

Breeder profile: Susan Brown

By Audrey M. Sebolt, Project Assistant



Box A: Cultivars released in 2010 by Susan Brown, Cornell University, New York



NY 1: This hybrid of 'Honeycrisp' by an advanced breeding selection, has the desirable attributes of 'Honeycrisp', without its production challenges. This fresh market cultivar is crisp, juicy and sweet. Trees are not susceptible to powdery mildew, bitter pit, leaf chlorosis or fireblight. NY 1 is also annual bearing.



NY 2: This variety has a wonderful blend of sweetness and tartness, along with exceptional crisp, firm fruits that store well. Fruits are suitable for both the fresh and processing markets and have high vitamin C content.

MDT-1 measures the crispness and firmness of apples.
Photo: Kate Evans, Wash. State Univ.



Dr. Susan Brown began breeding apples at Cornell University in 1990. Each year her program harvests 7,000 to 10,000 seeds from crosses. Her program manages 73 acres that include clonal trials of advanced selections, named cultivars and seedlings. Her primary focus is developing and releasing new cultivars for the fresh apple market. The Cornell University breeding program has released 66 apple cultivars, including 'Empire', 'Macoun', 'Jonagold', and 'Cortland'. In 2010, Susan released two advanced selections, New York 1 and New York 2 (NY 1 and NY 2 respectively; soon to be given trademarked names) in a cooperative partnership with NYAG, LLC, a cooperative open to all apple growers in New York State (Box A). NY 1 took only 12 years from cross to release because Susan saw the potential of this cultivar when it first fruited. The following spring, her program propagated trees of NY 1 for Cornell and grower trials. NY 2 took 18 years from cross to release. By 2013, it is estimated that there will be 900 acres of these two varieties planted in New York orchards.

Susan seeks germplasm for use in crosses for new and improved cultivars that have high vitamin C levels, unique and distinctive attributes such as color that "feathers" across the surface, outstanding quality including aroma, crispness, juiciness, firmness and a balance of high sweetness and high acidity that is maintained while in storage. An example of a cross that Susan made is 'Autumn Crisp' by 'Braeburn'. 'Autumn Crisp' was chosen because it has low browning, which is ideal for the consumer and the apple slice market, and high vitamin C content. However, this variety does not hold up well in storage. 'Braeburn', which has even higher vitamin C content, has good storage life, so this cross should have good vitamin C content and a diverse range of storage abilities. Seedlings from this cross are evaluated once they fruit, however, their overall "package" of a tree that will maximize grower profits and a fruit that will be accepted by the fresh market must meet and exceed the traits of other cultivars already on the market.

Susan is excited about the opportunity, through RosBREED, to collaborate with other apple and Rosaceae breeders in the United States. Standardizing phenotyping protocols within crop teams allows programs to compare data using the same metrics. In the past, crispness and firmness of apple selections was tested using a penetrometer or by biting into an apple. Generating data for this trait was time consuming and often subjective, depending on the tester. Jim Luby (University of Minnesota), Kate Evans (Washington State University), and Susan each decided to purchase an MDT-1 penetrometer (pictured left), developed by Mohr and Associates. This machine enables these three apple programs to more accurately

Breeder profile continued**Traits Susan is breeding for:**

- Distinctive and consistent fruit quality: flavor, firmness, crispness, and juiciness
- Fruit flavor including enhanced sweetness and acidity
- Reduced flesh browning – for the fresh market and the apple slice market
- Storage and shelf life, with freedom from storage disorders
- Higher antioxidant content (including vitamin C)
- Distinctive fruit appearance: skin color, hue, and stripes
- Disease resistance: scab and fireblight

and quickly measure the crispness and firmness of apples and can provide measurements for over 1,000 samples per day.

While marker-assisted breeding is a long term goal, Susan has been frustrated by a lack of reliable markers for traits of commercial importance. Susan feels that the DNA diagnostic markers that are developed through RosBREED efforts will be very powerful because they will be tested in three environments, Minnesota, Washington, and New York, and on a wide array of different genetic backgrounds.

Enhanced communications among Demonstration Breeders and interactions with the supporting research community are also benefits that Susan feels are important. She has attended both Annual RosBREED Advisory Panel Member meetings and values the interactions and feedback offered by Industry, Scientific, and Extension specialists.

Meet Susan's Breeding Trainee: Benjamin Orcheski

Why did you choose Susan Brown's program? I am currently working for my PhD in Horticulture in Susan Brown's lab. For years I have had an interest in the genetics of fruit crops (marvels of evolution). I discovered Susan through her website and was both fascinated and impressed by the work she is doing. After meeting with her and finding out first hand what a knowledgeable and fun person she is, I knew Cornell was the natural choice for me.

What is your thesis project if it has been determined? My project is based on studying epigenetic changes (DNA methylation pattern) in apple interspecific hybrids, and their relation to altered tree architecture and morphology.

What benefits have you seen to being part of RosBREED? I see two great benefits from being part of the RosBREED project. The first is learning about the theory and practice behind QTL mapping. I admittedly

knew very little about this facet of genetics before joining the project and am still learning a great deal. I have also gained an appreciation for the challenges and goals that each breeder has for their particular species (especially apple). It's really fascinating to hear each breeder's opinion of what the idealized fruit or plant would look like and how they want to achieve that.

The second benefit from being part of RosBREED is the friendships and connections that get built as the work progresses. It is really nice to work with like-minded individuals who have a common goal and appreciation. Also, understanding the mechanics and organization of a large scientific endeavor has been very helpful to me as a student and aspiring scientist.