New Raspberries Use Virus Against Itself

Raspberry lovers and growers—and the environment—could benefit from genetically modified raspberries under development by scientists with ARS and Agritope, Inc., in Oregon.

The team, working under a cooperative research and development agreement, has genetically modified Meeker raspberries to resist raspberry bushy dwarf virus (RBDV) in laboratory and greenhouse tests. Meeker is the dominant variety of raspberry in Washington, Oregon, and British Columbia, where 90 percent of North American raspberries are grown.

"We're inserting parts of the virus' genetic material into the raspberry plants to induce them to develop resistance to the disease," says ARS virologist Robert R. Martin.

Martin works with ARS' Horticultural Crops Research Laboratory in Corvallis, Oregon. Agritope is an agricultural biotechnology firm in Portland that uses genetic engineering strategies to improve produce. The firm has already successfully incorporated genes for other traits into several raspberry cultivars.

Raspberries infected with RBDV develop smaller fruit that crumbles easily. That makes the fruit unsuitable for use as whole berries in the fresh and frozen markets. While they can still be used for juice or puree, the crumbly fruit brings only about one-fourth the price per pound that growers get for fresh or individually quick-frozen fruit.

Worse, within 5 years, a field becomes so infected with RBDV that growers must take it out of production, remove the plants, fumigate the soil, and start over. That means fewer domestic raspberries and higher costs for consumers.

"If the plants could naturally resist the virus, Northwest growers would be more competitive in the world market because they wouldn't be out of production every few years," Martin says. And the environment would benefit from less chemical use. The scientists are trying three strategies to find the best way to induce RBDV resistance.

One approach is to interfere with the virus' ability to replicate by inserting a specific protein from the virus into the raspberry plant.

A second approach is to alter the viral gene that facilitates cell-to-cell movement in plants and then insert that gene into plants. The virus would then be able to infect one cell but the altered gene would prevent the virus from spreading throughout a plant.

The third method they're trying is to have the plant make a small piece of viral RNA, or genetic material, that does not make any protein. Through a natural plant mechanism, this RNA then gets targeted by the plant for degradation.

The researchers produced 25 plants of each of 300 transformed lines of Meeker. Last spring, they put the plants outside to begin field-testing. Within 3 years, they'll know which genetic lines—and which strategy—will work best. Then they can make the genetic material available to nurseries and plant breeders. They should also be able to use the results to incorporate RBDV resistance in other cultivars of raspberry, blackberry, or black raspberry.

The team has applied for a patent on their techniques.

"Because RBDV is so prevalent, many of the raspberries now in stores naturally contain proteins from the virus. We're merely manipulating those proteins for the plant's benefit," says Martin. —By **Kathryn Barry Stelljes,** ARS.

This research is part of Plant Diseases, an ARS National Program (#303) described on the World Wide Web at http://www.nps.ars.usda.gov/programs/cppvs.htm.

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