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DISEASE RESISTANCE × HORTICULTURAL QUALITY → SUPERIOR CULTIVARS

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Rosaceae Nemesis

Peach Bacterial Spot

Peach trees in humid regions worldwide are afflicted by bacterial spot, caused by *Xanthomonas arboricola* pv. pruni. Symptoms appear initially as spots on leaves, becoming necrotic as they grow larger, giving a "shot-hole" appearance. Severe infections can lead to premature defoliation, thereby weakening the trees and depleting carbohydrate reserves (Figure 1). Lesions on fruit render it unmarketable, resulting in severe economic losses.

Traditional control methods of antibacterial sprays or copper-based compounds are only effective in years with low to medium disease pressure, while societal concerns over agricultural antibiotic use and accumulation of heavy metals in the environment have escalated. Therefore, peach growers need a season-wide range of cultivars with superior fruit quality and some level of resistance to bacterial spot. The Univ. of Arkansas breeding program, led by John Clark, has been selecting for resistance for over 50 years and released some resistant cultivars, but it is focused on developing an expanded series of bacterial spot resistant peach and nectarine cultivars with different flesh types and improved flavors.

Fortunately, a source of fruit and leaf resistance is available from the 1976 NC release, Clayton (Figure 2). In a RosBREED effort led by Ksenija Gasic (Clemson Univ.), genetic loci were identified that control Clayton's fruit resistance. DNA tests developed for these loci predict with 80% accuracy the fruit resistance of seedling populations and are being incorporated in the Clemson and Arkansas programs for routine screening.

At Clemson, approximately 60% of the 10,000 seedlings from crosses made in 2015 are predicted to be discarded at the greenhouse stage, based on DNA marker information. The team is now focusing on identifying genetic loci controlling foliar and fruit resistance from other donor parents and developing DNA tests to allow the stacking of multiple resistance genes in new cultivars.

The deliverable to industry? Superior new cultivars with excellent horticultural quality and durable resistance to a devastating Rosaceae nemesis!

References

Okie WR. 1998. Handbook of peach and nectarine varieties – performance in the southeastern United States and index of names. USDA/ARS Agric. Handbook 714.

Gasic, K., Reighard, G.L.R, Okie, W.R., Clark, J., Gradziel, T., Byrne, D., Peace, C., Stegmeir, T., Rosyara, U. and Iezzoni, A. (2015) Bacterial spot resistance in peach: Functional allele distribution in breeding germplasm. Acta Horticulturae 1084:69-74.

Voorrips RE, Bink MC, van de Weg WE. 2012. Pedimap: Software for visualization of genetic and phenotypic data in pedigrees. J Hered. 103(6):903-907.

Figure 1. Bacterial spot effects on peach trees (left) and fruit (right). Photo: D. Ritchie

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

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

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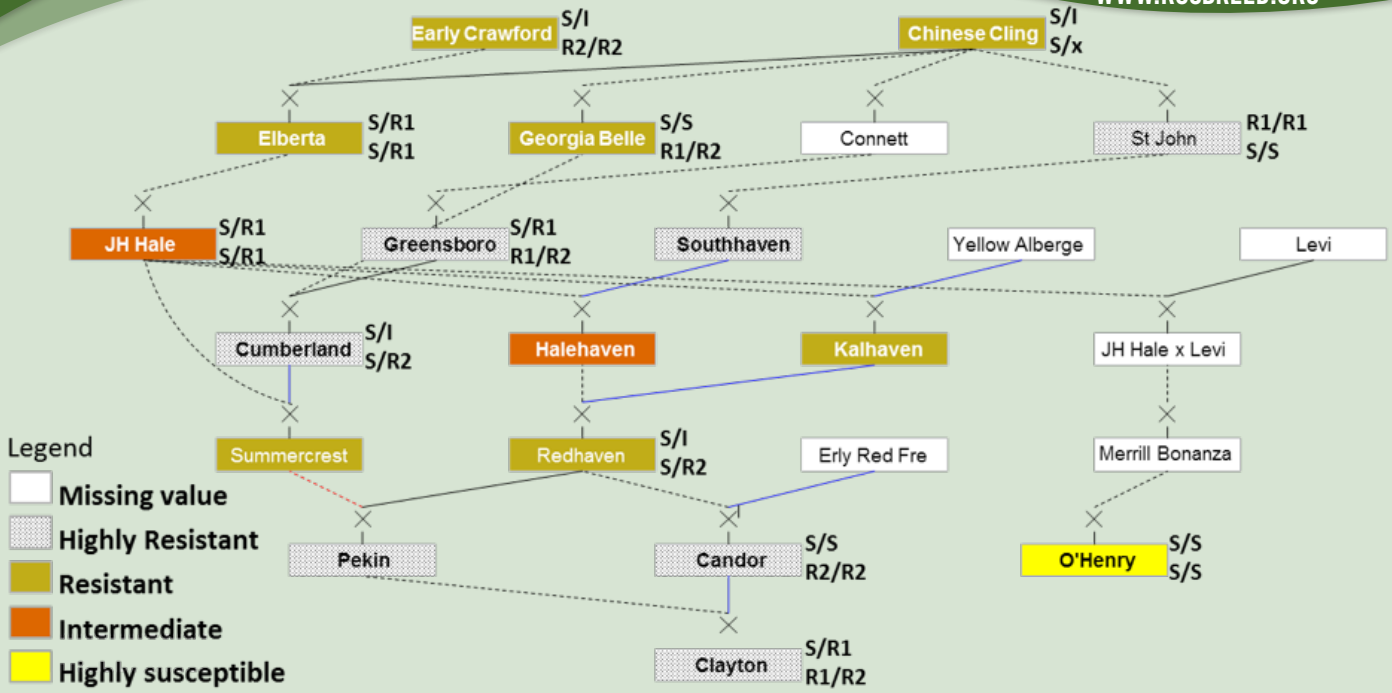

Figure 2. Pedigree of Clayton (Okie, 1998) and the inheritance of fruit bacterial spot resistance and susceptibility. Color legend based on literature data for overall performance against bacterial spot (Okie, 1998). Functional alleles: S, susceptible; R1 and R2, resistant; I, intermediate; x, unknown fruit response to Xap; Top, locus on chromosome 1, G1XapF, and bottom, locus on chromosome 6, G6XapF. Dotted line, seed parent; solid line, pollen parent. Figure generated with Pedimap 1.2 (Voorrips et al. 2012).

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