

We find it very important to be through budding by September 10th. The sap is still up until the last of September but the bud stand drops off sharply after this date. Sometimes we will leave some seedlings until spring if we are a little undecided as what to bud. We can bud by April 15 to 20th and grow mostly $\frac{5}{8}$ inch caliper trees which the trade prefers in this area.

We find that apple and prune trees headed at 42 to 48 inches in the orchards make the nicest trees to shape and the best angles for scaffolds so $\frac{5}{8}$ in. caliper trees are desired. Cherry and pears may be headed somewhat lower as they tend to grow very erect if not summer pruned the first year of planting.

PROPAGATION OF CITRUS PLANTS

HARLEY MARTIN

*S. A. Camp Companies
Shafter, California*

Citrus plants are quite simple to reproduce. Grown from seed, they do not usually produce true-to-type progeny; therefore, to maintain genetic continuity vegetative techniques are required. The familiar "T" bud is used almost universally to bud onto a suitable rootstock seedling. Plants bud easily in early spring or fall. Bud stands in excess of 90% are easily obtained with most varieties.

If citrus plants are so easy to propagate, why discuss them at all? Well, they are easy to reproduce but any citrus nurseryman can recall a few nightmares about mutations and virus diseases. Anyone can propagate citrus plants if he can control temperature, but few of us in the business have escaped some problems with mutations, or virus. Thus, a citrus nurseryman's primary concern is not with reproducing trees but protecting his customer and the citrus industry from the spread of virus disease and introduction of mutant or variant strain.

The citrus industry does not have any of the virus controlling techniques common to deciduous plant propagators. We can't use cuttings from rapidly growing terminals. We cannot use heat chambers. We cannot now use meristem cultures or other exotic methods used with ornamental plants. We do, however, have a trick of our own. Plant propagators have long known that the seed is a good shield against viruses. Seedling progeny rarely carry the virus diseases of their parents. A question is usually asked at this point if citrus seedlings are not true-to-type how is it possible to maintain varietal or genetic continuity using them to escape virus? To circumvent this problem the citrus industry has learned to take advantage of a peculiarity of citrus seed. The seed of many varieties produce more than one seedling from a single seed. They produce the normal gametophytic seedling plus others which arise from the nucellus, a tissue surrounding the sexual embryo. These nucel-

lar seedlings are not a product of sexual pollination and are, therefore, vegetative extensions of their fruit bearing parents. Having originated from seed they are, so far as is known, free of virus. Now another question must be answered. How are nucellar seedlings separated from sexual seedlings? This is not easy to do. Some sexual seedlings can be identified by deviation in leaf structure and physical expression. The remaining seedlings must be allowed to grow to fruiting. Fruit from these trees is observed for a period of years to establish trueness to type. Many citrus varieties have been freed of virus using nucellar propagating techniques. The varieties which do not produce nucellar seedlings remain a problem. Many virus diseases which are not readily apparent can now be detected by indexing, grafting suspected tissue into a suitable indicator plant. Spread of virus can therefore be minimized by selecting bud wood only from fruit bearing trees which have been indexed and determined free of major virus problems. Indicator plants are not now available for all virus diseases.

Citrus plants mutate readily. Mutant strains have been propagated accidentally with catastrophic results. Growers have invested thousands of dollars in groves only to discover, when they began to bear fruit, that the fruit is off-type and of little value. The citrus nurseryman must be constantly alert to prevent introduction of off-type or mutant strains into the industry. All mutants are not necessarily bad. Many of the outstanding varieties of fruit grown today are the result of mutations, but improvement through mutation is rare. In spite of the fact that most citrus varieties are easy to reproduce, the nurseryman has more than his share of troubles. Virus, mutation, and the usual soil born diseases and parasites are enough to cause many sleepless nights.

VIRUS INACTIVATION IN STONE FRUITS

DAVID ARMSTRONG
Armstrong Nurseries
Ontario, California

Viruses in stone fruits generally have serious economic effects ranging from complete loss of crop, if not death of the tree, to subtle loss of vigor that often has been wrongly attributed to "poor culture," if noticed at all. Freedom from most, if not all, viruses is apparently desirable.

Propagators have the basic responsibility to see that virus-free propagating materials are used. Once infected, the tree is infected for life for all practical purposes. Every propagator should be familiar with the symptoms of virus diseases, indexing techniques, and means of achieving and maintaining virus freedom.

Many viruses are significantly spread only through use of infected propagating material, and simple knowledge and use of virus-free propagating material is all that is necessary for