

# **FIELD PERFORMANCE OF RX1, VX211, AND VLACH CLONAL PARADOX ROOTSTOCK INTERPLANTS IN A YELLOW HOWARD ON SEEDLING PARADOX ORCHARD**

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## **ABSTRACT**

The yellow Howard on seedling Paradox malady has been extensive in Sutter and Yuba Counties since 2010. Following cool, wet springs from 2006-12, random trees in Howard orchards on seedling Paradox rootstock located in Sutter, Yuba and Yolo counties would turn yellow and often collapse by the end of summer. The orchards were between four and eleven years old, on a range of soils and irrigation systems and typically in well managed orchards. In 2011, seemingly vigorous, well cropped trees continued to show yellowing and wilting symptoms into September. We excavated roots in 2010 and 2011 including a tree that was near collapsing, a tree just beginning to show yellowing and one that was intermediate. The severity of root decay was consistent with the severity of canopy symptoms. There was no *Phytophthora* nor *Phythium* found, just various saprophytic type fungi, nor lesion nematodes. Following a dry spring in 2013, random Howard trees continued to turn yellow and collapse throughout the summer in one large severely affected orchard where hundreds of trees have died. A rootstock trial was established in spring 2013 at this site in Sutter County comparing bare root clonal Paradox RX1, VX211, Vlach, and seedling Paradox, in a severely affected yellow Howard orchard site. This pattern of tree collapse was observed again in 2014. In 2013, all clonal Paradox rootstocks survived but the seedling Paradox trees had twenty percent mortality. After grafting to Howard in 2014, the RX1 had twenty percent mortality. Although RX1 and Vlach were the largest trees shortly after planting, RX1 had the smallest mean diameter increase while Vlach had the largest increase after the second growing season. VX211 had the second largest increase in mean diameter.

## **OBJECTIVES**

To compare the survival and growth of the following clonal Paradox rootstocks: bare root RX1, bare root VX211, and bare root Vlach, to bare root seedling Paradox, planted as interplants in an eight year old severely affected yellow Howard on seedling Paradox orchard site.

## **SIGNIFICANT FINDINGS**

- The seedling Paradox trees had 20 percent mortality in 2013 with no further tree losses in 2014.
- RX1 was the only clonal rootstock to suffer losses; 20 percent mortality in 2014.
- Although RX1 and Vlach were the largest trees shortly after planting, RX1 had the smallest mean diameter increase while Vlach had the largest increase after the second growing season. VX211 had the second largest increase in mean diameter.
- RX1 struggled after trees were grafted in spring 2014.
- Seedling Paradox performed slightly better than RX1 in 2014.

## PROCEDURES

A rootstock trial comparing bare root RX1, bare root VX211, bare root Vlach, and bare root seedling Paradox, in a severely affected yellow Howard on seedling Paradox orchard site was established in spring 2013 in Sutter County. Eighty dead or dying yellow Howard trees were removed in January and February 2013 and holes were backfilled and mounded. Rootstocks were placed in these sites with no fumigation or other treatments. The three clonal Paradox and one seedling Paradox bare root treatments were planted March 27, 2013. There are twenty single tree replications in a randomized complete block design. Trees were measured on June 11 and December 9, 2013 and November 17, 2014 and monitored for survival and growth during the growing seasons. Trees were budded to Howard on August 28, 2013 but were unsuccessful. Trees were grafted to Howard on April 28, 2014. Grafted trees that didn't take or were too small were budded on September 9, 2014. Trees are irrigated with microsprinklers. Pre-emergence and contact herbicides were used for strip weed control. Statistical analysis was conducted using the general linear model in SAS.

## RESULTS AND DISCUSSION

In 2013, all clonal Paradox rootstocks survived but the seedling Paradox trees had twenty percent mortality (Table 1). After grafting in 2014, it was obvious that the RX1 were struggling; by October there was twenty percent mortality. The seedling Paradox had no further mortality. The RX1 and Vlach were significantly larger than the VX211 in June 2013; all clonal rootstocks were significantly larger than the seedling Paradox on this date (Table 2). By December 2013, Vlach and RX1 had the largest mean diameters but VX211 was not significantly different from RX1. Paradox seedlings were significantly smaller. In November 2014, Vlach were significantly larger, followed by VX211, with RX1 and seedling Paradox having the smallest mean diameters. Vlach had the largest mean increase in stem diameter, followed by VX211, then seedling Paradox, with RX1 having the smallest mean increase from June 2013 to November 2014.

Although RX1 and Vlach had the same mean diameters shortly after planting in June 2013, RX1 survived in 2013 but lacked the vigor of Vlach and VX211. After grafting in 2014, RX1 clearly struggled; four trees died, and RX1 had the smallest mean diameter increase in November 2014.

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Table 1. Rootstock survival 2013 and 2014 and combined total percent mortality

Treatment	Vlach	RX1	VX211	Paradox seedling
<b>2013 dead tree totals:</b>	0	0	0	4
<b>Total trees:</b>	20	20	20	20
<b>2013 Percent mortality:</b>	0	0	0	20
<b>2014 Dead tree totals:</b>	0	4	0	4
<b>2013-14 Total dead trees:</b>	0	4	0	4
<b>2013-14 Percent mortality:</b>	0	20	0	20

Table 2. Mean stem diameters (mm) and mean increase in stem diameter (mm) from June 11, 2013 to November 17, 2014. Data based on surviving trees.

Rootstock	Mean stem diameters 6/11/13	Mean stem diameters 12/09/13	Mean stem diameters 11/17/14 <sup>1</sup>	Mean increase in stem diameter (mm) <sup>2</sup>
<b>RX1</b>	16.7 a	16.7 ab	21.9 c	5.3 d
<b>Vlach</b>	16.4 a	17.9 a	29.5 a	13.1 a
<b>VX211</b>	14.6 b	16.0 b	24.9 b	10.3 b
<b>PDX seedling</b>	12.4 c	12.4 c	20.8 c	8.5 c
<b>Significance level (Value of P) for effect of rootstock:</b>	<.0001	<.0001	<.0001	<.0010

<sup>1</sup>Data based on surviving trees in 2013 and 2014.

<sup>2</sup>Based on mean increase in stem diameter from 6/11/13 to 11/17/14