## Paternity testing and delivering trait-predictive genotypic data

By RosBREED's Genotyping Team (Nahla Bassil, Barbara Gilmore, and Cameron Peace) assisted by April Nyberg (USDA-ARS-NCGR), Caprice Rosato (OSU), and Bassil Lab members, in collaboration with Demonstration Breeders and Breeding Trainees.

Nahla Bassil sorting apple leaves that were sent to her lab for DNA extraction

Nahla Bassil and Barbara Gilmore extracting DNA from apple leaves

Ksenija Gasic and Terrence Frett (Clemson University) reviewing data sent by Nahla

The Genotyping Team leads the effort to obtain DNA marker genotypes needed to enable marker-assisted breeding for critical fruit quality traits. Genotyping is performed on reference germplasm sets of apple, peach, cherry and strawberry (Figure 1, next page) carefully chosen to represent important breeding parents. In 2010, breeders sent leaves of each chosen tree to the Genotyping Team for subsequent DNA extraction. This effort has resulted in a repository of DNAs needed for genotyping during the RosBREED project.

Over the past few months, these apple, peach, and cherry DNAs were screened with promising trait-predictive DNA markers (Table 1, next page). These markers for high priority fruit quality traits were available yet not fully validated nor widely implemented in Rosaceae fruit breeding programs. The first demonstrations of marker-assisted breeding as facilitated by RosBREED will be conducted with these promising markers in 2011 (while in the meantime huge research efforts in other project areas are expected to provide many further diagnostic tools for fruit quality). Future Newsletters will document advances in breeding efficiency using this marker data. For example, allelic variants of a peach *endoPG* gene should be able to predict whether a peach will have fruit flesh that is rapid-softening, slow-softening, non-softening, free from the stone, or clinging to the stone (described in May 2010's *Jewels in the Genome* article). In cherry, a genetic test is available that is expected to simultaneously predict fruit size, firmness, and flavor (*Jewels in the Genome*, August 2010).

The genotypic data was delivered to the Pedigree-Based Analysis Team to soon validate and assess utility of these markers in specific breeding programs. A very excited group of RosBREED breeders are anxious to apply predictive markers in their programs, starting with refining their crossing decisions by using such knowledge as which of their potential breeding parents are predicted to produce fruit with superior flavor, texture, and size. Also of interest to breeders, early perusal of the genotypic data revealed that some pedigree records are incorrect. Did an individual result from stray pollen? Was there an error in labeling or record-keeping? Such knowledge allows breeders to confirm or reassess their records, and a chance to refine RosBREED's reference germplasm sets for maximized statistical power. While the Pedigree-Based Analysis approach requires pedigree information to be correct to arrive at valid conclusions, so does any study of inheritance and assessment of parental breeding value. This paternity testing is another example of how accessibility to the new tool of DNA-based markers can provide breeders with valuable biological insights.

**Paternity testing and delivering trait-predictive genotypic data cont.**

Table 1. Genetic tests conducted by the Genotyping Team on crop reference germplasm in early 2011

| Crop | Trait | Locus | Marker |
|---|---|---|---|
| Peach | Fruit flesh softening type (melting, non-melting, non-softening) and flesh adhesion to stone (freestone/clingstone). Also mealiness, firmness, flesh bleeding in storage | *F-M* locus on *Prunus* chromosome 4 | SSR: endoPG-1 and SCAR: endoPG-6 |
| Peach | Fruit sweetness (SSC) and acidity (TA) | QTL on *Prunus* chromosome 4 | SSR: BPPCT023 |
| Apple | Fruit acidity, crispness, and juiciness | *Ma* locus with QTLs on *Malus* chromosome 16 | SSRs: CH05c06and Hi04e04 |
| Apple | Fruit firmness | QTL on *Malus* chromosome 1 | SSR: Md-Exp7 |
| Cherry | Fruit size, firmness, and flavor | QTL on *Prunus* chromosome 2 | SSRs: CPSCT038 and BPCT034 |
| Cherry | Fruit acidity | QTL on *Prunus* chromosome 3 | SSR: BPPCT039 |

# Who's Who in the Genotyping Team

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