

# First Year Performance of 14 Almond Rootstocks in a Sandy Location Irrigated with Well Water

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**Introduction:** This replicated trial was established in January of 2011 in Winton, CA in Atwater Sand. It will compare the performance of Nonpareil on 14 rootstocks, and the performance of Fritz and Monterey on seven rootstocks. Each rootstock and variety combination has 6 trees within a block, with six replicate blocks. Many of the rootstocks are peach/almond hybrids (P/A-Hybrids) as the grower has developed an interest in these rootstocks since the participation in a previous UC rootstock trial. Prior to planting, the location was cover cropped with Merced Rye, tree sites were back-hoed, and the row-strips were fumigated with Telone-II at 33 gallons per acre. Spacing is 22'x18' and trees are irrigated using double line drip.

Rootstocks in this trial include:

Rootstocks planted on Nonpareil, Fritz, and Monterey	Rootstocks planted on Nonpareil, only
Nemaguard	Rootpac(R)-R
Hansen	TemproPac
BH#5	Krymsk-86
Viking	Cornerstone*
Atlas	Cadamen*
Empyrean-1	BB#106
Red Titan III	Floridaguard x Alnem (USDA)

**Objectives:** Rootstocks will be compared based upon growth, nematode counts, tissue sampling, and yield within the test location that experiences the following conditions: low exchange capacity soil, presence of ring, rootknot, and lesion nematode, high sodium within water used for irrigation, and areas of hardpan and shallow soil. Efforts will also be made to observe various phenological differences of these rootstocks such as bloom and harvest timing and influence on various diseases.

**Methods:** Soil mapping was done using Veris Electrical Conductivity Mapping (Strategic Farming). Zones of soil differences were identified (Figure 1), analyzed (Table 1), and used to help block the trial. Initial and season-end growth measurements were taken. Stem water potential (SWP) was collected from 3 trees in blocks 1-3 using standard procedure. The same trees within each block were measured 5 times, for a total of 15 days of SWP measurements. Water samples were collected twice within the growing season to determine water quality. Nematode samples were collected in October of 2012.

**Table 2:** Pre-plant soil analysis from the identified zones within the field.

	Soil Classification	Organic Matter %	P - Weak Bray PPM	Potassium PPM	Magnesium PPM	Calcium PPM	Sodium PPM	pH	CEC meq/100 g	Base Saturation %				
										K	Mg	Ca	H	Na
Block 1	Sandy Loam	0.7	16	68	264	1172	85	7	8.6	2	25.4	68.3	0	4.3
Block 2	Sandy Loam	0.5	36	63	141	668	39	6.6	5.1	3.1	22.6	64.9	6	3.3
Block 3	Loamy Sand	0.4	55	56	73	366	16	6.7	2.8	5.2	21.8	66	4.5	2.6
Block 4	Loamy Sand	0.4	72	52	62	290	25	6	2.6	5.2	19.7	55.9	15	4.2
Block 5	Loamy Sand	0.5	33	58	81	377	25	6.5	3	4.9	62.1	62.1	7.5	3.6
Block 6	Loamy Sand	0.7	82	64	207	845	82	6.6	6.8	2.4	24.8	61.5	6	5.2

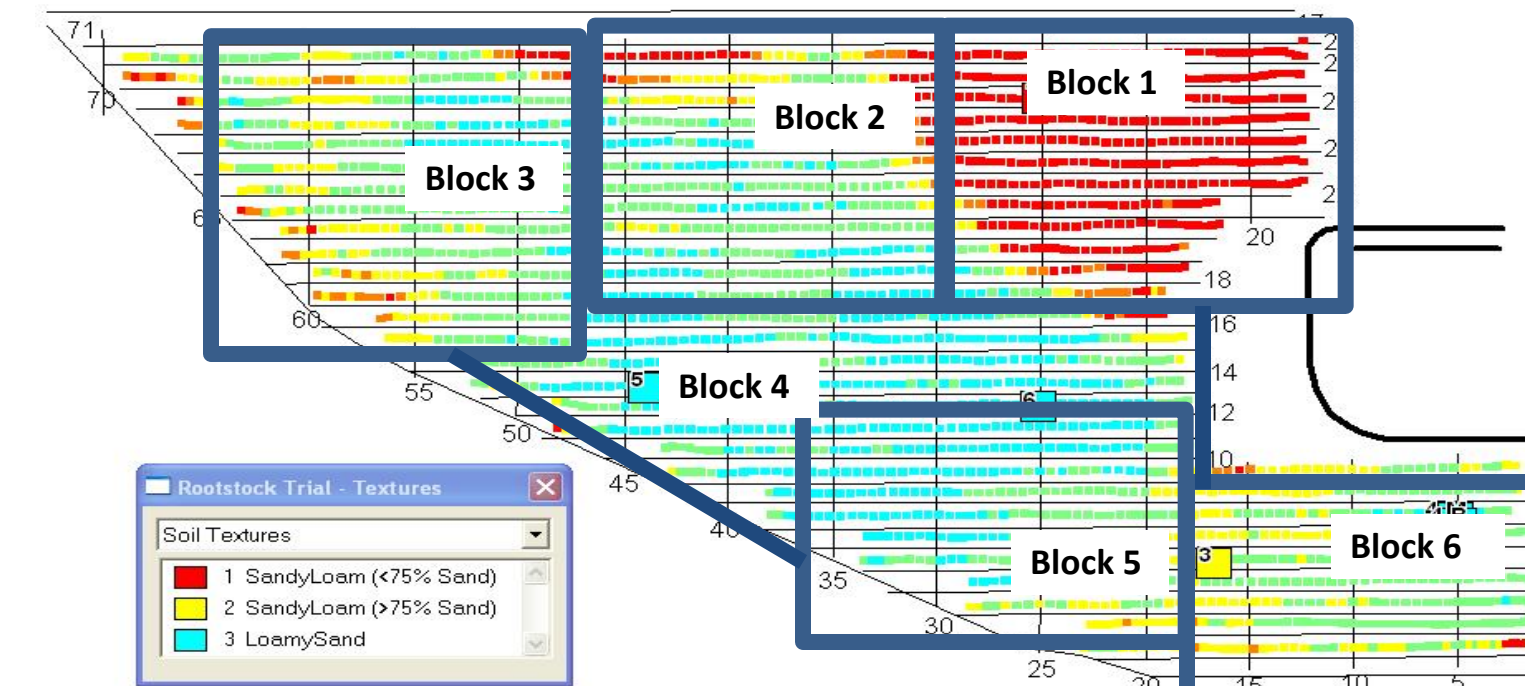


Figure 1: Soil electrical conductivity (EC) map of test plot with highlighted trial blocks. Red areas indicate heavier soil, while blue indicates lighter, coarser soil. EC mapping provides the ability to distinguish soil variations that are not detectable from viewing soil surveys. Differences in EC indicate different water and nutrient holding capacities.

**Table 3:** Stem water potential differences from baseline sampled from rootstocks grafted to 'Nonpareil.' Means without letters in common are significantly different, P=0.05.

Rootstock	2011 SWP off Baseline (bars)	2012 SWP off Baseline (bars)
Nonpareil Scion	Baseline (bars)	Baseline (bars)
Atlas	-1.49 AB	-0.98 ABCD
BB106	-1.86 AB	-1.48 CDE
BH5	-1.94 AB	-1.10 ABCD
Cadaman	-2.2 AB	-1.59 DE
Cornerstone	-2.07 AB	-1.30 BCDE
Empyrean-1	-2.06 AB	-0.43 A
Flor x Alnem	-1.17 A	-0.96 ABCD
Hansen	-1.57 AB	-1.34 BCDE
Krymsk-86	-2.54 B	-1.20 BCDE
Nemaguard	-1.62 AB	-0.86 ABCD
Red Titan	-2.19 AB	-1.60 DE
RootPacR	-2.54 B	-1.76 E
TemproPac	-2.04 AB	-0.79 ABC
Viking	-1.52 AB	-0.67 AB

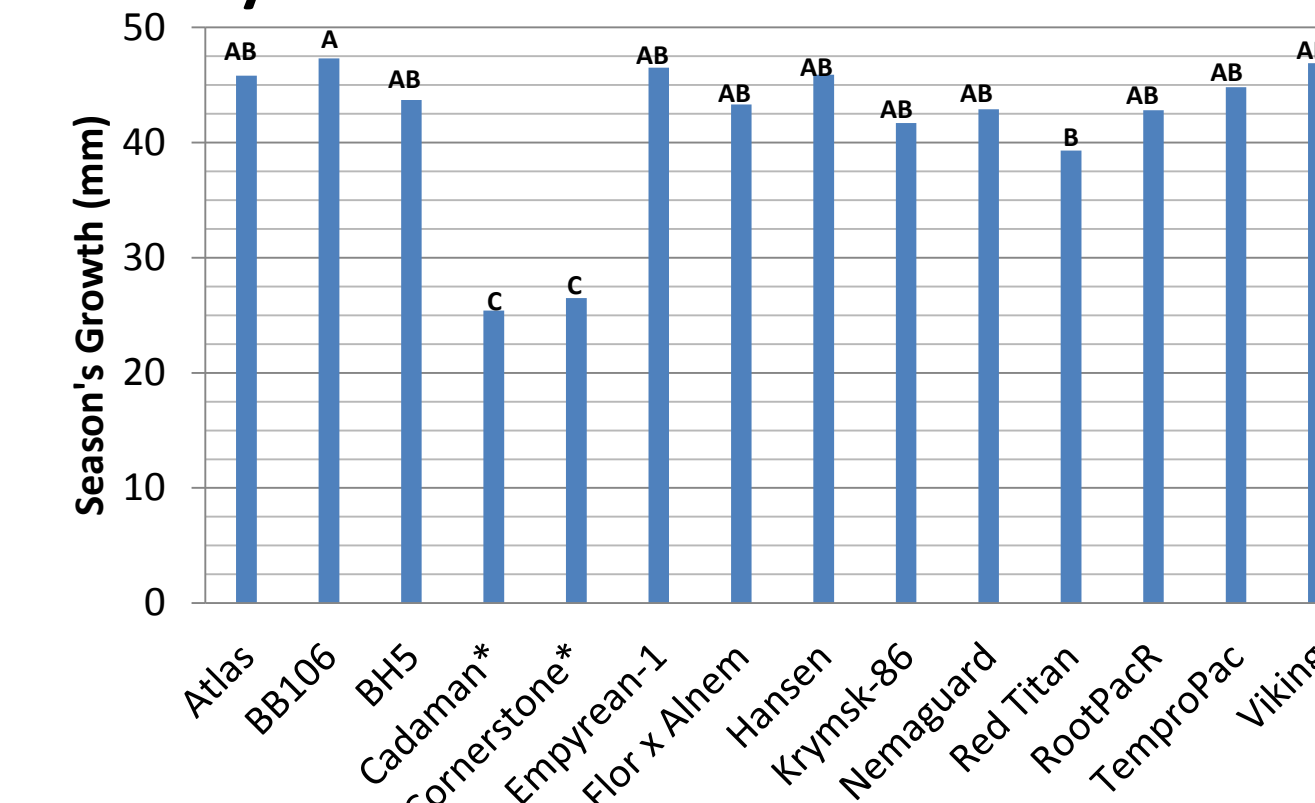


Figure 2: 2011 season's change in caliper of nonpareil scion grafted to 14 different rootstocks. Statistical groupings using mean comparison indicates significance at p<0.05. \* indicates a potted tree planted in mid-April.

## Results:

- Water and soil quality was suitable for almond production (table 1 and 2);
- Soil variations within field (figure 1) indicated the need to block by soil type;
- Overall, high vigor was observed within the trial, most likely due to presence of nitrate-nitrogen within the irrigation water (Table 1);
- Growth of the rootstocks in 2011 was similar for all rootstocks planted bare-root in January, trees planted in April were smaller (figure 2). There was no differences in growth between the 7 rootstocks grafted to 'Fritz' or 'Monterey' (data not shown);
- Rootstock influenced bloom timing on 'Nonpareil,' 'Monterey,' and 'Fritz' in 2012 (Table 4);
- Most 2<sup>nd</sup> leaf trees had similar SWP. Krymsk-86, Cornerstone, Hansen, BB106, Cadaman, Red Titan and RootPacR had the lowest SWP, indicating higher water stress throughout the season (Table 3).

**Acknowledgements:** Thanks to Bright's Nursery, Burchell Nursery, Dave Wilson Nursery, and The Nursery Company for donation of trees. Thanks to Strategic Farming, Inc. for soil electrical conductivity mapping.

**Table 4:** Bloom percentage of the variety 'Nonpareil' on 14 rootstocks and varieties 'Fritz,' and 'Monterey' on seven rootstocks. Observations were taken on February 22<sup>nd</sup>, 2012. Means without letters in common are significantly different, P=0.05.

	Nonpareil	Fritz	Monterey
Atlas	52.5 AB	30.8 AB	44.2 AB
BH5	43.3 AB	11.7 C	25.8 AB
Empyrean-1	75.8 A	68.3 A	70.8 A
Hansen	64.2 AB	51.7 AB	66.7 AB
Nemaguard	54.2 AB	26.7 B	23.3 B
Red Titan III	28.2 AB	25.8 B	32.5 AB
Viking	74.2 A	35.5 AB	53.3 AB
BB106	62.5 AB		
Cadaman	20.8 BC		
Cornerstone	10.8 C		
Floridaguard x Alnem	34.2 AB		
Krymsk-86	16.7 BC		
RootPacR	29.2 AB		
TemproPacR	36.7 AB		

\*All trees were planted in late January, 2011 with the exception of Cadamen and Cornerstone. These potted trees were planted in April, 2011.

**Table 1:** Water analysis taken from the well supplying the trial in 2011.

	pH	EC (dS/m)	SAR	Ca (meq/L)	Mg (meq/L)	Na (meq/L)	Cl (meq/L)	B (mg/L)	HCO3 (meq/L)	CO3 (meq/L)	NO3-N (mg/L)
Mid-Season	7.89	0.52	0.9	2.50	1.50	1.23	0.42	0.03	2.1	<0.1	19.6
Late-Season	7.90	0.52	0.8	2.44	1.47	1.18	0.42	0.03	2.1	<0.1	17.2