

Seed Management

Research & BMPs

**AIM Local Workshops
March 8-9, 2023**



Key attributes of a quality seed lot:

- Free of disease
 - Virus: PVY, Leafroll, PMTV
 - Bacterial: Blackleg, soft-rot, BRR, common scab
 - Fungal: Rhizoctonia, Fusarium, Pythium, silver scurf, late blight
- Physiological age/maturity of seed
- Bruising/mechanical injury/suberization
- Managing Seed Size profile

Physiological Age of Seed



Influenced by:

- Variety
 - End Use
 - Growing Conditions in previous year
 - Storage Temperature
-
- We can't turn the clock backwards!
 - Some varieties we may want to keep young (Burbank, Clearwater), others we may want to age (Prospect, Dakota Russet)

Physiological Age of Seed

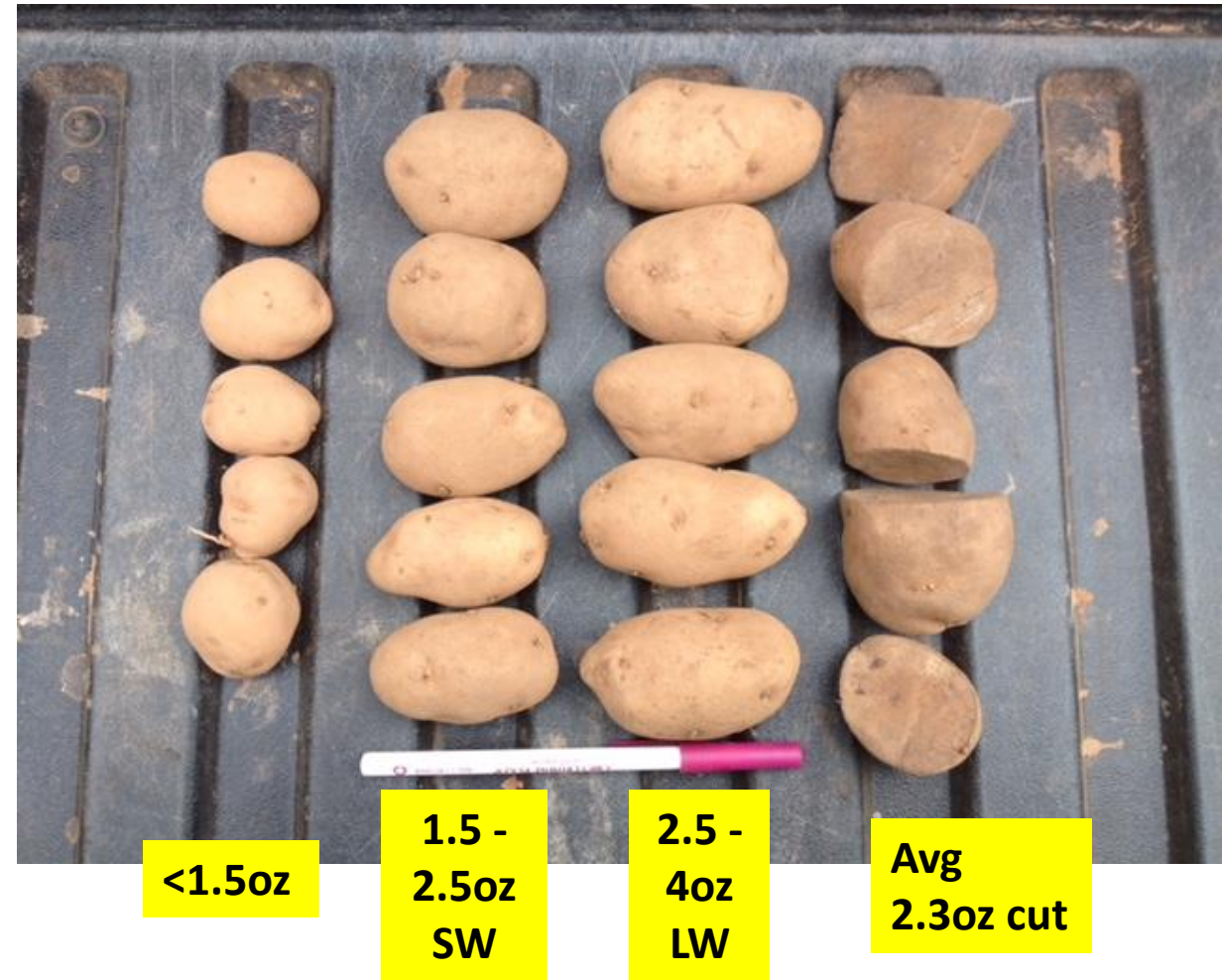
- VERY VARIETY DEPENDANT!
- In our AIM research as well as other trials, **keeping Russet Burbank seed refrigerated improves size, marketable yield.** Possibly also for Alverstone.
- This may be the opposite for some of the newer varieties.
- There may be advantages to putting age on some varieties
 - Dakota Russet
 - Prospect
 - Mountain Gem

Seed Size Profile

- AIM has been working on multiple trials in recent years with the goal of cutting less seed, while ensuring that the seed producer is still able to produce a profitable crop.
- Started with work looking at whole vs. cut seed comparisons
- In last couple of years, have focused on some other management practices that can influence the yield and size profile of seed
 - Nitrogen rate
 - Use of Gibberellic Acid (GA)
 - Whole seed management

2016-2017 Whole Seed Project with GCS

- 3 sites each year for two years, multiple seed sources compared
- Russet Burbank and Prospect
- Treatments for each seed source:
 - Cut seed (15 in)
 - Small whole (12 in)
 - Small whole (15 in)
 - Large whole (15 in)
 - Large whole (18 in)
- Small whole seed was sized 1.5 – 2.5 oz
- Large whole seed was sized 2.5 – 4.0 oz
- Average cut seed size 2.3 oz



Results over Two Years of Whole Seed Trial

In comparing average difference from hand cut seed over two years (4 total sites), whole seed treatments produced:

- **The same or better total yield**
- Slightly more smalls, slightly fewer > 10 oz.
- The same or better total crop value
- The larger sized whole seed (2.5 to 4.0 oz) consistently performed better for yield and crop value than the smaller whole seed or the cut seed.

Whole Seed / Reduced Cutting Considerations:

- These trials all compared whole seed with hand cut seed. No commercial cutter can replicate the precision of hand cutting.
- A normal run of seed (1.5 to 10+ oz tubers) will have **highly variable seed piece size** at the end, lots of opportunity for trimmed eyes, slivers, etc.
- The size of the seed piece and the consistency of size appears to have more of an impact on marketable yield.
- Maximizing the amount of “**prime size**” seed (**less than 7 ounces**) significantly reduces the amount of cutting necessary.

Whole Seed / Reduced Cutting Considerations:

- Whole seed can be sized out and planted separately to improve consistency of emergence and in-row spacing.
- **Whole seed can be planted earlier (cooler ground)**, increasing the size of your planting window.
- Effect of apical dominance in some varieties, blind sets, few eyes/set, multiple cut sides requiring energy to suberize



Managing Seed Size | Reduced N

2019 Trial

Treatment	0-5 oz cwt/ac	5-7 oz cwt/ac	Prime Seed	7-10 oz cwt/ac	> 10 oz cwt/ac	Total cwt/ac	Tubers/ 10 ft
Shep Low N	131	76	207	53	3	262	70
Shep High N	95	94	189	82	12	283	66
RB Low N	210	76	286	15	8	308	98
RB High N	198	57	255	15	3	271	99

Decreased N rate by 40 lbs/acre for RB, 22 lbs/acre for Shepody.

Spacing: 7.5'' for Shepody, 10'' for RB

Noticeable difference in vine growth and senescence between high and low N rates

Managing Seed Size | Reduced N 2022 – West Prince

Dakota Russet

Treatment	Tubers/ Plot	Specific Gravity	1-4 ^{oz} lbs/10 ^{ft}	4-7 ^{oz} lbs/10 ^{ft}	> 7 ^{oz} lbs/10 ^{ft}	1-7 ^{oz} seed (cwt/ac)	Total Yield (cwt/ac)
100 lbs/ac N	64.5	1.080	2.9	11.6	6.6	188.5	273.7
80 lbs/ac N	69.0	1.080	3.4	12.0	7.1	200.9	292.2
Difference	+4.5	0	+0.5	+0.4	+0.5	+12.4	+18.5

Alverstone Russet

Treatment	Tubers/ Plot	Specific Gravity	1-4 ^{oz} lbs/10 ^{ft}	4-7 ^{oz} lbs/10 ^{ft}	> 7 ^{oz} lbs/10 ^{ft}	1-7 ^{oz} seed (cwt/ac)	Total Yield (cwt/ac)
100 lbs/ac N	90.3	1.083	4.8	11.9	14.0	217.1	398.5
80 lbs/ac N*	89.2	1.086	5.0	11.8	13.5	218.6	394.1
Difference	-0.9	+0.003	+0.2	-0.1	-0.5	+1.5	-4.4

Managing Seed Size | Reduced N 2022 – East Prince

Dakota Russet

Treatment	Tubers/ Plot	Specific Gravity	1-4 <u>oz</u> lbs/10 <u>ft</u>	4-7 <u>oz</u> lbs/10 <u>ft</u>	> 7 <u>oz</u> lbs/10 <u>ft</u>	1-7 <u>oz</u> seed (cwt/ac)	Total Yield (cwt/ac)
177 lbs/ac N	92.3	1.084	6.7	13.2	6.2	259.4	340.0
145 lbs/ac N	91.3	1.083	5.7	14.2	7.0	257.4	347.4
Difference	-1.0	-0.001	-1.0	+1.0	+0.8	-2.0	+7.4

Mountain Gem Russet

Treatment	Tubers/ Plot	Specific Gravity	1-4 <u>oz</u> lbs/10 <u>ft</u>	4-7 <u>oz</u> lbs/10 <u>ft</u>	> 7 <u>oz</u> lbs/10 <u>ft</u>	1-7 <u>oz</u> seed (cwt/ac)	Total Yield (cwt/ac)
177 lbs/ac N	91.3	1.089	5.0	12.6	10.2	228.8	360.4
145 lbs/ac N	86.3	1.091	3.5	14.6	10.5	235.0	370.8
Difference	-5.0	+0.002	-1.5	+2.0	+0.3	+6.2	+10.4

Managing Seed Size | Reduced N

- Multiple years of trial work indicates that there is significant potential to reduce nitrogen rates on seed, providing:
 - Higher tuber numbers per plant
 - Higher specific gravity
 - Earlier maturation, less Reglone
 - Less residual N (nitrates, nitrous oxide)
 - Lower fertilizer cost!
- Will vary by variety, as well as whether a legume crop was planted in year before potatoes (N credit)

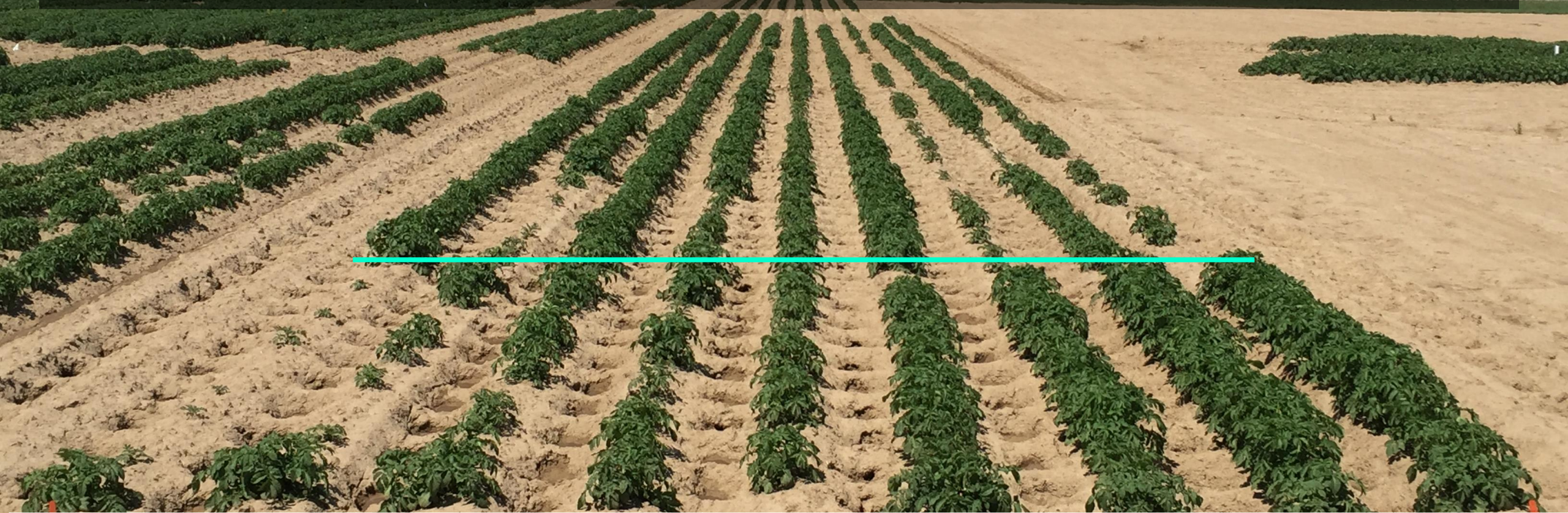
Effect of Seed Piece Size

- Especially in a year when seed supply is tight, there can be pressure to cut seed smaller.
- Smaller seed pieces with more cut edges have lower yield potential, higher risk of non-emergence.
- What is the sweet-spot for cut seed piece size?



Clearwater Russet Seed Size Demo and Research

MJ Pavek, Washington State University, 2020



0.5 oz

0.75 oz

1.0 oz

1.25 oz

1.5 oz

2.0 oz

2.5 oz

3.0 oz

3.5 oz

Effect of Seed Piece Size

Table 1: Emergence and Stem Count Results – Dakota Russet

Treatment	Emergence Jun 15 plants/row*	Emergence Jun 17 plants/row*	Emergence Jun 22 plants/row*	Total Plants in 4 plots	Total Stems/ row	Stems per Plant
1.5 ounce	6.0	14.8	26.5	100	36.5 a	1.46 a
2.0 ounce	5.8	16.8	26.5	100	42.0 ab	1.68 ab
2.5 ounce	5.3	14.0	25.8	100	46.8 b	1.87 b
3.0 ounce	6.0	18.0	26.8	100	60.5 c	2.42 c

* includes 2 guard plants in each row

- Very definite trend in terms of number of stems per plant

Effect of Seed Piece Size

Table 3: Yield and quality for Dakota Russet

Treatment	Total Yield cwt/ac	Smalls cwt/ac	Smalls %	> 10 <u>oz</u> cwt/ac	> 10 <u>oz</u> %	Specific Gravity	M. Yield cwt/ac
1.5 ounce	358.2 a	52.0 a	14.5	38.9 a	10.9	1.085	306.2
2.0 ounce	376.9 a	51.7 a	13.7	24.4 a	6.5	1.084	325.2
2.5 ounce	413.2 b	80.3 b	19.4	11.3 a	2.7	1.084	331.1
3.0 ounce	409.2 b	90.7 b	22.2	10.5 a	2.6	1.085	317.2

- We did not change the seed spacing depending on the seed size...so the small seed had fewer tubers but bigger tubers.
- If we had spaced out the larger seed piece sizes, we would likely have seen larger size profile and larger yields.
- There was a significant difference in Total Yield

Optimal Seed Piece Size

- Larger seed piece size is associated with better yield.
- Cut seed pieces under 1.5 ounces generally struggle to produce a viable plant.
- Cut seed pieces between 1.5 and 2.0 ounces may establish but can have reduction in yield.
- Consistently larger seed size may require adjustment to in-row spacing (variety dependent)



Managing Seed Size | Summary

Toolbox for producing a smaller profile run of seed without sacrificing overall yield:

- Warming up seed before planting
- Dial back the N
- Optimize in-row spacing
- Consider planting whole seed separately
- Gibberellic acid (GA)
- Narrower row width (34" vs 36")
- Pre-cut seed for varieties with strong apical dominance



Bruising/Mechanical Damage

Factsheet on PEI
Potato Agronomy
Site

Maximizing Crop Potential with Proper Seed Handling

based on presentation by Steve Holland, Holland Agricultural Services, WA
printed March 2017. Compiled by Ryan Barrett (ryan@peipotato.org)

Being Open to Improvement

The biggest opportunities for improved yields in potato production are often improvements to production practices which don't require spending significantly more. However, improvement requires changes from current practices to practices that produce consistently better results. Change is generally an evolution of refinement over time, examining steps in our production practices where practical and cost-effective improvements can be made.

Managing Seed for Optimum Yield Potential

There are few decisions as vital to producing a profitable crop of potatoes than purchasing high quality seed. Likewise, if you grow your own seed, ensuring that seed will provide you with the greatest potential for a large

seed), it is important to pay attention to the shape and size distribution of seed pieces coming out of your set cutter.

Generally, sets with larger weight (2.5 to 3.0 oz) are associated with improved emergence and performance. Conversely, small slivers and small tubers under 1.5 oz should generally be discarded, as their performance potential is often limited.

Additionally, having fewer cut surfaces per seed piece is also associated with higher yield potential. A seed piece with fewer cut surfaces is less susceptible to bruising or seed piece decay, and can better partition energy for wound healing.

Set Cutter Maintenance and Calibration:

Reducing Drop Height



Reducing Drop Height



Optical Eye retrofitted to old bin piler to automatically adjust height

Seed Cutter Disinfection

Photos courtesy Bluefield Acres



3 small booms with flat fan nozzles

Spray for 10 seconds every 4 minutes when cutter was running

Set Cutter Maintenance & Calibration:

- Sizing Roller Spacing: get the right sizes!
- Adjust flow volumes to ensure even cutting, minimal bruising
- Keep cutting knives sharp
- Check the horizontal knife for equal sized halves
- Open chip eliminator to discard pieces less than 1.5 oz
- ***Frequently take samples of your seed profile in order to make adjustments as necessary!***

BMPs for Seed Cutting:

- **Warm your seed up before cutting.** Warmer seed temperatures encourages suberization, clean cutting
- **Avoid drops**, particularly for cut seed pieces. A drop of 6 inches onto an edge or corner will cause bruising almost 100% of the time at 50F
- Do not store or cut seed in a storage previously treated with **CIPC**
- **Remove visibly diseased tubers** before cutting
- Use a registered **fungicide seed treatment** on cut seed.
- **Get your cut seed dried back down** to avoid soft-rot decay. Don't pile cut seed very high, ensure proper ventilation.

Thank You!

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