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# Field Screening of Size Controlling Rootstocks for Higher Density, Off Ground-Harvested Almond Orchards

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**Project No.:** HORT50.Duncan

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**Project Cooperators and Personnel:**

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## A. Summary

Due to environmental and food safety concerns, the almond industry is interested in exploring off-ground almond harvesting systems. Many current off-ground harvesting systems require smaller stature trees to accommodate machinery that extends over the treetops. For example, the current Tenias harvesting system allows for a maximum tree height of 18 feet and recommends a row spacing of 18 feet wide. Conventional peach and peach hybrid rootstocks likely have too much vigor and will require extensive annual or semi-annual pruning to maintain trees small enough. This will increase cultural costs, expose trees to wound pathogens and certainly reduce yield potential and the productive lifespan of the orchard.

Many stonefruit industries have turned to size controlling (dwarfing) rootstocks to maintain smaller tree size to accommodate cultural activities. Higher density almond orchard systems using dwarfing rootstocks has not been adequately explored. Many dwarfing rootstocks used in other stonefruit industries may not be compatible with almond, may exhibit different growth characteristics than other fruit tree species or may not be suitable for almond farming systems (minimal pruning, mechanical harvest, etc.). Current rootstock trials conducted by Duncan and others have shown significant growth retardation by many plum hybrid rootstocks compared to standard peach rootstocks. However, lower vigor rootstocks have been generally less productive than high vigor stocks under current, medium to low density almond farming systems. In addition, Duncan's long-term tree spacing trial has shown that tree planting density has a substantial effect on tree size. Closely planted trees stay smaller and require less initial training and annual pruning. We need to test the suitability of many dwarfing rootstocks for high density, off ground harvesting almond systems.

## B. Objectives

The goal of this project is to screen size-controlling rootstocks for compatibility with Nonpareil and Monterey and test their suitability in a higher-density almond growing system designed for off ground harvest. Most of the rootstocks in the trial are size controlling, but we have also included a larger, peach x almond hybrid for comparison. Most rootstocks are experimental developed from public and private breeding programs but a few are commercially available from California nurseries.

## C. Annual Results and Discussion

The trial is currently being initiated and there are no results at this time.

#### D. Outreach Activities

No outreach activities have been completed at this time. As the trial matures, information will be disseminated to the industry through field days, extension publications and various UCCE grower meetings, including the North San Joaquin Valley Almond Day.

#### E. Materials and Methods (500 word max.):

With input from commercial California nurseries and UC Davis emeritus professor, Ted DeJong, a list of 16 candidate rootstocks was assembled in 2019. Nurseries including Fowler, Sierra Gold, Dave Wilson, Burchell and Agromorilla grew trees for this field trial. The list of included rootstocks is shown in Table 1 below.

A 4.3 acre, replicated field trial was established at the UC Kearney Agricultural Research and Education Center in Parlier in the summer of 2020. The field was ripped, flood irrigated to settle, leveled and a double-line drip system was installed. Berms approximately 12" in height were pulled using an alfalfa levee maker. Tall berms were used to help accommodate the extra trunk height required by many over-tree harvesters, including Tenias. Most trees were grown as potted plants and were planted in the field in October, 2020. Three rootstocks (D63.182 from Wawona and New Root 2 and 266LZ4 from Zaiger) were grown as bare root and will be planted in January 2021. USDA rootstock Fl x K2 came from Foundation Plant Services in Davis and trees are currently being grown in pots at Sierra Gold to be planted in fall 2021. Thirty trees each of Nonpareil and Monterey on all rootstocks were planted. These varieties were chosen because of their importance to the California almond industry and because incompatibility has sometimes been a problem with rootstocks of plum heritage. Dwarfing rootstocks will be compared against industry standard Nemaguard and peach x almond hybrid Brights 5. Guard rows are planted on Krymsk 86 for observation.

Table 1. List of Rootstocks and Expected Comparative Vigor

Rootstock	Source	Approximate Vigor Compared to Nemaguard
1. Controller 6 (HBOK 27)	Fowler & Sierra Gold	65%
2. Controller 9 (P30-135)	Fowler	90%
3. 15E2007	Fowler	?
4. Rootpac 20	Agromorilla via Sierra Gold	55%
5. Citation	Sierra Gold	75%
6. MP-29	USDA via Sierra Gold	65%
7. DA 6	Sierra Gold	60%
8. D63.182	Wawona via Burchell	70%
9. New Root 2	Zaiger via Dave Wilson	30%
10.266LZ4	Zaiger via Dave Wilson	?
11.3776	Sierra Gold	65%
12.FL x K2	FPS via Sierra Gold	75%
13.#29	Sierra Gold	60%
14.Nemaguard	--	--
15.Viking	--	110%
16.Brights 5	--	120%
Guard rows: Krymsk 86	--	85%

Trees will be trained with trunks at least three feet tall to accommodate anticipated harvest with the Tenias harvesting system. We anticipate minimal training and pruning will be necessary for these smaller trees, but this will be determined after the first growing season. Parameters including signs of incompatibility, tree height, canopy width, trunk circumference, photosynthetically active radiation (PAR), tree anchorage, canopy architecture, and pathogenic nematodes will be measured annually, beginning in 2021. Trees will be examined for signs of incompatibility periodically throughout each season. Yield will be measured annually for both varieties once a commercially viable crop is produced (beginning at the end of the second or third leaf). Stem water potential will be measured periodically. The trial will persist for at least five years.

#### **F. Publications that emerged from this work**

1. None at this time