Peach Breeding Program of the University of Arkansas

John R. Clark
Deptartment of Horticulture, University of Arkansas

The University of Arkansas peach and nectarine breeding effort began in 1964, led by James N. Moore along with cooperator Roy C. Rom. Much of the early inspiration and breeding material used in the program came from Fred Hough of Rutgers University. The initial focus was mainly on canning-cling cultivars for baby food. This effort was encouraged by Gerber Products. Co., which had one of its largest processing plants located at Ft. Smith, Ark. Processing peach production was primarily in eastern Arkansas, where high yields of clings could be produced and fruit shipped across the state to the processing facility. The processing cling breeding effort continued until the late 1990s at which time it was terminated due to Gerber discontinuing peach production in the state.

Moore and Rom also had an interest in fresh market breeding, but not in the area of yellow- fleshed freestones which most peach breeding programs were emphasizing. Their idea was to specialize in other traits such as white peaches and nectarines. One of the more unique aspects of the program was that they used non-melting flesh parents in this breeding effort. These areas of emphasis paralleled nicely with the processing peach breeding. They were quite innovative in their thinking as they recognized the potential value of non-melting flesh for fresh-market peaches, allowing a more ripe fruit to be harvested and handled with good quality and without damage. This idea has expanded now in the commercial marketplace.

In the early 1980s, Hough sent his last shipment of peach breeding germplasm to Moore. In this final installment, unique firmness in low-acid white peaches surfaced. Selections were made from this material and this served as the basis for an enhanced effort in very firm-flesh fruits (including other sources of firmness than the canning-cling peach) with reduced acidity.

The breeding program continued after Rom and Moore retired (1989 and 1996, respectively), and the fresh-market effort moved forward. A focus throughout the life of the program has been bacterial spot resistance. No bacteriacides are used in the program, and selection pressure for resistance is quite substantial at the breeding site, the University of Arkansas Fruit Research Station, Clarksville. This site is also high chill, has winter lows of 5 to 10^{o}F, and receives about 45 inches of rainfall annually including during harvest season.

Fresh Market Peaches

White River was the first fresh-market, white-flesh, freestone release from the program (2002). It ripens July 20 (all ripe dates are at Clarksville, AR, where Redhaven peach ripens about July 1) and has large fruit size with up to 14.5% soluble solids. Flavor is standard acid. It is nearly immune to bacterial spot and among the healthiest trees in the program. White River softens when fully ripe as other melting-flesh types.

The year 2004 brought the release of the first low-acid varieties, White Rock and White County. White Rock was released due to its early ripening (June 25) and the hope is that this cultivar offers to local growers and shippers a distinctly unique fruit. Its flavor is light, sometimes described as “melon-like. While some consider the flavor great, others believe it not strong enough in white peach character. Thinning must be handled carefully with White Rock to attain good fruit size. Also, for completely unknown reasons, it is the only peach genotype in the program that is attacked by squirrels. White Rock appears to have two sources of firmness, the processing cling type, and a unique type introduced in the program in the 1980s. These sources appear to be possibly additive, providing for an exceptionally firm fruit that does not soften until fully ripe, if even then. Molecular characterization of the flesh types is also ongoing in the program currently to try to clarify exactly what genes are involved.

Individuals that sample varieties and selections in the Arkansas program often express that White County is the most outstanding peach released. It is low-acid, freestone with very firm texture. It can be consumed

readily at the crisp stage, and the flavor comes through very well when not fully "ripe". When White County does fully ripen, it softens much like a melting flesh peach. It ripens July 14 and has large fruit. It has 80% overcolor and is very attractive as well as near immune to bacterial spot in most years in Arkansas.

White Diamond was released in 2009, and is much like White County in many characters (low-acid, freestone), with an average ripe date of August 1. It also has good bacterial spot resistance. White Cloud was also released in 2009, and is a white-flesh, cling, non-melting peach. It has flesh similar to a canning-cling processing peach. It is standard acid and ripens July 6.

Nectarines

Three nectarines have come from the program, one melting flesh and two non-melting. The very early (June 12) ripening , melting flesh, clingstone Westbrook was released as a local-market nectarine with very good flavor. It lacks firmness for shipping, and is intended only for limited sales to attract customers for the early season. Westbrook is among the most bacterial spot resistant genotypes in the program.

Arrington and Bradley nectarines both have non-melting flesh. Arrington ripens June 21 and has a nice nectarine flavor coupled with the non-melting flesh from processing peaches. Fruit size is medium, with a distinct orange ground color. Bradley is large-fruited, and ripens July 4. Flavor is a processing peach/nectarine mix. Both hang well on the tree and allow for ripe fruits to be harvested and handled.

Processing Cling Peach Cultivars

The first two releases from the processing cling peach effort were Allgold and Goldilocks, introduced in 1983. These were grown to some extent to expand production beyond that of the "Babygold" series, the mainstay of the industry. Allgold' particularly added a moderately early, high- quality option with very good bacterial spot resistance. Following in 2000, Roygold and GoldJim were released. Roygold has even earlier ripening, with first harvest approximately June 20. GoldJim is a very high quality processing genotype , ripening near July 20. Both of these cultivars have excellent bacterial spot resistance. All of the Arkansas releases, with the exception of Goldilocks, have a golden to orange flesh with no red pigmentation providing for an excellent processed product with no browning from red pigments

Goldnine was released in 2000 also, but its path of evaluation and eventual commercialization deviated from the norm. Tested as Ark. 9, it was brought to Michigan in the 1970s for evaluation by Gerber. It was found to have very good winter survival, and additional test trees were propagated and planted by Gerber growers. Subsequent testing in Arkansas showed a major defect of a large amount of red pigment in the flesh. Processing evaluations were poor, and Ark. 9 was set aside as a potential cultivar. As time moved on, Ark. 9 began to be propagated commercially and sold as Arkansas 9. However, it had not been formally released. The challenge was introducing a cultivar that did not meet the program's quality standards for processing. I remember visiting with a peach specialist from Mexico in the late 1990s, and he told me that Arkansas 9 would be one of the main cultivars planted that year in his region. I decided then and there that it was time for this "child" of the program to have a name. Issues of proprietary rights aside (it could not be patented since it had been in commerce several years), a concern was how to shift the sales name Arkansas 9 to something else. I chose Goldnine with the hope that this name would be used by the nurseries as it was similar to Arkansas 9, but also to include the "gold" theme used in the Arkansas program. This all worked out quite well, and although not planned, Goldnine has been the most successful peach or nectarine to originate from the program.

What's Coming?

The work in both peach and nectarine in low-acids continues, and low-acid, very firm white types are in advanced stages of testing. Likewise, low-acid, yellow-flesh types are in evaluation. There is a limited amount of work on flat or saucer-shaped peaches and nectarines, incorporating all these traits – firm, low acid, very sweet. Again, these different fruit types are being developed to allow expanded options for growers beyond standard yellow, melting-flesh peaches.

The Arkansas program has expanded research in peaches, particularly in developing a postharvest protocol for evaluating storage potential. This work is in the early stages but is hoped to yield a method to fully evaluate if the various flesh types offer greater potential for handling, storage and marketing. Arkansas is also involved with large Specialty Crops Research

Initiative Grant RosBREED, specifically working on peaches, and focusing on genes controlling firmness and sweetness. The hope is that the firmness types can more precisely be characterized (both phenotypically and genotypically), and this can lead to a molecular marker being incorporated in the program to increase breeding efficiency.

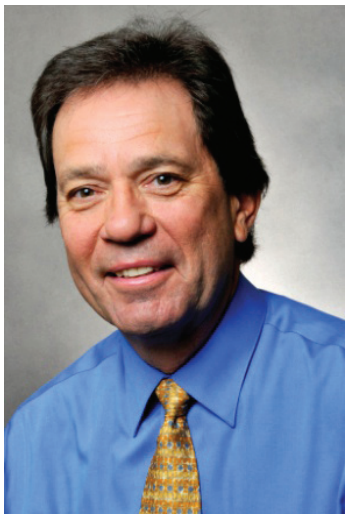
Further, some early cooperation in peach and nectarine breeding with Dr. Ksenija Gasic at Clemson University has begun. The hope is that a blending of breeding program germplasms and additional sites will provide for expanded variety development opportunities.

Peach and nectarine breeding is an interesting paradox. On one hand, there is no other crop category that I work with (and I work with several crops: berries, grapes) that is as enjoyable to eat and rejoice in as peaches and nectarines. But, challenges abound in improving several important traits and in finding a market and use for developments. Fortunately, we in the East continue to be blessed with a number of very viable breeding programs, both private and public, to provide a range of variety options.

To obtain Arkansas peach and nectarine cultivars, contact:

Cumberland Valley Nurseries, Inc.
P.O. Box 471
McMinnville, TN 37111-0471
800-492-0022

If other nurseries are interested in Arkansas peaches and nectarines, propagation agreements are available. New propagators are welcome to join the program.



John R. Clark is a university professor of horticulture at the University of Arkansas. His research responsibilities are his primary appointment, where he directs the University's Division of Agriculture fruit breeding program and manages the intellectual property rights of the program's developments.

Crops Dr. Clark works with include blackberries, table grapes, muscadine grapes, blueberries, and peaches/nectarines. His research activities are carried out in Arkansas, several US states, and various countries in the world. He also teaches in the areas of plant breeding and fruit production and advises graduate and undergraduate students.

A native of Mississippi, Dr. Clark has B.S. and M.S. degrees from Mississippi State University and a Ph.D. from the University of Arkansas.

Ernie Christ Memorial Lecture

The Ernie Christ Memorial Lecture, is presented at the Mid Atlantic Fruit and Vegetable Convention in January each year, held in Hershey, PA. The lecture was established in memory of Ernie Christ, the long time New Jersey tree fruit specialist at Rutgers Cooperative Extension. Ernie passed on September 12, 2000. He was loved and respected by fruit growers across North America. Ernie's passion was the furthering of knowledge of peach culture and science. A fund was established by the New Jersey State Horticultural Society with an initial gift by Adams County Nursery and since by grower donations. The fund supports an invited speaker each year at the Mid Atlantic Conference. The first Ernie Christ Memorial Lecture was presented by Dr. Rich Marini, Horticulture Department Head, Penn State University, in January of 2002. Dr. John Clark was invited to present the 11th Ernie Christ Memorial Lecture this year. The article presented in the beginning of this issue was from that lecture.