DWARFING ROOTSTOCKS FOR STONE FRUITS

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In recent years there has been an increased need for smaller sized fruit trees for high density plantings in commercial orchards and for the home garden. Reduced tree size can be obtained by several methods, such as the employment of genetic dwarfs, use of growth retardant sprays, heavy pruning — particularly summer pruning, and by the use of dwarfing rootstocks. The latter may be the most satisfactory means of reducing tree size of present desirable cultivars.

A peach breeding project has been initiated at the California Agricultural Experiment Station aimed primarily at developing genetically dwarfed cultivars which will produce high quality fruits. There is also underway a screening test of a number of private plant breeder's genetic dwarf seedling selections (6 to 8 feet tall) set at various planting distances to determine per acre production as well as fruit quality. Such breeding projects could ultimately best solve the problem of reduced tree size, particularly if a dwarfing gene can be introduced into otherwise desirable cultivars. Dwarfing in genetic dwarf selections is due to the short internodes of the fruiting cultivar. Such trees are budded onto the usual peach rootstocks, such as 'Nemaguard' or 'Lovell.'

For some tree fruit species there are available one or more clonal or seedling vigor-controlling rootstocks that result in reduced tree size. For apples, the Malling and Malling-Merton rootstock series, together with seedling stocks, provide almost any desired degree of tree vigor. For pears, several clonal quince rootstocks are available to reduce tree size, although some scion/rootstock combinations are incompatible and require an interstock. For citrus species, *Poncirus trifoliata* seedling rootstocks give reduced tree size, although other clonal dwarfing rootstocks have also been developed.

For the stone fruits — peaches, apricots, almonds, plums, and cherries, widely accepted and utilized dwarfing rootstocks are not generally available. Certain ones do exist, however, that have given good results with certain scion/rootstock combination. .

Peaches. Following studies by Sax (17) some 25 years ago, *Prunus tomentosa* (Nanking cherry) seedlings have been used experimentally (1) to give dwarfing of peach cultivars, reducing tree size, as compared to peach seedling rootstocks, by about 50%. Although *P. tomentosa* has bene known for many years to exert dwarfing of peach trees, it has not as yet been widely used for this

purpose. In spite of this, *P. tomentosa* is still considered (15) to be one of the most likely candidates for dwarfing peaches or, perhaps, *P. tomentosa* × *P. persica* hybrids. *P. tomentosa* however, is quite susceptible to root-knot nematodes which would eliminate it as a useful stock in many areas.

Prunus besseyi (Western sand cherry), too, has been known (1) for many years to exert a dwarfing influence on peach cultivars. Due to its cold hardiness, possible resistance to crown gall, and relative ease of clonal propagation, it would seem particularly promising for future use. Dwarfing of peaches from *P. besseyi* roots is slightly less than obtained with *P. tomentosa*. *P. besseyi* is currently being used to some extent as a peach rootstock, 1.2% of commercially-propagated peaches in the north Central U.S. in 1966 and 1967 being on *P. besseyi* roots, compared to 97.7% on peach seedling roots (19).

Both *P. tomentosa* and *P. besseyi* are reported (1) to carry latent viruses, so in any research with these plants as dwarfing rootstocks it would be necessary to start with heat-treated material.

Certain clonal stocks of *Prunus domestica* will dwarf peaches; the varieties 'Ackerman' and 'Pershore' ('Yellow Egg') being recommended in Germany (13) as producing dwarfed trees. Limited studies by Brase in New York (1) using seedlings of these two cultivars as rootstocks showed that good bud take with four peach cultivars was obtained, as was growth restriction, in comparison with peach seedlings as rootstocks. However, the late Carl Hansen, of the University of California, tried many *P. domestica* plums as possible dwarfing peach rootstocks under California conditions but without success.

Prunus hortulana will cause some dwarfing of peaches (3, 4, 12). The use of seedlings of the 'Wayland' plum, a *P. hortulana* cultivar, has been studied for a number of years at the California Agricultural Experiment Station, Davis, as a possible useful dwarfing peach stock (10). 'Wayland' seedlings appear to be compatible with most peach cultivars and they do not produce undesirable suckers. They are quite uniform and give uniform dwarfing effects. Hardwood cuttings have been very difficult to root. In California, 'Wayland' seedlings are now considered to be more promising than either *P. tomentosa* or *P. besseyi* for dwarfing peaches. A clone of *Prunus subcordata* 'Klamath 1' was selected by A.N. Roberts at Oregon State University as a suitable interstock between peach and *P. americana* roots to give semi-dwarfed, productive trees (10).

Two clonal *Prunus insititia* cultivars, 'Mirabelle' and 'St. Julian EM, type C', when used as rootstocks for peach cultivars are reported (13) to give a dwarfing effect.

Two peach rootstocks, 'Siberian C' and 'Harrow Blood', developed at the Harrow (Ontario) Research Station show tree dwarfing of peach cultivars during early growth but final tree size is reported to be about the same as obtained with peach seedlings (15). Apricot roots have long been known (4) to produce dwarfed peach trees but incompatibility has been a problem, seeming to vary with the ecological source of the apricot seed (5).

Some dwarfed or semi-dwarfed seedlings from peach breeding projects may be useful for developing clonal dwarfing rootstocks for the peach (18).

Cherries. Both sweet [*Prunus avium*] and sour [*P. cerasus*[cherries are conventionally grown on either seedling Mazzard [*P. avium*] or Mahaleb roots [*P. mahaleb*]. The clonal Mazzard stock from East Malling, England — F12/1 — produces uniformly vigorous trees. Mahaleb roots will give slightly smaller trees than Mazzard but the trees cannot be considered as being dwarfed.

In California 'Stockton Morello' [*P. cerasus*] has been used for many years as a semi-dwarfing clonal rootstock for sweet cherries (3), giving a tree substantially smaller than one on either Mazzard or Mahaleb roots. Formerly it was propagated by suckers arising from the base of the tree, but with the advent of new propagation methods it was found to be readily propagated by leafy terminal cuttings under mist if treated with IBA (7). The 'Stockton Morello' clone, as used in past years, was known to carry necrotic rusty mottle virus, thus infecting all trees for which it was used as a stock. By heat treatment techniques this virus was eliminated so "clean" stock became available. Although cuttings taken from such material rooted more readily than infected cuttings there are reports that the non-infected rootstocks do not result in the degree of dwarfing obtained with virus-infected material.

Prunus fructicosa, the Mongolian, or ground cherry, has been tested in New York (1) as a potential dwarfing stock for both sweet and sour cherries with rather encouraging results; it gives very dwarfed trees but it tends to sucker quite badly and may be better utilized as an interstock. Vegetatively propagated selections have been made for testing as cherry rootstocks (2). However, it was not considered to be a suitable cherry stock in trials in Washington State (20). One clone of 'Vladimir' [*P. cerasus*] (a group of sour cherries introduced into the U.S. from Russia about 1900 (9)) has shown distinct dwarfing of sweet cherries in California (16). It also enhances fruiting precocity, but graft incompatibility with some fruiting cultivars appears. Other defects are overgrowth at the graft union, root suckering, and poorly anchored trees. However, by using a hedgerow system of training trees to horizontal supporting wires, together with naphthaleacetic acid sprays to overcome suckering (14), it is believed (16) that commercial use could be made of this rootstock.

Interstock pieces of the Morello-type 'Northstar' [*P. cerasus*] cultivar are reported to produce dwarfed cherry trees (21).

There is considerable interest in the development of dwarfing rootstocks for sweet cherries and field trials are in progress in several countries (6).

Apricot. Apricot is conventionally propagated on either apricot or peach seedling roots. Peach roots are widely used commercially in California for the 'Tilton' and 'Blenheim' cultivars but in the eastern U.S. with other apricot cultivars incompatibility has occurred and peach roots are not recommended.

Although not used commercially, *Prunus besseyi* roots will produce semi-dwarfed trees, which are usually healthy and productive. *P. besseyi* can also be used as an interstock to dwarf apricots, giving even more dwarfing than when used as a rootstock (11). An interspecific hybrid between apricot and *P. besseyi* named 'Yuksa' has shown promise at the Vineland Station, Ontario, Canada (11) as a semi-dwarfing, compatible interstock between myrobalan [*P. cerasifera*] roots and apricot scion cultivars.

Plums. Myrobalan [Prunus *cerasifera*] plum seedlings may be considered as a standard plum rootstock, producing vigorous trees of European plum [*P. domestica*] cultivars.

There are a number of clonal rootstocks available giving varying degrees of dwarfing. 'Myrobalan plum B' produces a vigorous tree; 'Brompton', semi-vigorous; 'Pershore', an intermediate tree. 'St. Julian A' gives a semi-dwarf tree, and 'St. Julian K' a dwarfed tree. These rootstocks were developed in England (21).

Both *Prunus besseyi* and *Prunus tomentosa* will dwarf certain plum cultivars to about ⅓ size but the trees may not be well anchored and would possibly need to be supported. More experimentation is needed to develop information on cultivar behavior on these stocks, although some studies of these combinations has been done at the New York Agricultural Experiment Station (1). They report that 'Stanley' prune on *P. besseyi* started bearing at 2 years and fruited continuously during a 12 year test period.

Almonds. *Almonds would be included among the stone fruits* but there is no record of the development of dwarfing stocks for this species. Almond or peach seedlings or certain plum seedlings or clones are commonly used as rootstocks. Interest at present in almond rootstocks centers on the development of peach-almond hybrid roots, which are more invigorating than either almond or peach roots (8).

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