Interspecific Breeding Germplasm for Rootstock Research and Development

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PROJECT SUMMARY

Objectives:

- Evaluate efficacy of marker expression in different interspecies hybridization and introgression lines.
- Assess the marker inheritance patterns in segregating populations from the first objective.
- Determine whether inheritance patterns from the second objective may be sufficient to determine probable parentage of unknown or ambiguous rootstock clones or selections.

Background and Discussion:

Changes in planting practices, including the quantity and quality of land and irrigation water, have led to the need for a new generation of almond rootstocks. Germplasm from other species, either directly or through species hybridization, is often pursued to attain the greatest range of vigor, stress and disease tolerance as well as desirable horticultural traits. However, the acquisition of such exotic germplasm is often difficult and time-consuming.

At UC Davis, a diverse germplasm has already been developed combining almond, peach and related species. In this project, selected germplasm from the UCD almond and peach breeding programs with value for rootstock improvement has been characterized at both the whole plant and at the molecular level. This germplasm demonstrates extensive diversity both genetically and for the range of traits useful to rootstock improvement.

Field evaluations have also identified unique and potentially useful characteristics in parents and progeny, including modification of tree architecture from *Prunus scoparia* hybrid rootstocks, drought tolerance in a peach by *P. argentea* hybrid, and a pronounced invigoration of scion growth in several advanced interspecies introgression lines.

The genetic characterization of parent species, species-hybrids and subsequent breeding progeny has been completed using over 500 molecular markers. The use of molecular markers is used to improve breeding efficiency by identifying genotypes and so traits of interest at much earlier stages in the breeding program. These molecular markers have been shown to be frequently species-specific, which may confound their utility when wide species crosses or divergent species introgression is attempted. (Introgression is the transfer of the desired trait such as nematode resistance from the donor species to the rootstock through a series of recurrent backcrosses). In much of this diverse germplasm, molecular markers developed for peach showed varying levels of efficacy when applied to species hybrids and their introgression lines. Despite a frequent failure of molecular markers developed in one species to discriminate the genetic alleles of different species, the use of marker-assisted-breeding proved valuable for understanding general inheritance trends as well as identifying possible barriers, while also identifying potential opportunities for exotic gene transfer for rootstock improvement.

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Project Cooperators and Personnel: J Preece, C. Crisosto, J. Fresnedo, D. Kluepfel, M. Aradhya

For More Details, Visit

- Poster location 45; Exhibit Hall A + B during the Almond Conference; or on the web (after January 2017) at Almonds.com/ResearchDatabase
- 2015 - 2016 Annual Reports CD (15-HORT10-Gradziel); or on the web (after January 2017) at Almonds.com/ResearchDatabase
- Related projects: 16-HORT16-Aradhya/Kluepfel (COC)