



# HARD CHOICES AND HARD FACTS ON CHIP VARIETIES

## Despite many hurdles, a huge effort is underway to find a better chipping potato

By Charlie Higgins, chip variety development, Potatoes USA

Finding a better chip variety amounts to clearing about 100 hurdles. Wisconsin potato growers desperately need a variety better than Lamoka because of its propensity to rot in storage.

Lamoka chips beautifully in June after a long winter of storage, but how can growers get it to store until June?

Jeff Endelman, an associate professor in the University of Wisconsin-Madison Department of Horticulture, who leads the potato variety development program, and 11 breeders from other universities are examining about 1,000 crosses every year to try to find something better than Lamoka.

A lot of dollars are at stake. Nationwide, an estimated \$10 million is lost to diseases in chip potato storages every year.

The first hurdle a new selection must jump over is chip defects. Consumers want perfect chips with no brown defects. Of course, the chips need to be a perfect white-gold color. Consumers do not want any bitterness in their chips, so glycoalkaloid levels must be low.

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*“If a variety becomes commercially accepted, it is like a winning football team and brings royalty income into a breeder’s university.”*

**– Charlie Higgins,**  
*Potatoes USA*

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**Above:** Participants in the 2019 Wisconsin Potato & Vegetable Growers Association Member Development Program visit the Storage Research Facility at the Hancock Agricultural Research Station to learn about chip trials conducted there. Troy Fishler (back center), who was named HARS superintendent in 2020, leads the discussion.

Growers must be able to make a profit growing any new variety, so yields need to be as high or higher than Lamoka. The true yield is how many pounds a grower can sell after a long storage period. Growing costs have inflated so much that yield is more critical than ever.

Chip growers banded together 15 years ago to organize a nationwide trial program to better attack this problem. All growers contribute 3 cents per hundredweight to the national marketing and research organization, Potatoes USA.

**KEEP PRICES LOW**

Processors are also under pressure from consumers to keep prices low.

Consumers don't want chips that are too oily, and processors don't want to waste any expensive frying oil, so the higher the solids, the less oil it takes to fry the chips.

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***P. erythroseptica* (Pink rot)**

**Incidence by Variety**

Selection	BLUP rating for all years evaluated <sup>a</sup>				
	Incidence (%)	Penetration (mm/day)	Rating	Code	Number of years screened
MSV030-4/Petoskey	46.3	2.5	MR	3	4
MSX540-4/Machinaw	60.0	3.4	MS	4	4
Snowden	89.9	4.6	MS	4	5
NY139/Lamoka	76.2	4.5	MS	4	5
MSZ242-13	86.1	5.5	S	5	3
MSW474-1	15.4	0.4	R	2	3
NY163	56.5	2.8	MS	4	2
MSAFB635-15	53.3	2.5	MS	4	2
MSAA260-03	62.7	2.9	MS	4	1
MSAA324-04	65.6	3.3	MS	4	1
MSAFB609-12	75.3	4.7	MS <sup>b</sup>	4	1
NY168	59.4	3.0	MS	4	1
W15125-4	58.3	3.2	MS	4	1
Atlantic	64.3	3.1	MS	4	5

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## Hard Choices and Hard Facts on Chip Varieties . . .

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High solids, or high specific gravity, are one of the first hurdles breeders select for.

The size of the tubers is critical to chip processors. One processor told me, "If every tuber was exactly the size of a baseball [3 inches], it would be perfect."

Peeling loss and scraps lost during slicing is a problem for processors because they already have paid for the potatoes when they unloaded them.

Tubers that are too big make chips that break, and spuds that are too small lose too much in peeling loss. A perfectly round tuber slices best.

One excellent selection was recently turned down by a processor because it produces too many blisters in the chips that become crumbs in the bottom of the bag.

Disease is the biggest challenge for growers. Lamoka has some resistance to common scab, which is a great asset.

Pink rot is one of the first problems to show up in storage. Pink rot and pythium leak can start a cascade of bacterial soft rot with the potential to change a storage into a pile of stinky liquid.

North Dakota State University

### *Pythium/Globisporangium* (leak)

Selection	BLUP rating for all years evaluated <sup>a</sup>				
	Incidence (%)	Penetration (mm/day)	Rating	Code	Number of years screened
MSV030-4/Petoskey	74.7	6.7	S	5	4
MSX 540-4/Machinaw	53.7	4.1	MS	4	4
Snowden	26.6	2.1	MR/R	2.5	5
NY139/Lamoka	32.0	2.5	MR/R	2.5	5
MSZ242-13	77.6	4.2	MS	4	3
MSW474-1	54.6	4.2	MS	4	3
NY163	56.6	5.0	MS	4	2
MSAFB635-15	34.7	3.1	MR	3	2
MSAA260-03	78.0	5.9	MS/S <sup>b</sup>	4.5	1
MSAA324-04	58.3	4.4	MS <sup>b</sup>	4	1
MSAFB609-12	81.9	5.5	MS	4	1
NY168	46.9	3.9	MR <sup>b</sup>	3	1
W15125-4	65.6	5.2	MS	4	1
Atlantic	67.2	5.3	MS	4	5

Bacterial Soft Rot costs the chip industry millions of dollars each year. Lamoka is susceptible.

challenges breeders of potential new chip varieties to look for resistance to storage diseases.

For Lamoka, in the tables above and on the previous page, "MS" means moderately susceptible, and "MR" stands for moderately resistant. Lamoka tests moderately resistant to pythium leak.

Potatoes USA also screens for Dickeya, fusarium dry rot and southern rot. There is not enough budget to screen for many other diseases that are critical to the chip industry such as mop top virus and zebra chip, or resistance to the viruses.

Potential new chip varieties are also screened for stem end chip defects. This is a response to the environment causing a defect in the chips. A heavy rain followed by hot nights will cause some varieties to have too many chip defects to process.

A huge hurdle is bruise. Sometimes chip selections look good until they are piled 18 feet deep in a commercial bin where pressure bruise shows up.

A link between high solids and bruise makes it difficult for breeders to select for high specific gravity without increasing the bruise potential. Several breeding programs use black

### TUBER INOCULATIONS: BACTERIAL SOFT ROT, *P. carotovora*, *carotovora*

SELECTION #	years	average	
ATLANTIC	6	761	VERY SUSCEPTIBLE
LAMOKA	6	516	SUSCEPTIBLE
MSAFB635-15	2	110	MODERATELY TOLERANT
MACKINAW	5	477	SUSCEPTIBLE
PETOSKEY	5	455	MODERATELY TOLERANT
MSW474-1	3	129	MODERATELY TOLERANT
MSZ242-13	2	133	MODERATELY TOLERANT
NY163	2	132	MODERATELY TOLERANT
SNOWDEN	6	725	VERY SUSCEPTIBLE

spot bruise screening.

There are other hurdles that a selection must clear before it can become a commercial variety used by the chip industry. Each company performs their own qualification tests in their processing plants.

University breeders have a lot of financial investment in their advanced selections and a good deal of emotional investment. Some breeders become very protective of their babies if their selections clear most of the early hurdles.

If the data is not clear and some trials contradict others, it is confusing. If a variety becomes commercially accepted, it is like a winning football team and brings royalty income into a breeder's university.

#### SCREENING PROGRAM

Potatoes USA, the growers, processors, and breeders have worked together to develop a

## STEM-END SCORE SHEET

• Yi Wang et.al., USDA-ARS, University of Wisconsin



1/17/22 Petoskey  $[(27 \times 0) + (0 \times 1) + (1 \times 2) + (1 \times 3) + (0 \times 4) + (1 \times 5)] / 30 \text{ chips} = 0.33$

nationwide screening program.

Early selections must excel through the Early Generation Selection Trial; National Chip Processing Trials Tiers 1 and 2; SNAC Chip Trials; and then largescale NexGen Trials where full semi-truck loads are run through chip processing plants.

Ninety-nine percent fail.

Also, pathology, stem end, scab, and

bruise screening are performed on advanced selections before they can become varieties.

All this data is available to everyone at <https://potatoesusa.medius.re/>.

There are no perfect varieties. Every new variety seems to stumble on at least one hurdle. Lamoka is a good chip variety, but a huge effort is being made to find a better selection. **BCT**

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