Almond Variety Development: 2010

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Improved Almond Varieties: Objectives

1. Improved early pollinizers for *Nonpareil*, and ultimately,
2. Varieties that possess self-fertility and improved market value and disease/insect resistance.

Targeted Traits

- -Self-compatibility
- -Self-pollinating
- -Tree architecture
- -NOW resistance
- -Hull Rot resistance
- -phytonutrients

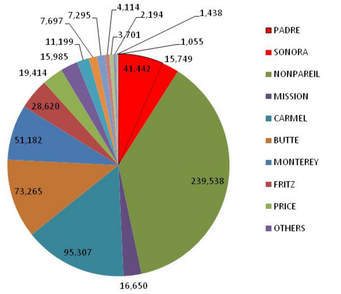
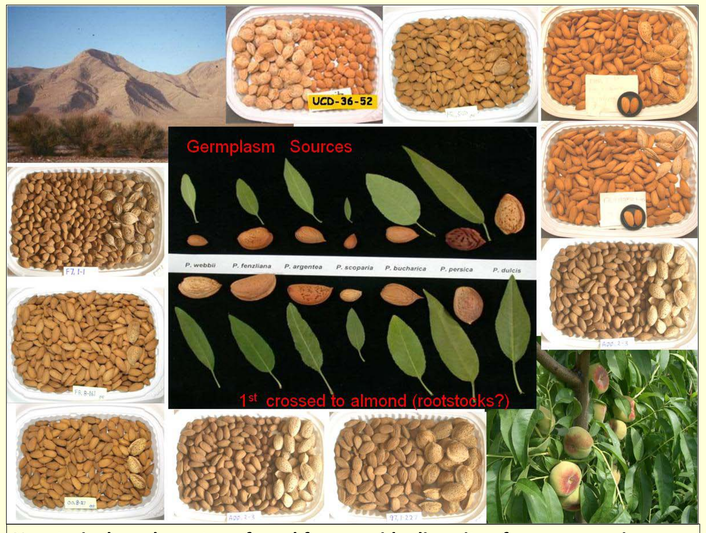
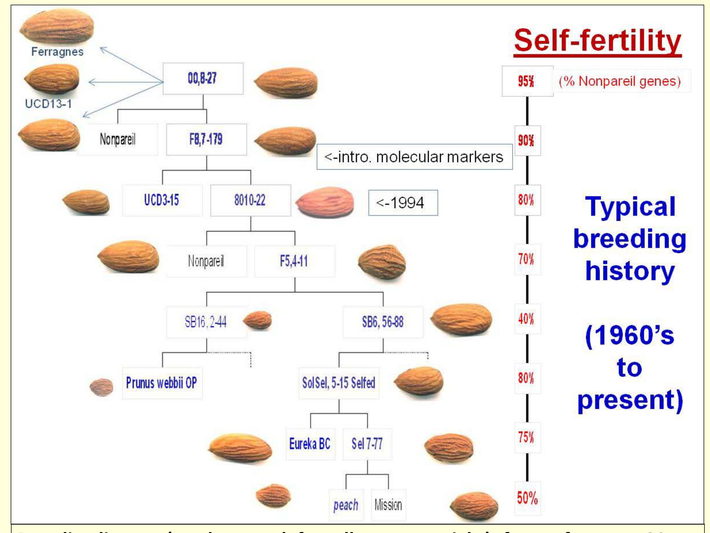


Fig. 1. Current California acreage is dominated by 'Nonpareil'. Remaining varieties with the exception of UCD bred 'Padre' and 'Sonora' are progeny of 'Nonpareil' by 'Mission' and so lack needed new genes.

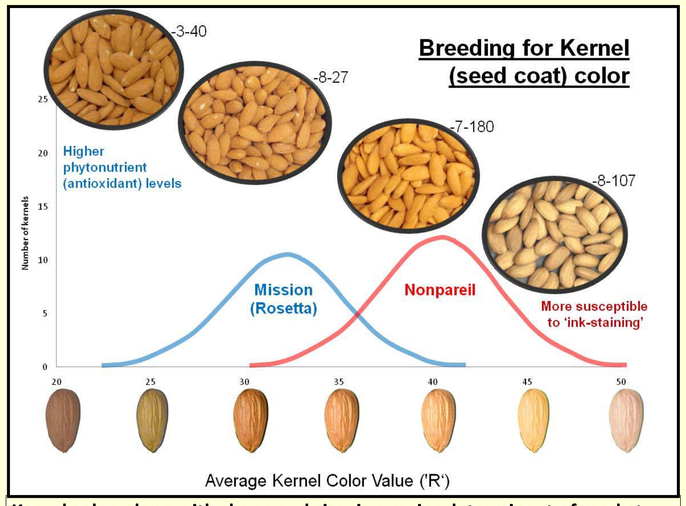
To breed new traits such as self-fruitfulness and disease/pest resistance into California almond varieties, the required genes must first be transferred from other sources. Since it is often not possible to know how effective a source (for example self-fertility from peach vs. the wild almond species *Prunus webbii*) is until it is backcrossed into cultivated almond, many independent sources are initially evaluated.



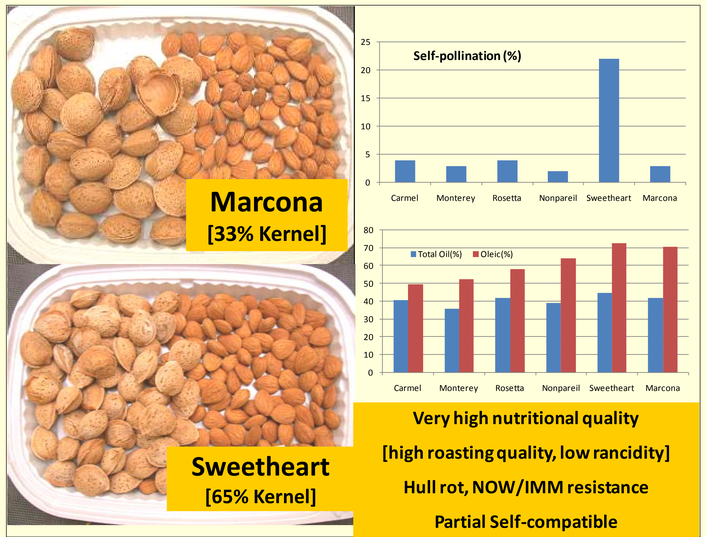
New traits have been transferred from a wide diversity of sources ranging from *P. scoparia* growing in harsh desserts of Iran (top-left) to peach growing in sub-tropical China (bottom-right). Shell and leaf characteristics of species parents (top center) and their initial hybrids with almond (bottom center) demonstrate the diversity of this material. Samples of advanced California adapted breeding lines derived from these sources is shown at margins.



Breeding lineage (seed parent-left; pollen parent-right)of one of approx. 20 distinct breeding lines used in the transfer of self-fruitfulness to cultivated almond. Good kernel and tree quality is rare in early generations but much more frequent with continued backcrossing to cultivated almond. Over 10,000 seed was recovered from approx. 200 controlled crosses in 2010.



Kernel color, along with shape and size, is a major determinant of market use. Darker kernel colors tend to dominate, particularly when crossing with European varieties and related species. Kernel color is more easily manipulated than either kernel size or shape making a wide range of final kernel colors possible. Because many of UCD self-compatible breeding lines were relatively recently derived from related species, most advanced almond selections still show color more akin to 'Mission' than 'Nonpareil'. Advanced SC Nonpareil-color-types are now becoming available.



'*Sweetheart*' was recently released as a high roasting quality alternative to the premium Spanish almond '*Marcona*' (above –see also shell cross-section at right). *Sweetheart* also combines improved levels of hull rot & navel orange-worm resistance and partial self-compatibility with high kernel levels of the nutrient oleic acid. Oleic acid is the nutrient which confers the cardiovascular health benefit to consumers as well as its premium roasting quality.

The transfer of new germplasm often result in promising new traits. Examples include UCD97,2-240 (top) combining high shell-seal and associated NOW, ant, aflatoxin, and hull-rot resistance from *P. webbii* (top); -UCD3-40 combining high antioxidant level with large-kernels and high yields from *P. fenzliana* (bottom-right), and UCD8-27 combining high levels of self-compatibility with Nonpareil-type kernels from *P. mira* (bottom-left).