## POTATOES & PES

Actionable Science Against Nematodes

## Selecting for Success: Potato Harvest is like a Box of Chocolates



Like the famous Forest Gump quote, a breeder never truly knows what they'll get from a potato cross until the first harvest in the field.

There are two factors that contribute to the unpredictable outcomes of potato breeding. First, potatoes are a tetraploid species. This means they have four sets of chromosomes. Compare this to humans, a diploid species, with two sets of chromosomes. This higher level of ploidy plays a role in the genetic complexity when the gametes – pollen and eggs – are formed.

The second factor is the high level of heterozygosity within potato. Heterozygosity happens when alleles (versions of genes) are not identical. This includes simple cases of dominant versus recessive alleles (think brown versus blue eye color) but can extend to instances where each potato parent has four different versions of the gene. The latter situation results in six distinct pollen or egg types for that gene alone. When you consider this gametic variation across the thousands of genes in a potato, it quickly becomes obvious that no two siblings from the same cross will be genetically identical.

During the first year of selection (known as the "four hills"), huge amounts of variation among siblings can be seen. For example, tuber shapes can range from perfectly round baseballs to oblong bricks.

The Cornell Potato Breeding Program allocates efforts to two distinct markets. 70% of the program is for developing potatoes that are made into chips and 30% of the program is for developing potatoes that are sold fresh in the grocery store, also known as tablestock. Selection criteria differ for these market categories. For chipping clones, factors like yield, shape, size, and maturity are all weighted relatively equally at the four hill stage of the breeding pipeline. On the other hand, the primary criteria of selecting tablestock clones are aesthetic, with a focus

on the tuber skin and shape. Agronomic traits like yield and maturity also play a role in selection of tablestock clones.

The breeder Walter De Jong and research support specialist Matt Falise walk side by side through the field as each are responsible for making selection in a single row. Selections at this stage happen quickly since there are thousands of clones to evaluate. When one of them deems a clone worthy of selection for the next season, they place an onion bag on the pile of tubers as an indication for the crew to collect it. Occasionally, they furtively place a bag on the other's row if they believe a potential good clone has been overlooked.

Once the day's work is done, the harvested potatoes are transported from Mount Pleasant to Cornell's campus for cold storage. Here, the tubers from the "four hill" selections await for further data collection of quality traits.

Article and Photos by Pia Spychalla



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