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Literature Cited


Response of Two Florist Azalea Cultivars to Foliar Applications of a Growth Regulator1

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Abstract

Bonzi (paclobutrazol) sprays of 100 and 150 ppm controlled bypass shoot development and increased flower number of 'Alaska' azalea compared to the control, while minimally affecting forcing time and bloom size. Sprays of 150 and 200 ppm suppressed bypass shoot development and increased flower number of 'Prize' azalea compared to the control without affecting bloom size. Paclobutrazol was more effective than B-Nine (daminozide) in suppressing bypass shoot development and enhancing flowering. Forcing time decreased and bloom size increased for paclobutrazol-treated plants of both cultivars compared to daminozide-treated plants.

Index words: growth retardant, bypass shoots

Growth regulators used in this study: Bonzi [paclobutrazol] B-[{(4-chlorophenyl) methyl]oxo-(1,1-dimethylhydrazo)-1H-1,2,4-triazole-1-ethanol; B-nine (daminozide) butanedioic acid mono (2,2-dimethylhydrazide).

Introduction

Growth retardants are an accepted component of florist azalea production. In addition to suppressing internode elongation (8), growth retardants promote flower bud initiation (3), result in multiple flower buds frequently forming on individual shoots (7), and hasten flower development (3). Stuart (8) suggested that growth retardants inhibit the growth of vegetative shoots that develop below the flowers (bypass shoots) and, more recently, growth retardants were shown to suppress bypass shoot development (9).

Daminozide [butanedioic acid mono(2,2-dimethylhydrazide)] and chlormequat chloride [2,3-chloro-N,N,N-trimethylethanaminium chloride] are the principal growth retardants applied to florist azaleas. Delayed flowering and smaller flower size are undesirable side effects of daminozide (1),

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while delayed flowering and smaller plant size are undesirable effects of chloromequat chloride (5). Paclobutrazol, currently labeled as Bonzi® for use on poinsettia, is an effective retardant on chrysanthemums (6), many species of tropical foliage plants (4) and annual bedding plants (2).

This study was conducted to determine the effectiveness of paclobutrazol in controlling bypass shoots of florist azaleas relative to daminozide and to evaluate the chemical’s effects on flowering.

Materials and Methods

Uniform 8.9 cm (3.5 in) liners of Rhododendron × ‘Prize’ and ‘Alaska’ were potted in March 1987, into 1.5 l (6 in) containers of peat:softwood shavings (3:2 by vol) growth medium amended with 3.6 kg/m³ (6 lb/yd³) SRF 19N-1P-8.3K (19-2-10), 3.6 kg/m³ (6 lb/yd³) dolomitic limestone, and 0.4 kg/m³ (0.75 lb/yd³) Micromax. Plants were placed in a double polyethylene greenhouse in a commercial azalea nursery in Semmes, Alabama, and maintained according to common commercial practices. Plants were sheared on July 1 and sprayed the following day with 3627 ppm dikegulac [2,3,4,6,6-bis-(1-methylthylidene)-α-L-xylo-2-hexulofuranosonic acid] to increase lateral branching. Plants were transferred to a shaded double polyethylene greenhouse (30% light exclusion, 20°C (68°F) minimum night temperature) 10 weeks after shearing (September 14) and divided into 8 equal groups. The following treatments were applied on September 15 in a volume of 204 ml/m² (2 qt/100 ft²): single paclobutrazol sprays of 0, 50, 100, 150, 200, 250, and 300 ppm and a daminozide spray of 3,000 ppm repeated 1 week later. Sprays were applied using a hand-held sprayer to uniformly wet foliage and stems. Treatments were applied approximately 0800 hours on clear days. Greenhouse temperature was 20°C (68°F) with 82% relative humidity at time of application. There were 5 replicates of 3 plants each completely randomized within a cultivar.

Plants received a weekly application of 150 ppm N from Peter’s 20N-4.3P-16.6K (20-10-10) Peat-lite Special through November 16. Plants were sprayed with a Benlate®/Da­

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Growth retardant</th>
<th>Concentration (ppm)</th>
<th>Number</th>
<th>Length* (cm)</th>
<th>Days to open flower*</th>
<th>Flowers</th>
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<tbody>
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<td>7.9*</td>
<td>50.3*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>50</td>
<td>3.0*</td>
<td>4.3</td>
<td>52.4*</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>0.9*</td>
<td>4.5</td>
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<td>55.0*</td>
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<td></td>
<td>250</td>
<td>0.0*</td>
<td>0.0*</td>
<td>54.2*</td>
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<tr>
<td></td>
<td></td>
<td>300</td>
<td>0.0*</td>
<td>0.0*</td>
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<table>
<thead>
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<th>Significance of rate*</th>
<th>c</th>
<th>c</th>
<th>l</th>
</tr>
</thead>
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<td>Daminozide</td>
<td>3000</td>
<td>9.2</td>
<td>4.3</td>
</tr>
</tbody>
</table>

*Mean length of 3 longest bypass shoots on each plant.
*Days to full bloom beginning when plants moved from cooler to greenhouse.
*Control included in regression analyses; l = linear, q = quadratic, c = cubic.
Table 2. Paclobutrazol effects on bypass shoot and flower development of Rhododendron × 'Prize'.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Concentration (ppm)</th>
<th>Bypass shoots</th>
<th>Flowers</th>
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</thead>
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<td>0.0*</td>
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<td>300</td>
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<tr>
<td>Daminozide</td>
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<td>7.5</td>
<td>129.1</td>
</tr>
</tbody>
</table>

Significance of rate:
- q = cubic
- c = quadratic
- l = linear

*Mean length of 3 longest bypass shoots on each plant.
†Days to full bloom beginning when plants moved from cooler to greenhouse.
*Mean of 3 randomly selected blooms per plant.
*Dunnett's test for least significant differences; means followed by an asterisk differ significantly from the mean of the daminozide treatment at the 5% level.
*Control included in regression analyses; I = linear, q = quadratic, c = cubic.

Paclobutrazol rates of 100 and 150 ppm applied 5½ weeks before cooling effectively controlled bypass shoot development and increased flower number of 'Alaska' compared to an untreated control, while minimally influencing days-to-flower and flower diameter. Rates of 150 and 200 ppm were most effective in controlling bypass shoots and increasing flower number of 'Prize', while not reducing flower diameter. Days-to-flower was greater at the 200 ppm rate compared to 150 ppm (46.6 vs 44.3). Daminozide was less effective than paclobutrazol in controlling bypass shoot development and enhancing flower number. Daminozide also delayed flowering and reduced flower size relative to paclobutrazol and the untreated control. The delay in flowering and smaller flower size of daminozide-treated plants has been reported previously (1), while the control of bypass shoots with paclobutrazol concurs with recent results by Whealy et al. (9).

Significance to the Nursery Industry

Bonzi (paclobutrazol) has the potential of becoming the standard growth retardant for florist azaleas due to superior bypass shoot control and enhanced flowering compared to daminozide. Paclobutrazol-treated plants flowered sooner and had larger blooms than B-Nine (daminozide) treated plants. Optimum Bonzi (paclobutrazol) rates ranged from 150 to 200 ppm for 'Alaska' and 'Prize', but may differ for other cultivars.

(Ed. note: This paper reports the results of research only, and does not imply registration of a pesticide under amended FIFRA. Before using any of the products mentioned in this research paper, be certain of their registration by appropriate state and/or federal authorities.)

Literature Cited


Evaluation of Nursery Container Designs for Minimization or Prevention of Root Circling

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Six different container designs were evaluated for their effectiveness in minimizing or preventing the development of circling roots around the sides and/or bottoms of containers. While both shrub and tree species were tested, the roots of the shrubs were generally small and fibrous enough that selection of a container to minimize or prevent circling roots was not an important consideration. For the tree species, the greatest amount of circling reduction was achieved with the soft polybags and the rigid stepped-pyramid containers. Because considerable difference exists in the cost of the newly-designed containers, both cost and root-modifying effectiveness should be considered if root modification is deemed important.

Index words: root modification, girdling roots, container-grown trees, poly bags, stepped-pyramid pot, low profile container, ribbed container

Species used in this study: goldenraintree (Koelreuteria paniculata); black willow (Salix nigra); white pine (Pinus strobus); American boxwood (Buxus microphylla); azalea (Rhododendron obtusum 'Hershey's Red'); honeysuckle privet (Lonicera pileata).

Introduction

Design and appearance are factors considered when a grower selects containers for nursery stock production, although the three major selection criteria are generally ease-of-handling, rugged construction and price (5, 10). In addition, features receiving considerable attention lately include color (4), pot lip shape (15), and design for improved winter protection (11).

All aspects of container design influence plant development and growth (and possibly sales). The number of different containers introduced onto the market in recent years has raised the questions of whether standardization of containers is needed, and whether standardization would be beneficial to both wholesale growers and retailers (1, 2, 3, 7). If an effort to standardize is started it could influence the willingness of growers to purchase containers with special design features unless these features are shown to be beneficial to the production of high quality nursery stock.

An additional reason container design, and more specifically side wall configuration, is considered by growers is because of the circling and potentially girdling roots that may develop on certain plants when they are grown in conventional round, smooth, straight-walled rigid containers. Circling roots formed during production have the potential, especially on trees, to enlarge to the point that they may shorten a plant's life span by girdling its stem (6). In addition, circling roots may fail to adequately anchor plants, and may restrict water and nutrient absorption (13).

Research has demonstrated that certain modifications of the container side wall will minimize or prevent circling roots (5, 13, 14). The purpose of this research was to compare the ability of several new container designs to minimize or prevent root circling.

Materials and Methods

Rooted liners of American boxwood (Buxus microphylla), black willow (Salix nigra), 'Hershey Red' azalea (Rhododendron obtusum 'Hershey Red'), and privat honeysuckle (Lonicera pileata), and seedlings of goldenraintree (Koelreuteria paniculata) and Eastern white pine (Pinus strobus),