Wild potatoes bring increased calcium for better tubers

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Jansky's team improved potato qualities by cross-breeding with South American wild potatoes. Credit: Shelley Jansky.

Have you ever cut into a potato to find a dark spot or hollow part? Early research shows that these defects are likely the result of calcium

deficiencies in the potato—and that tuber calcium is genetically linked to tuber quality.

Neither consumers at grocery stores nor the companies that make potato chips and fries want these low calcium defects. In addition to the cosmetic issues, these potatoes are more likely to rot.

Most farmed varieties of potatoes have naturally low levels of calcium. So researchers at the USDA-ARS and University of Wisconsin-Madison, including Shelley Jansky, John Bamberg, and Jiwan Palta looked to wild potatoes. Their purpose: to breed new potato cultivars with high calcium levels.

Many wild potato relatives are still present in South America. Their presence means growers' potato plants in that region often exchange genes with wild species. "That's a way they continue to evolve as the climate changes or as disease and pest patterns change," says Jansky. "But (in the United States), we have removed our potatoes from that environment. We have to breed new genes in from these wild relatives when we want to improve our cultivars."

These wild relatives are an invaluable resource for scientists across the country. "If you go down there and drive along the roadside you can see these weedy, wild plants growing along the roads and fields," says Jansky. "Whenever we have looked for any trait in wild potato species, we have been able to find it."

Using this wild variety of potato, *Solanum microdontum*, researchers found the genetic marker for higher calcium levels. Credit: John Bamberg.

And so it was with searching for a high calcium potato. The team found a wild potato with almost seven times as much calcium as a usual variety.

The next job was to isolate the calcium trait. Jansky and her colleagues interbred the high- and low-calcium potatoes. The resulting generations showed a 'molecular marker'—a pattern in the plant's natural DNA. This pattern led researchers to the plant's calcium trait.

"Finding this marker will allow us—and other breeding programs—to make faster progress in breeding potato plants with high tuber calcium

content," says Jansky. "This has been difficult and time-consuming in the past. You have to grow all the populations, harvest tubers, and then analyze the tubers for the trait you are looking at—in this case tuber calcium levels. And that's a long, laborious process."

This wild potato cultivar, *Solanum microdontum*, helped researchers identify calcium properties in potatoes. Credit: John Bamberg.

A typical breeding program grows and assesses up to 100,000 seedlings every year. It takes between 10-15 years to release a particular variety of crop plant.

However, the process simplifies with known molecular markers. "We can collect DNA from seedlings and check for these molecular markers," says Yong Suk Chung, the first author of this study. "If you have the marker present, then you select those seedlings and save a tremendous amount of time and labor."

Jansky's research is published in *Crop Science*.

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