

Evaluation of Rootstocks for Pistachio Production

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INTRODUCTION

In 1989, Dr. Louise Ferguson wisely initiated five rootstock trials distributed throughout the state. They were located in western Kern County, the UC Westside Field Station (western Fresno County), the Kearney Agricultural Center (eastern Fresno County), eastern Madera County, and Shasta County (near Anderson). Each trial included *P. atlantica*, *P. integerrima*, (Pioneer Gold I), *P. integerrima* x *P. atlantica* (Pioneer Gold II), and *P. atlantica* x *P. integerrima* (UCB-1). Each trial consisted of 400 trees (cv. Kerman), which were divided into 100, 4-tree plots, containing 1 of each rootstock. Ten of these 4-tree plots were then grouped into a single 40-tree irrigation set to facilitate irrigation and nutrition studies. Male trees (cv. Peters) were also replicated on each rootstock and placed every third tree within the row and every third row.

These trials provided milestone information about cold (Shasta County), verticillium (Westside Field Station) and salinity tolerance (western Kern County). The Kern County (prior to its use as a salinity experiment), Madera, and Kearney Agricultural Center (KAC) trials served to establish production differences among the four rootstocks. Cumulative yields from the first five bearing years showed UCB-1 significantly more productive than PG II or PG I, the latter two being very similar in yield. *P. atlantica* was significantly less productive than the other three rootstocks.

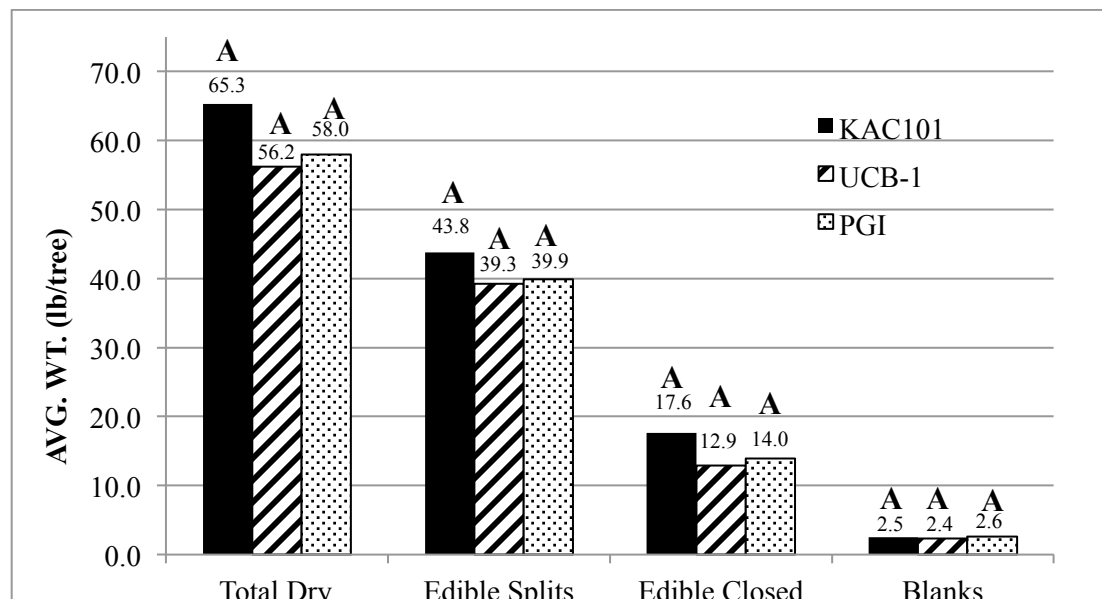
The lead author also assessed the relative productivity of these four rootstocks at orchard maturity. Yield data was collected in 2009 and 2011, when the trees were 20 and 22 years old, respectively. The orchard in both years was heavily cropped, which provided an excellent opportunity to contrast rootstock performance at maturity to that recorded during their first five bearing years. Yield data collected from 74 individual trees per rootstock showed that UCB-1 and PGII had become very similar in total dry weight and split nut production, which was significantly greater than that of PGI and *P. atlantica*. *P. atlantica* produced the least. UCB-1 and PGII produced a two-year average of 7.5 pounds more split nuts than PGI, and 14 more pounds than *P. atlantica*.

Individual tree yields from the KAC trial also revealed significant production differences in seedling rootstocks within a given species or hybrid. This spurred great interest in clonal development procedures and monitoring commercial fields for “superior seedlings.” In 2003, the authors identified one such UCB-1 seedling, and a long-term, replicated trial was established by the lead author to compare its performance as a vegetatively propagated clone (named KAC101) to standard UCB-1 and *P. integerrima* seedlings. Yield data collection began in 2008 (sixth leaf), and has continued annually. Each of the 16 trees per rootstock is commercially shaken. Dry weight and nut quality are derived from samples submitted to Wonderful Farms.

RESULTS

Chart 1 provides the 2017 yield summary of key production categories for the clonal rootstock experiment. Field weight data was converted to inshell split, edible closed inshell and shelling stock, and blank nut weights from two 20-pound composite samples taken at harvest for each rootstock and submitted for standard evaluation by Wonderful Farms. The results show that

KAC101 continues to yield very similarly to UCB-1 and PGI, based upon total dry, edible split, closed inshell and blank nut weights.



Now 15 years old, the cumulative total yield data from the sixth leaf is reported in Table 1. Over ten years, KAC101 has produced 36.3 pounds more total dry weight than UCB-1, and 44.1 more pounds than PGI. This represents an average of only three to four pounds per year. This is not statistically significant.

Rootstock	Cumulative Total Dry Wt. 2008-2017 (lb/tree)	2017 Nut Quality (percent)			
		Dry weight	Split inshell nuts	Closed shell nuts	Blank nuts
KAC101	327.3	42.10	67.09	27.01	3.86
UCB-1	291.5	42.54	69.79	23.03	4.23
PGI	283.2	41.88	68.81	24.04	4.47

CONCLUSION AND PRACTICAL APPLICATIONS

KAC101, a seedling of UCB-1 selected from the main trial and vegetatively propagated by hardwood cuttings, has performed similarly to randomly selected UCB-1 and PGI seedlings. Now 15 years old, the total dry yield of KAC101 averages 3.6 pounds per tree more than UCB-1, and 4.4 pounds more than PGI. This amount is not statistically significant, hence annual yield comparison with existing commercial rootstocks is concluded. Yield records have not suggested justification for verticillium, nematode, salinity, and cold tolerance screening. Ease of cloning using commercial tissue culture procedures might justify its release. Previous denutting experiments performed on individual mature trees in the old block, during two on-years, strongly indicate that “superior” rootstock performance (relative to yield only) is strictly a function of tree size, and **not** greater fruiting density. Canopy measurements within the **mature** rootstock trial support this conclusion, because the average UCB-1 and PGI tree is larger than

either PGI or *P. atlantica*. The release of an unproven UCB-1 sibling also subjects the pistachio industry to unnecessary risk.