



Tomato Grafting Opens Possibilities

Research shows tomato grafting could yield tomato producers a high-quality, high-quantity crop.

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Courtesy Ohio State University Extension

Researchers successfully grafted prolific tomato varieties with disease-resistant tomato varieties for a high-production tomato plant.

Open-field and high-tunnel tomato producers yearning for high-quality crop performance with marketable fruit neatly wrapped in one plant may find what they are looking for through grafting.

Ohio State University researchers with the Ohio Agricultural Research and Development Center have found success using grafting to improve tomato production. Grafting is a technique whereby the foliage of one plant (scion) is fused onto the root system of another plant (rootstock).

"We chose tomato because it is susceptible to a number of field stresses, very important economically and responds to grafting," says Matt Kleinhenz, a vegetable crops specialist at the Ohio State University Extension. "Still, other crops such as cantaloupe, watermelon and cucumber can also be grafted. So, what is learned with tomato grafting may also apply to these crops."

Until now, grafting has been reserved for the green industry and hydroponic-vegetable production, but Kleinhenz thinks that open-field and high-tunnel tomato producers could also employ the technique. Grafting in high tunnels may be particularly popular, because of the scale and economics of high-tunnel tomato production.

Typically, the rootstock varieties resist soil-borne diseases more effectively than the natural roots of the scion, and may also be more vigorous or scavenge nutrients and water more effectively. However, the rootstock tomato varieties usually don't produce marketable fruit—so that responsibility lies in the scion tomato variety. The combination of the two tomato varieties may work to the grower's benefit.

To put it in simpler terms, let's say a tomato producer has one tomato variety (Variety A) that has a delicious fruit, but poor disease resistance or high water or nutrient needs. The producer also has a second tomato variety (Variety B) with an undesirable fruit, but it's extremely hardy. By grafting the two varieties, he may end up with a tomato plant that has the desirable fruit of Variety A tomato and the hardiness of Variety B tomato.

"Growers and consumers aim for crops to be produced as responsibly as possible, so combining Varieties A and B may be an effective and responsible choice," Kleinhenz says. "Grafted plants may require less pesticide, fertilizer and water to remain healthy and productive."

Researchers are finding that grafting may improve tomato varieties more quickly and efficiently compared to traditional genetic breeding. While this may be a better approach, it may require extra time, specialized skills and other resources.

"Ironically, when grafting succeeds, it opens the door for more breeding because of the need for more commercial rootstocks and scions. Grafting also opens the door to using varieties previously thought to have little value given their weaknesses," Kleinhenz says.

Kleinhenz and his colleagues are now entering their final year of the three-year project, funded by OARDC SEEDS, the USDA's Organic Agriculture Research and Extension Initiative, and the Ohio Produce and Marketers Association's Ohio Vegetable and Small Fruit Research and Development Program.

OARDC researchers are collaborating with researchers from the University of Minnesota, West Virginia State University, North Carolina State University and Penn State University. Farmers have also contributed significantly to the project from the beginning and continue to test the performance of grafted plants on their farms.

"Overall, we have shown that grafted tomato plants can outperform ungrafted ones (especially when soil-borne disease and low soil moisture are present), identified strategies for overcoming obstacles to the use of grafted plants, and helped educate people to prepare grafted plants for themselves or others," Kleinhenz says.



According to Kleinhenz, while tomatoes are an important crop to many farmers, most rely heavily on a few varieties that meet certain characteristics in weight, size, color, taste and storage time.

"Grafting means a greater ability for farmers to provide these qualities under challenging field conditions, while maintaining ties to sustainability for consumers," he says.

For the project, researchers genetically bred 46 rootstocks and grafted them to two popular tomato cultivars: Cherokee Purple and Celebrity. They then compared field and high-tunnel grafted tomatoes to nongrafted tomatoes and found that in both production systems, grafted tomatoes out-yielded nongrafted tomatoes anywhere from 5 to 30 percent. The tomato yield increases were greatest in the presence of soil-borne diseases and in drought conditions.

In addition, researchers found that the chemical makeup of grafted fruit was indistinguishable to nongrafted fruit, meaning that the characteristics consumers use to measure a good fruit remained unchanged.

Finally, researchers found that grafted tomatoes had a higher productivity during the course of the season. The plants were large and healthy despite, in some cases, having not been fertilized, which is especially good news for organic producers, Kleinhenz says.