

Pear rootstocks

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Three species which are used for pear rootstocks—*Pyrus calleryana*, *Pyrus communis* (or European pear), and *Cydonia oblonga* (Quince). Although European pear and nashi are members of the *Pyrus* genus, the issue of scion/rootstock compatibility for European pears and nashi is more important than in apples, in particular with grafting between *Pyrus* and *Cydonia*. This can be overcome by using an interstem with a compatible variety, and while successful, this increases the overall tree cost.

Dwarf rootstocks for pears have been searched for and bred for many years world-wide without real success.

The following descriptions of the various groups of rootstocks available for European pears and nashi are based on observations at Orange and overseas data. Quince stocks produce a smaller tree but there can be incompatibility with both European pear and Nashi. More recent introductions of new rootstocks such as OHF and Pyrodwarf have not yet been evaluated under Australian conditions.

A comparison of dwarfing characteristics and disease resistance of the different rootstocks can be found in Tables 1 and 2 and Figure 1.

***PYRUS CALLERYANA* ROOTSTOCKS**

Pyrus calleryana D6 is the most commonly used rootstock for commercial pear production in Australia. This is a vigorous rootstock producing a large tree that is slow to bear fruit, especially if pruned hard in the early years. It is very productive and is compatible with most pear varieties.

Because of the vigour of D6, a size controlling rootstock is needed to gain the increased production efficiency characteristic of dwarfing apple rootstocks.

D6

Origin. Central, Southern China, and Vietnam.

Pyrus calleryana selection D6, clonal stocks of a strain selected from seed supplied by the University of Nanking, China in 1929, to Bathurst, Australia.

Description. Leaf: small glabrous, turning red in autumn.

Shape: 3–8 cm long, ovate or broader, often lobed with acute tip and rounded base.



Margin: crenate, juvenile simple

Shoot: thin reddish brown.

Vigour. Tree is very vigorous.

Propagation. Propagation with open pollinated D6 flowers for seed, which needs about 30 days chilling to break dormancy.

Resistance. Resistant to fireblight, leaf spot (quince fleck) and woolly aphid, moderately resistant to crown gall, collar rot, mildew, moderately susceptible to pear blast and pear decline.

Incompatibility. Compatible with European pears and nashi.



Uses. Widely used for all pears including nashi in Australia. Low chill requirement for growing, but is suitable for all districts in Australia, including colder areas.

***PYRUS COMMUNIS* ROOTSTOCKS**

A number of *P. communis* rootstocks have become available in recent years. Depending on the objectives of the breeding programs from where they originated, each has different characteristics that need to be carefully considered when selecting them. Little specific detail is available, as few of them have been rigorously evaluated under Australian conditions.

US breeding program: Old Home X Farmingdale Series (OHF)

The OHF series is one of the more recent overseas pear rootstock breeding programs that has produced a range of rootstocks for different climate and soil types. Professor F.E. Reimer, Oregon State College, searched for a fireblight resistant *P. communis* rootstock. He found this selection and named it OLD HOME. It had no blight in a bad year, but was not self fruitful. He found another seedling also resistant and named it FARMINGDALE 18 after its town of origin. The cross pollination of these two produced the fireblight resistant OH x F series selected by L. Brooks, Oregon, U.S.A. in 1960. These are patented and some have been introduced to Australia by ANFIC, but have not yet been evaluated under our conditions.

OHF 51 (Brokly)

Origin. *Pyrus communis* selection by L. Brooks, Oregon, 1960.

Description. Not available yet.

Vigour. Most dwarfing, similar to Quince A and C.

Propagation. Propagation with hardwood cuttings is difficult.

Resistance. Resistant to fireblight.

Incompatibility. None

Uses. Moderately good production, poor yield efficiency, moderately precocious, good anchorage, less tendency to sucker.

OHF 69 (Daynir)

Origin. *Pyrus communis* selection by L. Brooks, Oregon, 1960.

Description. Not available yet.

Vigour. Semi-dwarfing, similar to BP 1.

Propagation. Propagation with hardwood cuttings is difficult.

Resistance. Resistant to fireblight.

Incompatibility. None

Uses. Good production, high yield efficiency, moderately precocious, good anchorage, less tendency to sucker.

OHF 97

Origin. *Pyrus communis* selection by L Brooks, Oregon, 1960.

Description. Not available yet.

Vigour. Very vigorous, similar to *P. calleryana*, 130% Quince A,

Propagation. Propagation with hardwood cuttings is difficult.

Resistance. Resistant to fireblight.

Incompatibility. None

Uses. Moderately good production, moderately precocious, good anchorage, less tendency to sucker.

OHF 333 (Brokmal)

Origin. *Pyrus communis* selection by L Brooks, Oregon, 1960.

Description.

Leaf:

Shape: oval with attenuate tip and rounded base.

Margin: serrated.

Stipules: elliptical and narrow.

Vigour. Semi-dwarfing, equal or superior to BA 29, similar to BP 1

OHF 217

Origin. *Pyrus communis* selection by L Brooks, Oregon, 1960.

Description. Not available yet.

Vigour. Semi-vigorous, similar to BP 3 and WBC seedling.

Propagation. Propagation with hardwood cuttings is difficult.

Resistance. Resistant to fireblight.

Incompatibility. None

Uses. Good production, high yield efficiency, moderately precocious, good anchorage, less tendency to sucker.

Propagation. Propagation with hardwood cuttings is difficult. A weak stool.

Resistance. Partly tolerant to collar rot, sensitive to virus and nematodes, resistant to fireblight..

Incompatibility. None

Uses. Equal or superior to BA 29 in size and production, (poor yield efficiency?) depending on soil, good production, moderately precocious, good anchorage, less tendency to sucker. Compared with OHF 97 it has produced smaller fruit and yield of d'Anjou.

South African breeding program: BP series

Seedling selections were made in 1928 from seed of a wild pear tree with a strong chance of Kieffer being involved, at Ellsenberg, South Africa. These were selected and evaluated by A.F. de Wet, Fruit and Fruit Technology Research Institute, Stellenbosch (BP from Bion Donne Research Station).

BP 1

Origin. BP 1 was released 1974. Introduced to Australia in 1980s with patents controlled by ANFIC.

Description. Leaf: green with reddish green petiole, glabrous above and woolly beneath.

Shape: oval, acuminate with rounded base.

Margin: no serrations obvious until fully expanded, then small neat serrations.

Shoot: reddish grey with woolly young wood and tips of new shoots.



Vigour. Semi-dwarfing, similar to OHF 333 and OHF 69, 110% Quince A.

Propagation. Propagation by hardwood cuttings difficult, terminal cuttings root better than basal, roots 10% better than BP3. Hardwood cuttings difficult but propagate satisfactorily with bottom heat. These can be taken in mid April to May before all the leaves have fallen with a basal cut (5–10 mm) through bark and wood to assist rooting.

Resistance. Susceptible to fireblight, resistant to collar rot and latent viruses.

Incompatibility. None

BP3

Origin. BP 3 released in 1979. Introduced to Australia in 1980s with patents controlled by ANFIC.

Description. Leaf: new leaves reddish green and slightly woolly along the midrib underneath, with red slightly woolly petiole, then leaf becomes green with red edge then green and shiny when fully expanded.

Shape: oval, acuminate with rounded base.

Margin: neat fine serrations.

Shoot: reddish green with woolly tips.

Vigour. More vigorous than Williams' seedling, standard.

Propagation. Propagation by hardwood cuttings difficult, terminal cuttings root better than basal, roots 10% less than BP1. Hardwood cuttings difficult but propagate satisfactorily with bottom heat. These can be taken in mid April to May before all the leaves have fallen with a basal cut (5–10 mm) through bark and wood to assist rooting.

Resistance. Susceptible to fireblight, some resistance to collar rot and latent viruses.

Incompatibility. None

German breeding program: Pyrodwarf

In addition to disease-resistance, breeding programs have also been trying to introduce better propagation characteristics into pear rootstocks, as they are notoriously difficult to strike. Pyrodwarf originated from a cross between Old Home (fireblight resistance) and Bonne Louise d'Avranches (ability to strike hardwood cuttings) made by Helmut Jacob, at the Research Institute and College, Geisenheim, Germany. This is in quarantine now after being introduced to Australia by Flemings, but will not be evaluated here until it is released and multiplied up with enough trees for testing.



Uses. Low chill requirement for growing, precocious, no suckers.



Uses. Low chill requirement for growing, precocious, very productive, adaptable to variety of soil types from sandy loam to clay loam, no suckers.

PYRODWARF

Origin. Helmut Jacob, Germany.

Description. Not available yet.

Vigour. Low vigour.

Propagation. Easily grown from cuttings.

Resistance. Susceptible to fireblight (medium rating), susceptibility to decline unknown.

Incompatibility. No known incompatibilities.

Uses. High precocity in 2–3 years, yield efficiency, uniform fruit size, good anchorage, winter hardiness, no sucker development, no lime-induced chlorosis on high pH soils, more precocious and dwarfing than OHF 97, suitable for high density planting.

QUINCE (*CYDONIA OBLONGA*) ROOTSTOCKS

Quince has been used for some time as a rootstock for pears to produce a smaller tree that is more precocious, especially in Europe. Most quinces have some incompatibility with several pear varieties (especially the major ones grown in Australia), so an interstem of Beurré Hardy is necessary.

Thirty selections of quince were collected from Caucasia, via John Innes to East Malling Research Station, U.K., in 1936. H. M. Tydeman tested 15 of these against Quince A, B, and C as possible dwarfing rootstocks for pears. All were more dwarfing than Quince A. Incompatibility showed in all selections but the most promising were not tested in Australia. Only CQ 132 is still available in England. Eight were introduced to Australia by NSW Agriculture and were released in 1978.

No Caucasian quinces would be recommended at this stage. CQ 132 produced the smallest tree but not quite the lowest yield and could be grown closer together than Quince A. Incompatibilities apply to all of these, so double budded trees from the nursery would be necessary.

QUINCE A (Angers Quince)

Origin. Selection by East Malling Research Station for bush and smaller trees and high density plantings.

Description. Leaf: large with some soft puckering.

Shape: ovate, often abruptly acuminate.

Margin: smooth.

Stipules: medium large, ovate.

Shoot: in all directions, fairly straight.

Vigour. medium vigour.

Propagation. Easily as hardwood cuttings (June), and is highly productive on stools.

Resistance. High tolerance to woolly aphid, resistant to root lesion nematode, mildew and crown gall, medium resistance to pear blast, susceptible to quince fleck and fireblight.

Incompatibility. Not compatible with Beurré Bosc, Packham's Triumph, Williams' (except Williams' Compatible), Winter Cole, Josephine or nashi.

Uses. Suitable for bush and smaller trees, and high density plantings, but not near as dwarfing as the available range of apple rootstocks.



QUINCE C

Origin. Selections by East Malling Research Station for bush and smaller trees and high density plantings.

Description. Leaf: medium large with much rigid puckering.

Shape: roundish, blunt tipped.

Margin: smooth.

Stipules: fairly large, blunt ended.

Shoot: evenly thin, faintly brown compared to Quince A, bunchy candelabra appearance.

Vigour. Medium vigour.

Propagation. Easily as hardwood cuttings (June), and is highly productive on stools but less productive than Quince A.

Resistance. High tolerance to woolly aphid, resistant to root lesion nematode, mildew and crown gall, medium resistance to pear blast, susceptible to quince fleck and fireblight.

Incompatibility. Not compatible with Beurré Bosc, Packham's Triumph, Williams' (except Williams' Compatible), Winter Cole, Josephine or nashi.

Uses. Quince C medium vigour is similar to A until it crops then falls behind in vigour. Quince C is useful for shy croppers and garden



trees. Suitable for bush and smaller trees, and high density plantings, but not near as dwarfing as the available range of apple rootstocks.

BA 29 (BAC 29)

Origin. Selection made at the Fruit Breeding Station at Beaucoz -Angers, France, 1963, named from the initials of the farm at Beaucoz , Bois l'Abb .

Description. Leaf: large.

Shape: ovate roundish with acuminate tip.

Margin: smooth.

Stipules: medium, oval with pointed tip.

Shoot: fairly straight, reddish brown, shiny mostly but dull on older part of shoot.

Vigour. It is slightly more vigorous than Quince A and OHF 333.

Propagation. Very productive on stools, roots from cuttings (June), not as easily as A and C.

Resistance. Low susceptibility to virus.

Incompatibility. Some incompatibility, but fairly good with Williams', better than others with Beurr  Bosc and Dr Jules Guyot, but imperfect.

Uses. Suitable for bush and smaller trees, and high density plantings, but not near as dwarfing as the available range of apple rootstocks.



CQ 127

Origin. Selections introduced into Australia from UK in 1978.

Description.

Leaf: small.

Shape: round oval, acuminate tip.

Margin: smooth.

Stipules: none.

Shoot: slightly zig-zag, yellowish green with prominent lenticels, slightly woolly at tip.

Vigour. Semi-dwarf.

Propagation. Easily from stools or as cuttings.

Resistance. Susceptible to quince fleck and fireblight.

Incompatibility. Incompatible with major Australian varieties, interstem needed.

Uses. Similar in vigour and production to Quince A and C



CQ 129

Origin. Selections introduced into Australia from UK in 1978.

Description.

Leaf: small.

Shape: ovate, mucronate tip.

Margin: smooth.

Stipules: none.

Shoot: Slight zig-zag, grey brown, many burr knots on older wood.

Vigour. Semi-dwarf.

Propagation. Easily from stools or as cuttings.

Resistance. Susceptible to quince fleck and fireblight.

Incompatibility. Incompatible with major Australian varieties, interstem needed.

Uses. Similar vigour to Quince A and C but lower production.



CQ 130

Origin. Selections introduced into Australia from UK in 1978.

Description.

Leaf: medium

Shape: ovate, acuminate tip.

Margin: smooth.

Stipules: none.

Shoot: slight zig-zag, red brown, shiny, slightly woolly at tip.

Vigour. Semi-dwarf.

Propagation. Easily from stools or as cuttings.

Resistance. Susceptible to quince fleck and fireblight.

Incompatibility. Incompatible with major Australian varieties, interstem needed.

Uses. Similar vigour to Quince A and C but lower production.



CQ 131

Origin. Selections introduced into Australia from UK in 1978.

Description.

Leaf: medium small.

Shape: ovate, mucronate tip.

Margin: smooth.

Stipules: none.

Shoot: slight zig-zag, dull grey brown, some burr knots.

Vigour. Semi-dwarf.

Propagation. Easily from stools or as cuttings.

Resistance. Susceptible to quince fleck and fireblight.

Incompatibility. Incompatible with major Australian varieties, interstem needed.

Uses. Slightly less vigour than Quince A and similar production.



CQ 132

Origin. Selections introduced into Australia from UK in 1978.

Description.

Leaf: medium small.

Shape: oval, mucronate tip.

Margin: smooth.

Stipules: none.

Shoot: straight, dark green- red, rough with prominent lenticels.

Vigour. Dwarfing

Propagation. Easily from stools or as cuttings.

Resistance. Susceptible to quince fleck and fireblight.

Incompatibility. Incompatible with major Australian varieties, interstem needed.

Uses. Smallest of this group of quinces that have been tested at Orange but yield almost comparable to Quince A at closer plantings.



CQ 133

Origin. Selections introduced into Australia from UK in 1980.

Description.

Leaf: large.

Shape: oval, acuminate tip.

Margin: smooth.

Stipules: none.

Shoot: Slight zig-zag, dull orange - red, slightly woolly at tip.

Vigour. Semi-dwarf.

Propagation. Easily from stools or as cuttings.

Resistance. Susceptible to quince fleck and fireblight.

Incompatibility. Incompatible with major Australian varieties, interstem needed.

Uses. Not compared at Orange due to later release, but appears to be almost as vigorous as BA 29.



CQ 134

Origin. Selections introduced into Australia from UK in 1980.

Description.

Leaf: medium small.

Shape: oval, acuminate tip.

Margin: smooth.

Stipules: none.

Shoot: zig-zag, rough red brown with very prominent lenticels, thin.

Vigour. Dwarfing.

Propagation. Easily from stools or as cuttings.

Resistance. Susceptible to quince fleck and fireblight.

Incompatibility. Incompatible with major Australian varieties, interstem needed.

Uses. Not compared at Orange due to later release, but is very dwarfing.



Table 1. Vigour of the pear rootstocks in Australia in similar groupings as in apple

Group	European Pear	Nashi
1 dwarf		
2		
3	Pyrodwarf	
4	CQ 132, CQ 134	
5	Quince C, CQ 130, CQ131	
6	Quince A, OHF 51 CQ 127, CQ 129, CQ 133	OHF 51, 69, 97, 217, 333 BP 1
7	BA 29, BP 1, OHF 69, 333	BP 3 <i>P. pyrifolia</i> <i>P. communis</i>
8	BP 3, OHF 217	
9 vigorous	<i>P. calleryana</i> D6 OHF 97	<i>P. calleryana</i> D6 <i>P. ussuriensis</i> <i>P. betulifolia</i>

Figure 1.

PEAR ROOTSTOCK SIZE (approx.)

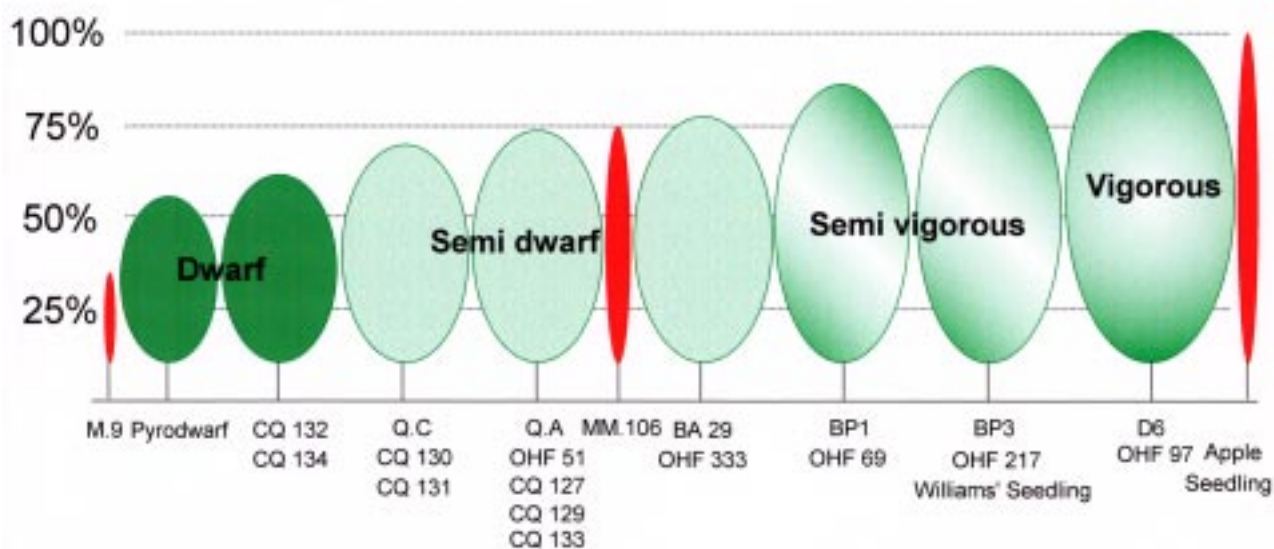


Table 2. Rootstock resistances

Rootstock	Fireblight	Quince Fleck	Crown Gall	Collar Rot	Pear Blast	Pear Decline	Woolly Aphid	Latent Viruses
D6	R	R	MR	MR	MS	MS	R	?
BP 1	S	R	?	R	?	R	?	R
BP 3	S	R	?	MR	?	R	?	MR
OHF 51	R	R	?	?	?	R	?	?
OHF 69	R	R	?	?	?	?	?	?
OHF 97	R	R	?	?	?	?	?	?
OHF 217	R	R	?	?	?	?	?	?
OHF 333	R	R	?	MR	?	?	?	S
Pyrodwarf	S	R	?	?	?	?	?	?
QA	S	S	R	?	MR	?	R	?
QC	S	S	R	?	MR	?	R	?
BA 29	S	S	R	?	MR	?	R	?
CQ 127	S	S	?	?	MR	?	?	?
CQ 129	S	S	?	?	MR	?	?	?
CQ 130	S	S	?	?	MR	?	?	?
CQ 131	S	S	?	?	MR	?	?	?
CQ 132	S	S	?	?	MR	?	?	?
CQ 133	S	S	?	?	MR	?	?	?
CQ 134	S	S	?	?	MR	?	?	?

S - susceptible, MS - moderately susceptible, MR - moderately resistant, R - resistant, ? - not known

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The information contained in this publication is based on knowledge and understanding at the time of writing (March 2003). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up-to-date and to check currency of the information with the appropriate officer of New South Wales Department of Agriculture or the user's independent adviser.