jects in terms of: aeration, insulation, moisture retention, and drainage.

SOME ASPECTS OF THE PROPAGATION OF RHODODENDRON, MAHONIA, AND ILEX BY CUTTINGS

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RHODODENDRONS

Most textbooks advise using relatively thin growths, preferably without a flower bud and, indeed, for the more difficult to root cultivars this is sound advice. However, for easier rooting cultivars, such as 'Pink Pearl' 'Sappho', 'Tortoiseshell Scarlet' and 'Cunningham's White', we deliberately choose strong vigorous shoots because we find we can still obtain a high percentage of success with this type of cutting and, of course, we get a much stronger one-year-old plant for lining out. Incidentally, this is a philosophy which we use with all plants where enough material is available. The terminal bud, whether vegetative or flower, is removed to encourage bushy growth. A wound is made on each side of the base of the cutting and about four leaves are left on. In the case of large-leaved cultivars, or those which have a spreading habit, these are trimmed by as much as ½ to prevent overlapping and consequent decay in the cutting bench. A start is usually made on making cuttings during the second week of October and the job is completed about a month later.

One of the problems frequently encountered with rhododendron cuttings after insertion is deterioration of the base, even with easy rooting cultivars. In my experience, once this sets in it will usually extend all the way up the stem and the cutting is lost. There are several possible causes:

a) The main one is undoubtedly poor aeration at the base of the stem, to which rhododendrons seem particularly susceptible. This is, of course, related to the rooting medium and the air/water ratio within it. We have experimented with various combinations, such as mixtures of peat and sand, peat and grit, and peat and expanded polystyrene, but have reached the conclusion that the most satisfactory medium is pure sphagnum peat (fine grade). However, it is important that the peat should be correctly prepared; I prefer it to be fairly light and dry when the cuttings are inserted. To increase aeration at the base of the cutting we have even gone as far as to place a false bottom in the bench of wire netting, providing an adequate number of holes are bored in the base of the bench to facilitate drainage and the upward passage of air into the bench. After insertion, the cuttings are heavily sprinkled and then covered with a sheet of 150g clear polythene film. Moisture condenses on the undersurface of the polythene which, being in direct contact with the leaves, prevents their drying out. I consider this to be a more satisfactory system than mist because less water is involved and, therefore, problems with poor aeration due to over-wet compost are less likely to occur. The polythene is removed once a week and is left off overnight to give the cuttings a good airing. Before the polythene is replaced the cuttings are sprayed lightly with water. By the time rooting commences, moisture from the condensation has worked its way down into the peat and no major watering is given until rooting is fairly well advanced when the peat is given a thorough soaking.

b) Other causes of stem deterioration are related to hormone and temperature levels, either individually or combined. We use various strengths of IBA in talc, usually mixed with an equal volume of captan dust. Thus a mixture of equal volumes of 4% IBA and 50% captan dust will produce an effective rate of 2% IBA. Too high a strength of hormone may cause damage to the base of the stem and subsequent breakdown, especially when combined with too high a temperature at the base of the cutting. We have suffered losses in the past which I am sure have been caused by these factors and we now take great care to see that our thermostats are functioning correctly before we start. We try to maintain a temperature of 65/68° F (20° C), no higher.

c) Another factor which may be involved is light intensity. As we all know, light intensity, temperature, and moisture levels are all inter-connected. An experience we had several years ago is worth recalling. That year the glasshouse which we use to root rhododendrons had been used for another purpose during the summer months and shading had been applied to the glass. This was not removed when the cuttings were inserted and on inspection about two weeks after insertion the whole batch of 5,000 cuttings was discovered to have begun deteriorating from the base. These were removed and so was the shading, and a further batch of cuttings taken, all other conditions and treatment remaining the same. This time rooting proceeded normally. Ever since we have taken great care to clean the glass before taking our cuttings and fortunately we have not suffered any similar disasters.

Hardening off and Bedding out. The cuttings remain in the rooting benches until the end of March by which time most will be strongly rooted. About a month earlier the undersoil temperature is reduced and the polythene is left off for longer periods at each weekly uncovering. A little ventilation is given on suitable days until the cuttings are thoroughly hardened off. They are then lifted and lined out approximately 5″ × 5″ in cold frames in a mixture of peat and leaf mold. Prior to planting an application of aldrin dust is worked into the compost as a precaution against vine weevil which can be a serious pest in this crop. After lining out, the rooted cuttings are thoroughly watered in and covered with shaded glass until growth commences.

We consider that removal from the propagation house to the cold frame is essential at this time while there is still a certain amount of cold weather to come, for the following reason. When we first began rooting rhododendrons cuttings, instead of the system I have just described, we potted the rooted cuttings and then stood them in a slightly heated glasshouse where the temperature was not allowed to fall below 40°F. We noticed that the first flush of growth was then very uneven, some cuttings not breaking at all, some making only very short growths and some breaking very late in the season. When the cuttings were removed to the coldframe about the end of March, however, flushing is strong and even. We have, therefore, concluded that a certain amount of low temperature is needed to promote normal growth. Of course, this only applies to cuttings taken in late autumn and which remain in the rooting bench throughout the winter; it is interesting to note that where cuttings are taken earlier and potted or lined out in coldframes before the end of December (as is often the case in the U.S.A.) the problem does not arise.

Subsequent Treatment in the Cold Frame. Once growth commences, ventilation is gradually increased and the lights finally removed. As soon as the first flush of growth is complete or just before, the tips are removed to encourage a further flush which will produce a fine bushy plant for lining out. In some years, with certain cultivars, it is possible to obtain three flushes of growth in one season by frequent stopping. An application of a balanced liquid fertilizer is given after each stopping.

Lining Out in the Nursery. Lining out in the nursery generally takes place in early autumn so that the frames are empty and ready to receive next year's crop the following March. Most cultivars will produce a saleable plant 18″ to 24″ high in two years from planting out, thus giving us a three year production cycle altogether.

MAHONIA JAPONICA

The problem with mahonias, as far as we are concerned, is always lack of material due to the naturally slow growth of plants in this genus. Apart from *Mahonia japonica* which, of course, can also be raised from seed, we are concerned with bulking up of some of the fine new hybrids of *M. japonica* and *M. lomariifolia*, *M. media 'Charity'*, its sister seedling *'Winter Sun'* and possibly the best of them all *M.* × *media 'Lionel Fortescue'*.

In order to make the most of the material we have we use leaf bud cuttings. These are taken during December/January. A single wound is given and the cuttings are then treated with 2% IBA in talc. They are then inserted singly into 2″ clay pots in pure sphagnum peat and plunged up to the rim into a heated glasshouse bench filled with peat and covered with polythene as already described for rhododendrons. A high rooting percentage is usually obtained and the rooted cuttings, after hardening off, are knocked out and potted on into 4½″ pots in which they are grown on for the rest of the season. Early the following season they are potted on into 7½″ whalehide pots and a saleable plant about 18″ high can be produced in two years.

ILEX AQUIFOLIUM

The propagation of hollies by cuttings is not a difficult operation and I do not propose to go into it any great depth. We usually take cuttings in late November or December using, where possible, strong terminal growth 15 cm long. These are rooted under similar conditions as already described for rhododendrons and mahonias, i.e. under polythene film and using a medium of straight sphagnum peat. We have also used mist in which case a more porous compost of peat and grit is used to cope with the extra moisture. Besides a wide range of cultivars of *Ilex aquifolium* and *I.* × *altaclarensis* it may be of interest that we also propagate the common *I. aquifolium* by cuttings. Although usually raised from seed, it may be 3 to 4 years before young plants 30 to 45cm are produced. By careful selection of strong vigorous cutting material, it is possible to produce well-branched liners of this size in only one season and with the added advantage of being much more even than seed-raised plants.

Because of pressure of work in the last two years we have taken our cuttings as late as January and early February; it has been interesting to note that results are equally as good as when cuttings are taken in November. They seem to root remarkably rapidly at this time and are usually strongly-rooted one month from the date of insertion.

Once rooted the cuttings are hardened off; we like to lift and pot just as the terminal bud begins to show signs of movement. They are then placed in coldframes under shaded glass until established, when the glass is removed. At the end of the first flush of growth the plants are stopped to encourage side branch. As with rhododendrons, vine weevil can be a serious problem in the pots and aldrin is used as a control.

LIGHT INTERLUDE — PHOTOPERIODISM

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The title of this talk is taken from the chapter heading of a book that I have just written but which has not, I am afraid, yet found a publisher. The book deals with *inventors;* not so much what they invent but the manner in which their minds work and how they come to have their inspirations. One of the points I try to make is that the inventor's mind is quite unlike that of, say, a designer or a research worker. A designer may be a very clever fellow indeed, as also are research workers such as biologists and chemists, but they suffer from one great fault which absolutely precludes them from being inventors . . . they cannot see the wood for the trees! Examples are given below to illustrate this allegation and it so happens that they are all about photoperiodism, hence the title.

Since photoperiodism was discovered in 1911, thousands of researchers have studied the effect in detail, making painstaking observations on hundreds of thousands (if not millions) of plants to determine whether they are long-day plants or short-day plants, or to study the effects of night breaks, etc. I have recently read two very erudite books on the subject, both by English authors; Harry Smith (Phytochrome and Photomorphogenesis, — McGraw-Hill, 1975) and Daphne Vince-Prue (Photoperiodism in Plants, — McGraw-Hill, 1975). They both quote about 500 references and Harry Smith actually draws attention to the fact that there were some 2,000 papers on the subject, so it can hardly be said to be an uncharted sea. It would appear that very clever people have now isolated the actual element responsible for performing the act of photoperiodism, — a molecule called *phytochrome.* Like other complex organic molecules, such as *chlorophyll* and the hormones, there is every

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