INTERSTEMMING PEARS: THE PEAR-QUINCE UNION

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When I first began work with pears I put them on quince rootstock for several reasons, the most important was that only the dwarfing of quince would enable me to set out many varieties in my small lot. Furthermore, the efficiency (production vs. tree size) of the pear on quince roots is considerably greater than on pear roots when each is given best soil and cultivation practices. There is now anecdotal evidence confirming the old European observation that quince roots improve the quality and precocity of the fruit as well.

Finally, quince roots have been noted to reduce the sensitivity of pear trees to fireblight, probably because quince reduces the initial flush of tender shoot growth. The late Bill Davie observed this first hand. He had an extensive orchard of hundreds of pear trees north of Pittsburgh in the l980's. In several years the orchard was decimated by fire blight. Even reputedly blight resistant cultivars like Magness succumbed. He noticed that trees on quince roots sustained considerably less damage than those on seeding.

Quince is one of the pome fruits and is usually considered the most related to pear. Nevertheless, pears and quince belong to difference genuses. There are over thirty different species of pear but only one of quince. Long-term, healthy grafts involving different genuses are extremely rare. Even healthy interspecific grafts, i.e., those between different plant species, are rare. Pear, at the least the species Pyrus communis we are most interested in, is unique in its ability to graft onto other genuses of the Rosaceae family with varying degrees of success, i.e., Amelanchier (serviceberry), Crataegus (hawthorn), Sorbus (mountain ash), Malus (apple), and of course Cydonia (quince). It is interesting to note that self-rooted pear trees have been known to live over 300 years, being among the longest lived members of the Rosaceae family. However pears grafted on quince seldom live longer than 40 years. Perfectly compatible grafts across genus or species line may not exist. But a little incompatibility causes dwarfing and imposes efficiency while too much causes excessive dwarfing and relatively quick failure of the union.

Until recently it has not been possible to asexually reproduce pear rootstocks efficiently by the usual techniques of cutting , layering and stooling. Seeding roots are of course reproduced from pear seeds and OHXF pear rootstocks are commercially reproduced by modern tissue culture. Therefore, it followed that when the great explosion of pear culture began in Europe in the l8th century the quince would be widely used as stock to reduce tree size because it can readily be reproduced by stooling. However it soon became obvious that not all pear cultivars were equally compatible with quince. Some were quite compatible, but others failed quickly, and some were in-between. The problem of incompatibility can be overcome by using an "interstem". That is: a pear cultivar which is known to form a good union with quince is first grafted to the quince root and later the desired cultivar is grafted upon the first which becomes an interstem..

The question then is "Which pear cultivars form such incompatible unions with quince that they need an interstem? Of course, one could always interstem all pear cultivars one wanted to graft to quince. But that is wasteful of time and effort. But that is what was done to over 440 pear trees on Quince A roots at the Brogdale research station in Kent, England! One needs a lot more interstem wood and most techniques of interstemming require an additional year before the desired scion makes adequate growth. Hence, a survey was made of the literature on the culture of the pear to determine which cultivars were compatible with quince. The results of this survey are gathered into the lists which follow. The sources consulted are listed. They are supplemented with knowledge of current horticultural practices, personal experience, and in the case of modern cultivars, announcements of new cultivars in journals. For purposes of accuracy I have retained the original text name for each cultivar, awkward though some are, but where another name is frequently used I have put it in parenthesis.

Obviously, in the real world compatibility is continuous, not discontinuous, as reflected in the arbitrary placement of cultivars into two distinct categories. Nonetheless, in order to attain practical results, some categorization has to be made using careful judgment, and it is not possible with current knowledge to make further distinctions. Nor have I tried to be inclusive. Leroy describes over 900 separate cultivars and Molon, several hundred. I have restricted the lists to those cultivars which may still be used in North America. Certainly I have missed many.

Upon studying the sources one is immediately struck by the observation that they don't always agree. For example, Seckel, which in the United States is considered to be incompatible, is never so mentioned in European sources. There may be two reasons for this: the US sources are old, or, except for Barret, are based on old 19th century lists and experience which involved quince roots of uncertain provenance.

In the US if a cultivar tends to lack vigor on quince we blame that on incompatibility even if the union is strong. However, lack of vigor is not as important to Europeans who prefer smaller trees and may have been using cleaner stock.

Hartmann and Kester report experimental evidence that in a union between pear and quince, a cyanogenic glucoside, purnasin, which is found in the tissues of quince, is translocated from the quince into the phloem of the pear. Some pear tissues have enzymes to break down the purnasin generating hydrocyanic acid as one of the decomposition products. In turn, the hydrocyanic acid attacks the phloem and xylem of both pear and quince at the graft, preventing the proper union from developing between the two. Some pears have an inhibitor which prevents the enzyme from breaking down the purnasin, and hence prevents the generation of hydrocyanic acid. These pear cultivars are more compatible with quince.

Quinces differ in their purnasin content as well. Some Provence selections have such low contents that they made good unions directly with Bartlett. Therefore, the compatibility of pear/quince unions depends upon the cultivar of the quince as well as that of the pear. Through practice, certain quinces have been selected as tending to form better unions than others, but no formal study of this characteristic comparing various quince lines exist. Decades ago the Europeans developed several lines of virus-free quinces: A, C and BA-29C. Use of these has reduced incompatibility problems.

Viruses can be another cause of incompatible unions. The cells of one of the graft partners are invaded by proteins of the other which are foreign to it. Many cultivars carry latent viruses, virus complexes, or microplasma-like bodies. In the case of the latent viruses, the infected plant shows no symptoms. However, if another plant is in contact with it for even five minutes and is sensitive to the viruses, it will become infected and eventually show symptoms. On the other hand, neither plant may be much affected but rather the viruses may cause necrosis of the union between the two, e.g. black line or failure of the union between Persian and Black Walnut due to the cherry leaf-roll virus, pear decline of Pyrus communis scions grafted onto Oriental pear roots due to a microplasm, incompatibility of some apple cultivars on EM106 due to tomato ring spot virus, etc.

To some extent, using a vigorous scion whose union is unaffected by virus as an interstem mitigates this problem. The virus still moves through the interstem but its effect on the second union between the interstem and the desired cultivar is much reduced or often eliminated as both are of the same species. The practice of interstemming to mitigate problems caused by virus infection suggests another hypothesis: the effect of viruses upon a graft union depends upon how closely related the two partners are. If they belong to the same species, there is seldom a problem; but if they belong to two different species of genera, e.g. pear and quince, then the graft is often quite sensitive to virus infection and necrosis of the union is more likely to occur. Obviously, using virus free material for both scion and rootstock avoids the problem of virus-caused incompatability.

The existence of viruses in plant material is not to be taken lightly. Sucking insects are now believed to be a major cause of virus spread, but indiscriminate grafting onto multi-variety trees, wild rootstocks, and stool beds has certainly been a factor. Entire cultivars which were "clean" several decades ago are now known to be virus-infected. The modern use of asexually propagated rootstock which has become virus-infected rather than the old practice of using seedling stock has also increased the problem. Seedling stock of pome fruits is virus-free as pome seeds do not carry viruses. The entire range of the original EM apple rootstock, which when released was clean, became infected with at least latent virus due to a practice of budding cultivars to shoots which still remained on the stools. In this way any virus-infected bud transmitted that virus to the entire stool, and thereafter to all rootstock derived from that stool and all cultivars grafted to that rootstock. Most of these apple viruses are latent and have not proven to be serious but still cause occasional incompatibility with some apple cultivars. The alternative and better procedure would be to remove the shoot from the stool and bud it after it had become self-rooted. This procedure would require an additional year, but it would keep the stool-bed clean.

In conclusion, List I is applicable to only virus-free scions and roots. Probably some cultivars in List II would be in List I if grafted under virus-free conditions. If one suspects virus taint, one might be better off using an interstem. As noted before I have not covered all pear cultivars.

List I

Pear cultivars which appear to be compatible with quince.

Abbe Fetel (Abate Fetel)
Alexandrine Douillard
Ananas de Courtrais
Aurora
Bartlett (Williams)
  (French and Swiss compatible only)
Bloodgood
Beirschmitt
Belle Guerandaise
Beth
Beurre Alexandre Lucas
Beurre Anjou
Beurre Capiaumont
Beurre d'Amalis
Beurre Diel
Beurre Dubuisson
Beurre Gifford
Beurre Hardy
Beurre Superfin
Butira Precoce Morettini
California
Clara Frijs
Colette
Concorde
Conference
Dabney
Dawn
Devoe
Doyenne du Comice
Doyenne Gris
Dr. Desportes
Duchesse Bronzee
Duchess d'Angouleme
Durondeau
Early Seckel
Easter Beurre (Doyenne d'Hiver)
Fique d'Alencon
Emile d'Heyst
Flemish Beauty
Fondante d'Automne (Seigneur)
Fondante de Moulins-Lille
General Leclerc
Glou Morceau (Beurre d'Hardenpont)
Gorham
Grand Champion
Graf von Moltke
Harrow Delight (HW603)
Harvest Queen (HW602)
Highland
Howell
Jeanne d'Arc
Josephine de Malines
Kieffer
Laxton's Superb
Louise Bonne de Jersey
Louis Pasteur
Magness
Maxine (Stark's Delicious)
Old Home
Olivier de Serres
Onward
Passe Crassane
Pierre Corneille
Rogue Red
Santa Claus
St. Andre
Sierra
Sirrine
Sucree de Montlucon
Thompson's
Tyson
Urbaniste
Vicar of Winkfield (Cure)
White Doyenne
Warren

List II

Pear cultivars generally not doing well directly on quince and needing an interstem.

Bartlett, including sports
Belle Lucrative
Beurre d'Arenberg
Beurre Bosc
Beurre Clairgeau
Beurre Flon
Beurre Gris d'Hiver Nouveau
Beurre Six
Bristol Cross
Cayuga
Chaplin
Clapps Favorite
Comte de Lamy
Dana Hovey
Doyenne d'Ete
Dr. Jules Guyot
Duchess de Brodeaux
El Dorado
Epine de Mas (Duc de Bordeaux)
Ewart
Forelle
Honeysweet*
Jargonelle
Laurence
Laxton's Progress
Leaxton's Early Market
Lemon
Madame Treyve
Marie Louise
Marguerite Marillat
Merton Pride
Michaelmas Nellis
Moonglow
Olivier de Serres
Packham's Triumph
Passe Colmar
President Heron
Seckel
Sheldon
Roi Charles de Wurtemberg (RCW)
Waite
Winter Nellis
Worden Seckel

*Honeysweet so far has been compatible for me grown as an espalier, but some report that with free standing the union often fails.

Sources

Baker, Harry, 1991. The Fruit Garden Displayed, 8th Edition. London, Royal Horticultural Society.

Barret, H. C., 1959. "Compatibility of Certain Pear-Quince Combinations", Fruit Varieties and Horticultural Digest, 14 (4); 3-6.

Field, Thomas W., 1860. Pear Culture. Saxton, Barker & Co, NY

Garner, R. J., 1979. The Grafter's Handbook. Oxford University Press, London, Appendix I.

Hartmann, H.T. and D. E. Kester, 1975. Plant Propagation, Principles and Practices, 3rd Edition. Prentice Hall, NJ, pp. 344-6

LeRoy, Andre, 1867. Dictionnaire de Pomologie, Vol. I & II, Poires. Paris.

Long Ashton Station Annual Reports, 1956, et seq. United Kingdom.

Molon, G., 1901. Pomologia, Ulrico Hoepli. Milan.

Societe Pomologique de France, 1947. Le Verger Francais, Catalogue Descriptive. Lyon, Paris.

Thomas, John J., 1867. The American Fruit Culturist. William Wood & Co., NY, p. 237.