EVALUATION OF BLACKLINE TOLERANT ROOTSTOCKS - 2016

Janet Caprile, Chuck Leslie, Bruce Lampinen

ABSTRACT

The purpose of this trial is to compare the performance of newly developed blackline tolerant rootstocks with Pardox and English rootstocks.

The trial was planted in the spring of 2011 in cooperation with Maggiore Ranches as a randomized complete block design. The scion variety is Chandler. The 3 main rootstock treatments have four 8 tree replicates of OR Chandler, WIP3, and seedling Paradox. A smaller number of observational trees were included of WIP2 (four 3 tree replicates) and WIP1 (seven single tree replicates) due to limited availability.

Trees were field grown specimens of uniform ¾" stock with no significant size differences (trunk diameters) among replicates at planting. By the end of the 2nd growing season, the Paradox, WIP3 and own rooted trees were all similar in size and the WIP2 and WIP1 were slightly smaller. By the end of the third growing season, the Chandlers on their own roots were slightly larger than the others, the trees on WIP3 and Paradox were identical, and the trees on WIP1 and WIP2 were slightly smaller. This trend in size (trunk diameters) has continued through year 6.

The plot was harvested for the first time in 2015. In 2016, the trees on Paradox and WIP3 had similar yields while trees on their own roots had lower yields, as they did in 2015. The observational trees on WIP1 and WIP2 had higher yields than WIP3 and Paradox in 2015 but were not harvested in 2016 due to rain.

OBJECTIVES

Compare the growth and performance of Walnut Improvement Program (WIP) blackline tolerant clonal rootstocks with Paradox and English (own rooted) rootstocks.

SIGNIFICANT FINDINGS

- The trees on WIP3 rootstock are similar in size and early yields to seedling Paradox.
- The OR trees are slightly larger and have slightly lower early yields.
- The incidence of crown gall was greatest in WIP1>WIP2>Paradox>WIP3. Own rooted trees had no crown gall.

PROCEEDURES

This trial was planted in cooperation with Mark Maggiore of Maggiore ranches as part of a new 35 acre OR Chandler orchard in April 2011 on a deep, uniform, Brentwood clay loam soil.
Trees were planted in a randomized complete block design on an 18' by 24' spacing and irrigated with full coverage sprinklers. The treatments consist of:

1. Own-rooted Chandler (four 8 tree replicates)

2. Chandler on WIP3 (four 8 tree replicates)
3. Chandler on Paradox seedling (four 8 tree replicates)
4. Chandler on WIP2 (four 3 tree replicates)
5. Chandler on WIP1 (seven single tree replicates)

Trees were field grown and nursery grafted by Burchell Nursery. Trunk diameters were measured on the scion (above the graft union) at 20 inches (51 cm) above the ground at planting and each fall/winter since 2012. Light interception measurements (PAR) were collected in 2014 with the Lampinen light bar and in 2015 with the Lampinen photo method. The block was evaluated for the occurrence of Walnut Twig Beetle/Thousand Canker Disease (WTB/TCD) in 2013 and for Crown Gall every year after 2012.

In 2015, the block was harvested for the first time using the grower's shaker and sweeper but picked up and weighed by hand rather than machine due to the light set. In 2016, the block was harvested mechanically using the grower's shaker, sweeper, and harvester and the UCCE San Joaquin County weigh wagon. The observational blocks were not harvested this year as the harvest was rescheduled due to rain and the hand labor needed for those small plots was not available before the rain. Quality samples were collected and sent to Diamond for analysis. Yield efficiency was calculated as pounds of nuts per trunk cross sectional area (lb/cm^2).

RESULTS AND DISCUSSION

Trees were of fairly uniform ¾" stock with no significant differences in tree diameters among treatments at planting. By the fall of 2012 (2^{nd} leaf), Paradox, WIP3, and own rooted Chandlers were comparable in size and larger than the WIP2 and WIP1 rootstocks (Table 1). By the fall of 2013 (3^{rd} leaf), the Chandlers on their own roots were slightly larger than all the others, the trees on WIP3 and Paradox were similar in size, and the trees on WIP1 and WIP2 were slightly smaller. This trend in size (trunk diameters) has continued through year 6.

The light bar readings shown in Table 2 indicate little difference in light interception (canopy size) among the three main rootstocks.

No Walnut Twig Beetle evidence was found on any trees during the 2013 survey. No Crown Gall was evident in 2013, 2014, 2015 but began to appear in 2016 and is presented in Table 5. The incidence was highest in the WIP1 and WIP2 rootstocks, intermediate in the Paradox rootstock, and lowest in the WIP3 rootstock. The own rooted trees had no crown gall.

The plot was harvested for the first time in 2015 and results are presented in Table 3. In both 2015 & 2016 the trees on Paradox and WIP3 had similar yields and yield efficiencies while trees on their own roots had lower measures. The observational rootstocks WIP1 & WIP2 had higher yields and yield efficiencies than Paradox and WIP3 in 2015.

There were no significant quality differences (Table 4) among any of the rootstocks in 2015 except for the % of Large Sound nuts: OR trees had a significantly higher % than WIP3 with the other rootstocks being intermediate. This may be due to the lower total yield in that treatment. Quality data for 2016 has not yet been received.

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Table 1: Growth: trunk diameter (cm) at 51 cm (20 inches) above the ground

Rootstocks	***Spr 2011*** *at planting*	***Fall 2012*** *2nd leaf*	***Fall 2013*** *3rd leaf*	***Wtr 2014*** *4th leaf*	***Fall 2015*** *5th leaf*	***Fall 2016*** *6th leaf*
Paradox	2.0 a	6.6 a	10.8 a	13.2 a	15.9 ab	17.2 ab
WIP3	2.1 a	6.8 a	10.9 a	13.7 a	15.8 a	16.9 a
Own rooted	2.0 a	6.9 a	11.7 b	14.7 b	16.7 b	18.0 b
WIP2	2.3	5.7	9.3	11.8	14.3	15.8
WIP1	2.1	5.9	9.9	12.4	14.3	15.8

Means followed by the same letter are not significantly different at P<0.05 using Fishers LSD

Table 2: Growth: % midday light interception (PAR) in October 11.

Rootstocks	***Fall 2014***	***Fall 2015***
Paradox	54.9 a	60.0 a
WIP3	55.4 a	57.9 a
Own rooted	55.7 a	55.4 a

Means followed by the same letter are not significantly different at P<0.05

Table 3: Yield and yield efficiency for the 2015 harvest.

	2015		***2016***	
Rootstocks	**YIELD 2015** (lb/acre)	**YIELD 2015 EFFICIENCY** (lb/cm^2)	**YIELD** (lb/acre)	**YIELD EFFICIENCY** (lb/cm^2)
Paradox	1002 ab	.049 a	3259 b	.148 b
WIP3	1020 ab	.052 ab	3202 b	.151 b
Own rooted	695 a	.031 a	1857 a	.079 a
WIP 2	1535	.095		
WIP1	1158	.073		

Means followed by the same letter are not significantly different at P<0.05

Table 4: Nut quality 2015

Rootstock	*Nut Wt (g)*	*% Lg Sound*	*% Edible Yield*	*% Extra Light*	*% Light*	*% Light Amber*	*% Amber*	*RLI*	*Rel. Value*
Paradox	12.4	94.2 ab	43.0	22.6	54.6	21.9	0.9	52.5	.81
WIP3	11.9	89.6 a	41.7	34.2	49.1	15.0	1.6	53.0	.80
OR	12.6	97.1 c	44.2	36.1	46.0	16.9	1.0	53.6	.85
WIP2	12.5	92.5 ab	42.9	20.3	51.3	27.8	0.6	51.7	.80
	NS	*	NS	NS	NS	NS	NS	NS	NS
WIP1[#]	12.8	94.1	45.6	37.1	48.5	14.5	0.0	51.6	.85

Means followed by the same letter are not significantly different at P<0.05; NS = not significant
[#] not included in the statistical analysis

Table 5: Crown Gall damage

Rootstock	*Incidence*		*Severity (% circumference)*	
	No. of trees	% of trees	Range	Average
Paradox	7/32	22%	5-50%	18%
WIP3	3/32	9%	25%	25%
OR	0/32	----	----	----
WIP2	5/12	42%	5-40%	28%
WIP1	4/7	57%	20-60%	42%