

PROPAGATION OF ACER PALMATUM CULTIVARS FROM HARDWOOD CUTTINGS

LAWRENCE L. CARVILLE ·

Rhode Island Nurseries
Middletown, Rhode Island 02840

Traditionally, *Acer palmatum* cultivars in the Northeast have always been propagated from dormant hardwood grafting. This method has assured the grower of successful stands of grafts which can be planted out in the spring and which will be winter hardy during the first season outside the greenhouse. The increasing scarcity of *Acer palmatum* seedlings for understocks and the rapidly escalating labor costs have prompted some growers to search for less expensive and more expeditious means of propagating *Acer palmatum* cultivars. A review of the literature within the IPPS indicates that growers have been experimenting with both softwood and hardwood cuttings of Japanese maples (1, 2, 3, 4, 5). Unit costs have always favored cuttings over graftage but many of the problems related to cuttings production have discouraged the commercial grower. I have achieved good results with softwood cutting production of *Acer palmatum* 'Atropurpureum Bloodgood'¹ but the problems incidental to taking and maintaining cuttings in mid-May more than outweigh the savings to be gained from this method.

Consequently, during the winter of 1972 I proceeded to experiment with hardwood cuttings of *Acer palmatum* 'Bloodgood,' 'Dissectum' and 'Dissectum Nigrum.' This experimentation was a supplement to our normal winter grafting operation; it was an attempt to utilize surplus scions and to search for a less expensive means of production.

Timing. Cutting material was gathered from field stock plants during the first week in January. Wood was stored in our cooler at 34° F until we were ready to process the cuttings. All material was from current season's growth and varied in thickness from 3/16" to 3/8".

Preparation of Cuttings. Cutting material was taken out of the cooler and brought into the work room as needed. Side branches were cut or trimmed from the wood and all cuttings were sized to lengths of 6"-8", with two or three pairs of nodes. Heavy cuttings root as readily as thin ones but we prefer cuttings of 1/4" diameter. All cuttings were given a double wound by removing a thin slice of epidermis about 3/4"-1" long on opposite sides of the basal end. We then made a clean, straight cut across the end of the cutting and set it aside for hormone application.

¹ *Acer palmatum* 'Bloodgood' - Selected from a seedling bed by Bloodgood Nursery, Long Island, New York.

Hormone. Although I have used dry hormone preparations of 0.08% and 1.5% IBA, I have found that Jiffy Grow² gives consistently better results. Cuttings were gathered together in bunches of 10 to 12 and are given a 10-second dip in a solution of Jiffy Grow, 1:4 (1 ounce Jiffy Grow in 3 ounces of water). Cuttings were immersed so that the wound was covered and after the 10-second dip were allowed to dry before sticking.

Media. I selected three different media in 1972 and have by process of elimination ruled out all but the peat/perlite mix. Initially, I stuck cuttings in a peat/sand mix, a John Innes compost potting mix and in a peat/perlite mix. Apparently the first two media did not provide sufficient drainage and most of the cuttings rotted within 4 weeks. The peat/perlite (2 parts peat, 1 part perlite) medium proved to be the most successful and I have been using it every winter since 1972. Wood flats, 24"×16"×4" with ¼" spaces between the bottom slats were used in the rooting operation. The flats were filled with the medium, slightly firmed and thoroughly watered. Cuttings were inserted directly into the medium in rows of 15, 150 cuttings to the flat. The flats were then placed on greenhouse benches, watered once again and ignored. Temperature in the rooting medium should be between 60-68° F and the air temperature should be maintained below 60° F at night. Excessive top heat and/or overwatering will lead to complete failure, thus my statement to the effect that the cuttings should be ignored. The medium should feel almost dry to the touch and at no time during the first 4 weeks should you be able to squeeze water from a handful of the mix. Frequent underwatering is preferred to occasional overwatering.

Rooting. Callus formation was visible after about 15 days and roots began appearing in 4 weeks from date of sticking. Vegetative buds will begin swelling at this time and new growth will be evident by mid-February. Overwatering can be disastrous at this point since the roots will rot very quickly if the rooting medium becomes too wet. I prefer to syringe twice daily with a 'fog type nozzle. The foliage should not be exposed to bright sunlight after syringing since the new growth is very tender and will burn quite easily. A weekly drench with a mild Captan solution is beneficial in controlling any *Botrytis* infection.

Potting. By mid-March the rooted cuttings may be potted or canned. Caution should be exercised in lifting the cuttings from the flats since rooting is extensive and many roots will extend through the bottom of the flats. I have found that the cuttings respond more successfully if the roots are not trimmed prior to potting.

² Jiffy Grow - Ingredients: IBA - 0.5%; NAA - 0.5%; boron - 0.0175%; phenylmercuric acid - 0.01%. Manufactured by G & W Products, Estacada, Oregon.

During the 1975 season, I carried several flats of cuttings through the spring season and planted them directly in nursery beds in mid-May. Other cuttings were potted in 2½" clay rose pots and will be planted in field rows in the spring of 1976. Those cuttings which were canned directly in one-gallon and two-gallon containers have responded remarkably well and were 15"-18" branched plants by late August. I definitely plan to continue this method of containerizing from the rooting flat during 1976.

Planting. Rooted cuttings were either planted directly from the flats into beds or were handled as previously discussed. Bed plantings took place in mid-May and all plants were mulched with "Serve-All" (sugar cane). Lath shades were placed over the beds to provide 50% shade during the first growing season. After two seasons in the bed, the plants were lifted, trimmed and planted in field rows during early May. The plants were now 12" to 15" and will be field-grown for 3 years until saleable.

Observations. After experimenting for 3 years with hardwood cuttings of *Acer plamatum* 'Atropurpureum,' I find that the advantages of this method favor a continuation of this program. Cuttings can be gathered leisurely during the winter months and do not require the careful handling necessitated by softwood cuttings. Since misting is not required during winter propagation, the facilities for rooting hardwood cuttings can be less elaborate than those required for summer cuttings. Growth commences in early spring so that hardwood cuttings are in "phase" with a normal growing cycle and we are not faced with forced growth which is sometimes difficult to maintain when plants are moved to the field.

SUMMARY

Many cuttings may be rooted with minimal care and limited facilities when they are taken as hardwood cuttings in early January. Unit cost of production is far less than that from softwood cuttings and is considerably less than that from graftage. Great care must be taken in watering during the early weeks when cuttings are forming callus. Overwatering will inhibit rooting and encourage basal rot. With proper care and minimal attention, a 60% to 70% rooting and survival rate is easily attainable.

The 'Dissectum' cultivars of *Acer palmatum* 'Atropurpureum' are more difficult to root and percentages as low as 25% are not unusual. I have rooted *Acer palmatum* 'Dissectum' and *Acer palmatum* 'Dissectum Nigrum' from hardwood cuttings but with no great degree of success. I am continuing to experiment with these cutlivars in an attempt to improve rooting percentages. I am also continuing with hardwood cuttings of *Cornus florida* 'Rubra' and *Fagus sylvatica* 'Riversii.'

The results I have obtained from hardwood cuttings of *Acer palmatum* 'Bloodgood' are sufficiently encouraging to justify a continuation of this program. Plants growing in the field have withstood three winters without appreciable injury and are displaying a growth rate at least equal to grafted plants. Although I have not completely discarded the practice of grafting the Bloodgood cultivar, I feel that it is only a matter of time before we discontinue grafting in favor of hardwood cutting propagation.

LITERATURE CITED

1. Briggs, B.A., 1965. Progress report on the rooting of Japanese maples. *Proc. Int. Plant Prop. Soc.* 15:343-344.
2. Gorton, F. B., 1956. Own-root versus grafted plants. *Proc. Plant Prop. Soc.* 6:37-39.
3. Lamb, J. D., 1972. Vegetative propagation of Japanese maples at Kinsealy. *Proc. Int. Plant Prop. Soc.* 22:240-242
4. Van Klavern, R., 1969. Growing *Acer palmatum* from cuttings. *Proc. Int. Plant Prop. Soc.* 19:144-145
5. Vertrees, J.D., 1972. Observations on propagation of Asiatic maples. *Proc. Int. Plant Prop. Soc.* 22:192-196

MODERATOR STAN SORENSON: We are now ready for questions for our first panel.

BRUCE BRIGGS: There has been a lot of research in the East on the effects of Ethrel in rooting cuttings. The work done was mostly with softwood and herbaceous plants. Basically, after dipping for 24 hours and 48 hours there was an accumulation of Ethrel in the tissues rather than removing a substance. My question is — do hardwood cuttings accumulate Ethrel within its wood — or are they slow to accumulate Ethrel?

BOB TICKNOR: The question may be — is there an accumulation of Ethrel or is there a leaching of inhibitors from the cuttings? This we can't answer, Bruce. We have had some variable results with pines; sometimes we have good results with Ethrel and, in another year, it doesn't work. So we are not real sure what the mechanism is, or whether it is a useful treatment. Ethrel releases ethylene, which is a growth regulator itself and it could be triggering root initiation.

VOICE: Bob, have you tried the quick-dip method? You said that you were not pleased with it on *Cornus florida*.

BOB TICKNOR: We did use quick-dip with Dip-N-Grow and actually it was equal to Hormodin No. 3 in its effectiveness. The one that did not work was when Benlate was added to the hormone.

BILL CURTIS: A question for Larry Carville. Have you used the method you described on *Acer palmatum* 'Dissectum,' either the green, or the red?

LARRY CARVILLE: Yes. I have to tell you that these cultivars don't respond successfully. They are much harder to root, even from a hardwood cutting. We also tried softwood cuttings, and didn't have the response with *A. palmatum* 'Dissectum' that we get with *A. palmatum* 'Atropurpureum.' I don't know what the reason is, but as we continue the operation we will probably stay with grafting for the 'Dissectum' cultivars and go with cuttings for the 'Atropurpureum' cultivars. One other thing that I would like to mention. We have been trying rooting of *Cornus florida* and we have had good success — not outstanding success. They are essentially the same methods as used for *Acer palmatum*, such as use of peat-perlite mixture. We are also trying *Fagus sylvatica*, *Riversii* cultivar — and that is a toughie; the rooting percentage is very low. But I think that practically anything will root. It is just a question of timing and hormones and rooting medium. This is what Bruce Briggs has been doing for 15 or 20 years — finding out what time of the growth cycle to take cuttings and what application of hormone to give them. We can root most things. But it is a question of perseverance and I don't know if we have the time to accept the challenge.

HUDSON HARTMANN: I would like to ask Phil Barker if he has tried vegetative propagation of the canyon maple and, if not, does he plan to do so?

PHILIP BARKER: We tried propagating canyon maple from 6-inch and 12-inch softwood cuttings taken in August from plants that had been severely pruned in April. The 12-inch cuttings rooted very well and, treated with Jiffy Grow, 100%. They rooted partly when treated with Jiffy Grow, diluted 50% but we got practically no rooting in the control. The 6-inch cuttings rooted likewise but not nearly as well as the 12-inch cuttings. I plan to try hardwood cuttings because softwood cuttings have certain drawbacks, principally that of availability of material.

RALPH SHUGERT: Following up Dr. Hartmann's question, Phil; looking at this from a commercial standpoint, what about budding? Many of the nurseries, particularly in the East, are geared for a good long budding program starting in late June. Now a two part question: part one, what rootstock should be used; and part two, have you had any budding experience with canyon maple? From a commercial standpoint I can't see stratifying and germinating seeds, picking up the seedlings, and putting them in Jiffy-7's, then going out in the field with them. That plant would cost about \$50 before you ever got it out. Economically, from a production standpoint, unless there is something that you have not shown in the slides, that would not be a feasible commercial operation. What about a budding operation?

PHILIP BARKER: I have had no experience in budding canyon maple. I told about this maple at the IPPS meeting in Tulsa

last December (1974). Several people were interested in getting some propagation material so in August, 1975, I sent budwood to about 10 different persons throughout the United States. Recipients were to try budding on *Acer saccharum* or any other *Acer* species that they were interested in. So in another year we will have more information to answer your question.

RALPH SHUGERT: What about compatibility with, say, *A. platanoides*?

PHILIP BARKER: I have no idea at all. I have no reason to doubt that it will be compatible with *Acer saccharum*, but *Acer platanoides* is in another group, and I have a question about it.

RALPH SHUGERT: But there has been no work done on it?

PHILIP BARKER: No work at all that I know of.

VOICE: I would like to ask Mr. Barker if he knows anything about *Acer grandidentatum* in a mild or, at least, a wet climate so we can speculate on its fall coloring.

PHILIP BARKER: I don't know how it is going to color elsewhere. I do know that the trees that are larger, which have deeper roots, do not color as well as do the younger trees. However, those trees that are in moist sites do tend to color quite well, too. So I believe that we can expect good coloration of this tree even in moist sites.

JOLLY BATCHELLER: What about temperature, wouldn't temperature be a factor in fall coloration?

PHILIP BARKER: I think coloration is controlled by temperature, as well as other factors. I can find very little information in the literature where fall coloration of any plant has really had very much study other than a physiological study to determine why it colors. But I don't find anything in the literature where stands of trees have actually been monitored to determine what environmental conditions may contribute to fall coloration. We are studying this now.

VOICE: What minimum temperature will *Acer grandidentatum* stand?

PHILIP BARKER: We have temperatures, where it grows naturally, that go to 30° F below zero.

JIM HINES: This is a question to Larry Carville on hardwood cuttings. At what temperature do you hold the tops of your cuttings?

LARRY CARVILLE: We try to maintain a top heat in the greenhouse of between 50° and 55° F. It's an old greenhouse so all our heat is underneath the benches. It is hot water heat. There is no heat in the air other than what the sun's rays will give us. We maintain a top heat at night at 50° to 55° F. We try to slow down the top development of the buds on new growth.

VOICE: Same in the day?

LARRY CARVILLE: Yes, if at all possible. We don't try to vent those houses during the day to cool them down and, as you know, when the sun comes up you're going to get the warming effect in the houses. So it is a night temperature that we are trying to maintain. The bottom heat is between 65° and 68° F.

RICHARD VAN KLAVEREN: This question is for Larry. I would like to know if you are using a fertilizer during your cutting rooting period?

LARRY CARVILLE: Absolutely not; there is no fertilizer in any of our greenhouses. I don't adhere to it in propagation. The medium is sterile; it's new peat and new perlite. We don't apply any fertilizer to the rooting medium and we don't apply any foliar feed to the cuttings when they begin growing or breaking top growth in the rooting medium. The only fertilization that takes place is when the plant goes into a potting mix, into a pot, or a container as it goes outside the greenhouse.

BARRIE COATE: Is it going to be possible to correspond with you to get cuttings from you again. If so, will the cuttings be from selected plants which could be later referred to by an accession number, or something, to get identical material later on?

PHILIP BARKER: Possibly, please write to me at my present address, I do keep the plants identified so that we can go back to those plants. There is great variability within this genus, within this species, and it is important I think to note precisely from which plant any budwood or seed material has come.

CURTIS ALLEY: In your budding operation you say you soak your buds in Benlate. At what concentration? This is for Mr. Mathies.

JOHN MATHIES: At a rate of ½ teaspoon per gallon. We just dip them in; we don't soak them. We cut the buds the night before.

CURTIS ALLEY: How long can you save your buds after you cut them?

JOHN MATHIES: Well, it depends, I would say 3 to 4 days. Cherries not so long — 1 to 1½ days. *Acer palmatum*, can go 3 to 4 days.

CURTIS ALLEY: Do they start turning brown? Do they give you some indication they are deteriorating?

JOHN MATHIES: That's right.

RALPH SHUGERT: John, have you had any experience with frozen bud sticks? The reason that I ask this — this practice is used somewhat in the West — some people have tried it and say they will never do it again; yet one of the largest wholesale nurseries, I guess in the world, the bulk of their bud sticks are all cut

and frozen. I was wondering if you had any experience out here with frozen bud sticks.

JOHN MATHIES: No, I am sorry, I have never used frozen bud sticks. It would be very interesting to try.

BOB TICKNOR: I know that some Western rose growers use frozen bud sticks. The early budding is all done with frozen buds that are shipped up from California.

STAN SORENSON: What do they do? Put the bud sticks in cold storage? Do they cut and defoliate them?

RALPH SHUGERT: I can speak just a little bit to this. I have never done it myself. I have seen it. The nursery referred to is Mount Arbor Nursery in Shenandoah, Iowa. While they do not have a member in the Society, if anybody would be interested they could contact me and I can give them a name to write to there. Their technique is to cut sticks just as if you were going to bud the next day, defoliate them, wrap in paper, slip them into a polybag and hold at 27°-28° F. Then they can go out in June and bud — primarily on stocks that were fall-planted. There is a short paper on this that Daryl Holmes gave to the Society in 1957 — (Volume 7, page 164). There is a reason for doing this. Quite often in the Middle West there is inclement weather so you cannot plant your stocks until maybe the first week in May, and then that throws you pretty far behind in your budding. So a lot of *Prunus* rootstocks will be fall-planted — *P. americana*, *P. tomentosa*, *P. besseyi*, and a lot of *Malus*, etc.; then they will be able to go in and bud using the frozen budsticks. Their stands have been good; you just drive through their fields and there they are. They have been doing this about 25 years, so it is not a new technique.

MIKE SMITH: What were the bottom and top temperatures used in the *Cornus* rooting studies?

BOB TICKNOR: The temperatures were essentially the same. We are using a propane heater. But it is set for 50° F in the plastic house and we are using 70° F bottom heat. So it is essentially the same temperatures that Larry Carville is using, except we do run into problems. On a bright day the temperatures can go up in that plastic house and I think this is where we can get into trouble. We can get a high temperature of 90° F in there.

MIKE SMITH: Are some of the *Cornus* rooting failures due to decay at the base of the cutting?

BOB TICKNOR: Yes, much of the failure is due to decay of the base of the cutting. Occasionally we will lose one that roots but the failure starts right at the soil line rather than at the base of the cutting. We have used Benlate drenches to try to prevent this but so far that hasn't worked out too well.

PAUL GREIBER: Don't some fungicides cause a problem in preventing rooting?

BOB TICKNOR: When we use Benlate in the hormone mix, we had less rooting than when we didn't include it, but we have had variable results with other things too. Sometimes we get better results in rooting some pines with Captan in the hormone mix. Benlate doesn't work on pines. Benlate is used on some of the rhododendrons. Some people are just dipping cuttings in a Benlate solution, like John Mathies is using with his bud sticks. They feel they get a benefit from Benlate without any added hormone. So it will vary with plant materials and the fungicide.

LARRY CARVILLE: On the subject of Benlate, we have been using a Benlate addition to our rooting powder. On softwood cuttings of azaleas we find that Benlate does inhibit root formation but those that do root are healthier plants. We prefer to take that sacrifice in order to get a healthier stand of rooted plants, although we are taking out some that don't root because of the Benlate in the rooting powder. On the hardwood maple cuttings which we are doing now we are not using Benlate at all in the operation. We have found the same decay at the surface of the rooting medium that Bob Ticknor referred to on *Cornus florida* and this bothers us somewhat. It is a question of overwatering, poor drainage, or a fungus, I don't know? We have used Captan, we are using Ban-Rot, or Truban, and we are using Terraclor in various proportions. We are trying to find out what will control this tissue breakdown.

VOICE: I would like to ask Phil Barker what the stratification procedure is for canyon maple.

PHILIP BARKER: The seed was gathered in late August, September, and October. We brought it into a cooler at 1° C for a few days. Once we had the seed all collected we dried it for 2 or 3 days, then we rubbed the wings off for bulk reduction purposes, and then put the seed into moist sand or moist peat-perlite, 1:1, and stored it at 1° C until planting in early March.

RALPH SHUGERT: Why stratify, why not fall sow?

PHILIP BARKER: I think you can do that. This maple bears seeds so infrequently that when 1972 came along with a good crop I wanted, primarily, to produce some seedlings for the next year. From what I could read in the literature and in previous *Proceedings* of the Plant Propagators' Society it seemed to me that the most successful method would be to overwinter it in stratification boxes and plant it out in the spring.

VOICE: Why is vermiculite not being used more?

BOB TICKNOR: Well, in my experience vermiculite, on a long term basis, tends to collapse and become soggy, whereas perlite is more stable. Also in rooting in flats, perlite is easier to carry in and out than is sand.