The Use of Plant Growth Regulators on Woody Ornamental Plants

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We in horticulture are the potential beneficiaries of a great deal of research being conducted in areas of biochemistry, chemistry, physics and plant physiology. Outstanding scientists, who are very often not plantsmen, have demonstrated that chemicals can profoundly affect plant growth. Today, for example, chemicals exist which can:

- prevent, delay, or stimulate seed germination
- retard or accelerate vegetative growth
  increase or decrease lateral branching
- chemically prune plants (roots and shoots)
- prevent, delay, or accelerate flowering
- inhibit or promote fruit formation
- defoliate plants
- substitute for cold temperatures or long days.

etc. , the list is very long.

It is our responsibility in horticulture to be aware of the information gained from research in other areas of science and apply it to current needs of our industries. This concept is the essence of our plant growth regulator program at OARDC.

One important concept must be understood concerning the use of chemicals to control plant growth. They are only a cultural tool for us to use, just like fertilizer and water. Chemicals can increase the quantity and quality of plant growth, but they will not substitute for poor cultural practices. In fact, best results will be obtained only when the best possible cultural practices are already being followed.

Our major goals in this program are to decrease the time it takes to produce salable size plants, increase plant quality, decrease labor costs and hopefully increase profits for the grower. I will present today some of the highlights of our work with growth regulators in past seasons.

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One phase of our study involved the testing of two growth retarding chemicals, B-Nine and Phosfon. B-Nine (N-dimethylaminosuccinamic acid) was used to help solve a troublesome problem with Pyracantha coccines Lalandi . This plant attains a salable size the second season after propagation but does not flower and fruit well until the third season. A single foliar application of B-Nine (10,000 ppm), applied in mid-August, induced excellent flowering and fruiting of Pyracantha the second season following propagation. Since the fruits are the major sales feature of the plant the potential exists, through the use of B-Nine, for marketing this plant earlier and at greater profit than had heretofore been possible.

A second growth retardant, phosfon (2,4-dichlorobenzyl tributyl phoshonium chloride) , was used in an attempt to increase flower bud formation on three year old plants of Rhododendron "Roseum Elegans". Phosfon is commercially available as a 10% solution and hence was used in this experiment. Phosphon was applied in the Spring as a soil drench at rates of 0.2 gm, 0.4 gm, 0.6 gm, and 0.8 gm per one gallon container.

Observations last fall indicated that untreated plants produced an average of less than one flower bud per plant. Phosfon treated plants, in contrast, averaged four flower buds per plant. The ease of Phosfon application, and the fact that it can be applied in the Spring at the time of transplanting thus reducing potential labor costs, suggests the possibility that this chemical can be adapted to commercial operations.

Gibberelic acid (GA_3) is a growth accelerating substance that has been used extensively on a variety of plants. In one study, Viburnum plicatum "Grandiflorum" plants were treated in mid-July with GA3 at concentrations ranging from 100 to 1,000 ppm. The objective was to determine if high quality plants of large size could be developed sooner than possible under normal cultural practices. The 1,000 ppm treatment resulted in excessive shoot elongation and, in addition, had the interesting effect of inducing treated plants to flower in late August. A concentration of 500 ppm GA_3 provided best results , as a larger than normal, but still quality plant was produced.

The cost of manually pruning certain plants, in order to obtain good lateral branching, is often quite large. Substances are available today, which will chemically prune plants and reduce manual labor requirements. These chemicals are esters of C_8 , C_9 , or C_{10} fatty

acids and work by selectively killing just the shoot tip of plants, thus inducing lateral branch formation. A commercial formulation of C8 and C10 fatty acids called Off-Shoot-0 was utilized in these studies.

One year old plants of Rhododendron "Roseum Elegans " were treated with a 3%, 4%, 5%, 6%, and 7% foliar spray of these fatty acids in Spring, 1968 when new growth was approximately 1/2" long. The 4% concentration proved to be the best as branching was increased and no injury occurred on treated plants. Control plants normally developed one break from a terminal bud while treated plants had from three to four breaks per bud.

The same esters of fatty acids were also effective in increasing lateral branching of Ilex opaca "Big Red". The most effective concentration was 20% applied as a foliar spray in the Spring when the holly was just beginning vegetative growth. A second application in mid-June, at the same concentration, increased branching even further. The end result this fall was a large well branched, very salable plant.

Off-Shoot-O was also effective in chemically pruning privet (3%) , Azalea mollis (3%) , Azalea Hino Crimson (5%) , and Taxus (3%). A big advantage of this chemical is that short tips are killed quickly, often two to four hours after treatment. Thus, if a crop is to be treated in the afternoon, trials can be run in the morning and any adjustment in effective spray concentration can be made prior to large scale treatment.

A second group of chemicals called Morphactins were also used in an attempt to increase lateral branching of several plants. The Morphactins are a group of three compounds of similar structure with varied biological activity. They, in contrast to the chemical pruning agents, do not kill the shoot tip, but rather retard its development and thereby induce lateral branch formation. This is an important difference as it is often undesirable, as in the case of many shade trees, to prune or remove the shoot tips from main branches.

The Morphactins as a group were effective in increasing lateral branching on Ilex opaca "Big Red" when applied as foliar sprays in the Spring at a concentration of 100 ppm. They were effective also

at 100 ppm in increasing branching on such plants as Boxwood juniper, Cotoneaster, and Viburnum.

The Morphactins, when applied as a foliar spray at a concentration of 1,000 ppm, proved to severely retard vegetative growth of Pyracantha and Honeysuckle. Applications were applied in late May and little growth occurred on treated plants during the growing season.

The Morphac tins, like most plant growth regulators, do not work on all plants and have undesirable effects on some plant genera. Forsythia, for example, following treatment with 1,000 ppm of the Morphactins, appeared as if it had just been treated with 2,4-D. The leaves were severely curled and distorted. In addition, foliar applications of the Morphactins (1,000 ppm) to Rhododendron "Roseum Elegans" resulted in no increased branching but rather moderate leaf distortion.

The last substance I would like to mention today is a material called Ethrel (2-chloro-ethyl phosphoric acid). This material induces many biological responses in plants but one of its outstanding attributes is that it is an excellent chemical defoliant. When used as a foliar spray, it has the interesting property of being converted to ethylene gas within a plant leaf thus causing natural leaf abscission. It does not burn or dessicate leaves in order to induce defoliation thus greatly decreasing potential injury to treated plants. Malus "Snowdrift", Acer Platanoides "Cleveland" and many rose varieties were completely defoliated in October, five days after treatment, with 5,000 ppm Ethrel. Lower rates of Ethrel (1,000-2,500 ppm) also caused complete defoliation of the same plants but took ten rather than five days for complete effectiveness. This chemical will soon be available commercially and I'm sure find many uses in nursery or landscape operations.

Thank you very much for your kind attention.