A General Review of Woody Plant Propagation

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In the year 1802, in the pioneer community of Manchester, Ohio, a boy of 16 wished to establish an apple orchard. Since there was a nurseryman in his family, he had already been taught how to bud, splice-graft, and cleft-graft on established stocks, but stocks were scarce. Apple seeds were probably available, but Joseph Curtis couldn't wait. He picked up a few apple roots which had been turned up by his father's plow, cut them in pieces and grafted scions onto them. The grafted plants developed into good productive trees and thus began the now common practice of root-grafting.

ROOT GRAFTING

Root and collar grafting are particularly well suited to the propagation of both commercial and ornamental apples. In good cultural conditions, root grafts will produce a high percentage of well-branched salable trees at the end of the second growing season. Since the grafting can be carried out during the winter, this technique helps to spread the propagation work over the entire year.

Modern propagators are rarely confronted with a shortage of stock, since suitable stocks are readily available from several large seedling producers. The Yakima Valley of Washington is a particularly famous area for seedling stock production.

For root-grafting on apple, I usually obtain straight seedlings in No. 1 three-sixteenths and up grade. We find that we can make about 250 grafts from every 100 such seedlings. We make the first graft well above the collar of the stock using a relatively short scion and a relatively short portion of the seedling root. The second and occasional third grafts are made on the piece roots using somewhat longer scions. These grafts are all planted deeply in early spring and I have not noticed any marked differences in their subsequent development.

SIDE GRAFTING

Such ornamental species as Magnolias, Japanese maples, and flowering dogwoods are commonly grafted on started stocks in winter. During recent years, I have worked away from my former practice of plunging such grafts in peatmoss in a 70° case. I believe that it was Mr. James S. Wells of Koster Nursery who first suggested that I ought to try such grafts on the open bench in a 60° house. We are still plunging grafts of flowering dogwood, but we are handling all magnolias and many maples on the open bench. For these plants we use side grafts with dormant scions on very slightly started stocks, usually with the buds just beginning to swell.

Following grafting, we dip the entire graft in ordinary parowax. We have a small thermostatically controlled hot plate which will maintain the wax at about 160°. I feel that it is rather important to maintain this temperature. Colder wax may coat the plant too heavily and delay growth while hotter might destroy the buds. We heat our wax in an old ice cream container which is about 6 inches in diameter and 15 inches deep. At the close of each day's work, we put our container into a home-made insulated half-barrel so that the wax will heat up quickly the next morning. This not only increases our general efficiency, but it helps to avoid the sometimes

dangerous practice of trying to heat grafting waxes too quickly.

With deciduous plants in general, we remove the entire stock in one operation by severing it just below the upper end of the graft union. I like to see stocks cut very low, possibly lower than in conventional practice since I believe that low cutting leads to quicker healing at the union. With conifers, we remove the stocks in two or more operations depending upon the species and the progress of the scions.

PLUNGING

We are still plunging our narrow-leaved evergreen grafts usually in a closed case with about 70° bottom heat. There are, however, two serious objections to this practice. One is that it is often difficult to maintain proper moisture conditions in plunged pots. The other is that we frequently lose many leaves on both stock and scion when grafts are plunged for long periods. I have found that grafts plunged in a mixture of Styrofoam A and peatmoss (1 part each by volume) can be syringed frequently without producing much settling and sogginess in the plunging medium. The Styrofoam A adds buoyancy and permeability to the mixture so that both pots and foliage can be kept suitably moist. Although we still lose a lot of foliage at times, I believe that the mixture has produced some improvement over pure peatmoss.

BUDDING

Bud-grafting, or budding, is one of the most efficient and commonly used of all propagating techniques. During the current year at the Arnold Arboretum, we have successfully budded *Malus, Prunus* and *Sorbus* in variety together with a few *Castanea, Cercis* and other species. We usually use budwood of the current season's growth on well-established stocks in which case the buds remain dormant until the following growing season. This year, however, we budded a few apples, using as budwood scions saved from our regular winter grafting. These scions were stored at 35-40° until mid-July, when they were used in plate budding on spring-planted apple stocks. Even at this late date, about half the buds began to grow within a few weeks. The stocks were then cut off above the developing buds.

PLATE BUDDING

We followed the method described by Mr. W. R. Leslie, Superintendent of The Dominion Experimental Station, Morden, Manitoba, in his publication "Results of Experiments 1931-1937." A flap of bark and wood is lifted from the side of the stock by a single downward stroke of the knife just as if the stock were being prepared for a shallow side graft. This flap is then shortened by a horizontal cut, leaving sufficient flap to come up to, but not cover, the bud. The bud may be prepared as in shield-budding, or it may be made into a narrow wedge at the base. In either case, it should be carefully fitted to the cut surface of the stock and securely bound with rubber budding strips or comparable material. Mr. Roger G. Coggeshall, assistant propagator at the Arnold Arboretum, has found this method easier to learn and to carry out than shield-budding.

Mr. Leslie reports that May is the best time to apply plate buds at Morden. If the budding is done before the leaves unfold on the stock, the stock should be cut back to within about 6 inches of the bud; if the leaves have unfolded, the stock should be cut back to the bud. Apple and crab have given best results with stored scions collected the previous autumn, but several species of *Prunus* have done better with scions obtained in late

winter and then stored for a relatively short time. Waxing may be of value with both apples and stone fruits, especially the latter.

I should think that plate budding in early spring would be a useful technique in many nurseries, particularly if scion wood were scarce, or if economic or special cultural conditions made it undesirable to leave stocks in the same location for more than two years. In some nursery areas, for example, apple roots are likely to become infested with woolly aphis during their third year in the field. Spring budding on spring planted stock might offer a partial solution to this problem.

On certain occasions, as when one desires to bud after the bark has ceased to slip properly, plate budding might be used to extend the normal budding season into early, or even late, autumn depending upon locality. For such late budding, freshly collected bud-sticks might be very successful.

USEFULNESS OF BUDDING AND GRAFTING

Any grafting technique practically assures the propagator that the grafted plant will be true to type and that it will almost always perpetuate the characteristics of the parent plant. Minor variations may occur in a vegetatively propagated plant, such as the McIntosh apple, but they are of distinctly minor importance when compared to the uniformity of McIntosh apples as a whole.

Although it is this uniformity which makes budding and grafting so valuable, increased vigor, hardiness, insect and disease resistance, and special form may all be imparted to plants by the grafting process. The role of grafting in increasing the vigor of rosebushes and in the development of hardy "frames" for apple trees, will be well known to this group. I should like, however, to speak briefly about insect resistance and special forms.

INSECT RESISTANCE

During the past year, I have become interested in the problem of

Fig. 1.—Rhododendron mucronatum (Azalea ledifolia alba). Plant at left was sprayed with 0.6% maleic hydrazide to induce bushy development; plant at right was not sprayed.

woolly aphis resistance in apple stock. There are several promising stocks in the experimental stage, and two which have been used commercially. The first is Ivory's Double Vigor which originated in the plantation of Ivory's Limited at Rangiora, New Zealand. This stock is believed to be a French crab seedling. It is not commonly available. The second, which has been used extensively in both New Zealand and South Africa, is the Northern Spy of American orchards. Both of these stocks have to be propagated vegetatively, which would doubtless make them expensive in relation to seedlings. I believe, however, that it would be well worthwhile for nurserymen to consider Northern Spy understocks if only to ensure a permanent stock block of apples in woolly aphis intested areas.

SPECIAL FORMS

Grafting may be employed to combine separate sexes in one plant, to produce standards of various kinds, and to produce dwarfs. There is perhaps more interest in dwarfs than in any other special form.

DWARFING

The fundamental causes of dwarfing are unknown but, at least in some cases, it is possible to identify a dwarfing stock by observing the relative masses of wood and bark in its roots. Standard stocks are characterized by much wood and relatively thin bark while dwarfing stocks have relatively little wood and very thick bark. This bark-wood ratio is evidently much more important than the growth rate or general development of a given stock on its own roots. There are doubtless slow-growing dwarf apple trees with normally thin-barked roots which would probably not make good dwarfing stocks. They may indeed give rise to normally vigorous trees in which the scion apparently overcomes the lack of vigor in the stock.

A particularly interesting feature of dwarfing stocks is that the dwarfing effect seems to limit the ultimate size of the tree more than its initial growth rate in the nursery row. Trees budded or grafted on dwarfing stocks may make a normal or near-normal growth for two or three years, but they will eventually slow down and will never attain normal size. In order to avoid scion rooting, all dwarf trees must be planted with the graft unions well above ground. This fact should be strongly impressed on every amateur gardener who purchases such trees. If planted too deeply, scion rooting will soon eliminate the dwarfing effect of the stock.

DWARFING STOCKS

The common quince, which is ordinarily grown from cuttings and used as a dwarfing stock for the pear, is perhaps the best known and most widely accepted of all dwarfing stocks. There are several dwarfing stocks for apples of which the various East Malling selections have received much attention. Clark's Dwarf, which has been developed at the Iowa State College, Ames, Iowa, is one of the most commonly used dwarfing stocks in American nurseries. At the Arnold Arboretum, the semi-dwarfing stock *Malus sikkimensis* is being tested both for commercial and ornamental varieties of apples (See Arnoldia Vol. 10, No. 12). Since this species comes practically true from seeds, it combines the desirable features of a clonal line with relative ease of propagation. In combination with McIntosh, the horizontal branching habit of the stock appears in the scion so that the resultant trees have very strong wide-angled crotches.

As far as I know, there is no generally accepted dwarfing stock for any stone fruit, but *Prunus tomentosa* looks very promising for several varieties of peach.

Dwarfing stocks for ornamentals are relatively underdevoloped although Professor L. C. Chadwick of Ohio State has suggested *Juniperus horizontalis* as a possible dwarfing stock for varieties of juniper. Professor Karl D. Brase of Geneva, N. Y., has done some testing of crabapples on Malling IX.

INCOMPATIBILITY

If all the unfavorable or abnormal phenomena, which can follow grafting, may be properly regarded as incompatibility, then incompatibility may be either disastrously harmful or relatively harmless.

Mr. W. D. Weeks, of the University of Massachusetts, Amherst, Mass., has reported that when certain strains of McIntosh are summer budded on Spy 227 rootstocks, both bud and stock are killed by the operation. Such extreme manifestations are relatively rare.

Overgrowths of scions are generally regarded as more undesirable than similar development of stocks, yet both are sometimes relatively harmless insofar as long life, flowering and fruiting are concerned. In the Arnold Arboretum, I have recently observed mature grafted plants of maple and horsechestnut which exhibit marked overgrowths at the point of union, yet both species are apparently vigorous and normal.

In the "perfect" graft union, the wood and bark of both stock and scion lie side by side in such a manner as to permit both elements to perform their normal functions of conduction and support. In imperfect unions, poor conduction of water, mineral nutrients, and elaborated food materials may limit the growth of both stock and scion. The union may also be weakened by the inclusion of thin-walled cells among the normally thick-walled cells of the woody area. Such unions may persist for several years, but ultimately the scions will break off smoothly at the point of union. Such clean breaks, especially when associated with poor growth, are the most common and most serious manifestations of incompatibility.

COMPATIBILITY

Botanical relationships are frequently a relatively poor guide to compatibility in grafting, but it is substantially true to say that seedlings of a species will usually make the best stocks for its subspecies and varieties. This is not to say, however, that one species may not be satisfactory as a stock for several others in the same genus, nor that grafting between genera will be necessarily unsuccessful. Most five-needle pines, for example, may be successfully grafted on white pine, while common quince, or *Cydonia*, is reasonably compatible with several varieties of pear, or *Pyrus*.

It is often possible to achieve a compatible union by using an intermediate stempiece of a variety which is compatible with both stock and scion. Clapp's Favorite pear, for example, is incompatible with quince but it can be successfully grafted on Old Home which unites well with quince. Buerre Hardy is a suitable intermediate for Bartlett pear.

CUTTINGS

Cuttings are of great and increasing importance in the propagation of woody plants, especially ornamentals. I personally do not believe that grafts will ever be entirely superseded by them, yet I am sure that many plants, now perhaps most commonly produced by grafting, will eventually be propagated almost exclusively as rooted cuttings. Broad-leaved rhododendrons, Japanese maples, magnolias, lilacs and even Florida dogwoods are now being profitably rooted by commercial nurserymen while all of us root

Taxus, arbor-vitae, and numerous deciduous shrubs on a more or less routine basis.

Of the numerous factors which may influence rooting and subsequent development, I wish to include only position of cut, hormones, and overwintering in this discussion.

POSITION OF CUT

Professor L. C. Chadwick of Ohio State University has made extensive studies on the effect of position of cut on the rooting of many species. His original papers are unfortunately out of print, but his recommendations for 86 species are presented in convenient tabular form on page 75 of "How to Increase Plants" by A. C. Hottes.

This table indicates that a cut one-half inch below a node is more effective with a wider variety of woody plants than a cut in the corresponding position above a node. A few genera, including weigela, will root better with the cut in the upper position. Cuts made at a node were more successful for several genera including six varieties of cotoneasters.

In our propagating work at the Arnold Arboretum, we have frequently had good success with cuttings of the basal ring type in which an entire short shoot is cut through its point of origin on an older branch. Some growers call this type cutting with a heel, but I prefer to reserve this term for those instances in which the cutting is removed with a much larger inclusion of older wood. With lilacs and viburnums, we do not ordinarily shorten these shoots, but I believe that removal of the soft tips is desirable with Japanese quinces and some of the more difficult azaleas. With rapid growers, we customarily include only one season's growth in our basal ring cuttings, but with slow growers, such as boxwoods, we may make the cut with two or even three year wood at the base.

HORMONES

The use of synthetic hormones is a well established and often beneficial practice in rooting cuttings. Assuming that one is thoroughly familiar with the most suitable hormone and the optimum concentration for the species under consideration, hormone treatments will unquestionably promote improved results with a wide variety of plants.

When the requirements of this assumption cannot be met, the indiscriminate use of hormones may do more to inhibit than to promote rooting. We must always remember that plants produce their own hormones and that these natural hormones are often present in sufficient amounts to ensure successful rooting.

I do not wish to be misunderstood. I am a pro-hormone man and I have successfully used hormones on dozens if not hundreds of species. In my present position, I am sometimes confronted with plants whose response to synthetic hormones is unknown. Indeed I may not even know what the plant is and it is with such plants that I feel particularly cautious.

When unknown response or identity is also associated with a shortage of propagating materials, we use a medium strength synthetic hormone on all species of the genera *Ilex* and *Rhododendron*. With all other unknown plants, we use no hormone treatments because we feel that we are just as likely to inhibit as to promote rooting. If propagating material is abundant we customarily include both treated and untreated cuttings for every species. In this way, we can accumulate data concerning the most effective use of hormones.

MALEIC HYDRAZIDE

Hormones, or hormone-like substances, may also be used to induce bushy development, thus eliminating laborious hand pinching of rooted cuttings. Although I cannot recommend its use on other than a trial basis, one of my experiences with maleic hydrazide shows definite possibilities in this connection.

Early in 1950, I carried out a series of experiments with maleic hydrazide (See Arnoldia Vol. 10, No. 6), a hormone-like chemical which was sent to us for experimental purposes by Dr. John W. Zukel, Naugatuck Chemical Division, United States Rubber Company, Naugatuck, Connecticut, as a solution containing 30 per cent by weight of the active ingredient in the form of the Diethanolamine salt. This new chemical is apparently effective in temporarily inhibiting growth in certain plants. When growth is resumed, there tends to be a greater-than-normal development of side shoots (See Figure I).

On January twenty-first, 1950, a few actively growing potted cuttings of Rhododendron mucronatum *(Azalea ledifolia alba)* were severely injured by spraying to run-off with a 0.6 per cent maleic hydrazide solution. This solution was prepared by adding 20 grams of the 30 per cent formulation, containing 6 grams of the active ingredient, to one liter of distilled water. A small amount of wetting agent was added to increase the effectiveness of the spray.

Both the treated plants and appropriate controls were left in the warm greenhouse in which they had been growing. On April fourteenth, or about three months after the treatment, the sprayed plants were forming new roots and there was considerable evidence of renewed bud activity. Within a few months, they were as large and apparently as healthy as the controls. They were, however, much more compact and bushy.

I now believe that the concentration of 0.6 per cent was higher than necessary and that a lower concentration might have produced a substantially similar effect with less temporary injury to the plant and a shorter period of inhibition. Maleic hydrazide is apparently more effective and less injurious on ericaceous plants than on some other species.

OVERWINTERING

There is often a big gap between a well established plant and a rooted cutting. Some plants may root well and either fail to withstand potting or die during their first winter. I believe that these difficulties are most frequently experienced with summer wood cuttings.

We have repeatedly rooted *Viburnum juddi* as soft current year twigs taken in July only to have them die within a few weeks after potting. They seemed to be affected at the soil line by some disease comparable to damping-off of seedlings.

In August, 1949, we made a small-scale comparison between soft cuttings of the current season's growth and twiggy short shoots with two or even three-year-old wood at the base. We found that such twiggy shoots would root as well or better than younger material although somewhat more slowly. This type of cutting, however, has given us much better survival and we believe that the age, or at least the firmness, of the wood at the base has a great deal to do with successful overwintering of this viburnum. Contrary to the experiences reported with magnolias and some other species, there seems to be no marked advantage in having these cuttings growing before being placed in a cold house for the winter. We have

perhaps not yet secured commercially profitable survival of our twiggy cuttings but we believe that we are working towards it both for *Viburnum juddi* and *V. carlesi*.

SEEDS

Although nearly always characterized by less precision of reproduction and frequently lacking the speedy development obtained from grafts and cuttings, propagation by seeds is still of the utmost importance. The production of seedling stocks alone is of sufficient interest to warrant inclusion of seeds in a review of this kind. One could easily give a whole lecture on the importance of seeds in the production of forest trees and general nursery stocks. I wish, however, to confine this discussion to three little-known techniques which we have found useful in the production of plants from seeds.

CLEANING FLESHY FRUITS

We have recently purchased a Waring Blendor for cleaning small lots of fleshy fruits. We first learned of this machine through an article by Mr. B. C. Smith of Ohio State University who recommended it for cleaning seeds of hawthorn. His results were published in the American Nurseryman (Vol. 92, No. 11).

The Waring Blendor is essentially a motor with a shaft which revolves at high speed to rotate two cutters which are suspended in the base of a specially designed bowl. Unless the timing is very exact, these powerful cutters will smash many seeds, even thick-coated Prunus.

We have been able to reduce such injury by covering these cutters with Tygon Tubing* (1/8 inch wall, 1/8 inch inside diameter). We removed the cutters, dulled the sharpest edges on an emery wheel and then pressed on short sections of the tubing. We believe that this protection would be reasonably adequate and satisfactory for such fruits as ripe crabapples and many viburnums, but the tubing wears out too quickly to be practical with *Prunus* and other hard coated seeds with sharp edges.

Upon the suggestion of Mr. Alfred Fordham, Assistant Superintendent at the Arnold Arboretum, we removed the cutters and replaced them with a small square of reinforced rubber taken from the center of the tread of a worn truck tire. This rubber square (about 5/16 inch thick and 1-11/16 on the sides) was fastened on the cutter head with the concave side up and we now have a very durable and satisfactory substitute for the original cutters. During the past several months, we have cleaned a wide variety of seeds without injury. We figure that the machine paid for itself the first day.

ROOT DEVELOPMENT

When I was a young boy, my father taught me to remove the tip of the tap root in transplanting small seedlings of such annuals as *Eschscholtzia* and the true poppies. When this tip is removed, the normally downward development is modified and such plants will develop a comparatively good fibrous root system.

In recent years, I have experienced considerable difficulty in securing nut tree seedlings suitable for use as potted grafting stocks. This difficulty has been particularly bothersome with black walnut in which it is very difficult to accommodate the usual long tap root in a pot of reasonable size. When the roots are pruned severely, survival of the seedlings is likely to be poor. I have found, however, that it is quite possible to produce a well

* A plastic tubing furnished through the courtesy of the Greene Rubber Company, Cambridge, Mass

branched root on a year old *Juglans nigra* seedling (See Figures II and III).

On 30 January, 1951, we stratified a quantity of cleaned *Juglans nigra* seeds by planting them close together in flats containing screened sphagnum. Since we wanted to avoid crooked stems, we placed the seeds on their sides with the sutures up. The flats were then placed in a cold house which is kept at about 40° during the winter months.

By the following May 17, many of these seeds were germinating and we then selected 100 seeds which had roots about one inch long and upon which young shoots had not yet developed. On some of these seeds, we snipped off about one half inch of the young root and we left others as controls. Both snipped and controls were then planted in a row out of doors. They were set about 8 inches apart and 4 deep. The plants grew well during the summer and we could see no substantial differences in their aerial development. There was, however, a very important difference in root development.

In our best lot of 40 snipped seeds, 37 survived until autumn. The most of these developed root systems as illustrated on the right in Figure II although several produced only horizontal or nearly horizontal roots as illustrated in Figure II. There were only 2 tap roots in this lot while the corresponding controls were nearly all tap rooted.

This method of producing branched roots certainly requires more hand labor than the usual practice of root pruning older seedlings with heavy machinery. I should think, however, that it would be much more economical than root pruning with spades. For our purposes at the Arnold Arboretum, the advantage of a well branched root system on a one-year seedling is the most important consideration. The feasibility of this method in

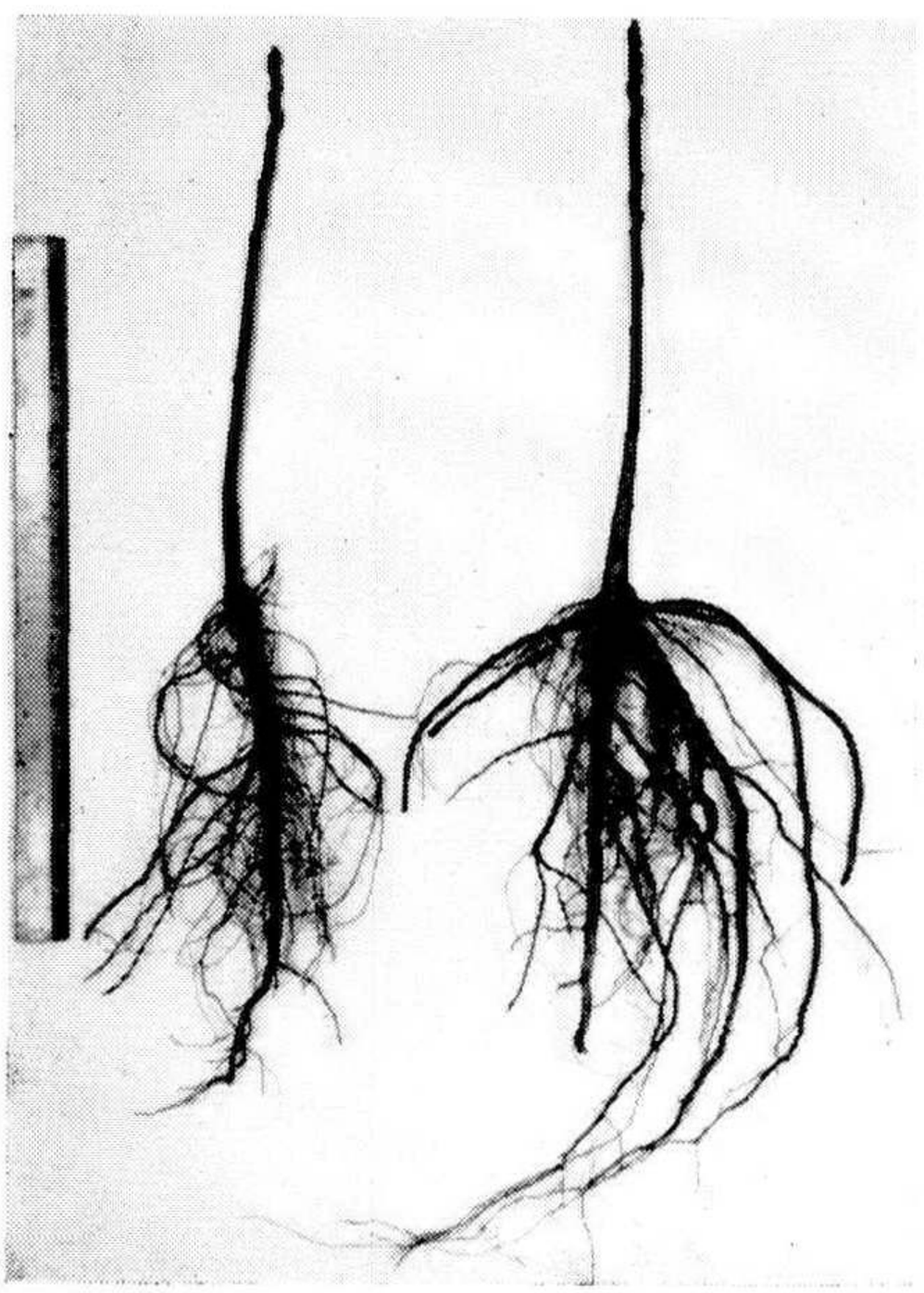

Fig. 2.—One year seedlings of Juglans nigra. Plant at left was tap-rooted; at right, branch roots developed by snipping in early stage of development. Comparable results have been obtained with Juglans hindsi and Castanea species. Scale is 18".

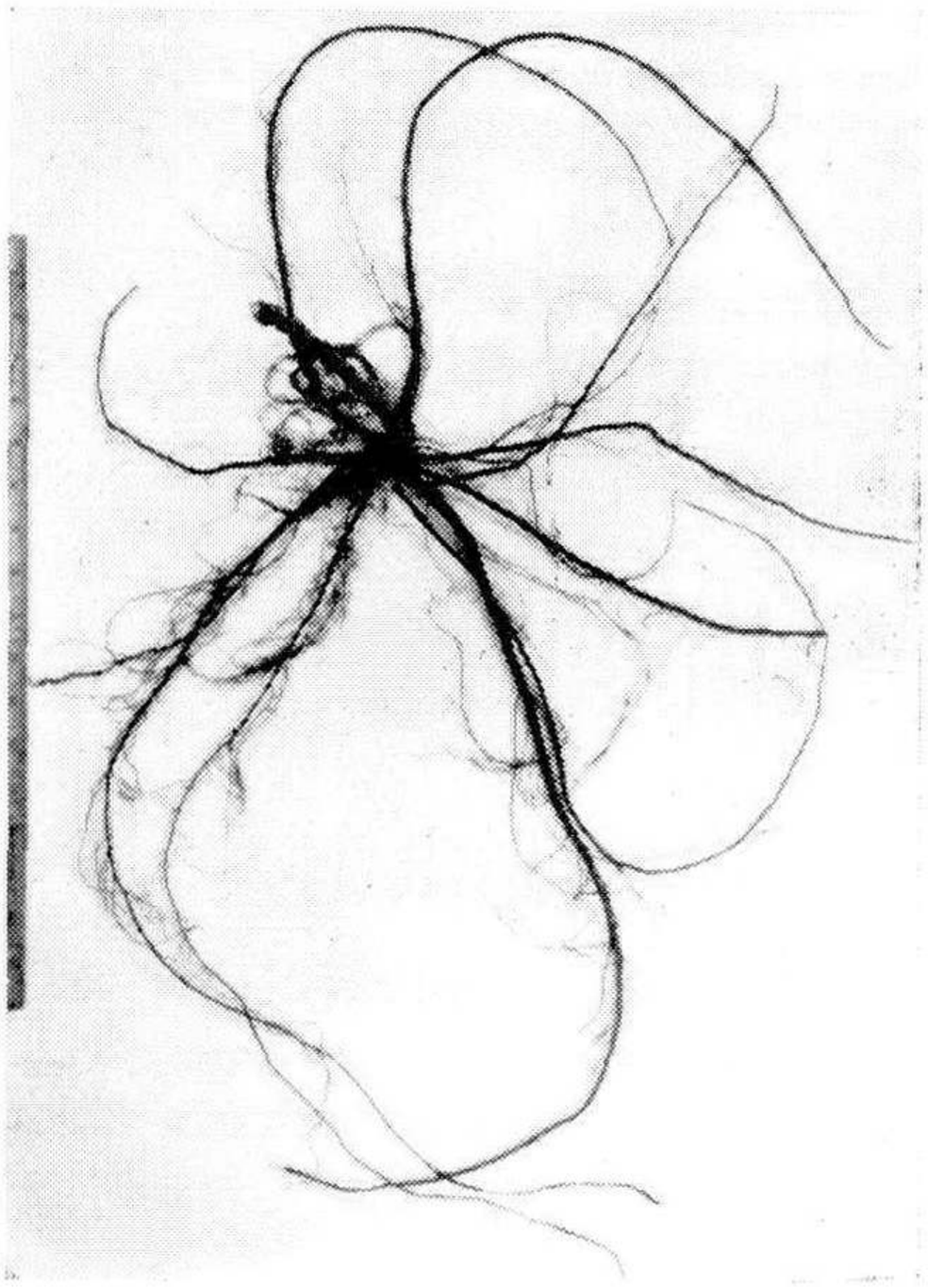

Fig. 3.—One year seedling of Juglans nigra photographed from above. This plant is being held erect by its horizontal type of root system. Scale is 18".

commercial nurseries is left to the judgment and ingenuity of the individual grower.

SOIL SUBSTITUTES

I have already reported my results in growing azalea transplants in a mixture of Styrofoam A and screened sphagnum moss (American Nurseryman Vol. 93, No. 1). I have brought along two plants of true American chestnut both of which were grown by first planting seeds in flats of pure sphagnum moss. The seedlings were later transplanted into 4 inch pots some in potting soil and some in a mixture of sphagnum moss and Styrofoam A.*

When these seedlings were transplanted in February, 1951, the mixture was watered with a solution containing traces of all the important minor elements together with a solution made by dissolving one level teaspoon of 5-8-7-1 (magnesium) in one gallon of water. This 5-8-7-1 application was repeated in March and early September. The potting soil was well fertilized during its preparation.

Even with this somewhat inadequate nutrient program, there was at the end of the first growing season, no appreciable difference between the growth of the plants in the mixture and that of the corresponding plants grown in fertilized soil.

There may be profitable possibilities for mail order nurserymen in growing certain large-seeded woody species by direct sowing in pots containing Styrofoam A and screened sphagnum moss. This is perhaps particularly true in relation to species which are normally rather difficult to transplant. We have recently sent potted seedlings of American chestnuts to Holland and Sweden by airmail at a cost of less than one-fifth the normal charge for comparable plants grown in soil.

AIR LAYERS*

Layers are not so generally used as are the more common methods of propagation by grafts, cuttings and seeds. There has, however, been one very important development in recent years. In 1947, the ancient art of Chinese air layerage was brought up-to-date when Colonel William E. Grove of Laurel, Florida first used plastic films in air layering litchi trees. Since the film he used is practically impermeable to water and water vapor, it is now possible to keep air layers suitably moist for months at a time even under out-of-door conditions. There may, indeed, be serious difficulty in keeping plastic-wrapped air layers from becoming soaking wet which is certainly disadvantageous to rooting. In a recent article in Horticulture (Vol. 29, No. 8), I have described and illustrated what I now believe to be the best method for applying air layers to northern woody plants.

Although I do not believe that plastic air layerage will ever replace the more widely accepted methods of propagation, I am sure that it has important special uses in the nursery business. While on a visit to the University of Maryland last winter, I talked to a nurseryman whose field of specimen Japanese maples had been severely injured by frost during the previous year. In early spring, plastic air layers were placed on relatively large uninjured branches. They rooted readily and before autumn it was possible to pull out the remains of the injured plants and replant with air

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* Samples of this material may be obtained from Mr. R. N. Kennedy, Plastics Technical Service, now Chemical Company, Midland, Mich.

* Since this talk was given, Dr. Donald W. Wyman has published a summation of our results with plastic wrapped air layers on a wide variety of woody species See Arnoldia Vol 11, No 7-8.

layers. It is in such special ways that plastic air layerage is likely to become of importance in the nursery business.

DIVISION

I cannot complete a review of woody plant propagation without mentioning division. Unless one wishes to increase one's supply in geometric proportions, it is often possible to maintain a good stock of some woody shrubs by simple division.

Spiraea, for example, can be easily propagated by removing suitable side shoots during digging or grading. In small nurseries, it may even be good practice to dig and plant at the same time. I have often dug orders in the field in early spring in situations where it was possible to replant enough small stock to replace the larger specimens which I took out.

CONCLUSION

I have discussed this review of woody plant propagation under the general headings of grafting, cuttings, seeds, layers, and division. I have mentioned a few little-known techniques and practices which I believe will be useful to you as plant propagators. I wish to thank Mr. Edward H. Scanlon for his invitation to attend this meeting and particularly for the opportunity to appear on this program.

The meeting adjourned at 5:30 p.m. The second annual meeting will be held in Cleveland at the Wade Park Manor December 12th and 13th, 1952.

Summer Meeting of Organizational Committee
Detroit, Mich., July 16, 1951

Present at this Organizational Committee meeting were: James S. Wells; James I. E. Ilgenfritz; L. C. Chadwick; William E. Snyder; Pieter Zorg, John Siebenthaler; Roy M. Nordine and Edward H. Scanlon. Absent were: Richard H. Fillmore; F. L. O'Rourke and Roger W. Pease.

The action taken consisted of the adoption of a Constitution; the establishment of the Plant Propagators Society with an original Charter Membership consisting of the original committee plus seven additional members who were present—making a total of eighteen Charter Members —however it was voted to extend Charter Membership privilege to any person who attended the first meeting in Cleveland. A complete list of Charter Members will be published in the next proceedings. Final action was the election of officers: James S. Wells, Pres.; L. C. Chadwick, Vice President; Edward H. Scanlon, Secretary-Treasurer.