

# ORCHARD PERFORMANCE OF SELECTED CLONAL PARADOX ROOTSTOCKS

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## ABSTRACT

Early results for one site show significant differences in first-and second-year survival.

## OBJECTIVES

Evaluate survival and growth of selected UC clonal paradox rootstocks.

## PROCEDURES

Three trials comparing survival and growth of selected Paradox clonal rootstocks have been established at commercial orchard sites in Calaveras and San Joaquin Counties: one in 2004 and two in 2005. Included are the following clones that have been identified by Greg Browne as having some resistance to *Phytophthora*: VX211, AZ2, NZ1, JX2 and RX1. VX211 was also found to maintain vigor in the presence of nematodes by Mike McKenry. RX1 is a *Juglans microcarpa* x *J. regia* hybrid. WIP3 was selected for tolerance to blackline caused by the cherry leafroll virus. Vlach is a commercially available clonal Paradox rootstock. The remaining clones are susceptible to *Phytophthora* or still under evaluation. Seedling Paradox and, in two sites, wingnut seedlings were included as controls.

The Jenny Lind trial was planted in 2004 and is located in western Calaveras County. Soil at the site is gravelly loam with indurated hardpan at depths from 1 to 5 feet. Drainage is poor, and the soil is subject to prolonged periods of saturated conditions during the winter and spring. The trial is located in a portion of a sprinkler irrigated 16' X 24' Chandler orchard where trees had previously died and several attempts at re-establishing trees on Paradox seedling rootstocks had failed. Several species of *Phytophthora*, including *P. cinammomi* were previously isolated from the soil and roots of dead trees in the orchard. We established this trial as a "worst case" test of the UC selections to assess their survival and growth under conditions very favorable to *Phytophthora* root and crown rot. Some of the test trees had been propagated by hardwood cuttings and were transplanted from plastic pots into the trial site. Others were supplied and planted as nursery-grown bare root trees. Trees were limited and variable in availability, so the number of trees of planted of the selections was small and variable Table 1).

The Linden trial site is located in a commercial 24' X 24'Eureka/Hartley walnut orchard in eastern San Joaquin County on Milton Road. Rootstocks were planted as bare root trees in March 2005 and grafted to Tulare in April. Soil at the site is Archerdale clay loam and the orchard is sprinkler irrigated. The soil is well drained but soil is subject to saturated conditions during late winter/early spring and during the summer if the orchard is over-irrigated. Test trees were planted as replants in trees sites where original trees had died, in a portion of the orchard with a history of repeated Paradox-rooted tree losses to *Phytophthora*.

The Stockton test site was planted in April 2005 in a 24' X 24' Paradox-rooted orchard on Jack Tone Road in central San Joaquin County. Soil at the site is Cogna loam and is well drained but subject to periodic saturated conditions as at the Linden site. Test trees were planted as bare root trees in replant sites where original trees had died, presumably from *Phytophthora* (The Linden and Stockton sites have not previously been tested for the presence of the pathogen. Attribution of tree death to *Phytophthora* was based on visual symptoms, including root and crown necrosis.). Trees will be grafted to Vina in 2006.

Visual ratings of tree growth, condition and survival were performed at the Jenny Lind site in July 2004 and again in July and October 2005. Tree survival was evaluated in October 2005 at Jenny Lind and November 2005 at the other sites. Tree growth, as measured by annual trunk circumference measurements, will be monitored beginning in 2006 at the Linden and Stockton sites.

## **RESULTS AND DISCUSSION**

Jenny Lind. Test rootstocks may be divided into three groups based on tree mortality and visual assessments of tree growth and condition through the second year. Wingnut seedlings, RX1, Vlach, VX211 and JX2 had the best survival and growth as assessed by visual evaluations (Figures 1 and 2). Poor performing selections included AX1, AX2, AX3, AZ2, PX1 and WIP3. Other rootstocks were intermediate, but generally grew poorly or had unacceptably high mortality in this test. These results are similar to those from previous artificial inoculation experiments with *Phytophthora citricola* (with the exception of AZ2).

Linden. Only six trees died or had unsatisfactory growth at the Linden site in 2005: JX2 (3 trees), AZ2 (1 tree), NZ1 (1 tree) and VX211 (1 tree).

Stockton. There was no tree mortality at the Stockton site in 2005. All trees grew vigorously and will be grafted in spring 2006.

## **ACKNOWLEDGEMENTS**

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Table 1. Selected descriptive information for clonal Paradox trials, San Joaquin County.

<b>Site</b>	<b>Soil</b>	<b>Irrigation</b>	<b>Tree spacing</b>	<b>Trial design</b>	<b>Rootstocks</b>
<b>Jenny Lind</b>	Gravelly clay with hardpan	Sprinkler	16' X 24'	Randomized complete block, 6 rows x 21 trees	<u>From pots:</u> * AX1, AZ2, GZ1, GZ2, NZ1, PX1, RX1, VX211, WIP3 <u>Bare root:</u> * AX2, AX3, GZ3, JX2, Paradox seedling, UX2, Vlach, wingnut seedling, 84-121
<b>Linden</b>	Clay loam	Sprinkler	24' X 24'	RCBD, test trees planted in replant sites	AZ2, JX2, NZ1, RX1, VX211, Paradox seedling (from pots)**
<b>Stockton</b>	Clay loam	Sprinkler	24' X 24'	RCBD, test trees planted in replant sites	AZ2, JX2, NZ1, RX1, VX211, Paradox seedling (from pots), wingnut seedling**

\*Seven trees of all rootstocks planted March 2004 except WIP3 (n=5), GZ2 (n=4) and wingnut (n=10)

\*\*Twenty trees of each rootstock planted March (Linden) or April (Stockton) 2005

Figure 1. Average visual rating of tree growth and condition of clonal and seedling test trees at Jenny Lind site (0 = dead, 1 = little growth, small, yellow leaves), 2 = moderate growth, leaves green but often small), 3= excellent growth and leaf color).

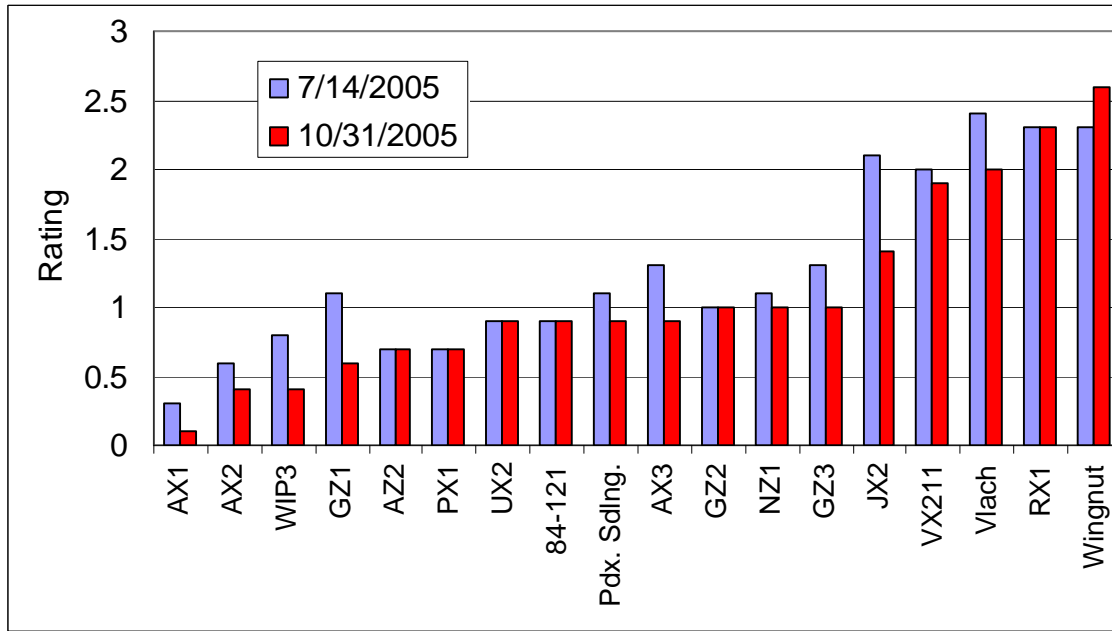


Figure 2. Average percent tree mortality for UC clonal selections and other rootstocks at Jenny Lind site, 2004 and 2005.

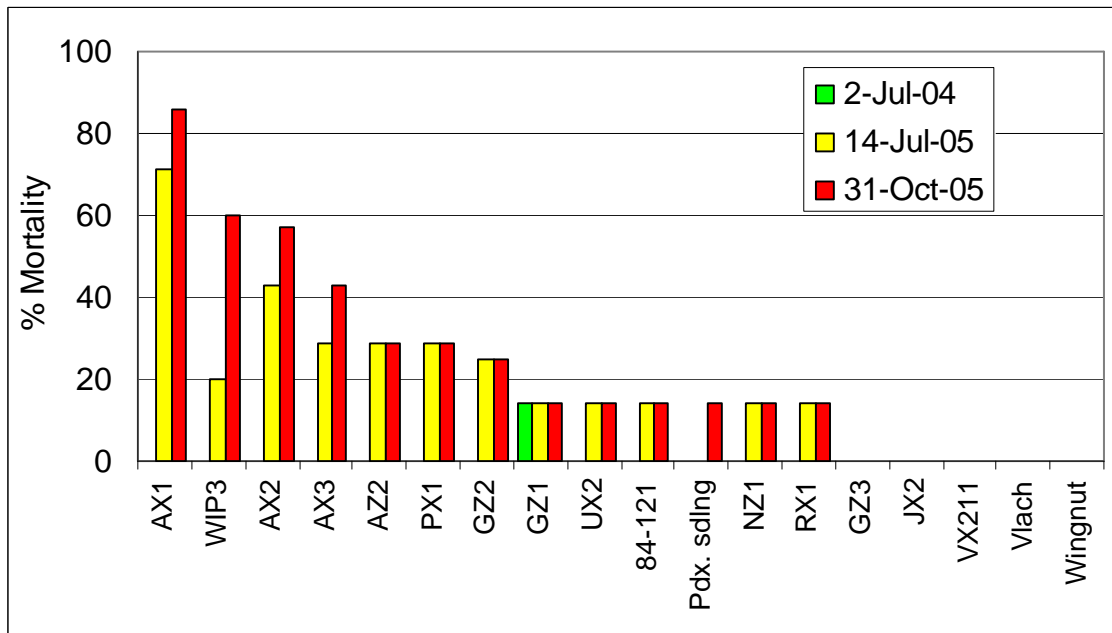


Table 2. 2004 (nuts/tree) and 2005 yield of own-rooted (OR) Chandler and Vina compared to Paradox rooted (PDX) Chandler and Vina in Sutter County Trial