Citrus Rootstock Problems

recommendations change as developments within citrus industry reflect influence of rootstock on tree and fruit

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The citrus rootstock problem in California has changed since the recent advent of quick decline and must be re-evaluated.

Rootstocks are known to have a bearing on the resistance of lemon trees to decline and collapse and the problem of replanting old citrus soils with young trees may be solved to some degree by the use of proper rootstocks.

Among other factors to be considered in evaluating rootstocks are their effects on yields, on fruit size, on fruit quality, on cold resistance of the trees and fruit, on longevity of the trees, and on the salt tolerance of the trees.

Sweet Orange

Sweet orange rootstock has given excellent results in California with all species and varieties of citrus budded on it. Fruit quality of such trees is good and equal to that of fruits grown on trees budded on sour orange and grapefruit stocks, and far superior to the quality of fruit on Rough lemon roots. Recent studies indicate that fruit size of oranges on sweet orange stock tend to be slightly smaller than those from trees budded on most other rootstocks.

Trees on sweet orange stock are long lived and are equally as hardy as trees on grapefruit or sour orange, and are somewhat more hardy than trees on Rough lemon.

Sweet orange stock does best on sandy loam soils. It does not grow very well as a replant in old citrus soils. Recent studies indicate that sweet orange is more sensitive to soil salinity than is sour orange.

Sweet orange is still a good rootstock and its use should be continued in California, particularly in the lighter, virgin citrus soils.

Sour Orange

The resistance of this rootstock to gummosis is one of its major assets however, oranges or grapefruit on sour orange are susceptible to quick decline.

Eureka lemons budded on sour orange root tend to develop shellbark and decline at an early age. Yields of navel oranges in some field trials on sour orange stock have been 15% to 20% greater than trees budded on sweet stock. Yields of Valencias and grapefruit on sour orange have been comparable to that of trees budded on sweet stock. Yields of Eureka lemons have been 10% to 20% smaller on sour orange than trees budded on sweet orange. The quality of fruit is comparable to that of fruit budded on sweet orange or grapefruit stocks. Fruit size of Washington Navel and Valencia oranges are larger on sour orange stock than fruit from trees on most other rootstocks.

Trees budded on sour orange stock are more hardy than trees budded on Rough lemon and grapefruit stocks. Sour orange grows well in heavy soils and grows better as a replant than sweet orange. It is more tolerant to salts than sweet orange.

Many trees in California budded on sour orange root are 50 to 55 years old.

In California this rootstock should only be used for lemons, particularly Lisbons, or possibly nucellar Eureka strains.

Rough Lemon

Rough lemon is a rootstock which has been overrated in California. Trees on this stock—with few exceptions—mature early in their orchard history and decline in appearance, vigor and production at an age varying from 10 to 25 years. There are some good orchards on Rough lemon in California, but they appear to be an exception rather than the rule.

Oranges budded on Rough lemon stock are tolerant to quick decline but with grapefruit tops the trees are apparently susceptible. Lemons budded upon it are predisposed to early and heavy outbreaks of shellbark. As a stock Rough lemon is no more resistant to gummosis than sweet orange.

Yields of various species and varieties budded on Rough lemon have usually been good for the first 10 years, but commonly no higher than trees budded on sweet orange. Fruit sizes of varieties budded on Rough lemon are good but no larger than fruit from trees on sour orange.

Fruit quality of orange varieties and grapefruit grown on Rough lemon stock is extremely poor.

Most trees on Rough lemon stock are relatively short lived, particularly in the coastal area.

Rough lemon generally grows well as a replant and growers frequently overlook its bad points because of this one favorable characteristic.

Grapefruit

Grapefruit rootstock has not been used extensively in California. Oranges budded upon it are susceptible to quick decline. Lemon collapse occurs more commonly on grapefruit root than on other roots. As a stock it is not as resistant to gummosis as sour orange root. In all the rootstock trials conducted by the University of California Citrus Experiment Station the yields of all species and varieties budded on grapefruit root have been from 15% to 30% less than those varieties budded on sweet orange or sour orange roots. However, occasional good orchards on grapefruit root do occur in California. There is a great deal of variability in grapefruit varieties and perhaps one with more favorable rootstock characters than others may be found.

In California grapefruit should be used only for lemons and then with some reluctance in view of the prevalence of lemon collapse upon some strains, particularly in coastal areas.

Trifoliate Orange

In commercial orchards trees budded upon trifoliate orange are extremely variable in size and appearance. Trifoliate orange stock itself is subject to exocortis disease which seriously affects the size, health and productive capacity of trees budded upon it.

Oranges budded on trifoliate orange appear to be fairly tolerant to quick decline.

In trials at the Citrus Experiment Station the yields of Valencia oranges on trifoliate stock have been equal to that of Valencia trees budded on sweet stock even though the trees budded on trifoliate are smaller. Navel trees on trifoliate orange have yielded about the same as those budded on sweet orange. Fruit size of oranges budded on trifoliate stock is larger than average. The quality of fruit of trees on trifoliate orange is high. Trees on trifoliate orange are hardy and will stand more cold than trees budded on

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sweet orange or sour orange roots. Trifoliate orange grows well as a replant and some strains are fairly resistant to nematodes. It grows best in acid sandy loam soils, but is fairly susceptible to injury by high salt content in the soil.

Present use of trifoliate orange as a rootstock should be restricted to oranges and for limited replanting purposes only.

Cleopatra Mandarin

The Cleopatra mandarin is a stock which has done well with all species and varieties in experimental trials of the Citrus Experiment Station.

Oranges and grapefruit budded on Cleopatra stock are tolerant to quick decline. Cleopatra root is equally as resistant as sour orange to gummosis. No other diseases are known to be a factor. Lemon shellbark seems to be less severe on trees budded on Cleopatra than on Rough lemon, grapefruit or sour orange stock. Lemon decline is less pronounced in trees budded on Cleopatra than on other stocks observed.

Yields of all varieties budded on Cleopatra have been equally as good as those varieties budded on sweet orange. Fruit quality of varieties budded upon it is comparable to that of fruit from trees budded on sweet orange or sour orange. Fruit sizes are average. Trees budded on Cleopatra are equally as hardy as trees budded on sour orange stock. It makes a good growth as a replant. Cleopatra does well on heavy soils and is better adapted for saline soils than sour orange or Rough lemon.

Use of this stock in California for all scion varieties is recommended for commercial trial.

Sampson Tangelo

Use of the Sampson tangelo as a rootstock in California has not been extensive except for lemons. Eureka lemons are less prone to shellbark and lemon decline when budded upon Sampson tangelo than on most other stocks. Yields of lemons have been as good or better on trees budded on Sampson tangelo than of trees budded on sweet orange and have increased as the trees become older.

In California, because of quick decline, Sampson tangelo stock should be used only for lemons.

Troyer Citrange

Troyer citrange rootstock is so new that its ultimate value is somewhat speculative.

The Troyer citrange is a hybrid of sweet orange and trifoliate orange and apparently has inherited some of the good qualities of both. It is highly resistant to gummosis.

Oranges budded on it appear to be tolerant to quick decline. The trees come into bearing early and bear good crops of large fruit of excellent quality. The trees are more resistant to cold than trees budded on sweet orange or sour orange. Its ability to grow as a replant in old citrus soils has been outstanding.

Use of this stock should be restricted to oranges and grapefruit. Lisbon lemons are growing well on it, but Eurekas have not as yet proved adapted to it.

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BLACKBERRIES

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vigorous five to seven canes per plant need be trellised.

Trellising should be done soon after harvest, and with as little breakage of canes as possible. If tip-pruned to eight to 10 feet at the time of trellising, the supporting canes will force lateral growth over much of their length. Such lateral growth can either be pruned back to eight to 20 buds in the winter, when the plant is fully dormant, or trellised on the wires. The pruning saves labor and results in larger, more uniformly sized berries, the trellising perhaps gives a greater total yield of fruit. Water must be applied during the fall and winter months, and post-harvest fertilization with nitrogen is desirable. Attempts should be made to control the raspberry horned-tail insect. This insect kills the terminal growth of new canes early in the spring. Lateral growth which arises from such canes is always weaker than the original and is believed more subject to die-back.

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The experiment showed that fruit which drop do so soon after full bloom, though some ovaries may grow several-fold before dropping.

These drops which showed early growth frequently lengthened at the same rate as fruits which continued on to maturity. They cease to grow suddenly but remain green, turgid, and firmly attached for several days. Finally many of the fruits turn yellow, shrivel, and drop from the vine.

In fruits which drop, abscission always occurs several days after the ovary ceases to grow, and thus appears to have a secondary role in preventing fruit set.

Embryo sac development, pollen-tube growth, and the early stages of seed development were studied in growing fruits and in drops. For the insect-pollinated flowers on unthinned vines, there was no evidence that fruit drop was caused by the misfunction of any of these processes.

The changes which bring about fruit drop apparently first affect the growth of the fruit as a whole and then the development of structures within the ovule. The sequence is just the reverse of what could be expected if processes associated with fertilization or embryo or endosperm development were the cause of fruit drop.

Fruit set in this test did not appear to be limited by the number of ovules fertilized. Counts of fertilized and nonfertilized ovules were made from sections of 13 growing fruits, and from sections from 13 comparable drops.

Of 78 ovules in the fruits growing normally, 13% were not fertilized; of 116 ovules observed in the drops, 10.2% were not fertilized. Although more extensive data are needed, there is no present indication that drops have fewer ovules fertilized.

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CHICKEN

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chickens which would meet specifications for USDA Grade A and most of those which would be included in the USDA Grade B classification.

A grading system at retail would focus consumers' attention on quality as one aspect of their buying and would serve to reduce the price spread noted for each grade.

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