THURSDAY AFTERNOON AND EVENING SESSION

December 15, 1955

The second session convened at 2:50 p.m., President Fillmore calling the meeting to order.

PRESIDENT FILLMORE: This afternoon our first discussion will be presented by Mr. Roger C. Coggeshall. Mr. Coggeshall is a graduate of the Stockbridge School of the University of Massachusetts. He was my assistant at the Arnold Arboretum for two years and is most certainly one of the brightest of the younger men in the field of plant propagation, both as a practiced art and as a science.

I now take pleasure in presenting Mr. Coggeshall, Propagator at the Arnold Arboretum, Jamaica Plain, Massachusetts.

Mr. Coggeshall presented his paper entitled "The Propagation of Asiatic Maples." (Applause)

THE PROPAGATION OF ASIATIC MAPLES

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The Asiatic maples about which I will speak today are not commonly known in the nursery business today, nor at some of the botanical institutions of this country.

The talk has been a result of the two hurricanes which caused such widespread damage over the Eastern part of the country, notably New England several years ago. The utility companies in this area suffered very heavy losses when the large elms and maples growing along our streets were blown down.

As the need for newer and smaller street trees developed to replace the giants that caused so much damage in falling, it was evident that methods of plant propagation should be developed to produce these plants. They should be propagated in ways other than seeds.

We have a fair representation of these smaller trees in Boston, and they have, until the present time, been grown primarily for seed. Seed propagation, as you know, is by far the cheapest and easiest method to propagate plants. However the percentage of seed that germinates varies greatly from year to year. One year we obtain a stand of 70 to 90 per cent and next year seed collected from the same plant will germinate only 10 to 20 percent, if it comes up at all.

This latter statement has certainly been borne out in our work at the Arnold Arboretum, in that seed selected from a specific plant of *Acer triflorum* for example, germinates very irregularly from year to year. One year seed collected from this plant, properly stratified and sown, will give us very good germination. The next year seed collected from the same plant and handled in the same manner will give us no germination.

There is certainly too much variation in the viability of these seeds to make seed propagation of these plants practical on a commercial scale.

The following is the list of plants which I will speak about today: *Acer grinnala, A. griseum, A. triflorum, A. tartaricum, A. buergerinaum, A. cappilipea, A. cissifolium,* and *A. palmatum.*

These plants are all of Asiatic origin and are relatively small in size compared with our native maples. At maturity they will range from twenty to thirty feet in height. Even at full height, they will still be below the utility lines.

There is one maple, however, that I did not mention in the preceding list as I do not think it falls in the same category. It is the blood-leaf form of the Japanese maple, *Acer palmatum atropurpureum.* I will, however, include it just briefly, as the time of year that these cuttings were taken should be of interest to you.

However before we discuss the propagation of these maples from cuttings, I would like to mention the technique employed to pretreat the seed for germination. All of our seed is stratified artificially under refrigeration. It is held at a temperature of approximately 40 degrees Fahrenheit for a period of three months. This three-month period is an estimated time, as we have no definite basis for the length of time other than the fact that this length of time seems sufficient to bring about germination of most maple seed.

There is experimental work now being carried out at the Arnold Arboretum where we have stratified seed from some of these maples for different periods of time: one, two and three months at a temperature of forty-one degrees Fahrenheit. We are trying to see if we can find the optimum length of time required to bring about maximum germination at this temperature.

Our regular seed procedure is as follows: the seed is collected in September and October, brought to the greenhouse, and stored dry in cloth bags until the first or middle part of November. At this time we mix the seed, wings and all, with a combination of sand and peat.

This sand and peat mixture is the rooting medium taken from the cutting benches of the previous summer's work. The medium is moistened and the seeds are thoroughly mixed with it. The mixture of seed and medium is then bagged in polyethylene bags. The ability of the plastic to retain water vapor keeps the mixture from drying out during the three months' period of refrigeration. There is no need of further watering once the bag is sealed. We seal the bags with rubber budding strips and, of course, the bags are labeled. The date the bags are to be removed from the cold temperature treatment is written on the label.

I believe that this type of stratification is much better than the technique we used to employ. Previously the seeds were sown out-of-doors in frames, mulched for winter protection, and nature was allowed to provide the necessary cold. The disadvantage of this procedure, however, is that the seeds are apt to dry out during a dry winter. Also, one of the most important things of the current type of seed stratification is that you can actually control the time at which the seed is sown. Figure back three months prior to when the frost is out of the ground in your particular locality, and stratify the seed under refrigeration during the preceding three months. Once stratified, the seed can be sown directly

into prepared beds outside. We time our seed stratification operation so that the stratified seed are ready to be sown in seed flats in the greenhouse during the middle of February. By sowing our seed one month or two prior to the normal coming of spring, we gain that much on the growing season. The resultant seedlings are much larger than if we had sown the seed directly in the ground outdoors.

The maples that I will speak of today have been propagated from cuttings in three ways: hardwood cuttings, softwood cuttings taken from forced plants in a greenhouse, and cuttings taken from soft, succulent growth in the summer. Let us first consider the cuttings taken from hardwood material.

As would be expected, the propagation of Asiatic maples from dormant hardwood cuttings is very difficult and we have had very poor results with many of the species that I will mention. With *Acer palmatum,* however, results were significant enough to be mentioned here today. The cutting material was collected in March and brought into the greenhouse. The cuttings were made from six to eight inches in length and were treated with different hormones. Some of the cuttings were wounded, some were not.

The type of wound used was similar to the one employed with rhododendrons where a piece of bark is removed from the base of the cutting. The cuttings were placed under plastic, as were all of the other cuttings about which I will speak today. We root most of our cutting material in one big frame covered with polyethylene. The frame is eighteen feet across and sixteen feet in length. The plastic is placed eight inches above the surface of the medium.

The cuttings were stuck in a medium of sand and peat—half and half by volume. The cuttings were made on March 16th. Of the eighty cuttings, forty were treated with a one per cent indolebutyric acid talc (our own mixture). They were wounded as described above. Of the forty cuttings, we potted 34 on April 27th, a little over five weeks later. Of the forty cuttings which were treated with the indolebutyric acid but were not wounded only ten per cent rooted. This beneficial effect from wounding has been reported repeatedly not only with rhododendrons and holly but with most plant material which is considered difficult to propagate. The cuttings rooted directly from the wounded area, that is, the initial root system came from this area. In time additional roots appeared from the cutting so that a uniform root system developed.

Cuttings taken in March and placed under the plastic, immediately started to grow and form shoots. These reached a length of two to four inches. This soft, succulent growth remained in a turgid condition due to the polyethylene. The relative humidity is very high under the plastic and the soft shoot growth did not grow hard after growth had stopped.

I should mention one other thing about the plastic. In the winter-time one disadvantage of using the plastic is the growth of mold and fungus. It may become disastrous unless controlled. We control the mold by applying Captan 50-W, two teaspoons per gallon of water every week to ten days. If you let the mold get a start, it is certainly harder to reduce than if you keep it controlled by spraying with the above chemical from the start.

I did not mention that when the cuttings were inserted in the medium they are watered in. Cuttings are never tamped. The cuttings are

watered very heavily after they are first stuck and during the winter months it is not necessary to water the medium again for a month to six weeks. The only two procedures necessary to operate a plastic covered propagating case in winter are a weekly spraying of the cuttings with Captan to control the mold and a monthly watering of the medium.

The second way in which the cuttings were propagated was from plants which were originally to be used as understock. However, the work load at the Arboretum was such that the plants progressed too far to be grafted. These plants developed soft shoots two to three inches in length. Since we could not graft them, we decided to use the new soft shoots for cuttings.

Here again the procedure was exactly the same. The cuttings were treated with hormones, stuck in sand beneath the plastic, sprayed with Captan every week or ten days and watered every month to six weeks.

Cuttings handled in the manner just described were made from the following: *Acer grinnala, A. palmatum, A. griseum,* and *A. triflorum.* We were not successful with *A. griseum.* Thirty cuttings of *A. grinnala* were treated with Hormodin #3 and stuck on January 12. Twenty-seven of these were rooted by February 2d. Another lot of 43 cuttings were treated and stuck on February 2d. Within three weeks time, 37 of these had rooted. Please bear in mind that these are soft succulent shoots taken from plants three to six years old which had been forced in the greenhouse. (Mr. Coggeshall displayed some of the plants developed from these cuttings.)

Cuttings of *Acer palmatum* were handled in the same way. The stock plants were two to four years old and again the cutting material was softwood. Of the 164 cuttings treated on January 26th with Hormodin #3 and inserted in a medium of sand under a plastic cover, 122 were sufficiently rooted on February 23d to be potted. Thirty-nine of another lot of fifty cuttings were inserted on February 11th and were rooted by March 15th. This last group of cuttings was treated with a one per cent idolebutyric acid talc. There was no sign of an over-dosage of hormone.

Cuttings of *Acer griseum* were taken from new growth of plants which were grafted. The scion wood was taken from a fifty-year old plant. None of the sixty cuttings stuck on March 4th rooted. I have this to say about *Acer griseum,* it is probably the hardest plant to propagate that I have worked with.

The last maple tried with cuttings of forced growth was *Acer triflorum.* We have run two tests during the past two years. One hundred cuttings were taken on February 1, 1955 and treated with one per cent indolebutyric acid (IBA) in talc. However most of the cuttings were killed because of the strong hormone used. There is, therefore, some variation within the maples as to the concentration of hormone that they can stand. Of the fifty cuttings treated with the 1% IBA, 28 were rooted on February 23, but of the fifty untreated cuttings, thiry had rooted. In another case, we treated fifty cuttings with 15 milligrams per gram of 2, 4, 5—trichlorophenoxyproprionic acid. This treatment was very injurious and we only rooted nine of the cuttings. Again the untreated group rooted very well, 36 of the fifty untreated cuttings developed roots. Cuttings of *Acer triflorum* do not grow nearly as rapidly as cuttings of some other Asiatic maples.

The third way in which we propagated these Asiatic maples was with softwood cuttings taken during the normal growing season. Until now I have been talking about cuttings taken from forced growth and rooted under plastic tents during the winter months. All we had to do was to control the growth of mold with a Captan spray every week and water the medium every month to six weeks. However, in the summertime the plastic traps heat and, if you do not shade, the cuttings will burn up.

Inside our greenhouses, we have wooden lath shades which can be raised or lowered as desired. We roll them down in the middle of April and they stay down until September. When the temperature outside of the greenhouse rises above 90° Fahrenheit, we shade the plastic cases with Saran cloth from noon until 5 p.m. This is the only shade that the cuttings receive other than the lath shade on the greenhouse. The temperacture underneath the plastic will exceed 100 degrees in severe hot weather. The cuttings will stand these high temperatures providing the temperatures and humidity are not changed suddenly by opening the cases. Thus shading is added to the operation of spraying with Captan every week and watering the medium every three to five weeks.

The following are the plants propagated in the manner just described: *Acer buergerianum, A. capillipes, A. cissifolium, A. tartaricum,* and *A. triflorum.* Our trials with *A. triflorum* were unsuccessful and *A buergerianum* was difficult to root. The other three species were successfully rooted.

Acer buergerianum is an excellent example of why some maples should be propagated from cuttings or grafts. We have a single plant in our collection and, to my knowledge, it has never set seed in five years. On August 24, 1954 we made fifty cuttings of *A. buergerianum.* Of the 25 treated with Hormodin No. 3, only four rooted, and only three of the 25 treated with Hormodin No. 2 rooted. The age of the stock plant was a great influence on the rootability of cuttings. I believe that in time and with more experience we will be able to increase this percentage of rooting.

Cuttings of *Acer capillipes* were taken from a forty year old plant on August 17, 1955. Only four of the 25 cuttings treated with Hormodin No. 3 rooted. This rooting response was increased to fourteen if the cuttings were wounded prior to treatment with the Hormodin powder. Five of the twenty-five cuttings treated with 1% IBA rooted, whereas only two cuttings rooted when wounded and treated with the 1% IBA.

Acer cissifolium is probably the easiest maple to propagate that we have tried. We obtained the following rooting for cuttings taken from a 35-year old specimen:

Treatment	Per Cent Rooting
1% IBA	88
1% IBA + Wound	100
Hormodin No. 3	72
Hormodin No. 3 + Wound	92

Wounding not only improves the percentage of rooting but also resulted in better root systems.

Another maple which we were also fairly successful in rooting was *Acer tartaricum.* In this case fifty cuttings were treated with each of two

materials. Only 15 cuttings treated with Hormodin No. 3 rooted, while 37 treated with 1% IBA developed roots. Although there is not a great difference in the strengths of these two treatments (.8 and 1%), the slight increase in strength of the treatment made a marked difference in the results obtained.

I mentioned previously that *Acer triflorum* cuttings taken from young plants rooted quite successfully. However, the stock plant used in these tests were thirty years old. We used three diferent hormone preparations but were unsuccessful in obtaining any rooting. This again emphasizes the advantage of taking cuttings from young juvenile growth.

Throughout this talk I have mentioned *Acer griseum*. We tried to root cuttings without success. Previous to this year we have tried to grow it from seed collected in the Orient, at different Botanical Gardens in this country, and at the Arnold Arboretum. We have not had success with seed from any of these sources except for a few seedlings obtained one year from the seed collected at the Arnold Arboretum.

We have tried grafting *A. griseum* on a number of different understocks but compatibility is a problem. On the strength of our work last year, I believe that we have finally found a partial answer in that *A. griseum* can be successfully grafted on *Acer triflorum* understock.

(Mr. Coggeshall illustrated the method of grafting used at the Arnold Arboretum with a number of kodachrome slides. A summary of his discussion is presented here).

I should emphasize that the technique you will see used with *Acer griseum* is the same method which we use on all of our deciduous grafting.

The understock is established in the pot one year prior to grafting. We use the whip and tongue graft on this established understock. Newly potted seedlings cannot be used successfully. The grafts are made when the roots start to grow and the top is still dormant. The top of the understock is removed with pruning shears by a slant cut. In a whip and tongue graft, when the stock and scion are placed together properly, there are four places where the cambiums can match. The ordinary whip graft affords a maximum of only two places for matching. We have found that with the whip and tongue graft there is an increase in the number of successful grafts and that the union is stronger.

The graft is tied with waxed string. We use No. 20 cotton twine that has been dipped in paraffin. The string is not tied; the ends are merely twisted together.

We have had trouble with fungus in the grafting case. The conditions of the grafting case are optimum for growth of fungus. We have also experienced difficulty in transferring the grafts with soft, succulent growth from the grafting case to the open bench. Now, instead of placing the grafts in a sweat box, we cover the graft unions with strips of polyethylene which are cut approximately one inch in width. The polycthylene is .002 inch in thickness. The plastic will break if it is pulled too hard.

The entire area of cut surface is covered with plastic and the completed grafts are placed in an upright position on an open bench. They are left here until time for planting out. New growth of the scion is hardened before being planted outside and we have experienced no loss. Fungus trouble has not been noted.

In a comparison of the polyethylene strip method with the waxing method, we have found no differences whatsoever. It is our experience that less time is required to wrap with polyethylene than to wax the union.

I realize that the work I have discussed involves only small numbers of cuttings or grafts, however we cannot work with the large numbers which you use. I believe that one of the functions of an arboretum, such as the Arnold Arboretum, is to test methods of propagating new plants and to develop techniques for the propagation of difficult species.

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PRESIDENT FILLMORE: This has been an interesting discussion of the work at the Arnold Arboretum on the propagation of Asiatic maples. We thank you, Roger, for the information.

Our schedule will permit a few questions on this paper.

MR. CASE HOOGENDORN (Hoogendoorn Nursery, Newport, R.I.): Does *Acer griseum* turn a brilliant red in the fall?

MR. COGGESHALL: As far as I know it does not turn as red as some of the other Asiatic maples. The outstanding characteristic of this plant is the bark.

MR. CARL KERN (Wyoming Nursery, Cincinnati, O.): What is the fall color of *Acer manchurian?*

MR. COGGESHALL: That is one of the best for fall color. We have two very old plants in our collection. So far, we have been able to root only one cutting from this plant.

MR. LOUIS VANDERBROOK (Vanderbrook's Nurseries, Manchester, Conn.): What was the understock used for grafting *Acer griseum?*

MR. COGGESHALL: We have used *Acer triflorum* successfully. The understock can be obtained from seed or by rooting cuttings.

MR. JOHN VERMEULEN: (Vermeulen's Nurseries, Neshanic Station, N.J.): We have lost grafts of *Acer saccharum monumentale* after they are well started. What do you use for the understock?

MR. COGGESHALL: We bud it on seedlings of *Acer saccharum.* We have also been successful in grafting it on *Acer platanoides.*

MR. VERMEULEN: Are the understock potted a year before grafting or can they be potted immediately before grafting?

MR. COGGESHALL: They are potted a year prior to the time they are grafted.

MR. WILLIAM H. BURTON (Burton's Hill-Top Nurseries, Casstown, O.): Can you give any comparative results between waxing the union and waxing the entire scion?

MR. COGGESHALL: In only two instances have we dipped the entire scion in wax. Both of these were successful.

MR. MARTIN VAN HOF (Rhode Island Nurseries, Newport, R.I.): Were the cuttings taken in February shaded?

MR. COGGESHALL: No sir. We do not use shade from September through the middle of March. Cuttings are placed in the polyethylene cases without any shade.

MR. CONSTANT DE GROOT (Sheridan Nurseries Ltd., Sheridan, Ont.): Have you had experience grafting *Acer palmatum* in August?

MR. COGGESHALL: I have not had such experience. Perhaps someone in the audience can describe his experiences.

MR. CHARLES HESS SR. (Hess Nurseries, Mt. View, N.J.): We find the results very good. Lately, we have also grafted dogwoods and beeches in August with excellent success. The understock, in all instances, was potted the previous spring.

MR. JACKSON: How do you secure the plastic strips?

MR. COGGESHALL: The plastic strip is tied with a half hitch just as a budding strip is tied.

MR. CHARLES E. HESS (Cornell University, Ithaca, N.Y.): Have you used the adhesive plastic material for tying buds and grafts?

MR. COGGESHALL: No I haven't, perhaps someone here can describe their results.

MR. JAMES S. WELLS (Bobbink Nurseries, East Rutherford, N.J.): It is actually a latex material which is used as a finger bandage.. It sticks the moment it touches. We have tried a few Koster Blue Spruce grafts with it. The results were quite satisfactory, however the material was unhandy to use. It is now available in narrow strips, and, if made in the required lengths, would be quite valuable.

MR. PETER E. GIRARD (Girard Brothers, Geneva, Ohio): We have also used this material and found that it works quite well.

MR. JOHN M. BOGDANY (Stephen Hoyt's Sons Co., New Canaan, Conn.): Does it have to be taken off or does it eventually disintegrate?

MR. GIRARD: It has to be taken off. We removed it at the time of transplanting.

DR. STUART H. NELSON (Central Experimental Farms, Ottawa, Ont.): In regard to the quick bandage material, it is adhesive only to itself. Therefore, when it is taken off, it can just be rolled off. It does not stick to the bark nor to the hairs on herbaceous plants.

DR. JOHN P. MAHLSTEDE, (Iowa State College, Ames, Iowa): I think that the greatest disadvantage in the use of polyethylene strips is the time required. It takes more time than other methods. The adhesive material can be put in a Scotch Tape dispenser and easily cut any desired length. Eventually it will disintegrate. If some of you are thinking of using polyethylene strips on junipers, it is essential that the juniper understock be as clean as possible. We have encountered growth of mold under the strips. An effective spray program prior to grafting will eliminate this trouble.

MR. GERALD H. VERKADE (Verkade's Nurseries, New London, Conn.): Is it also necessary to tie the graft before using the adhesive material?

DR. MAHLSTEDE: With the adhesive, all you need is a little piece of the tape.

MR. COGGESHALL: We have found that if the grafts are not tied, the polyethylene strips do not hold the stock and scion tightly enough. This is because of the elasticity of the polyethylene material.

MR. WILLIAM FLEMER III (Princeton Nursery, Princeton, N.J.): We have tried all kinds of grafting wraps and have settled on rubber budding strips as being the cheapest, the quickest to put on, and the easiest to take off.

PRESIDENT FILLMORE: I am very sorry we have to terminate this discussion, however there is a full program scheduled for the remainder of this afternoon and evening. Again I want to thank Roger for his splendid talk. I am certain that many of you have found his work with the Asiatic Maples of considerable interest.

The session recessed for fifteen minutes before commencing the Speaker-Exhibitor Session.