

Evaluation of Pistachio Breeding Selections, 2017-18

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INTRODUCTION

The UC breeding program began with the original crosses made in 1989 by Dr. Dan Parfitt and Joseph Maranto. As of 2009, the program continues with the breeding and evaluation of novel scions, but also experimental rootstocks. As new male and female pistachio cultivars are released to the industry, the focus of the program shifts to the evaluation of novel UC breeding crosses and other potential cultivars of interest to the industry. Older trials are abandoned and new trials created, often with the indispensable and long-term donation of land, labor, equipment and time by interested and generous private, cooperating growers.

Currently, we are evaluating eight advanced scion selection trials. These trials were planted from 2007 to 2016. Four of these trials have the objective of identifying male cultivars that demonstrated robust flower development and close bloom synchrony with Kerman or Golden Hills in years with insufficient winter chill/excessive winter heat. Two of these four are located near Inyokern, east of the Sierra Mountains in the high desert. Two of these eight trials are focused on the long-term performance of the recently released UC cultivar, Gumdrop, compared to Golden Hills and/or Kerman on UCB-1 seedling rootstock and on experimental rootstocks from the UC breeding program. One of these trials includes additional experimental male selections as pollinizers for Gumdrop. The other two trials compare UC advanced breeding selections with existing commercial cultivars for yield, nut quality characteristics, and bloom and harvest timing. In addition, we have a seedling-selection trial containing diverse breeding crosses, which may contain individual trees with potentially novel combinations of useful traits for the industry, such as greener kernel color, low chill/high winter heat tolerance, earlier or later bloom and harvest timing and others. This trial was planted in 2012, and the most precocious trees began blooming in 2016.

As part of the breeding program, seedling rootstocks originating from breeding crosses made in 2009 and 2011, have either been planted in rootstock selection trials (three of these) or in randomized and replicated evaluation trials in comparison with UCB-1 seedling rootstocks (two of these). These five trials are all located in Kern County, with one east of the Sierra Mountains, near Rosamond. Most of these trials are in orchards with high sodium, chloride and boron. All of these trials are now budded to Kerman, Golden Hills or Lost Hills, the earliest in the fall of 2011. Additional rootstock trials are planned. The objectives of the rootstock evaluation will be to identify breeding line, or individual rootstocks, which may confer greater cold and salt tolerance, comparable Verticillium wilt and Phytophthora crown rot resistance to that possessed by existing commercial rootstocks, and which will form a smoother, more uniform graft union with new cultivars such as Golden Hills, Lost Hills and Kaleghouchi, than do existing rootstocks. The first harvests of two of these rootstock trials occurred in 2017.

RESULTS

The breadth of the breeding program does not lend itself to brief summarization. However, some research areas will be discussed based on the degree of interest and rate of developing information from our trials.

UC cultivar Gumdrop: Gumdrop's most noteworthy characteristic is its early harvest (approximately 10 days earlier than Golden Hills and 20 days earlier than Kerman), while maintaining acceptable commercial nut quality characteristics. The earlier harvest of Gumdrop should reduce navel orangeworm infestation, as pressure from this insect increases later in the harvest season. The earlier flowering data, and some observations made during leaf-out and bloom, suggest that this cultivar may be more tolerant of "insufficient winter chill/high winter heat" conditions. As research continues, data and observations suggest the following regarding producing pistachios with Gumdrop:

1. Currently, Gumdrop is ready for harvest before nut-processing plants are open. Gumdrop should only be planted by grower operations having access to a plant that is capable of processing the nuts of this cultivar when they are ready for harvest.
2. Later in the season (July), some nuts produce a drop of gum on the hull (hence its name). A Gumdrop harvest is "stickier" than a Kerman harvest.
3. Gumdrop nuts do not hold well on the tree, and air temperatures can be hot when Gumdrop is ready for harvest. A timely "double shake" harvest is suggested. In the San Joaquin Valley, depending on season and location, the first harvest will occur in early August with a second shake a week to ten days later. Gumdrop is an alternate bearer like Kerman.
4. Gumdrop will perform best on well-drained soils where water ponding does not occur.
5. Gumdrop has shown more growth variability on UCB-1 seedling rootstock. Growth among Gumdrop trees has been much more uniform on Platinum[®] clonal rootstock, according to an observation trial planted in 2014.
6. Gumdrop grows faster than Golden Hills or Kerman. A minimum spacing of 20' x 20' within the orchard may be advisable on productive agricultural soils.
7. A male cultivar, named Tejon was released to the industry as a principal pollinizer for Gumdrop. It may be advisable to plant a second pollinizer with Tejon to assist with Gumdrop pollination in low-chill years. A non-proprietary cultivar, called Zarand, appears to meet this requirement. Zarand will be available from some commercial nurseries.

Seedling selection trial: The trees are being evaluated for leaf-out, bloom timing, and nut quantity/quality characteristics. Early leaf-out/flowering dates, in addition to parentage information, are being used as selection tools for moving germplasm from this trial to the 'low-chill/high winter heat' evaluation trial in the Coachella Valley, established in 2017.

Novel rootstocks: The rootstocks from the UC breeding program are novel in that the parentage is different from UCB1 or pure *P. integerrima* rootstocks. Two rootstock trials had enough yield present to harvest in 2017. In one of the rootstock selection trials, at fifth leaf, 12 selected rootstocks (grafted to Lost Hills) averaged 166 lbs./acre of edible yield compared to 13 lbs./acre for the UCB1 seedling controls. Contrary to what usually occurs with UCB1 or pure *P. integerrima* rootstock, the scion was of smaller circumference than the rootstock.

CONCLUSION AND APPLICATIONS

In another trial, two novel UC experimental seedling rootstocks are being compared to UCB1 seedlings. The scion is Golden Hills. Both the soil and irrigation water (up to 5 ppm) are high in boron. Average edible yields were not significantly different among the rootstocks at this, the first, commercial harvest. However, the canopy of Golden Hills, on UCB1 rootstock, demonstrated large areas of leaf-tissue necrosis with leaf drop, with few or no leaf symptoms on scions grafted to the novel rootstocks. Replicated leaf tissue analysis showed that leaves on UCB1 rootstock had average dry tissue levels of 1337 ppm, compared to 550 and 597 for the two novel rootstocks. Other differences in nutrient uptake were observed in these two trials.

These rootstock trials are in the initial stages; what the differences in performance noted this year might mean are not clear. However, currently, the commercial rootstocks available to the industry is limited. Exploring new interspecific genetic combinations for rootstocks appears to be a useful exercise, both in general knowledge and nut production possibilities inherent in diversity.