Pear Rootstocks: Present and Future[3]

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Introduction

Early work on pear rootstocks in the west centered around the search for resistance to fire blight (*Erwinia amylovora* (Bur.) Winslow, et al). F. C. Reimer collected blight resistant stocks such as Old Home and Farmingdale of European origin as well as a number of primitive species from Asia (7, 8). With the appearance in the 1950's of the new disease "Pear Decline," research was renewed on pear rootstocks in the western states (2, 11, 16, 21). It was learned that Pear Decline is caused by a pathogen, probably a mycoplasma, injected into the trees by infected psylla insects feeding on the leaves. The pathogen moves through the living bark downward to the root. If the rootstock is susceptible, phloem necrosis occurs below the graft union, causing the tree to die (1, 5, 6, 15, 19). Resistance to Decline was shown to be genetically controlled (12).

In 1960 we began a series of pear rootstock trials to study not only Pear Decline but a wide array of other environmental and biotic factors, including growth control and cropping efficiency (3, 4, 9, 10, 14, 18, 20). We have learned that no single rootstock is suitable to every situation.

Present Status

Rootstocks available in the United States are shown in Table 1. The most widely used stock is Bartlett seedling. It is moderately resistant to Decline and moderately hardy but is susceptible to blight, as are other *P. communis* seedling stocks. All seedling types are somewhat variable in resistance to Decline, except *P. betulaefolia* which appears completely resistant. *Pyrus pyrifolia* (serotina) and *P. ussuriensis* are not being propagated because they are susceptible to Pear Decline (1, 6).

After 22 years' research with selected clones of Old Home x Farmingdale (OH x F), we have identified a few which combine disease resistance with high yield potential, and some offer a measure of growth control (17). Tree size varies by clone as follows:

Vigorous	Semi-vigorous*	Semi-dwarf	Dwarf
OH x F 18	OH x F 217	OH x F 34	OH x F 51
OH x F 97	OH x F 267	OH x F 69	
OH x F 112	OH x F 361	OH x F 87	
OH x F 198		OH x F 230	
		OH x F 333	

*Domestic seedlings, because of variability due to Pear Decline, will generally be in the semi-vigorous category.

All of these clones are resistant to blight except 361, and possibly 87 which was not tested. The use of a selected clone permits the grower to choose the proper spacing for uniform, high yield. Clone 51 has been hard to establish in the orchard and has shown some winter injury in Canada.

Clonal Old Home has been largely discontinued as a stock because of the very low yield efficiency it induces. It also root sprouts very badly (4).

Quince stocks are not widely used except in Oregon and California, because they are ill adapted to a number of climatic and soil conditions. Most commercial varieties except Comice are not fully compatible with quince, but an Old Home interstem provides a universal compatibility bridge.

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[3]Oregon Agr. Exp. Sta. Tech. paper no. 6468.

Table 1. Traits of pear rootstocks in use in the U.S.A.

0 = none, not tolerant or resistant; 5 = much, high, very tolerant or resistant

Rootstocks	SOIL TOLERANCE:				Tree Vigor	Root Sprouts	Hardi-ness	Yield Effic.	Graft compat-ibility	RESISTANCE TO:			
	Low pH	High pH	Wet	Dry						Fire Blight	Pear Decline	Root Aphid	Nema-todes
Bartlett sdlg.	3	2	4	3	4	2	4	4	5	0	4	0	1
Nelis sdlg.	3	2	4	3	4	2	4	4	5	0	4	0	1
French sdlg.	3	2	4	3	4	3	4	3	5	0	3	0	1
Old Home clone	3	2	4	3	5	4	4	2	5	5	5	0	1
Bartlett clone	3	2	4	3	3	0	4	4	5	0	5	0	1
OH x F clones	3	2	3	3	2-4	1	4	4	5	5	5	1	1
P. calleryana sdlg.	4	2	4	5	4	1	2	4	5	4	4	5	5
P. betulaefolia sdlg.	3	2	5	5	5	0	3	4	5	5*	5	5	1
Provence Quince	3	1	3	2	2	2	2	5	3	0	5	5	5
EM Quince A	3	1	3	2	2	2	2	5	3	0	5	5	5
EMLA Quince C	3	1	3	2	2	2	2	5	3	0	5	5	5

*Only seedlings of ***P. betulaefolia*** from O.S.U. blight resistant parents are resistant.

Table 2. Traits of exotic *Pyrus* and related genera as potential rootstocks for future use with pear.

0 = none, not tolerant or resistant; 5 = much, high, very tolerant or resistant

	SOIL TOLERANCE:									RESISTANCE TO:			
Exotic Rootstocks	Low pH	High pH	Wet	Dry	Tree Vigor	Root Sprouts	Hardi-ness	Yield Effic.	Graft compat-ibility	Fire Blight	Pear Decline	Root Aphid	Nema-todes
Pyrus													
P. amygdaliformis	1	5	2	4	3	1	2	3	5	1	3	3	2
P. cordata	2	4	2	4	2	1	2	3	5	1	3	1	3
P. dimorphophylla	4	2	4	2	3	1	3	4	5	3	4	1	3
P. elaegrifolia	2	5	3	4	4	1	4	4	5	1	4	4	2
P. fauriei	5	1	5	2	1	4	4	2	5	4	3	2	3
P. nivalis	3	2	3	3	4	1	4	3	5	2	4	4	
P. pashia	4	1	3	3	3	2	1	3	5	2	4	3	2
P. syriaca	2	4		4	2	3	2	4	5		4	4	4
Related Genera													
Amelanchier	3	3			1	0	4	5	2	4		5	4
Crataegus	3	3	3		1	2	4	4	2	4		5	4
Sorbus	2	3			1	2	4	2	1	4		5	

Future Rootstocks

Table 2 summarizes tests under way for several years with many of the exotic stocks of the worldwide *Pyrus* collection (now part of the national clonal repository, USDA-OSU) and with several genera of the subfamily Pomoideae (*Amelanchier, Crataegus, Malus, Sorbus*). These stocks offer additional diversity in tolerance to certain soils and environments and in dwarfing.

Extremes are available in adaptability to soil conditions. Those most adapted to wet, acid soils are *P. fauriei, P. pashia* and *P. dimorphophylla.* Those best suited to dry, alkaline soils are *P. amygdaliformis, P. elaeagrifolia, P. syriaca* and *P. cordata.*

Growth control has been found in *P. fauriei, P. cordata, P. syriaca, Amelanchier, Crataegus, Sorbus* and *Cydonia.* Also extreme dwarfing has been found with M 26 apple stock, using a Winter Banana apple interstem which affords compatibility with pear scions.

A number of clonal selections have been made of these various seedling stocks with the objective of combining genetic adaptation with uniform tree size and consistent productivity. We plan to introduce some of these clones within the next 5 years.

A comprehensive list of research papers on the evaluation of *Pyrus* at the Northwest Plant Germplasm Repository, USDA-OSU, was published in 1981 (13). It includes studies on genetics/breeding, physiology, propagation, taxonomy, pathology, entomology, phytochemistry, and rootstock behavior.

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Book Review

Abscission. Fredrick T. Addicott. University of California Press, 2223 Fulton Street, Berkeley, CA 94720. ISBN 0-520-04288-3; 387 pages; 198 illustrations; $39.50.

Abscission — the shedding of plant parts — that plays an important role in the physiology and survival of plants. Personnel in agricultural production who deal with abscission on a daily basis could benefit from a better understanding of these processes as discussed in this text.

Topics discussed in the text are as follows: 1) Introduction, 2) Anatomy of abscission, 3) Abscission behavior, 4) Physiology, 5) Biochemistry and untrastructure of abscission, 6) Ecology, 7) Abscission in lower plants, 8) Genetics of abscission and dehiscence, 9) Paleontology and evolution of abscission, and 10) Basics of agricultural abscission.

Although not complete, there is a list of literature cited from which the researchers can seek additional details concerning abscission. R. K. Simons

Letter to the Editor

24 August 1982

Dear Roy:

Your investigations into the scion/stock combinations including those using M 27 bear out our observations after playing with M 27 for a dozen years. We want the small size plant which it gives, but not the poor vigor. Please see the sketches on the reverse of this sheet.

The knobs formed at the unions appear to be the result (or the cause) of the trouble. By using seedlings of M 27 for the rootstock, some better unions have been obtained on that end of the stem piece of M 27. However, we are still looking for a buffer to go between the M 27 and the cultivar which would give smoother unions at each end and also serve as a barrier against fire blight going on down to the root of the plant.

That same insert could also serve when M 27 was the rootstock.

Because they have some degree of blight resistance Prima, Liberty, and Nova Easy Grow have been used. None is as good as it should be. Can you suggest something?

Sincerely,

D. B. PERRINE
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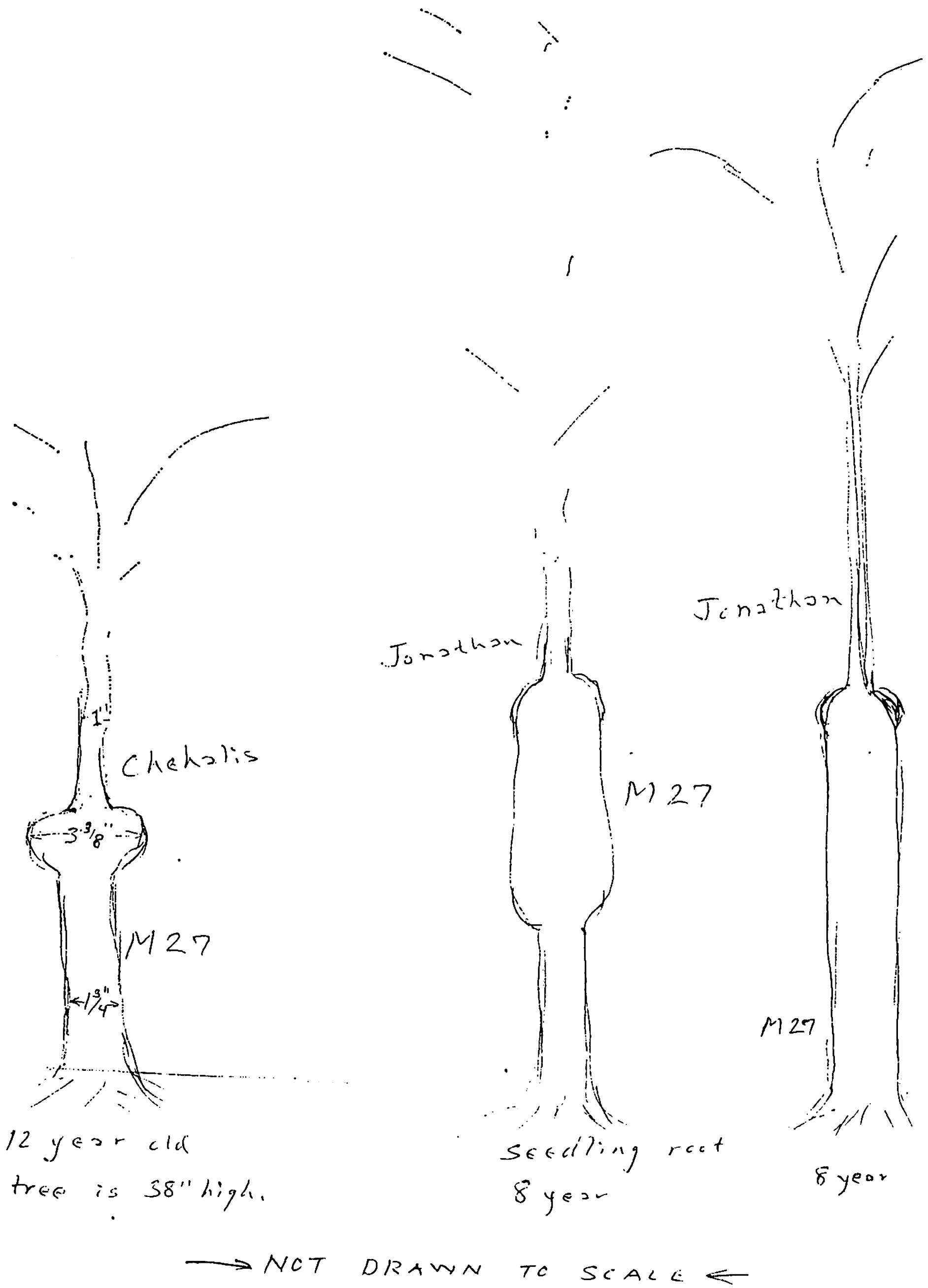
Chehalis
1"
3 3/8"
M27
1 3/4"
12 year old
tree is 38" high.
Jonathon
M27
seedling root
8 year
Jonathon
M27
8 year
NOT DRAWN TO SCALE

D. B. Perrine