until it returns the highest percentage of success. We're still experimenting with new ideas and hope to come up with a foolproof system.

One of the best ways to get into trouble is to be lax on the sanitation program. We clean all vegetation material such as scraps from cuttings, etc., out of the headhouse every evening. We wet the floor down before sweeping so that we do not put a lot of dust into the air. All floors and aisles are sprayed at least once a week with a solution of LF-10. Keep hose nozzles off the floor and wash your hands when leaving one house before going into another greenhouse if you've been handling plants. Just keep in mind that it is possible to realize a money return of somewhere around $40/sq ft of propagating bench, if you do everything right.

MODERATOR FLEMER: Thank you, Mr. Henrietta; that was excellent coverage of basic rhododendron propagation. Our next paper is by Harold Stoner and because everything is not started from cuttings, Mr. Stoner is going to talk to us about grafting.

GRAFTING, FROM SCION TO PLANT

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Westminster Nurseries is an old firm that was founded in 1893 by my grandfather, Mr. J.E. Stoner, growing mainly fruit trees. Many changes have taken place since then. One concept, formed back in the 1940's, has not changed and we believe this to be the basic success of our nursery; i.e., we have tried to be diversified in the types of plants we grow to satisfy most of the needs of the landscape trade to the best of our ability. Since we wanted to raise many different types of plants, including some of the unusual ones, we started the grafting procedures which we are still using today.

UNDERSTOCK AND SCIONS

On or about December 10th, the understocks are removed from the cold frames and brought into a greenhouse where they are kept at a temperature of 65°F for 6 weeks. We use 2-yr-old understock which has been potted in 2¼ inch deep clay pots.

Scions (from stock plants that have had no contact with herbicides) are collected on a daily basis to assure no loss of vitality. They are taken only when the temperature is above freezing, moistened, and stored in a room temperature of 35°F.

GRAFTING

We use one type of graft for all the cultivars we grow, and that is the side-tongue graft. It is simple, and our percentage of success is usually 65 to 95% dependent upon the cultivar of plant being grafted (Table 1). A 1¼ inch uniform cut is made on the understock just above the soil line to a depth of about one fourth the diameter of the understock. The scion is then selected to match the size of the understock on an individual basis. The diameter of the scion and the diameter of the understock should match. Once the scion is selected, a small portion of the lower end is cut off, and if needed, trimmed enough to make the wedge. The wedge is then made by cutting two sides 180^0 apart to fit the opening on the understock (Figure 1 - left)

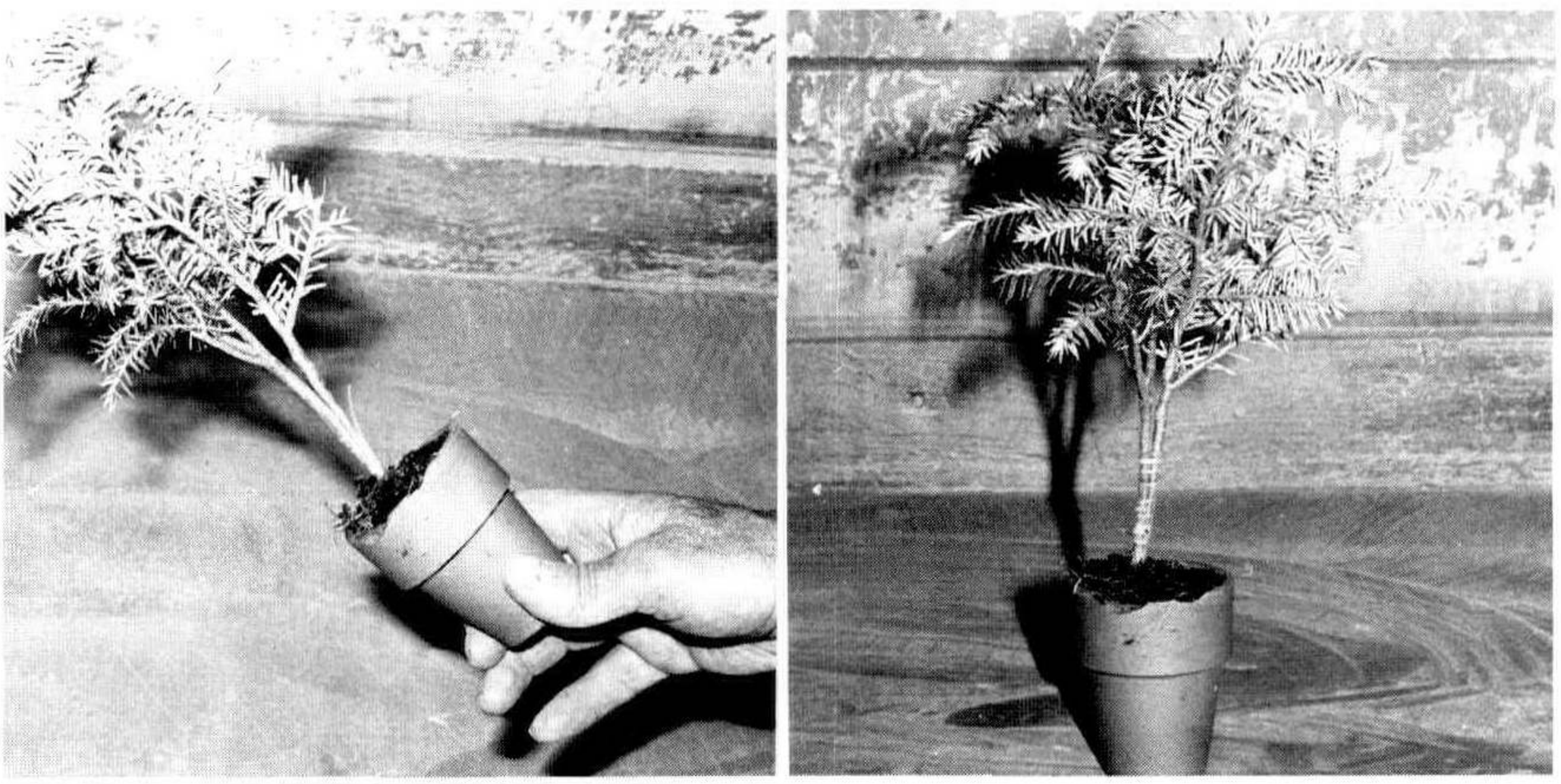

Figure 1. Left. **Observe the cut made on the understock with the tongue of the scion inserted and ready for binding.** Right. **Grafted plant with the binding in place.**

Binding is done with rubber grafting strips 5 inches long, 3/16 inch wide and 0.016 gauge starting at the top and working down. Close attention is paid to the alignment of the cambium layers just before the binding is applied. The same person who prepares the scion and understock also applies the binding being careful not to bind it too tightly, but firm enough to hold the union together until the scion unites with the understock (Figure 1 - right).

The graft cut is completely covered with paraffin wax to prevent air from getting to the union. We apply the wax with a small paint brush. Wax temperatures should not exceed 140^{0}F or your work may be for naught. As it has been pointed out by other members (1) in previous talks on grafting, you can very easily control the wax temperature by using a thermostatically controlled electric heating element.

Table 1. Successful graft combinations that we are presently using.

Understock	Scion	Percentage success
Juniperus horizontalis 'Plumosa' Andorra juniper	*Juniperus virginiana* 'Canaert' Canaert red cedar	95%
Thuja occidentalis 'Pyramidalis'	*Chamaecyparis obtusa* 'Nana Gracillis' dwarf Hinoki cypress	95%
Tsuga canadensis	*Tsuga canadensis* 'Microphylla' (Dwarf Compact, Upright)	90%
Same	*Tsuga canadensis* 'Pendula' (Sargent's weeping hemlock)	90%
Cryptomeria japonica	*Cryptomeria japonica* 'Lobbii' Lobb cryptomeria	95%
Picea excelsa Norway spruce	Picea pungens 'Koster' Koster blue spruce	65%
Acer palmatum Japanese Maple	*Acer palmatum atropurpureum* Bloodleaf Japanese maple	*70%*
Same	*Acer palmatum* 'Ornatum' ('Dissectum Atropurpureum') Laceleaf or Cutleaf Japanese Maple	95%
Wisteria sinensis Chinese Wisteria	*Wisteria multijuga*, (White & Pink)	90%
Same	*Wisteria sinensis*, (Blue)	90%
Same	*Wisteria sinensis*, (Purple)	90%

ROOT GRAFTING

Wisteria are root-grafted about the middle of February using the procedure described above except that the scion is grafted on the wisteria root instead of the trunk of the understock. The rootstock is dug just before it freezes. They are immediately healed into flats with soil and placed in a greenhouse at 65°F, and remain there until February. The roots are then removed and cut into 3 inch lengths. Since wisteria are grafted on root understocks, they are immediately potted into a 2¼ inch deep pot covering the wound of the graft. This allows us to skip the waxing procedure. Following the potting, they are placed in open benches and immersed in moist peatmoss deep enough to cover the top of the pot. They are held at 60° to 65°F for 3 months and are then canned into 1 gal containers and placed in an outside deep coldframe. They are 2-yr-old from the time they are grafted until they are sold as No. 1 grafted plants.

POST-GRAFTING CARE OF MAPLE AND CONIFERS

Maples are handled differently from wisteria and conifer grafts. Upon completion of the binding and waxing procedure, we

wrap the top of the understock and scion in wax paper. This tends to keep a higher than normal humid condition within the enclosure which is surrounding the scion and upper portion of the understock. We feel this procedure is worthwhile since we were able to increase our percentage of successful grafts, especially with the top-grafted Cutleaf Japanese maple. Maples are not put under double glass, but wrapped with wax paper, and are placed in moist peatmoss and cared for basically about the same as conifers.

Conifers are placed in a case on a 45^0 angle with the scion on top of the angle and understock on the bottom side. There are two reasons for using a 45^0 angle when placing the plants in the cases; 1) it lowers the overall height of the grafted plant within the case and 2) it allows the wound of the graft to be covered with moist peatmoss more easily. No direct watering is done while the plants remain within the case and a temperature of 65^{0}F is maintained as closely as possible. Because of the highly humid conditions created by underneath hot water heat and the evaporation of the water within the moist peatmoss, condensation collects on the underneath side of the glass. This moisture is removed morning and evening simply by wiping with an absorbant cloth. This moist environment is necessary for the survival of the scion until the wound of the graft has healed and the scion is then supported by the understock.

After 3 weeks the plants are removed and 1/3 of the understock is cut off and the peatmoss re-moistened. This procedure is repeated at 3 wk intervals until the understock is completely removed above the wound of the graft. When the understock has been cut off the second time, we start to air the cases just a small amount. Each week this is increased until the glass sash are completely raised. The wax paper on the maples is removed as soon as the scion shows signs of uniting (buds starting to grow). We then begin to cut the top of the understock back.

The conifers remain in the cases in the greenhouse until mid-May, (after any danger of frost) and are then bedded in peatmoss in outside coldframes. We cover the graft wound with peatmoss which will produce root growth in the area of the union. They are immediately covered with glass and shades. For the first 10 days, the glass sash are raised 1 inch. The glass is then raised slightly more every 2 to 3 days, so by the end of 30 days from the time they were placed in the outside frame, the glass has been completely removed; the shades are left on until August. They are then removed for hardening off for winter. The following spring, the conifers are ready for planting in the field or the container. The maples are planted in 2 gal containers and placed in deep coldframes outside. The binding is cut on the grafts at the time they are canned or bedded in the cold frames.

LITERATURE CITED

1. Wolff, Richard P. 1973. Successes and failures in grafting Japanese maples *Proc. Int. Plant Prop. Soc.* 23:339-345.

MODERATOR FLEMER: Thank you, Harold, for a very clear and interesting paper. The anchorman for this afternoon's session is Dr. Noel Jackson from the University of Rhode Island who's topic is: "Through the Looking Glass".