

**Table 1. continued**

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Removal of seed coat and washing	these treatments seeds may germinate when subsequently given Treatment 1.
GA <sub>3</sub>	
Kinetin	
KNO <sub>3</sub>	
Ethylene	

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### A TECHNIQUE FOR THE ACCELERATED PRODUCTION OF COMMERCIALY ACCEPTABLE CITRUS CLONES FROM SEED

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I am often asked, "Couldn't we plant the seeds from that nice fruit we have just eaten and grow a tree in our garden just like that."

Two of the important aspects making this impracticable are time and thorniness. In the first place, seedling trees take considerably longer to produce fruit than budded trees do. Secondly almost all citrus cultivars grown from seed show a high degree of juvenile vigour which is accompanied by a high degree of thorniness.

Twenty years ago I got "hooked" on the technicalities of citrus production and particularly in citrus nursery propagation. It didn't take long to discover a vast amount of fascinating information in word and picture in "The Citrus Industry," by Reuther, Batchelor and Webber (1). One of the interesting snippets I remembered was, "the physiological change which causes the decrease of seedling thorniness, therefore, can not depend solely on the age of the tree or clone from seed: it seems to be favoured rather by repeated cell division, and perhaps by erectness or exposed position of the shoot."

As I collected over the years for my citrus arboretum, one of the problems I found in introducing new cultivars from overseas was the need to be ultra-cautious to avoid the introduction of serious virus diseases not present in Australia. I decided to introduce seed rather than budwood, as a precaution against future trouble with virus. Citrus seeds do not carry virus. This is where the propagation problems started. Fine strong, thorny, fruitless, time-consuming seedlings, year after year, growing bigger. Faced with this problem, it was then that I remembered the comment equating distance with time.

Utilising this fact has, and will continue to make it practicable for me to produce within my own life-time new cultivars which can be early fruiting, thornless, and acceptable in the commercial sense.

Using seed intended for development as a commercial clone, strong vigorous clones are grown as single pole trees for literally as long in distance or length as is possible on a seasonal basis. As time progresses apical buds and peripheral buds will tend to be less thorny. Once thornless buds are available, Stage 2 can be attempted.

To assess fruit quality early it is necessary to overcome the juvenility of the seedling material and to induce fruiting. This is done by budding into *Poncirus trifoliata* rootstock. Trifoliata is one of the most precocious rootstocks known, and it is common to have fruit produced from buds placed in this stock in the second year instead of in 5 to 6 years as with most other stocks. Sufficient Trifoliata seedling trees are required for continuous testing. Since the growing of these Trifoliata seedlings takes some years in itself it took me some years to establish this prerequisite before I could start the programme.

The second stage consists of selecting two thornless buds close together at the apex of the seedling. One is put into the Trifoliata stock, and the other into the base of a vigorous seedling rootstock of a different cultivar. The rootstock of a different cultivar is used to avoid any error in identifying the test bud if other buds in the stock shoot at the same time. Whilst the two buds taken are not identical (in view of the tendency of citrus to mutate) it is nevertheless reasonable to assume that they are, providing that continuous checks are made throughout the programme.

The first bud in the seedling rootstock is grown on using the lopping technique (1), the aim being to grow the bud for as long in length and time as possible. For practical purposes let us assume that six feet is a reasonable obtainable length in the one season. When the bud placed in the Trifoliata stock has developed nicely the tip of that shoot is pinched out to produce a bush of shorter shoots which will be more fruitful. If the check fruit pro-

duced on the Trifoliata is not commercially acceptable then that seedling combination is eliminated from the testing program before more time consuming development is done with it.

The same process is repeated for the next four or five years. One thornless bud is placed back into a Trifoliata seedling, and the other thornless bud back into the base of the previous year's growth. As time progresses, the decreasing thorniness of the seedling becomes more and more obvious. This continuous reproduction must be accompanied by a reliable and legible identification number system.

Hopefully by the end of the 5th year the original bud from the first seed has progressed at the rate of 6 ft. per year to achieve a total of 30 feet of growth. Relating this back to the original comment in Reuther, Batchelor and Webber — in the shortened time of 5 years, 30 years of effective growth has been obtained. In summary 5 years of continual reproduction plus the introduction of the 5th test bud into the Trifoliata stock, followed two years later by fruit for testing, gets us to a situation of 7 years development in lieu of a 30 year wait. We are still dealing with seedlings which started off virus-free and, providing that care has been taken not to cross inoculate the test material, a further stage can be undertaken.

The new material is put onto a range of rootstocks considered commercially useful and these are planted out in a commercial orchard for observations, including:

- bud union compatibility
- earliness or lateness of fruit maturity
- adaptability of the rootstock/scion combination to various soil types
- and many other criteria which go hand-in-hand towards development of a new commercial variety.

The program is limited by the practical considerations of the number of seeds that can be handled on an individual basis. The more you can handle the greater the chances that some of the selections will turn out to be commercially useful.

#### LITERATURE CITED

1. Reuther, W., L. Batchelor and H. Webber. 1973, The Citrus Industry, Vol. I, II, and III, University of California, Berkeley, California.

