

FINAL REPORT
WTFRC Project #: PR-01-90

Project Title: Northwest Pear Rootstock Trial

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Objectives: To develop a rootstock that is precocious, high yielding with high quality fruit, and has some dwarfing characteristics. This would result in high density orchards, that inputs are efficiently managed from the ground or platforms, and are friendlier to the environment. Ideally the rootstock should be resistant (or at least tolerant) to the pests and diseases that plague Northwest orchards.

1. Identify rootstocks that induce dwarfing characteristics, precocity, high production, and high fruit quality under varying soil and climatic conditions in the Northwest utilizing conventional rootstocks, interstems, and newly available rootstock material.
2. Determine the climatic adaptability of Concorde and Taylor's Gold with three rootstocks in the Pacific Northwest.

Significant findings:

- Bosc on 708-36, Fox, and Pyro 2-33 rootstocks suffered the greatest losses to a suspected early freeze.
- Differences in TCSA response to rootstock occurred between the two d'Anjou plantings.
- D'Anjou trees with Fox 16 or Pyrodwarf II roots, Bosc trees with Fox 16 roots, and Bartlett trees with 708-36 roots had the smallest TCSA.
- Rootstock did not significantly affect D'Anjou canopy volume.
- No significant differences were observed in the Taylor's Gold and Concorde rootstock trial.

Methods:

Objective 1: Assess rootstocks for dwarfing and semi-dwarfing characteristics, precocity, yield, and fruit quality under varying soil and climatic conditions in the Northwest utilizing conventional rootstocks and newly available rootstock material.

Maintain d'Anjou plantings in Hood River and Cashmere, a Bartlett plantings in Parker, and a Golden Russet Bosc plantings in Tonasket. The following trials will be maintained or established:

1. Maintain phase I planting of the Northwest pear rootstock trial. Rootstocks include: Pyrodwarf, Pyro II (2/33), Fox 10, Fox 11, 708-36, OHxF 87, OHxF 40 – planted in 2002, terminate 2011.
2. Prepare site for d'Anjou planting as second part of Northwest pear rootstock trial. Rootstocks will include: Brossier (28-152), Retuzier (OH11), Horner (H-4, H-10, & H-51), BM-200 (Australia), INRA P-2532, *Pyrus heterofolia*, and OHxF 87. – plant 2005, terminate 2014.
3. Continue to develop the rootstocks for the 2006 planting.

The experimental design will be a randomized complete block design with 10 blocks. The spacing will be wide enough to minimize the chance of tree interactions within the life of the experiment (10 years), but will need to fit within the grower's orchard. Pollenizers will account for 20% of the trees. Pruning and training will be consistent with industry standards except we will utilize a support system.

Data to be collected annually will include: 1) Trunk cross sectional area (25 cm above bud union); 2) Canopy height, canopy spread (2 directions); 3) Flower clusters and fruit set (whole trees 1st five years); 4) Yield; and 5) Fruit size and grade.

Additional data to be collected: 1) Planting time root system rating (1 to 5, poor to excellent), and TCSA; 2) Any observations as to insect or disease preference (we are not going to scout the blocks every week); and 3) Reason(s) for tree loss, if any.

Objective 2: Determine the adaptability of Concorde and Taylor's Gold with three rootstocks in the Pacific Northwest.

Establish Taylor's Gold and Concorde pears on three rootstocks. Establish them in 2004 in conjunction with the rootstock trials as listed in objective 1. The procedures and data to be collected are the same as described above.

Results and discussion:

Rootstock played a significant role in tree survival (Table 1). Bosc and Bartlett trees on 708-36, Fox, or Pyro 2-33 rootstocks suffered up to 50% loss due to a suspected early freeze.

Table 1. Effect of rootstock on tree survival in 3-year-old trees.

Percent survival^z

Rootstock	Cashmere D'Anjou	Hood River D'Anjou	Tonasket Bosc	Yakima Bartlett	Cashmere Bartlett
708-36	80	100	56 bc	90 ab	-
Fox 11	90	100	44 c	100 a	-
Fox 16	90	-	80 ab	80 b	-
Pyro 2-33	90	100	43 c	100 a	100
Pyrodwarf	90	100	100 a	100 a	100
OHxF 40	90	100	100 a	100 a	-
OHxF 87	90	100	100 a	100 a	100
OHxF 97	-	100	-	-	-
Nellis	-	100	-	-	-

^z Means within a column followed by the same letter are not significantly different at p=0.05 – Tukey's test.

D'Anjou trees with Fox 16 or Pyrodwarf II rootstocks had the smallest trunk cross sectional area (TCSA) (Table 2). Bosc trees with OHxF rootstocks had significantly larger TCSAs than Bosc trees on other rootstocks. In the Yakima Bartlett planting trees with 708-36 rootstocks had the smallest TCSA.

Table 2. Effect of rootstock on canopy volume and TCSA in 3-year-old trees.

Rootstock	Trunk Cross Sectional Area (cm ²) ^z				
	Cashmere D'Anjou	Hood River D'Anjou	Tonasket Bosc	Yakima Bartlett	Cashmere Bartlett
708-36	19.7 b	26.9 ab	21.9 b	5.6 d	-
Fox 11	20.0 b	24.0 ab	20.0 b	7.5 bc	-
Fox 16	18.1 b	-	18.1 b	7.3 cd	-
Pyro 2-33	18.4 b	22.3 b	19.3 b	9.0 abc	19.1
Pyrodwarf	21.6 b	28.7 a	21.6 b	10.2 a	19.6
OHxF 40	26.6 a	25.9 ab	26.6 a	9.3 ab	-
OHxF 87	27.7 a	26.1 ab	27.7 a	9.2 ab	20.9
OHxF 97	-	26.9 ab	-	-	-
Nellis	-	26.0 ab	-	-	-

^z Means within a column followed by the same letter are not significantly different at p=0.05 – Tukey's test.

Trees with Pyrodwarf II rootstocks again produced the greatest increase in TCSA between 2003 and 2004 for the two d'Anjou and the Bartlett plantings (Table 3). The greatest increase in TCSA in the Bosc trial occurred with the OHxF rootstocks.

Table 3. Effect of rootstock on the percent growth increase in TCSA of 3-year-old trees.

Rootstock	Growth Increase in TCSA (%) ^z				
	Cashmere D'Anjou	Hood River D'Anjou	Tonasket Bosc	Yakima Bartlett	Cashmere Bartlett
708-36	92.7 b	133.3 b	116.4 b	76.1 c	-
Fox 11	113.8 b	116.4 b	109.0 b	78.1 c	-
Fox 16	122.7 ab	-	98.0 b	79.1 c	-

Pyro 2-33	188.5 a	160.7 a	105.1 b	113.9 ab	129.2 b
Pyrodwarf	98.1 b	135.5 ab	115.4 b	127.6 a	166.3 a
OHxF 40	112.1 b	117.6 b	145.5 a	104.3 b	-
OHxF 87	154.2 ab	134.7 ab	155.6 a	108.4 ab	172.5 a
OHxF 97	-	135.2 ab	-	-	-
Nellis	-	134.9 ab	-	-	-

^z Means within a column followed by the same letter are not significantly different at p=0.05 – Tukey’s test.

Minor yields occurred in 2004 (Table 4). Hood Rive d’Anjou trees with OHxF 40 rootstocks and Tonasket Bosc trees with Pyro 2-33 rootstocks produced the greatest yields.

Table 4. Effect of rootstock on yield in 3-year-old trees.

Rootstock	Yield (pound per tree) ^z				
	Cashmere D’Anjou	Hood River D’Anjou	Tonasket Bosc	Yakima Bartlett	Cashmere Bartlett
708-36	0.0	0.4 abc	0.5 b	0.0	-
Fox 11	0.0	0.9 ab	2.8 b	0.0	-
Fox 16	0.0	-	0.0 b	0.0	-
Pyro 2-33	0.0	0.1 bc	2.2 b	0.0	0.0
Pyrodwarf	0.0	0.0 c	0.1 b	0.0	0.0
OHxF 40	0.0	1.2 a	0.5 b	0.0	-
OHxF 87	0.0	0.4 abc	7.9 a	0.0	0.0
OHxF 97	-	0.5 abc	-	-	-
Nellis	-	0.0 c	-	-	-

^z Means within a column followed by the same letter are not significantly different at p=0.05 – Tukey’s test.