East Lansing, Michigan
"Insect Pests of Shade Trees & Shrubs"
Purdue University, Cooperative Extension Service
(Mimeo E-41)
Lafayette, Indiana
"Plant Pest Handbook"
Connecticut Agricultural Exp. Station
(Bulletin #600)
New Haven, Connecticut
"Illinois Trees: Their Diseases"
Illinois Natural History Survey
(Circular #46)
Natural Resources Bldg.
Urbana, Illinois

MODERATOR TUKEY: Our next subject is propagating blueberries by cuttings. Mr. Philip Fisher will be the speaker.

ROOTING BLUEBERRY SOFTWOOD CUTTINGS

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My subject is rooting blueberry cuttings which is, of course, the cultivated high bush blueberry, *Vaccinium corymbosum*. There are not many other propagators here, if any, who want to know how to root blueberry softwood cuttings under mist, but possibly some of our experiences will have some application in other fields, with other material. The field is very specialized because if you do not have a blueberry plantation in a blueberry growing area, you do not have the material or market for blueberry plants.

Traditionally in most states blueberries are rooted from hardwood cuttings. The whips from the previous year's wood are 12 inches to 30 inches long, about the diameter of a pen or pencil, cut in 6-inch lengths and taken in March while the plants are dormant. The cuttings taken from the tip of the whip root better than those from the more mature wood at the base, and cuttings with leaf buds root better than those with flower buds. I first heard about rooting blueberry softwood cuttings at the Experiment Station in Puyallup, Washington, many years ago. Because of their cool climate, they had some success rooting them without intermittent mist.

About that time I heard about what Harvey Templeton was doing and what Jim Wells was doing at Dundee, and we got our first advice and nozzles from Jim at that time. We were advised by the Experiment Station at South Haven, Michigan, that even if we could root softwood cuttings, we could not winter them over unless we had a greenhouse. We have been

able to root them under intermittent mist and winter them over in the same bed.

We have a crude, inexpensive set-up. I will show you a few slides which may have application for others who do not have a greenhouse. Further, I believe plants started from softwood cuttings are on the average superior to those rooted from hardwood cuttings. Another advantage is that when the South Haven Experiment Station or the U. S. Department of Agriculture at Beltsville thru their test cooperator in New Jersey releases a new variety, it can be multiplied much more rapidly because so many more laterals can be taken from a plant than can hardwood whips. The plant can grow and bear fruit at the same time you are removing softwood laterals.

The wood is usually ready somewhere near the 10th of July. We do not adhere to a date. They are heel cuttings and the laterals must have completed their primary growth and be taken just when the second growth starts. We used to get a tail that had to be cut off on a block, but by pulling them just with the right snap we get no tail but there is a ring of the old bark, or collar, at the base of the heel cutting and from which a good mass of roots start. You want a blueberry bush and not a tree and from this base it has been our experience more strong canes emerge from the base in the nursery than from hardwood cuttings.

For our propagating bed we put a layer of washed gravel on level or slightly raised ground and use one tier of concrete blocks for the sides to hold the medium which is half horticultural peat and half Perlite. We mix it on a concrete floor and keep it wet for about 2 weeks to make sure it is mixed and damp.

In the two beds you will see on the slides, we are able to stick about 8,000 cuttings in each. Our beds are about 120 feet long and 4 feet wide and the cuttings are spaced 2¼ inches by 2¼ inches.

The mist lines are about 7 inches above the bed and supported by stakes. We have found that two mist lines are better than one. We are in the country and have to rely on well for water. Our jet pump unexpectedly failed at a critical time and emergency extra shade saved most of the cuttings. This past summer the Jim Leech family's portable swimming pool with 8,000 gallons of water and a pump has been moved near the propagating beds with many hours of emergency mist available.

A small percent of the cuttings do not callous and another small percent are not rooted well enough to give them space in the nursery, plus normal casualties, but on the average 60 to 75 percent root well enough to make good plants. We are also in the Christmas tree business and use the tree planter to line the cuttings out in the nursery where they stay normally for two summers.

The cuttings must be taken off very early in the morning, as soon as you can see, and the lower half of the leaves are stripped off right in the field. The cuttings must be kept damp and stuck immediately. The bed is covered, quonset shape, with 6 inch by 6 inch concrete reinforcing wire covered with 4 mil polyethylene 6 feet wide and then covered with 46% Saran shade. If there should be a rainy, cloudy day, it is ideal, and the entire job can be done in one day instead of on several early morning segments. A crew starts sticking as soon as some cuttings are available. There is a 1/16 H.P. exhaust fan at one end of the bed. The mist is on while the cuttings are being stuck. They are flooded in as every few feet of bed is stuck and the polyethylene and shade are unrolled to cover the cuttings as sticking progresses. We have tried Hormodin #2 and #3 and found no response. The nozzles are 4 feet apart on ½ inch galvanized pipe. Each nozzle (#4 NW) delivers 4 gallons per hour if run continuously. We went thru the electronic leaf and other control devices, but now use a time clock set for 1 minute on and 5 minutes off until rooting starts and then the time off is increased. A thermostat shuts off the time clock if the temperature of the air is below 70 degrees Fahrenheit in the bed. The exhaust fan runs continuously in daylight. We have a small opening in the end of the bed opposite the exhaust fan so that the mist is carried over the bed. It is necessary to keep the leaves wet continuously when the bed temperature is over 70 derees. The mist and exhaust fan keeps the bed temperature below 80 degrees.

We remove the polyethylene when rooting is well started, but leave the shade on until fall. In preparation for winter when the cuttings are rooted and are losing their leaves, we sprinkle about one inch of sawdust right on the entire bed. After some frost and light freezing we cut pine boughs (the concrete reinforcing wire mesh is left over the beds) and cover the beds with a thick layer of boughs so that there is protection from extreme low temperatures and they are entirely dormant all winter and until the pine boughs are removed in the spring.

When the nursery ground is ready, the plants are shaken out, the last year's peat and Perlite are discarded and we are ready for the next batch. The cuttings are stuck just before the earliest varieties are ready to pick in July, so that the work load timing is favorable.

Blue Crop is a very large, popular, and satisfactory semi-early new variety that is very hard to root from a hardwood cutting but can be rooted very successfully from softwood cuttings. Some new varieties are being named and released this year. New blueberry varieties are not patented since the chief breeders are the U. S. Department of Agriculture at Beltsville and Stanley Johnston at the South Haven Experiment Station in Michigan. He bred and released all of the popular Haven series of peaches. For 25 years he has been crossing high bush and low bush blueberries to get a lower bush with excellent

winter hardiness and other superior qualities. He has just named and released "Blue Haven." The crosses made at Beltsville are now all tested on the Galletta Brothers plantation at Hammonton, New Jersey. At the present time this cooperator has about 20,000 seedlings under observation, as well as about 500 acres of blueberries in production. A selection named and approved for release next spring is "Lateblue." In return for furnishing the land, cultivation and care of the seedlings and years of observation, the cooperator has, when a variety is released, the only source of plants for sale. There is also a new early variety which will probably be released next spring. A supposedly good early variety, Earliblue, released several years ago, did not live up to expectation. Because some older varieties become obsolete and new varieties are being introduced, there is a market for plants and we have found that softwood cuttings are the best method of propagation for us.

MODERATOR TUKEY: The final speaker for this afternoon will be Dr. Albert Johnson of the University of Minnesota, St. Paul, Minnesota.

VARIATION IN CLONES OF RED-OSIER DOGWOOD

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Nurserymen have long recognized the importance of using plants well adapted to their local climatic conditions in order to produce attractive and fully hardy specimens. Presently, there is an increasing interest in the use of native plant materials. For this reason knowledge of factors relating to the geographic origin of plants used for propagating purposes is of growing concern.

In 1963 we obtained dormant cuttings of red-osier dogwood from points both in the United States and Canada. Figure one indicates the collection points of dogwood and the source of specimens in the University of Minnesota Herbarium. The resulting plants were grown in the greenhouse and then transplanted in a randomized block design into the experimental plots.

Variations both in plant form and growth rate were noted during the first growing season. The extremes in variation in form are evident when comparing a typical plant from the Minneapolis area (Figure two) with those of the same age from Alaska (Figure three) and Seattle, Washington (Figure four).

Total growth by October, 1963 was determined by measuring all stem material in excess of three centimeters. Figure five indicates total increment of all clones studied. In comparing increment with climatic parameters such as length of grow-