RESEARCH RESULTS for NURSERYMEN

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CHEMICAL CONTROL of GROWTH

GROWTH RETARDANTS:

Stem elongation of Roundleaf Japanese Holly, Gardenia, and Burford Holly plants was retarded by growth retardants B-nine and Cycocel applied in August. One application of 0.5% spray of B-nine was more effective than Cycocel at the same concentration. Foliar discoloration (irregular yellowing of the new foliage chiefly confined to the edges) indicative of toxicity was noted on Roundleaf Japanese Holly and Gardenia plants when treated with 0.5% Cycocel. Soil applications were also effective on these plants.

AZALEA - DAYLENGTH, LIGHT INTENSITY, and GROWTH RETARDANT:

The influence of daylength and light intensity on the effectiveness of growth retardants was studied. Plants of the Coral Bell and Salmon Beauty varieties were pinched in June and treated with retardants in July. Light intensity treatments for summer growing varied from full sunlight to 50% reduction. The influence of shortening the daylength to 9 hours in August was also studied.

Plant shape. Compact plants resulted from shortening the daylength in August, increasing the light intensity during the summer, or using the retardants B-nine or Cycocel. There was only slight interaction of these factors. Cycocel was more effective than B-nine on the variety Salmon Beauty, whereas B-nine was more effective than Cycocel on the variety Coral Bell.

Time of flowering. Light intensity and daylength interacted to influence flowering date. Shortening the daylength in August delayed flowering of plants grown in full sunlight during the summer, and hastened flowering of plants grown under 50% light reduction. When a light shade (25% reduction) was used, daylength did not influence flowering date.

Daylength also interacted with growth retardants to influence flowering date. For plants grown under normal daylengths, use of retardants delayed flowering. However, when the plants were subjected to shortened daylength in August, use of retardants did not delay flowering.

Increasing the light intensity during the summer resulted in delayed flowering. Use of retardants did not influence this reaction.

Number of flowers. Use of retardants resulted in more flowers and increased uniformity of flowering. The other factors did not influence the number or uniformity of flowering.

AZALEA - EFFECTS OF COLD STORAGE, TIME, AND DURATION:

To study the time and the length of cold storage on flowering of Azalea plants treated with retardants, cooperative studies were conducted at the Ornamental Horticultural Field Station, Mobile, the

Blackwell Nursery, Semmes, Rosemont Greenhouses, Montgomery, and the Dept. of Horticulture, Auburn, Ala.[1/] Plants of Hexe, Red Wing, Chimes, and Coral Bell were sheared in June and treated in July. Cycocel and B-nine were used as foliar sprays at various concentrations. Plants were stored and forced at Mobile, Montgomery, and Auburn.

Only results of the plants stored and forced at Auburn are reported here.

Influences of retardants on shape of the plants. Normally Azaleas grown in southern Alabama develop many wild shoots late in the summer. These extremely vigorous shoots develop from the basal portions of a plant and contribute to an uneven crown. Flower buds initiate on these shoots late in the summer and are often immature when the plants are cooled for early forcing. This delay of flower bud initiation results in delayed authesis of the flowers, contributing to uneven flowering often described as undesirable for early forced pot Azaleas.

There was a difference in effectiveness of the retardants depending on the variety studied. B-nine was more effective than Cycocel in ensuring compact, uniform crown development on the Coral Bell, Hexe, and Red Wing varieties. Both retardants were equally effective on the variety Chimes. With this variety there was little visual difference between the treated and controlled plants. The difference in plant shape was not too pronounced in the Red Wing and Hexe varieties. Only with Coral Bell were there striking differences in crown formation or compactness.

Increasing concentration of both retardants resulted in increased compactness. At the time the plants arrived at Auburn, the concentration of each retardant that seemed to produce the best shaped crown were as follows:

Variety	B-nine	Cycocel
Coral Bell	0.20%	3-oz./gallon
Hexe	0.20%	2-3 oz./gallon
Chimes	All treatments appeared about the same	
Red Wing	All about the same	2-3 oz./gallon

Damage during storage period. Only with the variety Coral Bell stored from Sept. 12 to Nov. 12 were storage difficulties experienced. After approximately 6 weeks of storage, foliage injury began to appear on these plants. This injury became progressively more severe, and finally it resulted in damage to the flower bud and the stem. In severe cases the plant died.

1/ Cooperation of Dr. Raymond L. Self, Pathologist in charge of the Ornamental Horticulture Field Station, Owen Blackwell and Owen Blackwell, Jr., Blackwell Nurseries, and W. W. Paterson, Rosemont Gardens is gratefully acknowledged.

Retardant use did not increase or decrease the severity of the foliage injury.

Gibberellic acid and flowering. (1) Without refrigerated storage only the variety Chimes flowered uniformily enough to be considered salable when the plants were treated with gibberellic acid beginning on Sept. 19. Maximum flowering occurred about Dec. 18 for all treatments except the highest concentration of Cycocel. This treatment resulted in a slight delay.

Eleven applications of gibberellic acid were made on the Chimes variety between Sept. 19 to Nov. 1. By the latter date there was considerable show of flower color. Since the gibberellic acid damaged open flowers, the treatment was discontinued. As noted, maximum flowering occurred 1½ months later, although some plants were ready for sale by Thanksgiving. The plants that were treated with B-nine flowered earlier than those getting the other treatments. It was estimated that each plant received 33 milligrams of gibberellic acid.

(2) Use of gibberellic acid hastened flowering of all varieties given approximately 4 weeks refrigerated storage beginning on Sept. 12. The speed-up varied with the varieties. The Coral Bell and Red Wing varieties were approximately 2 weeks early in flowering, whereas Chimes was about 4 weeks.

Storage period and flowering. The length and time of storage greatly influenced flowering time. Approximately 4 weeks of storage begun in October (Oct. 14 to Nov. 12) was as effective as the longer period started in September (Sept. 12 to Nov. 12). The Oct. 14 to Nov. 12 period was more effective than the Sept. 14 - Oct. 14 storage period. It is possible that the flower buds were not mature and ready for storage on Sept. 12.

Influence of retardants on forcing time. The influence of retardants on forcing time varied with variety. Both retardants delayed the flowering of Chimes and Hexe, but did not seem to influence flowering time of Coral Bell. The flowering of Red Wing seemed to be hastened. The time and duration of storage did not influence these results.

Vegetative growth during forcing. In general, use of retardants resulted in less vegetative growth during forcing. However, there was considerable vegetative growth on all treated plants.

AZALEA - LIGHT INTENSITY AND RETARDANTS:

A study of the influence of light intensity on effectiveness of B-nine and Cycocel was made at Auburn, using the azalea varieties California Sunset, Dr. Bergman, Lentengroot, Pink Supreme, and Sweetheart Supreme. Light intensities studied were full sunlight and 50% reduction with saran cloth.

Light conditions alone influenced rapidity of flowering after refrigerated storage (8 weeks at 40° F). Full sunlight during the entire summer, or full sunlight early in the summer followed by shade from August 1, resulted in delayed flowering.

The effective concentration of Cycocel or B-nine was not influenced by light intensity treatments.

WOODY ORNAMENTALS PRODUCTION IN CONTAINERS

Factors Influencing Cold Hardiness:

The influence of soil mixture and soil moisture content were studied, using plants of *Ligustrum indicum* and *Abelia grandiflora*. The plants were grown in No. 10 food cans and had been planted the spring before and grown outdoors in full sunlight. During the winter, the plants were subjected to 0 to 5° F. in a deep freeze, then placed in a greenhouse to determine the extent of cold damage. The soil mixtures studied were: peat and perlite (1-1); peat and loam soil (1-1); and peat and builders sand (1-1).

When soil freezes there are three distinct stages. During the first stage, the soil temperature decreases to approximately 32° F. The next stage is the freezing of soil moisture. During Stage 2 the soil temperature remains at approximately 30-32° F. After all moisture is frozen, the soil temperature again begins to decrease (Stage 3). The lower limit is determined by the air temperature surrounding the container of soil.

The soil temperature decreased much faster on the edge of the soil ball than 1 inch from edge. During Stage 1, temperature decreased fastest at both locations in peat and perlite medium; the soil and peat mixture lost heat the slowest when the temperature approached 33° F. at edge of soil ball of the peat and perlite mixture, recorded temperatures were as follows:

Soil Mixture	Temp. at Edge of ball °F.	Temp. 1 inch from edge °F.
Peat-perlite (1-1)	33.6	38.9
Peat-sand (1-1)	37.1	41.2
Peat-soil (1-1)	39.1	42.7

The length of time before Stage 2 was completed varied with location and soil mixture. This stage of the peat and perlite mixture was shortest and that of the soil and peat mixture was longest.

Soil Mixture	Time required for soil mixture to freeze: Edge of ball Hr.,min.	1 inch from edge Hr.,min.
Peat-perlite (1-1)	1:48	2:20
Peat-sand (1-1)	2:30	3:50
Peat-soil (1-1)	3:00	3:58

The rate of thawing was not influenced by the soil mixture, and it was more rapid at the edge than 1 inch from the edge of the soil ball.

Injury to the plants was greatest in the soil and peat medium and least in the perlite and peat medium. Abelia plants were injured more than Ligustrum plants. On a score of 0 to 5 with 5 being no injury, the following results were obtained.

Soil Mixture	Ligustrum	Abelia
Peat=perlit (1-1)	3.8	2.3
Peat=sand (1=1)	3.5	1.2
Peat-soil (1-1)	2.8	0.5

Dry soil cooled faster than moist soil at the edge of the ball, but there was no difference 1 inch from the edge. The time necessary to complete Stage 2, however, was longer with moist soil. Moisture content did not influence the degree of injury under the conditions of this experiment.

Irrigation Studies:

The use of an illumination totalizer to determine need for irrigation of container plants was studied, using Burford Chinese Holly, Abelia grandiflora, and India Privet. The plants were grown outdoors in full sunlight in a soil mixture of 1 sand, 1 peat.

The instrument proved to be an excellent way of determining need for irrigation. Plant growth was excellent. Growth index of the plants were as follows:

Irrigation Control	India Privet	Abelia grandiflora	Buford Holly
Check-visual means	230	98	25
Light measure	232	105	27
Light measure with rain correction	211	100	22

Making a correction for rainfall was not necessary, probably because rainfall was not heavy. From April through October (the duration of this study), only in 10 days (24 hr. periods) was rainfall of $\frac{1}{2}$ inch or more recorded.

Water was applied more times to the plants under the light control than the check plants. This occurred primarily in the early part of experiment.

Month	Check	Light measure	Light measure with rain correction
April	6	9	8
May	11	15	15
June	11	18	17
July	13	15	13
August.......	13	13	13
September ...	12	12	12
October	12	12	12
Total	78	94	90

Evaluation of viability of plants:

Use of the electrical conductivity test to determine viability of plants and extent of damage from environmental conditions was studied with rose and shrub althea as test plants. Stem sections were leached in water and conductance of the resulting solution measured. The results indicate that this procedure will evaluate the extent of injury to plant tissue.

Since data of this test are expressed as a percentage of 2 readings on the same tissue, the sample size did not influence the results.

Nature of the leached solutes was not determined, but some ninhydrin sensitive compounds were present. Proline was the only amino acid definitely identified.

Extraction acid determination of free amino acids was not a good measure of viability of plants.

PROPAGATION

Time of Taking Cuttings:

Softwood cuttings of Enonymus japonicus, Anthony Waterer Spirea, and Rosa wichuriana were taken at weekly intervals from late March to late April. After 4 weeks under mist, little difference was found in rooting response. The cuttings increased in hardiness during this period as shown by a shear test.

Chemical Treatment:

Use of chemical treatments resulted in increased rooting response of softwood cuttings of Anthony Waterer Spirea and Enonymus japonicus. In general, Rainbow, Hormodin, Rootone, and Chloromone seemed to be equally effective.

Chemical treatments also increased the rooting of softwood cuttings of Chinese Redbud made in April.

Daylength:

Increasing daylength in the spring resulted in increased rooting of softwood cuttings of Pearlbush and decreased rooting of *Camellia sasanqua* and Roundleaf Japanese Holly. Daylength did not influence rooting of *Forsythia viridissima*. There did not seem to be an interaction of daylength and chemical treatment on rooting.

Nurse-seed Grafting:

A procedure of inserting a scion into a germinating seed of chestnut and camellia has been developed by Professor J. C. Moore, Department of Horticulture, Auburn. The plant is removed, detaching the cotyledons. The scion is then inserted into the remaining seed. Although the cotyledons first initiate roots, rooting of the scion is stimulated. Professor Moore has shown that a water extract of the cotyledons stimulated rooting of willow, camellias, geranium and chrysanthemum cuttings.

The active chemicals may be extracted from the cotyledons with water and many organic solvents such as methanol and ethanol. Using the mung bean bioassay, the extract was shown to stimulate rooting.

Treatment	No. roots per cutting
Distilled water	6.6
5×10^{-6} M IAA	3.0
5×10^{-6} M IAA+ extract from chestnut	10.3

Apparently there are at least 4 compounds present in the germinating chestnut seed that stimulates rooting as co-factors. Chromatographic analysis showed the compounds to have a similar Rf position to the co-factors isolated from Ivy leaf by Hess.

Influence of Leaves:

Chemical treatments with Hormodin, Chloromone, Rainbow, or Rootone rooting compounds did not replace the influence of the presence of leaves on the rooting of chrysanthemum cuttings. Use of Chloromone increased the rooting response of the leafless cuttings. However, this response was approximately one-half that of the check treatments; the other chemicals did not have any influence on rooting of leafless cuttings. These results show that compounds other than auxins must be present to induce rooting and that the leaf is the center of production. Furthermore, apparently some of these compounds are present in Chloromone.