Flowering of *Rhododendron* and *Kalmia* in Response to Application Date of Bonzi or Sumagic

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INTRODUCTION

Growers would like field-grown *Rhododendron* and *Kalmia* to have a compact growth habit and flower in the 3rd year from propagation. Thirty years ago, Stuart (1960) showed that growth-retarding chemicals, in combination with a cold and day-length forcing treatment, would induce flowering in *Rhododendron* a year after propagation. The triazol chemicals, uniconazol and paclobutrazol (Davis et al., 1988), may induce flowering more effectively thán those used previously. The reduction in stem elongation due to triazols can last for several years. A drench of paclobutrazol at more than 1000 ppm essentially inhibited any growth of*Rhododendron* in the following year (Wilkinson and Richards, 1991). I applied lower concentrations of paclobutrazol (Bonzi^{TM}) and uniconazol (Sumagic^{TM}) in three seasons to determine how concentration enhances flowering of *Rhododendron* and *Kalmia*.

MATERIALS AND METHODS

Plant Material and Growth Conditions. The large-leaf *Rhododendron catawbiense* 'Boursault' and *Kalmia latifolia* 'Carousel' were used in this study. All plants were propagated and potted in 8-liter pots at Prides Corner Farm (a commercial nursery), Lebanon, Connecticut. The 'Boursault' plants were grown in a mix of hardwood bark, softwood bark, peat, and sand (32 : 32 : 32 : 5, by volume). The 'Carousel' plants were grown in a mix of peat, hardwood bark, and sand (50 : 33 : 17, by volume). In March of the year of treatment, all pots were top-dressed with an Osmocote 9-month timed-release formulation of 17N : 6P : 10K w/w plus minor elements at a rate of 36 g for the 'Boursault' and 24 g for the 'Carousel'. During the growing season, plants were spaced one-pot diameter apart in full sun, and watered at regular intervals. To protect the plants over the winter they were arranged as closely as possible in unheated high tunnels that were covered with white-polyethylene film in late October and uncovered in late March. Insecticides and fungicides were applied according to normal production practices.

Application of Growth Regulators. All plants were treated in mid June of the 2nd year after propagation and grown on at Lockwood Farm, Hamden, Connecticut—the experimental farm of the Connecticut Agricultural Experiment Station. Treatments were a single spray application of one of a range of concentrations of two growth regulators. The chemicals were paclobutrazol in the Bonzi formulation (Uniroyal Chemical Co., Naugatuck, Connecticut) and uniconazol in the Sumagic formulation (Valent Chemical Co., Walnut Creek, California). A volume of 100 ml was applied per plant in 1992 and 1994, and 50 ml per plant was applied in 1995. In the results, the concentrations applied in 1992 and 1994 are doubled, as if plants received 50 ml (1.5 fluid ounces) of the spray in each year.

A batch of solution was applied in its entirety to a group of plants. The solution was applied to leaves and stems as a timed, directed spray, with repeated applications to equalize the volume applied to each plant, and to reduce runoff to a minimum. Six or more plants of each cultivar were not sprayed to serve as controls.

Measurements. In April, three stems on each plant were marked with white paint just below the terminal bud. In October, the length of new growth was measured on three branches of each plant. Typically, the growth was measured for the longest leader on each of three different branches resulting from pruning in the first year of propagation. If there were only two branches, a side shoot was measured. In October, stems terminating in a flower bud or truss were counted. The large terminal buds of 'Boursault' were presumed to be reproductive buds.

Analysis. An analysis of variance was done separately for each cultivar. The chemicals were treated as independent fixed effects. Regression determined the significance of concentration of the chemicals. The three stem lengths for each plant were treated as repeated measures.

RESULTS

Stem elongation of 'Boursault' was relatively insensitive to the growth regulators. It was only partially retarded at the highest concentration of Bonzi applied in 1992. Bonzi had less effect than Sumagic at the concentrations used here. It had no effect on stem elongation in 1994 and 1995. Sumagic only reduced stem length at concentrations greater than 5 ppm in 1995.

Except in 1995, the 'Boursault' rarely flowered unless sprayed. When sprayed in 1992 or 1994, each concentration of Sumagic was effective for inducing flower buds. Every plant flowered when sprayed in 1992 with 8 ppm Sumagic. Flowering tended to increase with concentration of Bonzi in 1992, but Bonzi did not increase flowering in 1994. Neither Bonzi nor Sumagic increased flowering of 'Boursault' in 1995.

Stems of 'Carousel' grew 7 and 10 cm, when sprayed in 1992 with 60 ppm Bonzi or 24 ppm Sumagic, respectively, compared to 18 cm for the controls. In 1994, both Bonzi and Sumagic reduced stem growth from 19 to about 4 cm. At the concentrations used in 1995, Sumagic reduced stem growth more than Bonzi.

In 1992 and 1994, the 'Carousel' rarely flowered unless sprayed, but when sprayed in June, most of the plants flowered. In 1992, Sumagic and Bonzi induced a similar number of flowers per plant. In 1995, the untreated 'Carousel' had about 7 stems terminating in flowering racemes. Bonzi increased the number of flowers only at 10, 100, and 200 ppm, and Sumagic increased the number of buds only at concentrations of 10 ppm and above.

DISCUSSION

Wilkinson and Richards (1991) reported that paclobutrazol greatly enhanced flowering in *Rhododendron*. They suggested a spray application at 500 ppm would be appropriate for inducing flowers. Ranney et al. (1994) found that a spray of 200 ppm Bonzi did not enhance flowering of *R*. 'Roseum Elegans', although soil drenches were effective. I found that sprays of Bonzi at concentrations as low as 10 ppm were effective. These contrasting results may be due to differences in the environment in which the plants were grown and in their age. Day length and temperature affect flowering of *Rhododendron* and these vary among the locations in which the growth

regulators have been tested. Ranney et al. (1994) treated plants in the first year after propagation, a younger stage than the plants used in the present study, which were in their second year. In Connecticut, triazol growth regulators sprayed at low concentrations on 'Boursault' in the first year of propagation did not affect stem elongation or flowering (Larson 1993, personal communication).

Sumagic was more effective than Bonzi at inhibiting stem growth, as observed for several other species (Davies et al., 1988). Sumagic was more effective than Bonzi for inducing flowering of 'Boursault'. However for 'Carousel', the flowering response to Bonzi and Sumagic did not differ.

These triazol growth retardants may more effectively induce flowering than the chemicals used in the past because of the persistence of their effects. As shown by Wilkinson and Richards (1991), triazols can affect growth and flowering for 2 years after application. In the present study, spray applications in June induced flower buds, although the development of visible flower buds did not occur until 3 months after application. Thus, the persistence of the effect of Bonzi and Sumagic may be an important aspect in their ability to induce flowering.

The persistence of the effect of triazol growth retardants on stem elongation could be a problem for landscape plants. Transplants may not fill out the space allocated to them for several years, or as long as stem elongation is inhibited. A continuation of the present study will determine the effect of the triazol growth regulators on stem elongation of transplanted 'Boursault' and 'Carousel' plants in the 3 years after application of the chemicals.

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