Is it possible to breed varieties which lend themselves to greater mechanization in their propagation? Will it be economic in the future to stick cuttings in containers which are eventually despatched to the customer? What part will growing room play in the future of the plant propagation business? These and many other questions are being raised when propagators meet together and we can be sure that there is an exciting time ahead of us in this particular field of propagation.

BRIAN HUMPHREY: Are there any adverse affects from steaming the peat in the cutting compost?

J. L. KITCHEN: Constant steaming will break peat down but we are removing a lot of compost with the cuttings sold to the growers. This means that we have to top up regularly. We churn up the peat regularly to make sure that the fine particles do not remain at the bottom of the benches. After steam sterilisation a very thorough watering is given to leach out anything which might be harmful.

A MEMBER: Do you have any experience with Finnish paper pots?

J. L. KITCHEN: No. The problem is that we really want something large enough to root a cutting in and also send to the grower. There is a Japanese paper pot we might use but we have not tried the Finnish paper pots.

D. HARRIS: Why do you maintain an air temperature of 60°F? Could this not be dropped to 55°F? On rooting cuttings with bottom heat or under mist how necessary is it to keep the air temperatures as high as we do by traditional methods?

J. L. KITCHEN: The reason is that the whole plant, from the stock plant until flowering, is grown at 60°F. Propagation takes place at the same temperature; you can let it vary a degree or two but anything more may upset the flowering response. The grower is relying on the variety to flower in the stated time, 10, 11, 12 or 13 weeks. We therefore maintain this uniform temperature.

NOTES ON THE GRAFTING OF PICEA PUNGENS 'KOSTERIANA'

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Although the advances made in recent years by the use of mist techniques, have made it possible to propagate difficult subjects from cuttings, a few notes on my experiences in raising *Picea pungens* 'Kosteriana' by grafting, may still be of interest to those who, for one reason or another still continue the practice of grafting this very beautiful tree.

My first experience of grafting this subject dates back to the early days of the Second World War, when for obvious

reasons our supply of this tree abruptly dried up, so if we wanted to maintain a stock we had to go it alone. With this end in view, my boss suggested that I tried my hand at grafting them for ourselves, and in the autumn of 1940 I hurriedly potted up fifty stocks of *Picea excelsa*.

We had a well established tree of *Picea 'Kosteriana'* in the nursery, and in the following January I was able to collect fifty suitable scions. Without delay I grafted these on the *Picea excelsa* stocks using the simple side graft and placed them on their sides in a close propagating case. In due course I had forty eight successful takes which gave me great satisfaction. I rather boastfully declared that the grafting of this subject was child's play; why we had hitherto imported them was beyond my comprehension! I was later to revise my opinion, as will be seen, for this was indeed a case of "beginners luck".

During the next few years, owing to the tribulations of war, it was not possible to make any further attempts at producing this subject, as in common with other nurseries, we had to devote our efforts to the production of things to eat and forego other desirable luxuries. In the meantime our forty eight plants grew into very good specimens, and by the end of the war they were a source of pride to us and were very soon disposed of.

By 1946 we were sufficiently reorganised to start serious propagation once again and it was decided to include one hundred *Picea* 'Kosteriana' in our grafting programme. Our specimen tree was not capable of furnishing us with that number of scions, so they were obtained from a reputable firm. In January 1947 I grafted these on to established stocks, again placing them in a close case with mild bottom heat. They soon showed signs of good callousing finally giving a fair take of some eighty five per cent; not quite so good as the first time but at any rate a worthwhile effort. For the next three or four seasons we repeated these results, still obtaining our scions from the same source and working one hundred at a time. In the early nineteen fifties we stepped up the number to two hundred a year; this time we were not so successful, callousing was not so even over the batch and we finished up with a take of about sixty per cent. I put this down to variations in the quality of grafting wood. We continued for the next two seasons on the same scale and with the same results. During this period I noticed that the uneven callousing was conforming to a definite pattern; those grafted first were the best but they tailed off down the batch. It will be noted that we were obtaining the scions from away; after allowing for the time of collection, packing and transit, some six or seven days would have elapsed by the time they were all grafted, and this I am sure was an important factor for success or failure.

In 1957 I read in a book written by a very reliable authority that the proper time to graft *Picea* 'Kosteriana' was in the

late summer or autumn, so I decided to try this. The experiment was not a success. Our take fell to fifty per cent and the uneven callousing down the batch was much more pronounced. Obviously the time factor was more critical at this season, as the scions deteriorated more quickly than in the early part of the year. Furthermore the scions exuded a gum which set into a resinous wax between the tissues, making a very effective adhesive but preventing proper callousing from taking place. In many instances a number of these lived throughout the winter, but died in the spring.

Not to be defeated, we tried again for the next two seasons with the same results, some fifty per cent take, but the last time we tried in 1965, they were almost a complete failure only some ten per cent being saved. Something was very wrong and I decided that in future I would return to the original time early in the year, and if possible I would get the scions from our own stock. In January 1967 I succeeded in getting two hundred scions from our own specimen tree, taking terminal shoots having not less than three radial buds, and collecting only fifty at a time. These I side grafted using three variations, namely simple side graft and long and short tongued veneer grafts, and as usual put them into the close case. Result, ninety five per cent take without any noticeable difference in the method of grafting employed. I repeated the same procedure in January 1968, with the same successful result, and now feel in a position to do a little summing up with a certain degree of authority. I will therefore proceed to make a few points, for what they are worth, as follows.

(1) *Time factor*

This I considered to be the most critical single point in success or failure. If possible, do not collect more scions than can be worked on the same day.

(2) *Season*

Grafting is best undertaken in the early part of the year.

(3) *Scions*

It is not necessary in my opinion to prepare the stock tree in the traditional way. Any good terminal shoot, having not less than three radial buds (four is better still) will make a satisfactory plant. Provided that the shoot is strong and firm, there appears to be no difference in the results if the cut is made at the base of the current year's wood, or just below the radial shoots on the previous year's wood. In the latter case the graft is, of course, that much larger.

(4) *Stocks*

These should be well established in pots, and should be kept somewhat on the dry side at grafting time, as the roots are quick to resent over wet conditions in the case.

Snagging of the stock should be done in two stages. The first about six weeks after grafting, when they may be reduced by half and at the same time should be stood up in the case. The final snagging should be done when the scions start into

active growth and roots show signs of fresh activity. This is usually about twelve weeks after grafting, when this was done early in the year. After hardening off they should be safe to plant out in the early summer.

FRANK WILLARD was not present to give his talk in person but in the discussion which followed the reading of the paper C. E. SALTER asked whether temperature could have had any bearing on the variable grafting results.

BRIAN HUMPHREY: The most important thing seems to be that the stocks must be thoroughly dried off. The Dutch pay particular attention to this factor.

CHARLES DEMPSTER: Some of the poor results in summer might be due to red spider infestation. Excelsa stocks are often badly affected.