

2014 SOLANO COUNTY CLONAL PARADOX ROOTSTOCK TRIAL

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ABSTRACT

The California walnut industry utilizes two seedling rootstocks for commercial production, Northern California Black (*Juglans hindsii*) and Paradox hybrid seedling (*Juglans hindsii* x *Juglans regia*). Both rootstocks are open pollinated resulting in genetic variability. This genetic variation leads to non-uniformity in the field related to size, vigor, compatibility, and disease susceptibility. Due to superior vigor, better adaptability to marginal soils and greater tolerance to *Phytophthora* crown and root rot, Paradox is the preferred rootstock for Northern California. Recent technology has resulted in micropagation and commercial availability of three new clonal walnut rootstocks, RX1, VX211 and Vlach. Clonal rootstocks have several horticultural advantages. First, they can be selected for desirable attributes such as disease resistance, nematode tolerance and vigor giving farmers the opportunity to match rootstock selection with planting sites. Second, they will impart less genetic variability and be more predictable in the orchard. Disadvantages include the loss of genetic diversity in orchard plantings and additional expertise is required to micropropagate, nursery culture and graft to produce a commercially viable product.

A trial was planted in Solano County to evaluate Burbank, RX1, Vlach and VX211. Paradox seedling was also planted as the control.

OBJECTIVES

To evaluate the three newly released clonal paradox rootstocks and other test selections, a rootstock trial was planted in Solano County. The plot evaluates five rootstocks includes Burbank, RX1, Vlach and VX211 with Paradox seedling as the control comparison. The trial evaluates growth characteristics, yield potential and possible disease tolerance.

PROCEDURES

The rootstocks were clonal propagated by the UC Walnut Breeding Program and were grown for the first season at a commercial walnut rootstock nursery. The trial contains four clonal rootstocks; Burbank, RX1, Vlach, VX211 and Burbank with Paradox seedling used as the control comparison. Vlach was the only variety that was not grown all in the same nursery and the same clonal propagation. The portion of Vlach that was grown in the same environment as the other is labeled Vlach-1 and the Vlach from the other nursery is labeled Vlach-2. Vlach-2 was grown for two seasons in the nursery while Vlach-1 was only grown one season in the nursery.

The trial was planted on March 31, 2009 in a Solano County orchard with a Yolo silty clay loam soil. Tree spacing was 24 x 18.5 feet in an offset design. The experimental design was a randomized complete block design with 7 replications. Each plot contains 10 trees; two rows

wide with 5 trees in each row. Measurements of caliper were taken before planting and trees were randomly mixed for each plot with the same ratio of small and large trees. The trees were budded to Tulare in August 2009 by a professional crew. In 2010, missed buds were rebudded in August. Five trees were replanted on March 18, 2010 to replace trees that died in 2009 (3 RX1, 1 Vlach and 1VX211).

Overall health of the trees including the age of rootstock and scion was collected in August 2012. Circumference (cm) at 13 inches above ground was collected and after that was collected at two feet above the ground.

RESULTS

The tree health and age were collected in August 2010. As of August 2010, 58 trees have been re-grafted since the initial graft date in 2009. Of those 58 trees, there are 16 Burbank, 20 RX1, 3 Vlach, 9 VX211 and 10 Paradox seedlings.

By 2012, the Vlach-1 and Vlach-2 were no longer significantly different in rootstock circumference size so they have been reported together. RX1 rooted trees tended to be smallest with the effects significant in 2012 and 2014 (Table 1). In 2014, Vlach rooted trees were significantly bigger than those on all other rootstocks (Table 1). Significant differences were found among blocks (data not shown). The block differences may have been due to high temperatures at planting with the last blocks going in late in the day, differences between grafter bud survival, or soil difference across the field.

Midday photosynthetically active radiation interception tended to be lowest in RX1 with the differences significant in all years except 2012 (Table 2).

Yield per unit light intercepted and overall yields were similar among all the rootstocks in 2013 (Table 3). In 2014, yield per unit PAR intercepted was lowest in RX1 and highest in VX211 (Table 3), similar to the PAR and trunk circumference patterns (Table 1 and 2). There were no significant differences in yield in 2014.

This orchard has not produced near the optimal line in the past two years (Fig. 1). This might be because it has been pruned in a traditional manner up to this point in time.

DISCUSSION

The differences in size between the clonal rootstocks seen in the first year after planting decreased over the years and by 2013, there were no significant differences among any of the clones or the seedling Paradox (Table 1). However, in 2014 the RX1 was again significantly smaller in circumference compared to the Vlach (Table 1). There were also no significant differences in yield for the first harvest in 2013 or the second harvest in 2014 (Table 2). This suggests that under the good soil conditions in the Solano County trial, there does not appear to be an advantage to the clonal rootstocks over Paradox seedling.

Tables

Table 1. Average circumference (cm) for the clonal rootstocks versus Paradox seedling rootstocks in 2011, 2012, 2013 and 2014. Letters indicates significant difference with Duncan's multiple range test. There were no significant differences in circumference in 2013.

Rootstock	Nov. 2011 circ. (cm)	Nov. 2012 circ. (cm)	Dec. 2013 circ. (cm)	Dec. 2014 circ. (cm)
Vlach	19.5 a	38.7 b	46.4 a	55.0 b
VX211	19.5 a	42.3 a	48.3 a	57.8 a
Paradox seedling	19.8 a	39.7 b	46.3 a	54.5 b
Burbank	19.5 a	38.9 b	43.1 a	52.9 b
RX1	19.8 a	35.1 c	38.1 a	45.4 c

Table 2. Average photosynthetically active radiation interception for the clonal rootstocks versus Paradox seedling rootstocks in 2011, 2012, 2013 and 2014. Letters indicate statistical difference within a year using Duncan's multiple range test.

Rootstock	2011	2012	2013	2014
Vlach (B)	9.7 ab	23.4 a	40.4 a	52.4 a
VX211	10 ab	22.4 a	38.5 a	52.2 a
Paradox seedling	8.5 bc	21.2 a	36.4 ab	51.1 a
Burbank	8.9 bc	20.3 a	35.9 ab	49.7 ab
RX1	7.4 c	19.2 a	31.7 b	45.3 b

Table 3. Yield per unit photosynthetically active radiation intercepted and yield per acre for the Paradox seedling versus clonal rootstocks.

Rootstock	2013		2014	
	Yield per unit PAR intercepted	Yield (tons/ac)	Yield per unit PAR intercepted	Yield (tons/ac)
Vlach	0.023 a	0.90 a	0.034 ab	1.78 a
VX211	0.021 a	0.78 a	0.036 a	1.86 a
Paradox seedling	0.023 a	0.84 a	0.031 ab	1.61 a
Burbank	0.019 a	0.69 a	0.032 ab	1.59 a
RX1	0.021 a	0.71 a	0.029 b	1.44 a

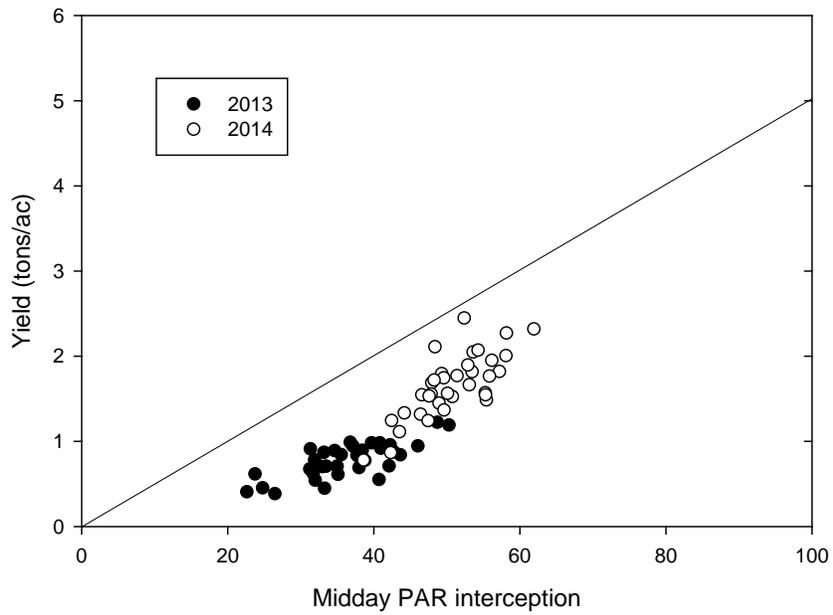


Fig. 1. Midday canopy photosynthetically active radiation interception versus yield for the 2013 and 2014 seasons. The best orchards can average near the diagonal line.