ROSBREED SCIENTISTS DEVELOPING DNA TEST FOR BLACK SPOT RESISTANCE IN ROSE

Black spot of roses is a fungal disease that presents a major challenge for landscapers and home gardeners alike. Black spot causes defoliation that results in a weakened plant that blooms less, is more vulnerable to other pests and pathogens, and less likely to survive the winter. The fungus overwinters in fallen leaf litter on the ground, tolerates a wide range of temperatures, and at the first sign of warm, wet weather, is ready to infect nearby roses all over again. While fungicide treatments exist for black spot, frequent applications are necessary to prevent disease onset due to the short 10-day life cycle.

The market demand for rose cultivars is primarily for a "set it and forget it" low maintenance rose, according to Dr. Jason Zurn, RosBREED postdoctoral fellow at the USDA in Corvallis, Oregon. Zurn and RosBREED colleagues are trying to understand the genetic basis of resistance to black spot infection in rose to give consumers low-maintenance rose cultivars that do not need fungicide sprays to control black spot.

A climbing rose cultivar with pink flowers called Brite Eyes™ ('Radbrite') was Zurn's main focus for this project. Brite Eyes™ was already known to be genetically resistant to three races of the black spot fungus, including one race for which few other roses carry resistance. When Brite Eyes™ was screened for resistance to all known races of black spot, it was found to have genetic resistance to all but one, meaning Brite Eyes™ can resist infection from almost every known variant of the black spot fungus.

A Brite Eyes™ rose, which is resistant to almost all known races of the fungus that causes black spot

So what does Brite Eyes™ have, genetically, that other roses don't? The next step was to cross Brite Eyes™ with a highly susceptible rose, 'Morden Blush', and test the progeny plants to get a better idea of how the genetic resistance is inherited and where it might be located in the genome. About half of the progeny plants inherited black spot resistance, and were resistant to all seven races of black spot fungus that were included in the study. Similarly, those seedlings that were susceptible were susceptible to these seven races. This indicated to Zurn that a single location in the genome is controlling resistance to these seven races of black spot in Brite Eyes™ and its progeny.

Roses are tricky plants to examine genetically – Brite Eyes™ has four copies of each chromosome (humans have two), and some traits may be inherited differently depending on how the four sets of chromosomes interact, but Zurn was able to find the approximate location of the newly discovered resistance gene in the Brite Eyes™ genome. The next step is to evaluate the Brite Eyes™ resistance region on the rose reference genome to identify which genes are at work in black spot resistance. Zurn says he hopes to begin validating a DNA test by early 2019. Once the DNA test is ready, rose breeders across the country will have another tool in their genetic toolbox to efficiently screen roses for genetic resistance to black spot and develop new cultivars that need fewer fungicide sprays to stay healthy and beautiful.

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.