

Breeder profile: John Clark

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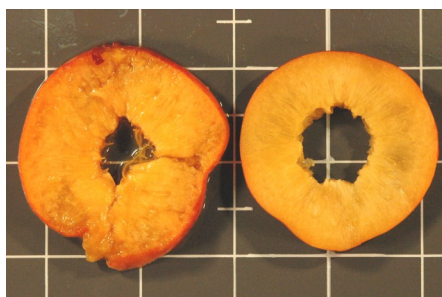
John Clark, University of Arkansas

Box A: Traits that John Clark evaluates:

- ★ Firmness at harvest
- ★ Sweetness
- ★ Acidity: normal and low
- ★ Flesh texture: melting and non-melting flesh
- ★ Fuzz and no fuzz (peach and nectarine)
- ★ Fungal and disease resistance



White (left) and yellow-fleshed (right)



Melting (left) and non-melting flesh (right)



Freestone (left) and clingstone (right)

John Clark is one of the four RosBREED peach Demonstration Breeders and is a professor at the University of Arkansas. John started his career there in 1983 and in addition to peaches he also breeds nectarines, blueberries, blackberries, table grapes, and muscadine grapes. John considers his peach-breeding program to be a “mature program”, where he breeds for improved cultivars using the germplasm that he inherited from his predecessor, James Moore. The program’s aim is to develop high quality ripe fruit for consumers that are either melting or non-melting, clingstone or freestone, white- and yellow-fleshed peaches and nectarines for the fresh market. To achieve this goal, John aims to produce 4000-5000 first-generation peach seedlings every year and evaluates these seedlings for multiple traits (see Box A).

John recognizes that his peach breeding must address the major limitations in peach production, which include achieving adequate fruit sizes, tolerating fungal diseases such as brown rot, and maintaining post-harvest durability for handling to enable delivery of high-quality fruit to consumers. The task is all the more daunting when he has to face mid-winter damage to tree buds, frost, hail, drought, and heat stress in different seasons of the year. Despite these challenges, John states that the genes for superior performance of these production traits are accessible in his program; however, the million-dollar question is: How should he package these production traits in a form that producers and consumers will accept?

For most fruit crops, it is generally understood that consumers have a wide preference range for aroma, acidity, and sweetness. When it comes to peaches, John often considers several questions while evaluating his seedlings for fruit quality and making selections: Will consumers accept the white-fleshed peaches or will they only prefer yellow-fleshed peaches? Will consumers buy a fresh-market clingstone peach? Are white peaches and nectarines important enough for eastern U.S. growers? How accepting are consumers of a range of fruit acidities and “light” flavors that some low-acid peaches and nectarines can provide? These are questions John ponders but he is hopeful that he will be able to narrow down these preferences after RosBREED’s Socio-Economics Team surveys peach producers and consumers this winter and next year, respectively.

In the past, John Clark’s program has used traditional plant breeding practices. When asked at the start of RosBREED if he would consider using marker-assisted breeding (MAB) in his program, John used this analogy: “I see the shiny new Lexus, I just need the keys to drive the car.” One key for peach is the endoPG genetic test (for more information [click here](#)), which can readily distinguish melting versus non-melting flesh types and freestone versus clingstone. The RosBREED peach crop team has finished its second year of phenotyping and one of the many traits phenotyped was melting versus non-melting flesh. Phenotyping for this trait can be extremely challenging because the characterization of the trait can change as the fruit ripen, thus making it difficult to classify the flesh type with certainty. John is extremely excited that RosBREED will characterize some of his breeding germplasm for this trait at the molecular level using the endoPG genetic test. John will then know what alleles he has in his parents and seedlings and how those alleles were inherited. MAB can also be used in his program to select for larger fruit that have enhanced sweetness, optimal acidity, and desirable flesh color – in other words, he will soon be given the several keys to the “shiny new Lexus”.

Breeder profile continued

John Clark feels that RosBREED is leading to many great things. RosBREED is providing innovation to Rosaceae breeding programs, which many of these breeding programs have not seen in the past. This innovation is being introduced through the development of RosBREED's [Breeders' Toolbox](#) and the use of DNA markers for MAB and the [MAB Pipeline](#) that Dr. Cameron Peace (Washington State University) has developed. RosBREED is also encouraging future breeders, "Breeding Trainees", to learn about and use these new innovations by supporting their degrees through assistantships and travel support so that they can attend scientific meetings and training workshops hosted by RosBREED. Breeding Trainee Paul Sandefur is currently working with John at Arkansas (for more information about Paul, read below).

RosBREED is developing a model for their Demonstration Breeding programs - the MAB Pipeline. Can this model be used for Rosaceae Community Breeders? John believes it can! He stated that he always hesitates when there is new technology, because it can sometimes be trendy but not useful. But, John feels that if a new technology, such as RosBREED's MAB Pipeline, has useful application and can show it has value to reduce costs, more precisely pinpoint genes and their phenotypes, while showing diversity for traits that we haven't been able to characterize in the past, this new technology can make a tremendous difference in breeding rosaceous crops!

Box B: Cultivars John Clark has released (all have bacterial spot resistance):Fresh Market peaches (all are white-fleshed)

- White Diamond: low-acid and medium-sized freestone peach that has a sweet, distinct flavor often associated with white flesh
- White Cloud: non-melting cling peach, standard acidity and a distinct flavor often associated with white flesh
- White County: exceptional low-acid peach with large size
- White River: first fresh-market, white free peach to be released from Clark's program. The tree is very productive and produces large fruit that are high quality and ripen mid-late season
- White Rock: very productive tree. Fruit ripen mid-early season, low-acid, and have a flavor and firmness exceeding anything achieved in previous Arkansas breeding

Nectarines

- Westbrook: yellow, cling nectarine with excellent flavor for the very early season
- Arrington: yellow, non-melting cling nectarine, early season, very firm at maturity
- Bradley: yellow, non-melting cling nectarine with large size

Processing peaches (for baby food and canned peaches)

- AllGold
- Goldilocks
- GoldJim
- Roygold
- Goldnine

Meet John's Breeding Trainee: Paul Sandefur

Paul Sandefur, University of Arkansas

Why did you choose John Clark's program? During the final semester of my undergraduate horticulture studies, I completed a special project course under the advisement of Dr. John Clark. While working on my project, I realized that I had finally found my calling. Fruit breeding became my passion and I knew Dr. Clark would be the perfect mentor to provide me with the knowledge and experience needed. Dr. Clark's relentless drive yet relaxed attitude make even the hottest Arkansas summer days enjoyable.

What is your thesis project? For my thesis project, I am evaluating the flesh type and storage performance of Arkansas peach and nectarine genotypes. My first goal is to develop a peach and nectarine storage protocol for evaluating selections and other genotypes within the program, with the goal of this protocol being incorporated into yearly evaluations. Second, I am assessing the accuracy and functionality of endoPG molecular markers in predicting flesh type differences in peaches and nectarines through the first application of marker-assisted breeding in the Arkansas program.

What benefits have you seen by being part of RosBREED? Above all, RosBREED has provided me with a broad view of the diverse and complex world of fruit breeding. Thanks to RosBREED, I have had the opportunity to get to know many of the 'all-stars' within the breeding community. I now know that the professionals who have published groundbreaking and truly inspiring research are real people! RosBREED has also been a valuable resource for information regarding genetics and genomics, greatly expanding my knowledge and experience. Although the last RosBREED meeting left me excited for the future, I left on a sad note knowing it would be my last. After two years and three meetings I have made many new friends, am excited to be a part of the breeding community, and am very thankful for having the opportunity to be a part of the RosBREED team.