RosBREED

DISEASE RESISTANCE × HORTICULTURAL QUALITY → SUPERIOR CULTIVARS

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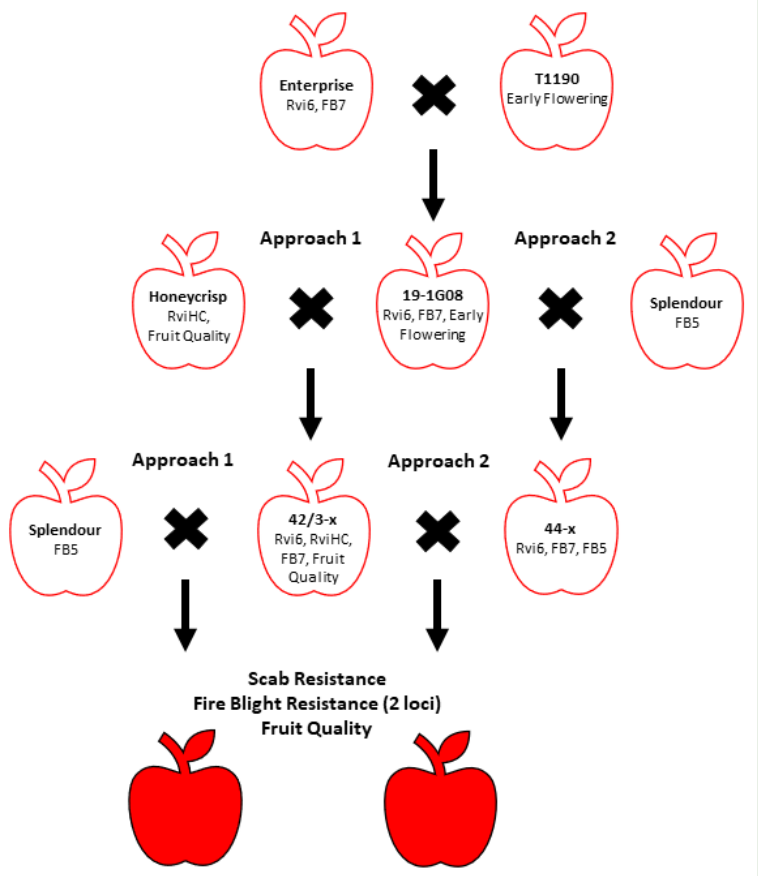
NEW APPLE CULTIVARS WITH RESISTANCE TO MULTIPLE DISEASES ON THE WAY

New apple cultivar development is well underway for RosBREED, thanks to a cutting-edge rapid breeding technique and application of DNA information generated in the project. Dr. Jay Norelli at the USDA-ARS Appalachian Fruit Research Station, Kearneysville, WV, is breeding apple trees with genetic resistance to scab and fire blight, two major challenges for U.S. apple growers.

Apple scab is a common fungal disease managed by pesticide sprays and clearing leaf debris at season's end. Fire blight is a bacterial disease difficult to prevent and even harder to control once an orchard is infected. Fortunately, we have sources of genetic resistance to the two diseases for breeders to use as parents. 'Enterprise' carries genetic resistance to both scab (*Rvi6* resistance factor originally from the wild species *Malus floribunda*) and fire blight (*FB7* source from heritage cultivar Cox's Orange Pippin), and 'Splendour' carries resistance to fire blight at another genetic location (*FB5*, original source still under investigation). 'Honeycrisp' carries another resistance factor for scab (RviHC) and an allele for its characteristic crisp fruit texture, for which RosBREED has developed a DNA test (Ma-Indel).

Using traditional selective breeding strategies to combine all these resistance alleles into a single individual would take decades, even enhanced with DNA tests.



Norelli's breeding scheme for combining scab resistance, fire blight resistance, and fruit quality traits into one apple cultivar.

Apple trees generally don't bloom until they're around four years old. Even if a breeder knows a young tree would make a good parent, they must wait years to cross it. This is where the cutting-edge tree fruit rapid breeding technique comes into play. Norelli has created a transgenic apple line with a gene borrowed from birch trees that promotes flowering at an early age. Trees bloom with viable pollen and can set fruit at 10-12 months from seeding. Selected offspring can then be crossed with parents with other valuable genetic factors, taking years off the breeding cycle. Importantly, the early flowering transgene can be crossed out when no longer needed, so the cultivars ultimately created using this technology are not considered to be genetically engineered once released for producers.

Further enhancing breeding efficiency by applying DNA tests that identify which seedlings carry genetic factors for both fruit quality and disease resistances, Norelli and his team expect to have elite lines combining the crunch of 'Honeycrisp' with pyramided and combined genetic disease resistance for scab and fire blight ready for release in less than a decade. Thanks to this work, consumers will benefit from new cultivars with superb fruit quality and growers will have a powerful tool to manage pernicious diseases.

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.