ORIGIN OF ADVENTITIOUS ROOTS AND CALLUS ON STEM CUTTINGS OF ILEX OPACA AS INFLUENCED BY WOUNDING AND SYNTHETIC GROWTH SUBSTANCES

L. C. Chadwick and K. W. Reish
Ohio State University
Columbus, Ohio

The remarks that I have this morning are going to concern the problem of the effect of wounding and synthetic growth substances on callus formation and the initiation of adventitious roots on American holly.

I think I should mention at the start that I want to give credit to Dr. Reisch, who supervised much of this problem, and to Donald Kling, who carried out many of the actual experiments.

The purpose of the experiment was to determine the effect of wounding and the use of synthetic growth substances on callus formation and on root formation on Ilex opaca, and perhaps more important, to study the anatomy of the origin of callus and adventitious roots.

I am sure that most of you are familiar with the literature that would indicate that wounding of cuttings of Ilex opaca have resulted in stimulation of root formation and also the fact that use of synthetic growth substances have also resulted in increased root formation. Some of the literature would indicate that wounding was perhaps more important than the use of synthetic growth substances.

In the way of procedure, these cuttings were taken on December 28. They were made up six to seven inches in length of terminal growth and stuck on January 6. Four treatments or one control and three treatments were used. One consisted of simply wounding the basal end of the cuttings with 3 three-quarters of an inch slits on the stem. Synthetic growth substances were used in another treatment. The substances were naphthalene acetic acid and naphthalene acetamide. The fourth treatment was a combination of both wounding and the use of synthetic growth substances.

Three hundred cuttings were used in each of the treatments for a total of 1,200 altogether.

As far as the anatomical study was concerned, ten cuttings were removed from each plot every four days and an anatomical study made on those sections. We will not go into detail on that particular part.

As far as the results were concerned, based on the evidence in this piece of research at least, there was no advantage at all of wounding. This, I realize, has been differed with and contrary to what has been reported previously, in fact, contrary to some of the work we had done previously. We did find, on the other hand, consider-

able stimulation from the use of the synthetic growth substances from the standpoint of increase in roots, quickness of rooting, and the number of roots.

After approximately 45 days with the cuttings that were treated with synthetic growth substances, the rooting performance was essentially 95% to 100%. At the same time, the control cuttings were about 30%.

I think now if we can have the few slides we can cover the anatomical aspects of this problem.

This is a slide of the basal end of the cutting at the time the cutting was made. I point out the pith which made up about a third of the diameter of the stem. The xylem was very extensive in comparison with the amount of phloem tissue, in fact, there was about one phloem cell to eight xylem or the xylem was eight times as extensive as the phloem tissue. We will refer to that a little bit later.

This is a longitudinal section through the basal end of the cutting, indicating callus formation, and I think you can see that the callus here is developing from the cambium tissue. That was true in all cuttings regardless of whether they were treated or not treated.

This shows a cross section of the start of root initiation. This was apparent in about ten days after the cuttings were taken.

Here is a little later stage in the development of a root initial and this slide indicates the situation that exists where synthetic growth substances are used, and not on control cuttings. I might indicate that this root initial is forming from the relatively new phloem cells. That appeared to be true in practically all cases where synthetic growth substances were used.

I might also indicate with the use of synthetic growth substances we had a proliferation of phloem cells to the extent that considering the total cross section of the stems involved, the phloem was practically equal to the size of the xylem. I mentioned previously the xylem was eight to one of phloem. After treatment it was about one to one. I might indicate perhaps as a point of interest that there was no differentiation of the cells in the new root initial until after emergence had occurred.

This is a longitudinal section of a control cutting and here is where there was a decided difference in root origin, depending on whether or not the cutting was treated with a synthetic growth substance. As I have indicated, with the treated cuttings, roots originated in the phloem tissue. When they were not treated they arose in the cambium cells that had extended down into the callus and that appeared to be true in all cases.

On the treated cuttings the roots arose along the basal inch of the cutting. On untreated cuttings, only down at the very base and

the actual root origin was in cambium which developed down into the callus.

Just in summary, I would make this remark, that wounding did not seem to be important either in the formation of callus or root origin as far as this piece of work was concerned.

Secondly, that the origin of adventitious roots varied depending upon whether or not the cuttings were treated with a synthetic growth substance. With growth substances the origin was in phloem tissue. Where no treatments were given, the origin was in callus tissue. This is one of about two reports in the literature that I know of where roots have actually been shown to originate in callus tissue.

Thank you.

MODERATOR MARCH: The next item on the program is "Pocket Planting Mixer", which will be the topic of our next speaker, Mr. Harvey Gray, New York State University, Agricultural and Technical Institute, Farmingdale, New York.

POCKET PLANTING MIXER

Harvey Gray
New York State University
Agricultural and Technical Institute
Farmingdale, New York

Propagators and plantsmen dealing in ericaceous plants recognize the importance of fibrous, acid organic matter in the production of their crops.

In commercial production costly operations and organic matter must be recognized and reconciled with. Young plants either seedlings or cuttings, in their first and/or second year present no great problem nor cost, when grown in beds containing up to 50% peat. It's in the field product with plants in their second, third, fourth years that the organic matter requirement becomes a costly production problem.

Large quantities of organic matter added to mineral soils in an overall application is costly. Small quantities of fibrous peat to create an organic pocket for planting presents a costly operation if a uniform pocket mixture is to be created. It is here that the pocket mixer comes into play.

To make use of the pocket mixer for ericaceous plants, the mineral soil is first deeply tilled with a rotating tiller. One large shovelful of soil is removed along the planting line. Each hole will be filled with sphagnum peat that has been nicely shredded. The "Go-Kart mechanized wheelbarrow" is used to transport the peat to the