

more practical proposition mainly because there are several million cells in a plant.

We start with a male plant grown from a single cell and we are able to produce these by the hundreds of thousands. The main technical difficulties are not in the plant physiology, but the horticulture and nursery practice because the real skill comes in hardening them for transfer to the glasshouse.

In finalising, we go back to the point I made of the close relationship between work in plant physiology and work in virology. This gives the procedure we use for growing asparagus. We have a couple of possibilities here; we can produce a callus, we can then disperse it into free cells; the free cells will then produce embryos and then form plants. Take them in solid medium into the glasshouse or nursery field. Our first clone of asparagus is being grown at our new field station at Camden. On the other hand we can treat the callus rather like a cutting, i.e. induce roots to form and then induce buds to form and so forth but the yield of plants in this way is not so great.

PROPAGATION OF CONTAINER-GROWN ROSES

ROY RUMSEY

*Rumsey's Rose Nursery,
Dural, New South Wales*

Off and on, over the years, we had grown miniature roses from cuttings, but it was not until about 1968 that we stopped budding miniature roses, with the exception of "Standards", and grew them entirely from cuttings. It is quite satisfactory to take cuttings from either softwood or hardwood material and, according to the time of the year, a salable plant can be produced in quite a short time. We root the cuttings under constant daytime mist, harden them off outside, then pot them up as needed.

None of this is really news, as everyone knows by now, that miniature roses from rooted cuttings are, by far, better than budded plants; sales also have increased greatly since they were available for the public propagated in this manner.

However, this started us wondering if it would be possible to produce the larger type roses as budded plants, completely container-grown, with the rootstock placed in the soil mix and, at no time would the plants be field-grown. Of course, we had already seen the advantages of container-grown nursery stock amply demonstrated by growers of other plants, using steam-treated soil, etc. but, in spite of our queries all over the globe, we could not find anyone who had actually done this on a commer-

cial scale with rose plants, so we had to work out procedures for ourselves. With the assistance we received from Plant Pathologists, Department of Agriculture Officers, as well as some of our fellow nurserymen, we have succeeded in this venture, and we do not grow roses in the field anymore, with the exception of a few standards, which we just haven't organised as yet — but this will be done as soon as we can get time to handle them.

We use *Rosa multiflora* rootstock, but have several different clones, each with definite characteristics, some serving special purposes. The cuttings from the briars are taken during winter, and made up exactly as for field-grown plants. The first time we did this we put 10,000 unrooted cuttings into 2" tubes and they were rooted and ready for budding in about six weeks. We had a special bench made in the shed and the budders inserted on the buds in a comfortable standing position. The budded plants in the tubes were then placed in boxes and set down outside. After about 14 days it appeared as though we were going to have a high bud strike, but just at this point the exercise failed — the reason, confirmed later, was a lack of food supply in the tubes.

The next trial of 10,000 cuttings were again placed in tubes in January (in Australia we can take summer cuttings as well as winter), and they were rooted and ready for budding in about three weeks. From this particular batch we had only 12 buds which failed to "take" in the 10,000. This, of course, was phenomenally high, and we were naturally very happy. However, after a few more exercises of this nature, and with the help we had from Department of Agriculture officers on our project, it appeared that around January, under outside conditions, was about the only time of the year that we could expect these good results. At this time stocks were at their peak growth activity while there was still sufficient food left in the tubes to last until the process of "healing" of the bud and stock was completed. Naturally, not all of our budding can be done in such a short time, so the tube method was abandoned. Our next trial was to put the unrooted cuttings into 6" containers in a soil mix which has been worked out to feed the cutting until the bud had completely "taken", and the stock ready for heading off. This method is the one we have finally adopted and which we have found to be so successful. In good weather conditions budding is done outside but if wet weather persists, and we cannot afford to wait for a fine break the plants are brought into the shed and we can get the buds on and not lose valuable production time. Naturally the plants are placed outside again as soon as possible. In the spring/summer season a saleable plant can be produced in six to eight months from the time the stock cutting is planted. This plant, of course, can only be sold in the soil in the container; it does have to be left longer if it is to be sold bare-root.

We usually commence budding in late October unless we have some stored budwood which can be used as soon as the cuttings are rooted; we do not do very much of this as we have a fairly long budding season which we can extend into April if necessary, although we do like to be finished by the end of March.

We use the same soil mixture for all our roses whether they are miniatures or large-flowered types. We have naturally tried many different mixes over the years, but now seem to be reasonably settled on one which is 50 % medium loam, 25 % river sand, and the balance made up of peat and perlite. The fertilizer added to the soil mixture is a small amount of superphosphate, sulfate of potash, blood meal, and bone meal; a little dolomite lime is also added, depending on the pH test. We start with a pH of 5.5 which will rise to about 5.75. This soil mix, with the fertilizer added, is sufficient for the first three months, after which additional nutrients are added by using RiteGro fertilizer tablets. We found that liquid feeding was costly and was soon leached out by watering. Otherwise, the plants are sprayed regularly and, in general, treated as should be done to keep up a high quality.

Some interesting observations on these container-grown plants are worthy of mention. The first thing that surprised us, and which we had not actually expected, was the terrific system of fine fibrous roots which are the results of the special soil mix and the steam treated soil. It is natural in the field to get a reasonably good root system, but it is quite impossible to get anything like this tremendous mass of fibrous root which every plant has. Now it has been recognised for many years that a plant with an abundance of feeding roots will transplant with greater success than one which has just a large tap and/or anchor roots, which has to make sufficient feeder roots to see the plant on its way in the new position where it has been planted. There is also the factor of large cut surfaces on these roots, leaving entry for soil or water-borne pathogens. We still send out quite a lot of plants bare-root in the winter, and here we just shake off the soil, wash it off if required by quarantine regulations, and pack in the usual manner with moist peat around the roots. There is absolutely no doubt that this type of plant will make a quicker recovery than one with less fibrous roots.

The container-grown rose has, of course, considerably extended our selling season so that now not a week goes by without some rose sales taking place. At first we did not know how well the public would accept this new idea, but this matter was soon made clear to us in a most favourable way. We also began to get the idea that maybe we could just sell through from spring to autumn, and that would do us but what has, in fact, happened is that our winter trade has also increased, so the final result is

that we now work harder than ever as far as hours are concerned, but certainly not as laboriously.

Another point amply demonstrated in our nursery is that we can grow really beautiful specimens of some of the rose cultivars which cannot be successfully grown in the open field; these include some of the rich yellow and gold colours which the public so badly wants.

We have had our failures, of course, with container-grown roses; they were really all due to nutritional problems we encountered. At times we killed plants with fertilizers, so we are very wary of a change, even now. We do need a longer-lasting fertilizer and will probably start using one shortly; most of our larger-type roses are in the container from 8 to 18 months before sale.

We have also not succeeded in establishing plants for this length of time in any of the very light soil mixes; the roses do seem to need a compact soil to hold them for a long period of time. It has surprised us, too, what good plants can be grown in a not very large container. We do prefer a container with almost perpendicular sides as it seems, with this type of container, the roots just keep going to the edge, then just keep on making more; there is certainly no trouble with root binding in the pots.

Some of you must be wondering about the cost; it is hard for me to state categorically if the plants are appreciably more costly to produce in the containers than in the field. I would say they are, but the quality is there, and I know the price can be obtained for quality. Because the plants are sold with the leaves on throughout the spring to autumn months, we have to use fungicidal sprays every 10 days. Watering, too, is a constant task; this cannot be left as is possible with field-grown plants. However, all in all, the plants do repay for the extra care and attention and it is very satisfying to produce something really well and, of course, there is less waste.

We were assured by many people at the outset of one container-grown rose venture that you couldn't possibly produce a rose in a container and at times we did, of course, have very real doubts about it ourselves; however, we stuck it out and have now established this most satisfactory production method. We know for sure that we will never return to growing roses in the field again.