

in the wounded tissues. Gorenz suggested and observations with nut scions confirm, that budwood which is to be shipped should first have a fungicide treatment. The same thing is true with scions or budwood to be stored before use.

In some of my earlier trials, the dry wettable ferbam powder was lightly dusted on cut bud pieces, and some correspondents report good grafting results where scions are shaped, then dipped in ferbam powder before grafting, but probably more uniform results will be obtained with the concentrated mixture in water

Part of the benefit from ferbam and zineb applications on buds may derive from a stimulative effect on callus formation resulting from use of these chemicals. Both are dithiocarbamate compounds, and contain nitrogen which is at least slowly available as a plant nutrient. Where ferbam is sprayed on fruit trees it has been noted that leaves take on a greener appearance. A similar stimulative effect has been noted with cuttings of some herbaceous plant materials that had ferbam applied to their cut ends.

* * * * *

MODERATOR WARNER. Thank you very much.

The next speaker is Mr. Zimmerman of Rutgers University, New Brunswick, New Jersey. I understand you are doing work under a fellowship. Is that correct?

MR RICHARD ZIMMERMAN (Rutgers University, New Brunswick, New Jersey): Yes, and I would like to express my appreciation to the Metropolitan Nurserymen and the New Jersey Nurserymen's Association for sponsoring the work I have been able to do at Rutgers. This is the first chance I have had to come back to Ohio, which is my home state.

Mr. Zimmerman read his prepared paper entitled "Effects of Liquid Fertilizers on Rooting of Cuttings." (Applause)

EFFECTS OF LIQUID FERTILIZERS ON ROOTING OF CUTTINGS

RICHARD H. ZIMMERMAN
*Department of Horticulture
Rutgers University
New Brunswick, New Jersey*

In the past twenty years, there have been scattered reports of the treatment of cuttings with various types of fertilizers in an effort to improve rooting. These attempts have covered a wide variety of plants, numerous types of fertilizers and several methods of application. In many of the trials, root and/or shoot growth was stimulated by the addition of fertilizer but in almost all cases, the cuttings also had to be treated with a chemical root-inducing compound for the effects to be noticeable.

A series of experiments was conducted with cuttings of several species of woody ornamental plants to determine the effect of fertilizer applications during the rooting period on the rooting, root growth and shoot growth of the cuttings.

It was found that soaking greenwood cuttings of California Privet (*Ligustrum ovalifolium*) for 24 hours in a liquid fertilizer had no effect on rooting or root growth and a very slight effect on shoot growth. After the cuttings were inserted in the rooting medium, fertilizer was applied to groups of cuttings at two-day, four-day and six-day intervals. The fertilizer used had an analysis of 15-35-25 and it was used at one teaspoon per gallon, a gallon being enough to treat 250 cuttings. In comparison to cuttings receiving no fertilizer, the cuttings treated at the four-day interval had the greatest increase in growth at the end of 39 days in the bench. No increase in rooting percentage was found although root and shoot growth were increased at least 25 per cent. Cuttings receiving no fertilizer produced no lateral shoot growth while 25 per cent of the cuttings treated at four-day intervals had an average of 5 shoots per cutting.

The rooted cuttings were planted in flats and measured six weeks later during the first week of October. Differences in terminal shoot growth were not changed but there were striking changes in the number and distribution of lateral shoots. Lateral shoots had developed on most of the cuttings which had received no fertilizer and to a lesser extent on the cuttings treated with fertilizer. The plants which received no fertilizer were shorter but had more lateral shoots than the plants which had received fertilizer at the four-day intervals.

The following spring, the plants were set out in the field but no differences in overall shoot growth were found after one growing season in the field.

Cuttings of Japanese Yew (*Taxus cuspidata*) were treated with different concentrations of a commercial water soluble fertilizer with the analysis of 23-21-17. This was used at the rates of one-half, one and two teaspoons per gallon with one gallon treating 350 cuttings. Applications were made weekly. The two higher rates increased root growth by 50 per cent in comparison to untreated cuttings.

The time of application of fertilizer in the rooting period was also studied. Fertilizer was applied to the cuttings before roots had formed, after roots had formed and both before and after roots had formed. There was also a group of unfertilized cuttings as a control. Hardwood cuttings of *Taxus cuspidata* and *Pyracantha coccinea* were used in one experiment while softwood cuttings of *Pyracantha*, *Viburnum Sieboldii*, *Spiraea Bumalda* Anthony Waterer, *Corylus Avellana* and *Cornus mas* were propagated under intermittent mist in the other. The commercial 23-21-17, water soluble fertilizer was used at the rate of one teaspoon per gallon per 400 cuttings. The hardwood cuttings were treated weekly and the softwood cuttings every three days.

With cuttings of *Taxus*, it was found that fertilizer applied after roots had formed was more effective in stimulating root growth than fertilizer before roots formed. The fertilizer applied after roots formed resulted in a 25 per cent increase in rooting percentage and root growth.

Both hardwood and softwood cuttings of *Pyracantha* showed a greater response to fertilizer applied before the roots had formed. As much as a 50 per cent increase in root growth was found for both the hardwood and softwood cuttings.

The cuttings of *Cornus* and *Corylus* rooted very poorly and no differences were found between the different treatments. The cuttings of *Spiraea* and *Viburnum* rooted very well but again no differences were found.

From the work completed to date, it appears that the effectiveness of fertilizer applications varies with the time of application, the method of application, the amount of fertilizer and the plant species.

* * * * *

MODERATOR WARNER: Thank you, Mr Zimmerman.

Our next speaker is Frank Turner, who I am sure needs no introduction. When we were talking a while ago, he was very conscious of this rule that we have in the Propagators' Society that we should not withhold information from fellow members. He is so conscientious about that, he told me he was telling things he didn't even know.

Mr. Frank Turner, Berryhill Nursery Company, Springfield, Ohio, presented his paper. (Applause)

FORM VARIATIONS IN *TAXUS* AS RELATED TO THE SOURCE OF THE CUTTING ON THE STOCK PLANT

FRANK TURNER

*Berryhill Nursery Company
Springfield, Ohio*

Thank you for the privilege of appearing before you to call some of these observations to your attention. To clarify the title, "Form Variations in *Taxus* as Related to the Source of the Cutting on the Stock Plant," I will say that we are referring to the location or level from which the cutting is taken from the stock plant as it in turn is related to the subsequent development of the mature specimen. My remarks are made in order to stimulate thinking about observable differences that could be attributed to taking cutting pieces from various plants and from the "same" plant in different locations, whether that be done by design or habit.

On several occasions at these meetings we have been reminded of the influence of position on the plant and the influence of the age and variety of plant on the rooting of yew cuttings. These reports have been confined almost universally to the speed, percentage, and quality of rooting. In some reports the plant subjects have been of types usually considered quite difficult to root. We have seldom, if ever, had reports on the subsequent development of these rooted cuttings. In saying this, I mean to imply that there seems to be little information on the capability of these experimentally rooted cuttings to efficiently make plants of good quality and desirable structure.

If you grant that this situation is true regarding variations in plants in general, I believe that I can point out some observable variations in *Taxus* varieties which may be due to the type of cutting and the location on the plant from which it was taken.

Some of the reasons why a grower selects a particular type of plant and type of cutting for propagation have good reason. He often be-