	15	N	N	-	N	N	F-G	F-G	N	N	N	P	S-M
Linex* (Pre)	7	-	E	-	F-G	F-G	E	G	-	G-E	G-E	F	N-S
Rimsulfuron (Pre)	2	N	F	-	P	P	E	N	-	F	P	P	N-S
Metribuzin* (PPI/Pre)	5	F	G-E	G-E	P	P	G-E	F-G	G-E	P-F	G	G-E	N-S
Outlook* (PPI/Pre)	15	N	P-F	-	F-G	F-G	G-E	G	-	N	N	P-F	S-M
Prowl* (PPI)	3	N	N	P	N	N	G-E	G	N	N	P	F-G	N-S
Reflex* (PRE)	14	-	F	-	G	F	E	E	-	G	F-G	P	S
Sonalan (PPI)	3	N	N	P	P	P	E	G-E	P	N	P	G-E	S
Treflan* (PPI)	3	N	N	P	N	N	E	G-E	N	N	P	G	N-S

Postemergence weed control (p. 116-119)

POST - APPLIED HERBICIDES*	Mode of Action**	Grasses							Broadleaves				
		Barnyardgrass	Brome, Downy	Foxtail, Green	Foxtail, Yellow	Quackgrass	Volunteer Cereals	Wild Oat	Buckwheat, Wild	Cocklebur, Common	Horseweed (Marestail)	Kochia	Lambsquarters
Rimsulfuron	2	G-E	-	G-E	G-E	G-E	G-E	G-E	N	N	N	E ¹	F
Metribuzin*	5	F	N	F	F	P	P	-	G	P	F-G	F-G	E
Poast	1	E	P-G	E	E	F	G-E	G-E ¹	N	N	N	N	N
Select* / Select Max	1	E	P-E	E	E	G-E	E	E	N	N	N	N	N

POST- APPLIED HERBICIDES*	Mode of Action**	Broadleaves											Crop Safety***
		Lanceleaf Sage	Mustard, Wild	Mustard, Winter Annual	Nightshade, E Black	Nightshade, Hairy	Pigweed, Redroot	Waterhemp (ALS-R)	Prickly Lettuce	Ragweed, Common	Smartweed, Annual	Thistle, Russian	
Rimsulfuron	2	-	E	E	G/N	P-F	E	N	-	P	F	P ¹	N-S
Metribuzin*	5	-	E	E	P	P	G	P-G	G-E	E	E	-	N-M
Poast	1	N	N	N	N	N	N	N	N	N	N	N	N
Select* / Select Max	1	N	N	N	N	N	N	N	N	N	N	N	N

Tips for maximum efficacy

- Incorporate (tillage or water)
- Timing
 - PRE: prior to emergence (follow label)
 - POST: small weeds, <1 inch tall is ideal
- Use adjuvants with POST herbicides
- Tank mix herbicides to improve weed control spectrum



Soil factors for preemergence herbicides

- pH
- Organic matter
- Soil texture
- Soil moisture



Timing of herbicides

- 3 – 5 week window for PREs
- Program could include:
 - Tillage / field preparation
 - Planting
 - Hilling
 - Herbicide prior to emergence
 - Postemergence herbicide



How to optimize weed control?

- Use an integrated weed management approach with many tools.
 - Tillage
 - Best herbicides at right time
 - Cultural management practices
 - Do not encourage herbicide resistance

