Rootstock Breeding *Project #Hort-10*

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Location: Plant Sciences, University of California/ Davis

Support from the Almond Board of California is gratefully acknowledged

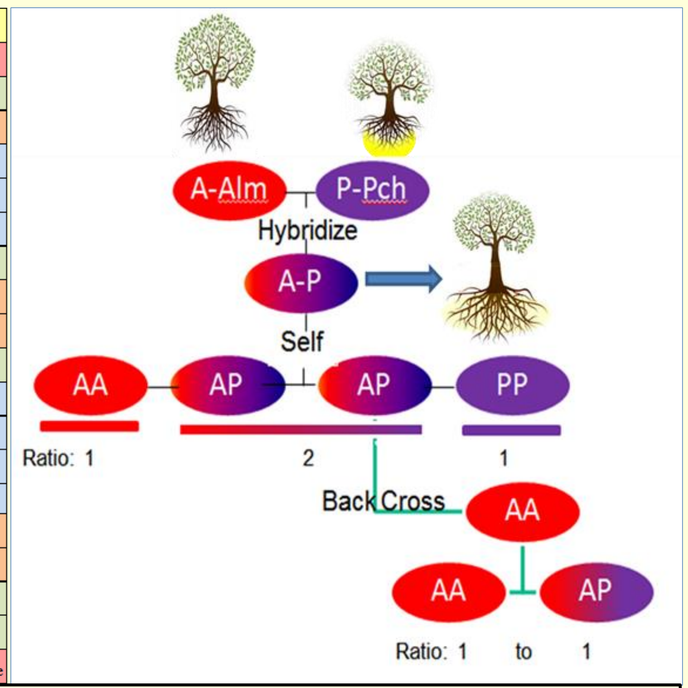
Cross	2017	2018	2019
Almond by peach	92	476	628
Peach by wild peach	228		39
Plum by plum		231	136
Almond by plum		48	23
Peach by plum	3	38	57
Multi-species cross	7	44	164

Number of progeny seed recovered from the UCD Rootstock Breeding Program over the last three years

Introduction and Approach

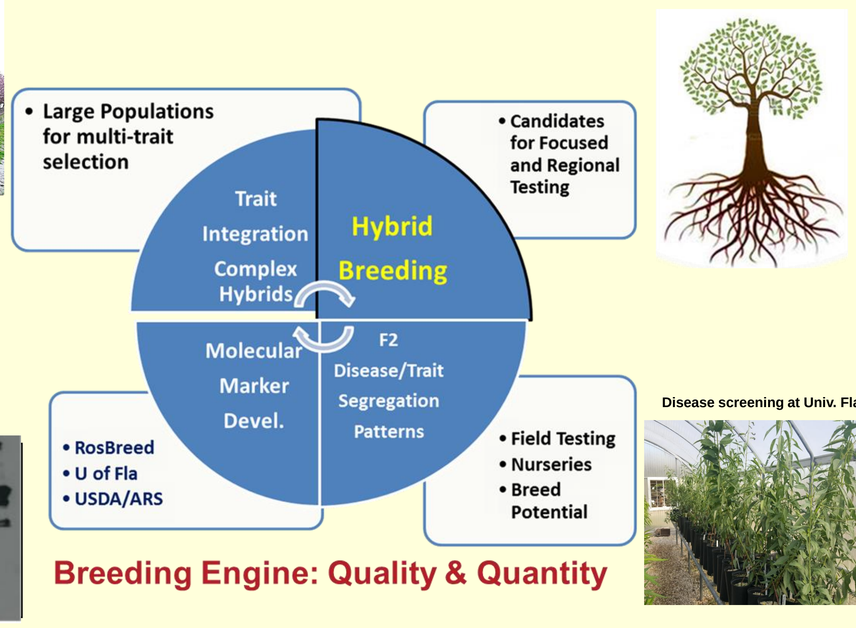
Changes in planting and cultural practices have led to the need for a new generation of rootstocks with improved disease and environmental stress resistance. Responding to this need, a number of public and private efforts have been initiated to research, develop and test new rootstocks for California tree crops. Germplasm derived from interspecies hybrids is often pursued to attain the greatest range of vigor and desirable horticultural traits. However, the development of such exotic germplasm is often difficult and time-consuming and the genetic and genomic interactions can be complex and unpredictable. As part of the long-term UCD almond and peach genetic improvement programs, breeding lines have been developed combining almond, peach and plum as well as related Prunus species. Selections within this germplasm continue to demonstrate traits showing good promise for ongoing rootstock improvement efforts.

Item	Genetic background
Atlas	Almond, Peach, P. davidiana, Plu8m
Bright Hybrid	Almond, Peach, P. davidiana
Cadaman	Peach x P. davidiana
Citation	Almond, Plum
Compass	P. besseyi x P. americana
Controller 5	P. salicina x Peach
Cornerstone	Peach x Almond
Empyrean#1	Peach x P. davidiana
Flordaguard	Peach x P. davidiana
Hansen 536	Almond, Peach, P. davidiana
Hiawatha	P. besseyi x P. salicina
Ishtara	P. cerasifera, P. saliciana, Peach
Krymsk#86	Peach x P. cerasifera
Marianna 2624	P.munsoniana x P. cerasifera x P. hortulana
Nemaguard	Peach x P. davidiana
Nemared	Peach x P. davidiana
Nickels	Almond, Peach, P. davidiana
Paramount	Peach x Almond
Viking	Almond, P. blireiana, P. cerasifera, P. Mume

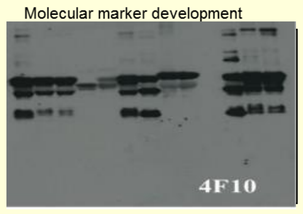


Most commercially established and promising new almond rootstocks are interspecies hybrids. Hybridization allows the simultaneous recombination of major disease/stress resistance genes from both species parents while also conferring improved hybrid vigor to the rootstock/scion. Because this hybrid vigor can mask the effect of major resistance genes, inheritance patterns in progeny populations are analyzed to identify major genes by their expected inheritance ratios (1:2:1 in selfed- and 1:1 in backcross progeny). By this approach, the most promising individuals within each species cross can be identified for use as commercial rootstocks and in further breeding efforts.

2017 Interspecific hybrids at UCD
Large populations required for:
-accurate molecular mapping
-recombine the numerous traits required for commercial success

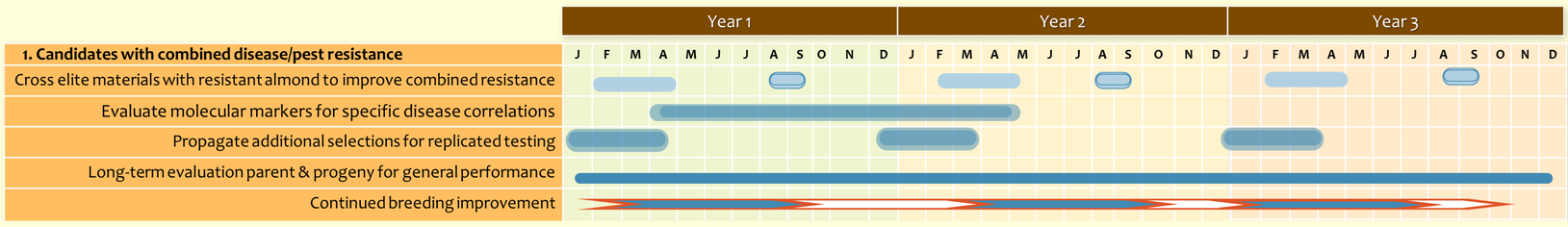


Molecular marker development



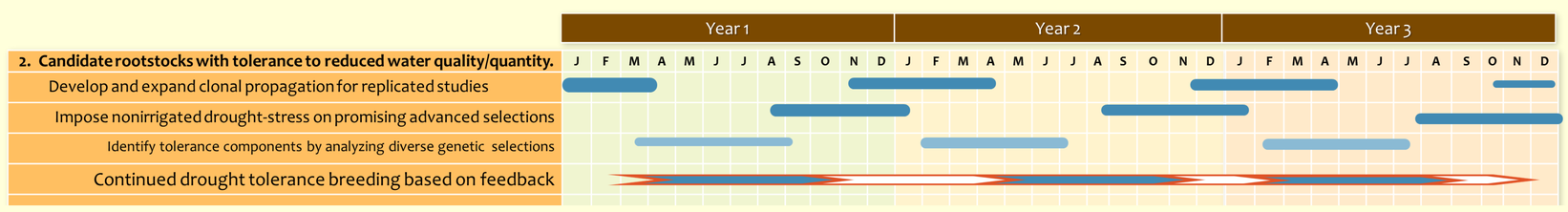
Disease screening at Univ. Fla.

Promising interspecies hybrids as well as their segregating progeny populations are entered into the breeding cycle for assessment of individual hybrid rootstock potential as well as it's further breeding potential (based on trait inheritance patterns). Segregating progeny populations are also required for the development of molecular markers for desired resistance traits. The ability to consistently develop large breeding populations both improves marker development efficiency as well as allowing effective recombination of not just desired major resistance gene but also the myriad of other genes required for commercial success.



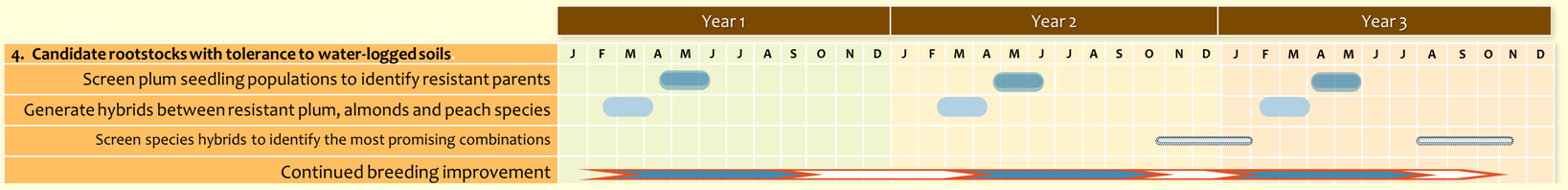
Three year plan for breeding improved almond rootstocks by combining resistance from almond, peach and plum targeting resistance to nematodes and commercially important diseases including heart-rots and cankers, oak root fungus and crown rot.

<*Peach by plum hybrid showing promise for resistance to oak root fungus]* *[Peach by almond hybrid showing crown gall in field screenings*>



Three year plan for breeding rootstocks tolerance to reduced water quality and quantity through the recombination of salt-tolerant and deep-root-mining traits from peach-almond hybrids with improved water-use-efficiency from promising selections of plum and wild almond.

<*Propagation of difficult to root (almond by peach by plum) hybrid]* *[Selection for drought tolerance in minimally irrigated field screenings*>



Three year plan for breeding rootstocks tolerance to asphyxiation from saturated-soils through the recombination of asphyxiation tolerance from almond species hybrids with Armillaria resistance and improved root development and anchorage from promising selections of plum, peach and wild almond.

<*Almond hybrid showing tolerance to "wet feet"]* *[**Citation** almond by plum rootstock showing good root development/anchorage*>