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DISEASE RESISTANCE × HORTICULTURAL QUALITY → SUPERIOR CULTIVARS

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DNA TESTING HELPS CLEMSON PEACH BREEDER COMBAT DISEASE WITHOUT SACRIFICING FRUIT QUALITY

Creating new peach cultivars is a slow process. It takes several years from an initial cross for a peach tree to grow and mature enough to produce a “real” crop of peaches. Aside from the eating quality of the fruit, peach breeders are also evaluating test trees for their ability to resist (actively fight off) or tolerate (not show ill effects from) various diseases. Two of those diseases with worldwide importance are brown rot and bacterial spot. As breeders work to combine fruit quality attributes with resistance to important diseases, the first hurdle is identifying parents that have the desired attributes.

Dr. Ksenija Gasic is the peach breeder at Clemson University. Every year she makes crosses between peach trees with good disease resistance and peach trees with good fruit characteristics. In the last few years, she has been able to rapidly and efficiently evaluate her seedlings for important traits using DNA tests developed in the RosBREED project. RosBREED is a multi-state, multi-institution USDA-SCRI project dedicated to the improvement of U.S. rosaceous crops through targeted applications of genomics knowledge and tools to increase the efficiency of breeding programs.

One tree that reached maturity this year, labeled SC10-38-006, holds particular promise. It came from a cross made in 2010 in which the father had an exceptional ability to tolerate the presence of brown rot fungus but poor fruit quality. The mother had excellent fruit quality, but its response to these diseases was unknown. In its early years, SC10-38-006 had shown good tolerance for brown rot, but the real surprise came when the tree was evaluated for resistance to bacterial spot infection.

RosBREED researchers have developed DNA tests for two separate loci in the peach genome influencing bacterial spot resistance. Any peach tree can have zero, one, or two copies of resistance alleles at each locus. Trees with at least one resistance allele per locus will be resistant to bacterial spot infection, and having resistance alleles at multiple loci is ideal. Of the hundreds of sibling trees that Gasic screened, only SC10-38-006 inherited two resistance alleles at both bacterial spot resistance loci. Between the spot resistance, the brown rot tolerance, and decent fruit quality, it’s not an exaggeration to call this a new super tree!

Now that she has a single source of resistance alleles for one pathogen and tolerance alleles for another, Gasic is crossing SC10-38-006 with other selections that don’t have the same disease resistances but do have excellent fruit quality. For all future seedlings, she is planning to use RosBREED DNA tests for bacterial spot resistance to decide which young plants to throw out. She expects to evaluate up to 10,000 seedlings this year, and after DNA-testing them she will keep only about 3000 that carry alleles for resistance to bacterial spot. This screening will free up resources to focus on evaluating other traits, such as brown rot tolerance and fruit quality, to create the next generation of delicious, disease-free peaches adapted to the Southeastern U.S.

USDA United States Department of Agriculture National Institute of Food and Agriculture

RosBREED is a Coordinated Agricultural Project composed of a multi-state, multi-institution, and multi-disciplinary team of scientists who are dedicated to the accelerated genetic improvement of U.S. rosaceous crops using diagnostic DNA tools. This Coordinated Agricultural Project is funded through the USDA’s Specialty Crop Research Initiative by a combination of federal and matching funds.