SOME ASPECTS OF WOOD PLANT PROPAGATION IN ENGLAND

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Mr. Chairman, ladies and gentlemen, may I say what a great pleasure it is to be able to talk to you even thought I am very sorry I am not able to appear before you in person. Here at Hillier's now we have quite a happy band of Plant Propagators' Society members. With Pete Dummer, head propagator, and Asger Laursen in charge of mechanization on the nurseries. The next slide after this rather horrible apparition which must be on your screen at the moment is one of Asger on one of those special narrow row tractors and the following slide shows Pete Dummer at work in one of our rather old-fashioned English propagating houses. Next we see Pete at work on one of the older types of grafts, the Rhododendron saddle graft which was up to a few years ago very popular here. We find, however, that this graft shows very little advantage over the side-veneer graft recommended and described by Mr. Wells in his book on propagation. It is surprising how tradition dies hard for the side-veneer graft which we can see on the next slide is a very much better proposition for our beginners and has proved to be very successful and relatively simply. We do like to pick stocks with young green bark rather than older more woody stocks which are suitable for saddle grafting. I'll say more about grafting later on. But let's move on to propagation by cuttings. Here we see a good old mist propagation system which was installed on a glass house at Kew Gardens many years ago. This was one of the original mist installations in the country. The type of system used here was the Mac Penny type which has the misting nozzle coming up in a stand pipe through the bench. This system has the advantage of simplicity and lack of support needed to carry overhead lines which were used in the N.I.A.E. — National Institute of Agricultural Engineering system which we can see in the next slide. In this slide we can see a MacPenny mist system in the foreground and the N.I.A.E. system labeled on the bench behind. The N.I.A.E. system has the advantage over the MacPenny system where it comes to using containers on the benches. There is absolutely no obstruction whatsoever to these containers by the stand pipe which comes up through the bench on the Mac Penny system. Other advantages claimed for the MacPenny type system are the relative freedom from drips and the MacPenny nozzles themselves are a very well made job and do give extremely fine atomization of the water. Generally speaking most mist installation in this country are installed in glass houses. An exception, however, may be seen in an outside installation using a number of Dutch lites layed on their

sides, the mist nozzles are situated inside, and the whole frame is covered with a roll of slatting. This system works very well for cuttings inserted during the summer months but they do not make any use of this equipment in the winter and it's turned off. When I last looked at this installation there were many choice plants including *Magolia soulangeana,* which were rooting very well indeed under these conditions. They do have bottom heat fitted in the form of electric cables which are thermostatically controlled. Humidification or as I believe you call it, fogging, has not become very popular. Quite honestly the climate is so humid anyway, I wonder if we would really need a fogging installation.

The next slide shows a humidifier system fitted to a glass house in Boskoop. This house was double glazed — that is two layers of glass spaced about ⅝ inch apart by specially adapted glazing bars. One of the important points said in the use of humidifier was to have a house with a high ridge. In other words a large cubic capacity. This prevented the fog from condensing readily on the glass in addition of course to the insulating effect of the double glazing and prevented excessive amount of drip which is supposed to be one of the big drawbacks of the fogging system. The experimental station in Boskoop has carried out trials comparing the use of double glass, mist and humidifier systems and the last time I was over there, about two years ago, they were considering giving up the use of the humidifier system completely as it appeared to be inferior to the other two systms. I must say, however, that this opinion wasn't shared by everyone in Boskoop and some of the very best growers and very best propagators seemed to be very keen and very enthusiastic about the humidifier system, thinking that it has advantages over any other propagating system for cuttings. It is important to remember I think though that this isn't the only means of propagating cuttings and we attempt to make good use of some of the more traditional methods which were popular before the introduction of mist. One of these is rooting cuttings in a cold frame, or in summer time it is frequently called the sun frame. And here we propagate more easily rooted types of plants such as forsythia, weigela, spiraea, etc. and the technique is briefly to put a layer of sand 2 - 3 inches deep on natural soil which should preferably be well drained. Erect on top of this some boards and then place frame lites, Dutch lites, English lites, or this year we've tried polyethylene over the sand. It is necessary of course to hand spray. We are considering installing a hand operated misting system. Having mentioned sand reminds me that pH is a very important factor we think in the rooting of cuttings. And we did take great care to search for a grade of sand which had the necessary low pH. After some months we found a sand which has a pH of 4.5 and we check this reading occasionally to be sure that we are being supplied with an even sample. It does vary

somewhat but it's surprising once you hit upon a seam of sand which is acid in reaction, it appears that it tends to stay that way.

We have heard a great deal about the use of fungicides such as Captan on cuttings. On some varieties of Rhododendron, the effects of Captan are quite outstanding and I might say this response isn't uniformly shown on all varieties and all species of Rhododendron by any means. I wish it were. It would appear that Captan is acting as a growth substance rather than as a fungicide because the cuttings without Captan which have not rooted have not in fact generally rotted.

These Rhododendron and the *Acer palmatum* shown on the next slide were treated with IBA in quick dip form. I think we can claim to be one of the pioneers of the use of quick dip hormones commercially and we have now had some four to five years experience with their use. We are quite convinced that for species which require high concentrations of rooting hormone, the quick dip method of application is by far the best. The *Acer saccharinum* which we see here was inserted on the 1st of June and the photograph was taken on the 18th. In other words a very extensive root system can be built up in a cutting in a matter of a fortnight with *Syringa vulgaris* varieties we do occasionally get rooting in 7 - 10 days. This is using extremely soft cuttings and the optimum concentration of IBA. The strength of IBA varies considerably of course from species to species and even from cutting to cutting. And I don't believe it is possible to get the absolutely perfect optimum concentration for every cutting. What we aim to do and this I think is a rather new concept, certainly for English propagators anyway, is to use a concentration of IBA above the optimum. In other words we deliberately set out to damage the base of the cutting by a high concentration of IBA. This is once again I must stress with species such as Rhododendron and Acers, and Azaleas which do appear to be tolerant of high concentrations in any case. With *Syringa vulgaris* as well we are not all perturbed by killing off the bottom quarter or half inch of the base of the cutting by a strong application of IBA. It's roots that we want and not callus and the fact that a cutting is callusing up well at the bottom is usually an indication to us that the IBA concentration was not sufficiently high. We find that by applying a rooting hormone in a quick dip form, that wounding is generally unnecessary. And it would appear that the alcohol content of the quick dip carries the rooting growth substance into the stem sufficiently well to make wounding quite superfluous.

Using these ideas we are now rooting most of the so called hardy hybrid Rhododendrons — Pink Pearl, Cunningham's White. We have been able to root *R. sinogrande* using 3% IBA dissolved in 60% alcohol, but rooting results are never

consistent and never very high and we still favor grafting for these types at present anyway.

I though you might be interested in this next slide which is of the nurse seed grafting technique which was described in one of the Plant Propagators' Proceedings. I have shown this for two reasons. Firstly, it forms a convenient bridge between techniques of propagation by cuttings and by grafting which I hope to discuss next. The other reason is to make just one comment on this technique. When Professor Moore described it, he did say that the scion inserted into the germinating seed produced roots. Pete Dummer and I carried out this technique a while ago and I am sorry to say we were never able to see these roots breaking from the scion. From our observation, the roots always appear to come from the cut stumps of the cotyledons. These rooted very readily indeed and we found the longer they were left after cutting, the more roots we produced. But as I have said we never have been able to see any roots coming from the scion itself. As far as we can see they have no real commercial application. Growth seems to be very slow indeed and the only real benefit we could see would be the complete freedom from suckering which you would get with this type of plant.

The next picture shows our beds of potted understocks ready for grafting the following spring and summer. In order to avoid some of the high labor involved in potting up these stocks we are naturally interested in the idea of grafting onto bare rootstocks. And although it is often perfectly feasible, the next slide which is of walnuts shows one of the effects at at least that you are liable to get by using bare rootstocks. We have compared the growth rate of grafts worked onto an established understock and a graft worked onto a nine-month-old unestablished rootstock. As you will see the rootstock established in a pot for 2 years showed considerable gain in growth over the unestablished stock.

Of course grafting the wide range of plants we do at Hillier's, one of our big problems in grafting is the question of compatibility and incompatibility. For example, with magnolia we need to grow five different stocks to insure compatibility of all the scion varieties which we use. We grow 4 or 5 different maples and 3 or 4 different Quercus species as understocks to avoid incompatibility problems. Oaks are notoriously bad for forming a good union and we always treat them with great care up to 2 - 3 years after the grafting procedure. They are always weak at the union for this stage and losses in the nursery can be heavy if you have some rather big footed nursery workers.

The next slide shows the importance of temperature during the grafting period. A discussion of the condition necessary during the grafting stages I'm afraid is out of the question in the short time at my disposal. I can only express the extreme importance of thoroughly drying the understack be-

fore grafting. This was touched on by Dr. Dorsman in his paper recently at the International Horticultural Congress. And we, for our part. always so far as possible insure the stocks are as dry as possible at the grafting stage. Temperatures are generally best in the 60 - 65°F. region, but some genera do appear to have a higher temperature requirement and Juglans are quite happy in temperatures up to 80°F. Generally speaking we do not have remarkedly good results by budding, certainly in this part of England at least. I often read with envy some of the successes that you have in the States by budding techniques. Whether the fault is ours or of the climate I do not at this moment really know.

Well now ladies and gentlemen if no one has yet turned me off, I'll close on the next slide which I suppose must be one of the most famous horticultural views in the world — it's of the palm house at Royal Botanic Gardens at Kew and wish you every success for the following lectures in your meeting and thank you very much for listening to me.

CHIKO HARAMAKI: Our next speaker is our program chairman, Stu Nelson, from Saskatoon, Saskatchewan.

THE ROLE OF BOTTOM HEAT IN THE ROOTING OF CUTTINGS

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Bottom heat is a practice of supplying additional heat to the medium and is not limited to the rooting of cuttings as we propagators might think. In fact, it possibly has more use in the forcing of growing plants than in the rooting of cuttings. I suppose that the first use of bottom heat can be traced back before the "Dark Ages" as with most of our horticultural practices, but I have not tried to do this. Rather, I will limit my remarks to the use of bottom heat—mostly electrical—as we know it today. It would seem that the acceptance of electricity, rather than manure, could be dated at around 1930 and in the early 1930's, there were a number of reports from different countries describing the installation and economics of such a procedure (1, 4, 7, 15). The economics of electricity over manure would seem to have been easily proved (5, 23) but I am not sure that I can say the same, without considerable reservation, for the beneficial effects on rooting.

By the way bottom heat is tossed around in conversations at this meeting, one would suspect that it might be the password to success and that the literature would abound in references. Neither would appear to be true. In fact, good experimental comparisons, either in favor or against bottom heat as a tool to aid rooting; are very few. It would be dif-