

Phenotypic Variability in Non-grafted UCB-1 Pistachio Rootstock

Ewelina Jacygrad¹, John E. Preece², Deborah Golino¹, Richard Michelmore³



¹Foundation Plant Services, University of California Davis, 455 Hopkins Road, Davis, CA 95616 USA

²USDA National Clonal Germplasm Repository, 3201 Straloch, Davis, CA 95616, USA

³Genome Center, University of California Davis, 451 Health Sciences Drive, Davis, CA 95616, USA

Introduction

Most pistachio rootstocks are currently F₁ seedlings from controlled inter-specific crosses. These F₁ seedlings are genetically variable because of the inherent heterozygosity of both parents. UCB-1 is a seedling rootstock that is widely used in commercial pistachio production. It's parents are *P. atlantica* X *P. integerrima*. In 2013, 960 UCB-1 seedlings were planted near Davis, CA followed by an additional 264 seedlings one year later. This population is being used to investigate the UCB-1 phenotypic and genotypic variation and to look for superior UCB-1 individuals that might be used as clonal rootstock. Phenotypic measurements began after the first growing season, in January 2014. Data included, tree height, trunk caliper, and branching. There was high phenotypic variation in the planting. Tree height and caliper were weakly correlated during the first two growing seasons. The genomes of the parent trees and UCB-1 seedlings are being assembled and genotyping-by-sequencing of the whole population is underway. These genetic and phenotypic data will be combined to determine the genetic basis of stunting of some trees grafted onto UCB-1 rootstock.

Derivation of UCB-1 rootstock

P. atlantica (female) x *P. integerrima* (male)



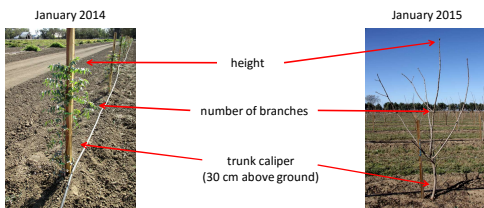
Genetically variable

Selected for Verticillium resistance by Dr. Lee Ashworth, UC Berkeley

UCB-1 (F₁)



Material and Methods

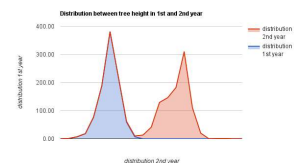
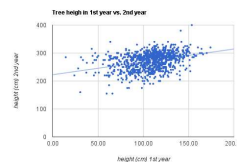
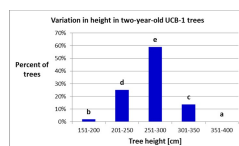
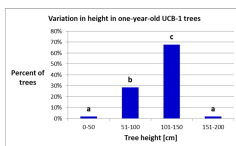


- 960 UCB-1 seedlings planted in field at UC Davis in early 2013
- Phenotyped annually

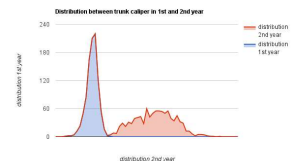
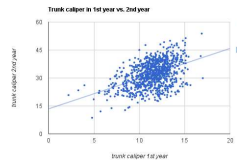
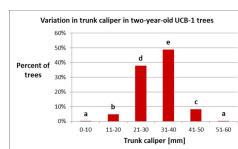
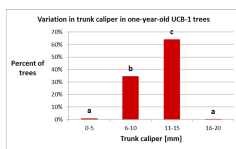


Results

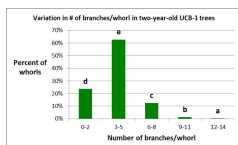
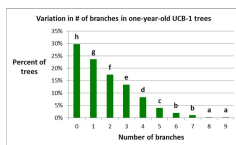
Variation in height in one and two-year-old UCB-1 trees



Variation in trunk caliper in one and two-year-old UCB-1 trees



Variation in # of branches in one and two-year-old UCB-1 trees



Conclusions

- High phenotypic variation of UCB-1 rootstock was present in population planted in 2013 at UC Davis.
- After the first year of growth, the height for almost 70% of trees was 101 to 150 cm, while after second year almost 60% of trees were between 251 and 300 cm.
- Trunk caliper for more than 60% of one-year-old UCB-1 trees was 11 to 15 mm, while almost 50% of two-year-old UCB-1 trees had a caliper of 31 to 40 mm.
- There was a weak correlation between height as well as trunk caliper of UCB-1 trees after both the first and second years of growth.
- The regression model for tree height accounts for 11.4% of the variance while the one for trunk caliper accounts for 20.6%.
- Approximately 539 Mb (*P. integerrima*) and 588 Mb (*P. atlantica*) of the predicted 600 Mb genome have been assembled for each parental tree.

Genome assemblies of *P. atlantica* and *P. integerrima* based on Illumina Hiseq 2500 reads

	<i>P. integerrima</i>	<i>P. atlantica</i>
# Contigs >1 Kb:	19,341	30,228
Contig N ₅₀ :	133,028 bp	78,650 bp
Total length assembled:	539 Mb	588 Mb

Total genome size = ~600 Mb.