Jewels in the Genome

By Amy Iezzoni, Project Director

What is a "Jewel in the Genome?"

- *An individual's genome is the full complement of genetic information that it inherited from its parents. Within this vast repertoire of genetic information, individual genes are being discovered that control critical production and fruit quality traits. As these valuable rosaceous gene discoveries are made and put into breeding applications, we will describe them in this column as "Jewels in the Genome."*

Floral initiation in strawberries is directly related to crop productivity. Most older strawberry varieties only initiate flowers during short days and therefore produce just one crop, in the spring. However, other strawberry varieties have been bred that initiate flowers irrespective of photoperiod, providing several cycles of flowering and fruiting during one growing season. Therefore, the genetics are available for multiple strawberry fruit crops a year on the same plants. The term used to describe the everbearing strawberries is "remontant".

In California, short day varieties are grown from January to April and remontant types are grown from April to October. Remontant varieties are also highly desirable for summer production in other U.S. production areas. However, breeding remontant cultivars for the midwestern and eastern U.S. has proved challenging as additional cycles of flower initiation can be inhibited by hot summer temperatures. In addition, determining which seedlings are remontant is extremely difficult as environmental conditions greatly affect this trait.

Using a remontant variety, 'Tribute', which inherited its remontancy from Californian ancestors, Dr. Jim Hancock and his RosBREED Breeding Trainee, Sonali Mookerjee, discovered several genetic markers that are associated with the remontant trait in this lineage (Mookerjee 2012). One of the most robust simple sequence repeat markers, EMFn117, is on strawberry chromosome 7 (Sargent et al, 2006). The functional allele, present as a single copy in 'Tribute'-derived progeny, is predictive of remontancy even during the challenging hot summers. However, not all remontant varieties have this functional allele – there are other sources too. Nevertheless, the EMFn117 marker will likely provide a predictive genetic test when using remontant germplasm derived directly from 'Tribute' or from 'Tribute's Californian ancestors. Nahla Bassil and her group at the National Clonal Germplasm Repository are currently evaluating several segregating families to verify this association.

With genetic knowledge of what strawberry seedlings will be remontant, breeders can select for remontancy in the greenhouse without spending the time and resources on large field plots and without the concern of imprecision from environmental factors. This knowledge increases resources that can be allocated to critically important consumer-related traits such as the wonderful fruit flavors and aromas present in strawberry germplasm. Therefore, because the EMFn117 genetic test for remontancy will lead to the more efficient breeding of productive strawberry varieties, it is selected as one of RosBREED's "Jewels in the Genome."

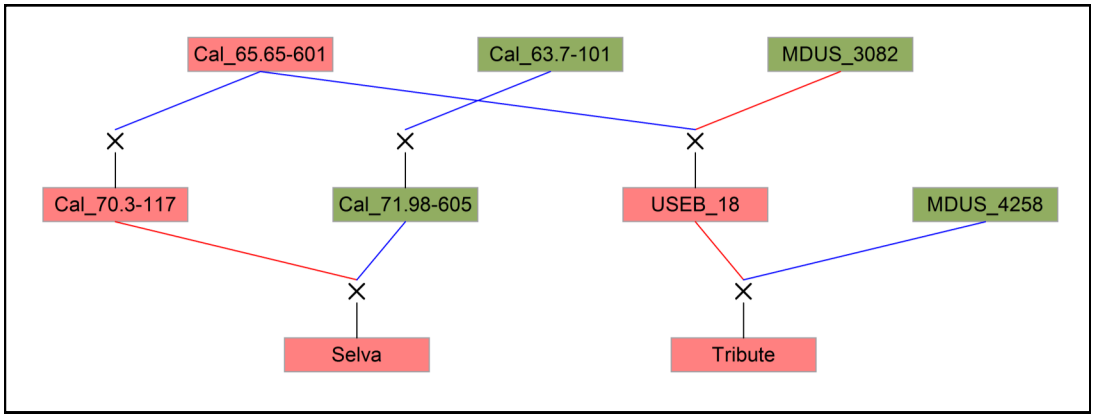

Figure 1. Tribute used the same California selection (Cal_65.65-601) that is in the background of all the UC-Davis remontant types. Here Selva is shown as a representative. Selections in red are remontant and green are non-remontant. Figure is illustrated by Pedimap.

Mookerjee, S. 2012. Genetics of remontancy in octoploid strawberry (*Fragaria* × *ananassa*). Ph.D. Dissertation, Michigan State Univ., 191 pp.

Sargent, D.J., J. Clarke, D.W. Simpson, K.R. Tobutt, P. Arús, A. Monfort, S. Vilanova, B. Denoyes-Rotham, M. Rousseau, K.M. Folta, N.V. Bassil, and N.H. Battey. 2006. An enhanced microsatellite map of *Fragaria*. Theor. Appl. Genet. 112, 1349-1359.