Quest for the best apple

Kate Evans leads most advanced apple breeding program in world

By DAN WHEAT
Capital Press

WENATCHEE, Wash. — When Kate Evans was a little girl in Sheffield, England, she enjoyed pulling apart plants in her parents' garden.

She was seeing how they were made. She was looking for flower and leaf buds.

"My parents were fine with it. We had lots of flowers. There were enough to spare," she says with a smile.

Forty years later, she's developed and manages what is arguably the most advanced apple breeding program in the world. It's the first to use DNA testing for fruit quality, in other words aimed at the best firmness, crispness, juiciness, flavor, sweetness and storability of apples.

Some European apple breeding programs were first in applying DNA testing to disease resistance, she said.

Evans came to the Washington State University Tree Fruit Research and Extension Center in Wenatchee seven years ago as an associate professor of horticulture and pome fruit (fruit produced by flowering plants) breeder and head of the center's apple breeding program. She succeeded Bruce Barritt who retired and had started the program 14 years earlier.

Evans had her doctorate in plant molecular biology and had spent 16 years leading apple and pear breeding programs for East Malling Research, in England.

When she arrived in Wenatchee, the center's apple breeding program was just heading toward DNA testing.

"It was in its absolute infancy, so a lot of the work I've focused on is how to use that technology to develop the logistics of the application because it has to be 100 percent accurate regarding the traceability of the data to the individual seedlings," she said.

"When you use the data, you remove or throw away the seedling. So it's terminal selection. If you make a mistake and throw away the wrong one, you've wasted everything," she said.

DNA testing is done at seedling selection stage and prior to that in selecting the most efficient parent combinations to produce desired characteristics.

Previously, parents were chosen for their general fruit and tree characteristics, but with DNA genetic markers parents can be better selected to reduce the number of poor progeny. A genetic marker is a gene or short sequence of DNA that's a good indicator of a specific trait or characteristic.

"You can have markers for single traits, markers for multiple traits and several markers for the same trait. Not often is a trait controlled by a single gene," she said.

"We know acidity is predominately controlled by two major genes, but for other more complicated characteristics the DNA tests only explain a portion of the overall characteristic," Evans said.

A lot of research is going into identifying more DNA markers. But it is slow work. The USDA-funded RosBREED project led by geneticists Amy Lezzoni, professor of plant breeding at Michigan State University and Cameron Peace, associate professor of horticulture at WSU in Pullman, is making progress.

Quality and storability are the overriding targets of the WSU apple breeding program. Producers want fruit that pleases consumers and stores well for year-long sales.

More specifically, Evans uses DNA testing to aim for desired levels of flavor or sweetness versus tartness (sugar versus acidity), firmness, texture and ripening.

It takes about 18 years from crossing parents for hybrid seed to reach commercial release of a new variety.

"The DNA technology is more focused on efficiency than speed, but in five years we may be at a point of having sufficient DNA markers for important characteristics that we will be able to take out one of the selection phases and save three to four years," Evans said.

Three new varieties were released from the program in recent years, all from Barritt's breeding. WA 2 didn't gain traction in the industry because there was no commercial name and companies were leery of marketing a variety that could end up with multiple names. WA 5 had some long-term storability issues.

WA 38, released over the past several years, was given the name Cosmic Crisp by WSU in 2014. Proprietary Variety Management, a Yakima company that specializes in variety management, is assisting WSU with the apple.

Nurseries budded trees this past fall and there may be 500,000 trees, instead of 300,000, divvied out to growers by lottery for planting in the spring of 2017, Evans said.

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Kate Evans

Age: 49

Born and raised: Sheffield, England

Family: Husband, Peter Smytheman, entomologist and research intern WSUTFREC. Children: Thomas, 16; Chloe, 1

Education: Bachelor's degree in genetics and plant-biology, Leeds University; doctorate in plant molecular biology, Durham University

Occupation: Associate professor of horticulture and pome fruit breeder, WSU Tree Fruit Research and Extension Center, Wenatchee, Wash.

Dan Wheat/Capital Press

Kate Evans, Washington State University apple breeder, looks at fruit from breeding selections at the WSU Tree Fruit Research and Extension Center in Wenatchee. The apples came out of cold storage and were brought to room temperature for a week before being measured for firmness, crispness, flavor and juiciness.