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No-till potato variety trial

IN A NUTSHELL

Rob evaluated 28 potato varieties using a no-till deep mulch method with spoiled hay that requires no hilling.

- Most of the potato varieties, including a diversity of types, did well with the mulch method with limited greening.
- Chieftain had the highest yield and marketable yield.
- Huckleberry Gold, Yukon Gold, Kennebec, Sangre, Purple Viking, Dakota Pearl were lowest yielding varieties.

FARMER-RESEARCHER
Rob Read, Willow Creek Permaculture Farm

MOTIVATION

For the past several years, Rob has planted his potato crops using the mulch method advocated by Ruth Stout in the 1950s. The method is to sow seed potatoes directly on the surface area (in this case, an untilled previously-tarped area), then cover densely with mulch (in this case, spoiled hay about 1'-2' tall at establishment).

Rob's experience, as well as research by others (**1**) shows that the mulch method, while often producing less yield when compared to other methods, still shows great potential due to the large labour savings when planting and harvest are done with hand tools.

The objective of this trial was to test whether different varieties of potato produce better yields when using the mulch method for no-till production in calcareous soils in southwestern Ontario.

METHODS

Rob planted potatoes in three replicate blocks, and randomized the order of potato varieties in each block by drawing names from a hat.

Bed preparation per square foot:

Aged chicken manure - 20 g

Feather meal (Black Swallow) - 4 g

Gypsum (Black Swallow -) 0.82 g

Boron (Borax) - 0.14 g

PLANTING

On May 15th, Rob placed tubers on top of soil that he'd tarped until planting, and covered the potato seed with 1-2 feet of spoiled hay mulch. He planted 48" wide beds with 12" spacing between seed potatoes. There were 5 seed potatoes of each variety in each block, with 50 g seed pieces and a total of 1 kg total seed for each variety.

Rob's potato patch.

Seven of the varieties had smaller seed potatoes, leaving extras beyond the trial set-up. With this seed, Rob planted in a row after the main replicates. These varieties were treated separately, and not included in the primary data analysis.

IN-SEASON MANAGEMENT

Throughout the season, he weeded as needed, which was minimal.

VARIETIES PLANTED

1. Agria
2. Alta Rose
3. AmaRosa
4. Ballerina
5. Bellanita
6. Bridget
7. Caribe
8. Chieftain
9. Dakota Pearl
10. Excellency
11. French Fingerling
12. Gold Rush
13. Green Mountain
14. Huckleberry Gold
15. Kennebec
16. Nicola
17. Norland
18. 'Old Fashion Red'
19. Orchard Hill Rose
20. Pink Fir Apple
21. Purple Majesty
22. Purple Viking
23. Roko
24. Russet
25. Russian Blue
26. Sangre
27. Superior
28. Yukon Gold

Table 1. Yield and marketable yield of the 28 potato varieties Rob tested in this trial, listed in order of average marketable yield per plant. Note that Rob placed some edible (and sellable) potatoes in the unmarketable category, such as those with growth cracks that typically come from fast growth due to heavy rains.

VARIETY	TYPE	AVERAGE TOTAL YIELD (G/PLANT)	AVERAGE MARKETABLE YIELD (G/PLANT)	YIELD NOTES
CHIEFTAIN	Red/White	1,113	908	Overall Best Yield; Best Red/White
RUSSIAN BLUE	Blue/Blue	1,001	815	Highest Yield, Blue/Blue
BELLANITA	Yellow/Yellow/ (Fingerling)	968	751	Highest Yield, Yellow/Yellow
PURPLE MAJESTY	Blue/Blue	875	730	Second Highest Yield, Blue/Blue
BRIDGET	Yellow/White	1,026	670	Highest Yield, Yellow/White
ORCHARD HILL ROSE	Red/White	643	595	Runner-up, Red/White
AMAROSA	Red/Red	676	589	Highest Yield, Red/Red
AGRIA	Yellow/Yellow	804	574	Second Highest Yield, Yellow/Yellow
GREEN MOUNTAIN	Tan/White	611	547	Highest Yield, Tan/White
NORLAND	Red/White	655	519	Runner-up, Red/White
SUPERIOR	Yellow/White	550	491	Runner-up, Yellow/White
OLD FASHION RED'	Red/White	570	470	Runner-up, Red/White
BALLERINA	Yellow/Yellow	457	448	Runner-up, Yellow/Yellow
CARIBE	Light Purple/ White	660	441	Highest Yield, Light Purple/White
FRENCH FINGERLING	Fingerling; Red/ Cream	704	438	Runner-up, Fingerling
ROKO	Red/White	587	411	Runner-up, Red/White
PINK FIR APPLE	Fingerling; Pink/ Yellow	470	396	Runner-up, Fingerling
RUSSET	Russet; Brown/ White	442	388	
ALTA ROSE	Red/Cream with pink	402	373	
GOLD RUSH	Russet; Light Brown/White	561	358	
NICOLA	Yellow/Yellow	567	324	Runner up, Yellow/Yellow
EXCELLENCY	Yellow/Pale Yellow	504	314	
HUCKLEBERRY GOLD	Purple/Yellow	349	298	Lowest Yield
YUKON GOLD	Yellow/Yellow	453	290	Lowest Yield
KENNEBEC	Yellow/White	473	254	Lowest Yield
SANGRE	Red/White	351	195	Lowest Yield
PURPLE VIKING	Mottled purple and red/White	242	194	Lowest Yield
DAKOTA PEARL	Pale yellow/ White	269	145	Lowest Yield

DATA ANALYSIS

To evaluate the marketable yield of different varieties, we used a statistical model called analysis of variance (ANOVA) with a 95% confidence level to calculate the least significant difference (LSD) needed to call the treatments "statistically different".

Using a 95% confidence level means that if we measure a difference between any two treatments that is greater than the calculated LSD, we expect this difference would occur 95 times out of 100 under the same conditions. In this case, we consider the difference reliable and refer to the results as statistically significant. On the other hand, if we had measured a difference between any two treatments that was less than the calculated LSD, we would consider these treatments unreliably different or statistically similar. We could make these statistical calculations because Rob's experimental design involved replication of the treatments.

FINDINGS

As shown in **Table 1**, Chieftain was the top yielding variety. Huckleberry Gold, Yukon Gold, Kennebec, Sangre, Purple Viking, and Dakota Pearl were the lowest yielding varieties.

While there was a broad range of average yields of the varieties in between Chieftain and the lowest yielding varieties, their yields were statistically indistinguishable from each other. This is because of variability among the three replicates of each variety. For example, one replicate had much higher yields than other replicates, so we could not be confident whether varieties in that replicate would regularly yield high or low based on the data collected in this trial. That's why some varieties that appear to have substantially higher average yields in **Table 1** actually have comparable statistical results.

ROB'S FAVOURITES

Bolded varieties above are Rob's favourites, and ones he plans to replant in future years. He selected these because they were high yielding in this trial. Note that Russian Blue and Purple Majesty were the most prone to rot in storage, though losses were not that high. Rob is also replanting Nicola. In the trial Nicola was planted beside a similar looking variety, and it's possible that its yield was underestimated. Alta Rose was another variety that Rob will replant. In the trial, this red-skinned variety produced one plant with purple-skinned tubers.

REASONS FOR UNMARKETABLE POTATOES

- Greening, especially where mulch was disturbed
- Growth cracks from a lot of rain
- Small size

NOTES ON GREENING

- Blue/purple skinned varieties naturally prevented greening.
- High ranking yellows (Bridget and Bellanita) had issues with greening, especially if the mulch was disturbed.
- Chieftain also had substantial greening in one replicate likely due to disruption by chickens.
- To prevent greening it helps to top up the mulch as needed — it can be easily tossed by poultry.

PLANT HEALTH

Rob did not see signs of scab or hollow heart in 2023 or previous potato crops, and he did not have serious issues with potato leafhopper. During consumption, he observed some hollow heart, especially on large potatoes, and he observed a very minor amount of scab, but neither was enough to be considered a serious issue.

Vole damage, however, has been an issue. To mitigate this in 2023, he tried several new techniques. He attempted to harvest immediately after plant die-back (though in some cases this was not possible); he deployed a solar-powered sonic spike that puts out sounds in the ground that are annoying to rodents; he planted garlic around the perimeter of the entire area; and finally, he had more adult cats around! Overall, vole damage was not an issue in 2023 so one, some, or all of the mitigation factors appear to have worked, with a strong indication that it was the sonic spike that helped most!

NEXT STEPS

In a few cases, 1 kg of total seed per variety provided excess seed. Rob planted these small seed potatoes separately, and many produced well. Notable were Ama Rosa, Nicola, Pink Fir Apple, and to a lesser extent Bellanita and French Fingerling. This observation led Rob to wonder which potatoes can produce well with smaller seed potatoes?

New trial varieties could be potentially trialed from the seed 'potato berries' from this diverse population. Rob saved a lot of seed and started some as as seedlings in 2024.

Another opportunity would be to compare varieties that did well in the mulch method to other growing methods (in ground, in ground with mulch, in grow bags).

REFERENCES

1. Potatoes Five Ways: A Trial Looking at Different Potato-Growing Methods. The Low Tech Institute. Accessed June 27, 2024 at https://lowtechinstitute.org/2018/12/04/potatoes-five-ways-a-trial-looking-at-different-potato-growing-methods/.

Chieftain, the top performing variety in this trial.

Bellenita waiting to be weighed.

A row unmulched and ready to weigh.

A heap of French Fingerling.

Pink Fir Apple. Beautiful, but very fiddly to clean.

The 'kingdom' of Purple Majesty.

Potato piles ready to weigh.

TAKE HOME MESSAGE

The deep mulch no-till method for organic potato production worked! Most of the potato varieties, including a diversity of types, did well with the mulch method - with protection from voles.

Growers using this method can grow one or more varieties of different types, and have a rainbow of spuds for discerning customers.

Having replicates of each variety was well worth it, since this provided insurance for when chickens stirred up mulch, etc., and allowed us to see variability across the field.