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sensitive to Fusilade 2000. Conversely, 'Hershey Red' was earlier reported sensitive to Fusilade 4E (1), but was not affected by Fusilade 2000 in our test.

Increasing the rate of Fusilade 2000 to 0.28 kg/ha (2x) resulted in injury to 9 of the 14 cultivars 30 DAT. These data indicate that application beyond the recommended rate for annual grass control may result in injury ranging from tip burn to stem dieback and leaf necrosis.

Significance to the Nursery Industry

Fusilade 2000 stimulated flowering on sensitive azalea cultivars the following spring when applied prior to September in the Mobile, Alabama, area, with 'Hino-Crimson' azalea injury being similar to that from an application of Off-Shoot-O. From this work and other research (1, 2, 3, 4), sensitive cultivars appear to be red floweing azaleas only; other colored azaleas are not affected (injured/pruned) by Fusilade 2000. With these non-red azaleas, Fusilade 2000 may be applied safely at any time of the year. Among the red flowering azaleas tested, sensitive azaleas that should not be treated with Fusilade 2000 after September include 'Hino-Crimson,' 'Hinodegiri,' 'Sherwood Red,' Girard's Scarlet and Girard's Rose.

(*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.)

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Effects of Three Herbicides on the Foliage of Kurume Azaleas[1]

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Abstract

A single foliar spray of Fusilade 2000 (fluazifop-butyl) [(±)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl] oxy] phenoxy] propanoic acid] or PP005 (fluazifop-p-butyl) [butyl (R)-2[4-[[5-(trifluoromethyl)-2-pyridinyl] oxy] phenoxy] propanoate] at 0.50 or 1.0 kg/ha (0.45 or 0.89 lb/A) caused extensive foliar damage and reduced growth of 'Hinocrimson' azaleas but not 'Hershey Red.' Poast (sethoxydim) [2-[1-(ethoxyimino)butyl]-5-[2-ethylthio)-propyl]-3-hydroxy-2-cyclohexen-1-one] at 1 kg/ha (0.89 lb/A) or less did not injure 'Hinocrimson' or 'Hershey Red' azaleas. Scanning electron microscopy observations and photographs of the upper leaf surface of the untreated control plants of both azalea varieties revealed that the epidermal cells were uniformly turgid and covered with smooth epicuticular wax. The leaf epidermal cells of 'Hinocrimson' azalea treated with Fusilade 2000 or PP005 at rates of 0.25 kg/ha (0.22 lb/A) or more were flaccid, the epicuticular wax was damaged, and the stomatal configurations were altered to produce cells with an ovoid pointed appearance. When 'Hinocrimson' foliage treated with Fusilade 2000 or PP005 was examined with energy dispersive X-ray analysis (EDX), a potassium (K) peak which was over 3 times higher than that of the untreated control plants was observed. No increase in potassium peak size was observed following EDX analysis with any 'Hershey Red' foliage samples.

Index words: Poast, Fusilade 2000, PP005, herbicide, grass weeds, scanning electron microscope (SEM), energy dispersive X-ray analysis (EDX)

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Introduction

Weeds must be controlled effectively in azaleas for maximum growth in the field (5, 14), containers (6, 10, 17, 24), or the landscape (8, 16, 22). Handweeding is expensive and damage (2) to both foliage and root systems is a common problem under all landscape crop growing regimes (7, 13, 14, 16, 19, 25).

Recently a number of postemergence herbicides used for grass control have been evaluated for use in woody landscape crops (1, 3, 4, 6, 9, 17, 18, 22, 23, 26). These compounds include Poast (1, 3, 6, 7, 8, 11, 16, 21, 22), Fusilade 2000 (6, 7, 11, 21, 22, 25), the PP005 (3).

Many varieties of azaleas are grown in the United States and some are sensitive to foliar herbicides (1, 11, 15, 16, 24). Frank and Beste (13, 15) found that Fusilade 2000 caused extensive foliar damage to 'Hinocrimson' azaleas at rates of 0.25 kg/ha to 1.0 kg/ha (0.22 to 0.89 lb/A). The plants treated at 0.25 kg/ha and 0.50 kg/ha (0.22 and 0.45 lb/A) were not significantly smaller than the control plants after two years, but those treated at 1.0 kg/ha (0.89 lb/A) were. No injury was observed on 'Hershey Red' or 'Delaware Valley White' azaleas at these rates (13, 15). Ahrens (1) and Derr (11) also reported injury to 'Hinocrimson.' Gilliam *et al* (16) found that Fusilade 2000 at 0.6 and 1.1 kg/ha (0.54 and 1.0 lb/A) damaged 'Hexe' azaleas, while Kuhns *et al* (21) also observed foliar damage to the variety 'Rosebud' at 0.27 kg/ha (0.25 lb/A) and kill at 2.2 kg/ha (2 lb/A). They also reported slight foliar damage to 'Mothers Day' azaleas as did Ahrens (1), but no injury to 'Gibraltar,' 'Girard's Rose' and 'Herbert' azalea at rates up to 2.2 kg/ha (2.0 lb/A). Bing (6) reported no injury to 'Fashion' azalea at rates up to 1.1 kg/ha (1.0 lb/A).

Poast was evaluated on a wide variety of azaleas without injury at rates up to 2.2 kg/ha (2.0 lb/A). Frank and Beste (13, 15) reported no injury with Poast at 0.25 to 1.0 kg/ha (0.22 to 0.89 lb/A) on 'Hershey Red,' 'Hinocrimson' and 'Delaware Valley White.' Ahrens (1) found no injury at these rates on 'Hinocrimson' and 'Mothers Day.' Derr (11) found no injury on 'Poukanense,' 'Hinocrimson,' 'Coral Bell,' 'Hershey Red,' Tradition,' and 'Delaware Valley White' azaleas with Poast at rates up to 2.2 kg/ha (2.0 lb/A). Gilliam *et al* (16) reported no injury to 'Hexe' azalea with applications of Poast at 0.5 or 1.1 kg/ha (0.45 to 1.0 lb/A). Kuhns *et al* (21) found no injury with Poast at 0.27 and 2.2 kg/ha (0.25 and 2.0 lb/A) on 'Gibraltar,' 'Girards Rose,' 'Herbert,' 'Mothers Day,' and 'Rosebud' azaleas. Bing (6) found no injury on 'Fashion' azalea with applications of Poast at 0.25 and 0.50 kg/ha (0.22 and 0.45 lb/A).

Experiments were conducted to determine the effect of the three post-emergence herbicides, Poast, Fusilade 2000, and PP005, on the foliage and growth of the Kurume azaleas 'Hinocrimson' and 'Hershey Red' which were genetically related and had foliar and flowering characteristics which were similar. These two varieties are grown by many azalea growers in the United States.

Materials and Methods

Two experiments were conducted during 1984 and 1985 at a commercial nursery near Salisbury, MD. All azaleas in these experiments were propagated in July of 1983 or 1984 and included liners of 'Hinocrimson' and 'Hershey Red' transplanted into the field in April of 1984 or 1985. Each variety was planted in separate field blocks 1.5 by 80 m (6 ft x 264 ft) in beds raised 30 cm (12 in) in a Matapeake silt loam (Typic hapludult, fine-silty mixed mesic) modified with 324 m^3/ha (520 yd^3/A) or approximately 390 MT/ha (173 T/A) fresh wt of decomposed pine bark and wood mulch. A 5 cm (2 in) layer of pine shavings was also applied immediately after planting. The experimental design was a randomized complete block with three replications. Each plot was 1.8 x 3.1 m (6 ft x 10 ft) and contained 20 azaleas.

Ronstar (oxadiazon) [3-[2,4-dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2-(3*H*)-one] as a granular formulation was applied at 2.2 kg/ha (2.0 lb/A) to all plots during May of 1984 or 1985. Poast, Fusilade 2000, and PP005 were applied as a topical spray on July 11, 1984 or July 3, 1985 at 0.25, 0.50, and 1.0 kg/ha (0.22, 0.45, and 0.89 lb/A). All sprays were made using a backpack CO_2 boom sprayer which was calibrated to deliver 215 L/ha (25 gal/A) with 2.3 L/ha (0.25 gal/A) of crop oil. Crop oil alone in water was also applied as a separate treatment at the same rate. Wind velocity was less than 3.5 km/hr (3 mph) at time of application.

Ten random azaleas in each plot were labeled and the height and width were measured in 1984 on the day before treatment (July 10), and at 36 (August 16), 83 (October 2), 340 (June 17, 1985), and 406 days (August 22, 1985) after the applications. At the time of treatment the 'Hershey Red' azaleas had a combined average height x width of 240 to 290 cm^2 (94.4 to 114.2 in^2) while the 'Hinocrimson' azaleas averaged between 190 to 265 cm^2 (76 to 106 in^2). Observations were made on the day before treatment (July 10), and at 7 (July 17), 17 (July 27), 36 (August 16), 83 (October 2), and 413 (August 28, 1985) days after treatment to determine phytotoxicity as it related to crop quality and marketability, using a rating system of 0 to 10. Plants with a rating of 0 to 3 would be acceptable for sale and those with a rating of 4 to 10 would be considered of poor quality and not marketable. Dead plants were rated as 10. In 1985 the height x width was measured 5, 43, and 91 days after application. Phytotoxicity was rated 16, 42, and 114 days after treatment. Data were subjected to analysis of variance and linear and quadratic effects were determined for herbicide rates.

Six days after treatment in 1985 foliage samples, which were 15 to 20 cm (6 to 8 in) long, were collected from plants of both azalea varieties which were treated with each compound at each rate. All cuttings were randomly collected from plants which were not among the 10 plants regularly evaluated for phytotoxicity or measured in height and width during these experiments.

Scanning electron microscopy (SEM) observations of the upper and lower leaf surfaces of leaves from each treatment and untreated control plants of 'Hinocrimson' and 'Hershey Red' were made.

Twenty fresh, hydrated leaf samples from each treatment were mounted on carbon planchets with graphite adhesive and attached to aluminum stubs. As a control for beam and vacuum-induced artifacts to hydrated specimens, similar samples were fixed in 3% glutaraldehyde, washed in pH 7.2 monobasic and dibasic Na-phosphate buffer (3x), dehydrated in ethanol, and critically-point-dried in CO_2 and mounted on carbon planchets. All samples were coated with carbon that was vacuum evaporated on a rotary-tilting stage and were examined with a Hitachi Model S-500 SEM equipped with a cold stage to reduce heat artifacts during examination.

SEM photographs of the leaf surface were made for both treated and untreated control plants. Samples were also examined with energy dispersive X-ray analysis (EDX) (Tracor Northern-2000) according to the method of Krause (20).

EDX analysis was performed to elucidate any chemical changes of treated or untreated leaf surfaces in combination with morphological changes observed with secondary electron images.

Results and Discussion

Weed control. Weed cover during the evaluations of the 1984 and 1985 experiments did not exceed 5% in any plot. No major amount of grass or broadleaf weed species was observed at any time during these experiments (data not shown). No broadleaf weeds were damaged by any treatment in this or perviously reported experiments (13, 15).

Azalea quality and marketability. During 1984 and 1985 significant foliar injury was observed on 'Hinocrimson' azaleas treated with Fusilade 2000 and PP005. As rates of both Fusilade 2000 and PP005 increased phytotoxicity increased. Phytotoxicity observed to 'Hinocrimson' azalea is comparable to that reported by Ahrens (1), Derr (11), and Frank and Beste (13, 15). No significant differences in quality were observed when compared to the control plants after 83 days (Table 1). 'Hershey Red' azaleas were not significantly injured with Fusilade 2000 or PP005 at any rate during these experiments (Table 2). This concurs with the work of Derr (11) and Frank and Beste (13, 15). 'Hinocrimson' or 'Hershey Red' azaleas treated with Poast at increasing rates were not significantly different from the control plants at any time during these experiments (Tables 1 and 2). These observations reaffirm those of Derr (11) and Frank and Beste (13, 15). During the 1985 experiments the phytotoxicity observed for all treatments was comparable to that observed during 1984 (1985 data not reported).

Plant size. 'Hinocrimson' azaleas treated with Fusilade 2000 or PP005 at increasing rates were significantly smaller than the control plants at 36 and 83 days after treatment (Table 3). This size differential is similar to that reported previously (13, 15). During the 1984-1985 experiment, 'Hinocrimson' azaleas treated with PP005 at increasing rates grew less than the untreated control plants (Table 3). Fusilade 2000 or PP005 at 0.25 kg/ha (0.22 lb/A) were not significantly smaller in size from the untreated control plants during the first 36 days of the study. No significant reduction in the growth of 'Hershey Red' azaleas was observed in 1984 or 1985 with any treatment up to 406 days after treatment (Table 4). These results were similar to those previously reported (13, 15). Crop oil alone did not reduce significantly the amount of growth of either variety of azalea (Tables 3 and 4). At 36 days some stimulation of growth was observed with 'Hershey Red' azaleas treated with crop oil alone. Plant size following the 1985 experiment was similar to those of the 1984 experiment (data not shown).

Azalea foliage observation. Scanning electron microscopy (SEM) observations and photographs of the upper leaf surfaces of untreated control plants of 'Hinocrimson' and 'Hershey Red' azaleas revealed that the epidermal cells of both varieties were uniformly turgid and covered with smooth epicuticular wax (Figures 1A and 1B). The leaf epidermal cells of the upper or lower surface of the 'Hinocrimson' azalea treated with Fusilade 2000 at 0.25 kg/ha (0.22 lb/A) or rates up to 1.0 kg/ha (0.89 lb/A) were flaccid and the epicuticular wax was damaged (Figure 1C). The higher the Fusilade 2000

Table 1. Quality of 'Hinocrimson' azaleas as influenced by one application of herbicide on July 11, 1984 (0-10 scale).

Herbicide Treatment	Rate kg/ha (lb/A)	Days after treatment 1	16	36	83	413
Untreated control	—	0.02	0.13	0.77	0.67	0.44
Fusilade 2000	0.25 (0.22)	0.30	1.03	1.77	2.63	0.25
	0.50 (0.45)	0.20	1.90	2.33	2.50	0.44
	1.0 (0.89)	0.27	5.10	3.07	1.90	0.17
Poast	0.25 (0.22)	0.30	0.40	1.00	1.97	0.56
	0.50 (0.45)	0.30	0.43	0.87	2.17	0.38
	1.0 (0.89)	0.27	0.37	0.69	1.23	0.43
PP005	0.25 (0.22)	0.17	1.43	1.80	2.40	0.23
	0.50 (0.45)	0.27	5.90	2.73	2.37	0.19
	1.0 (0.89)	0.17	8.00	4.20	3.33	0.56
Crop oil alone	—	0.17	0.20	0.90	1.93	0.23
Sources of variation[z]						
Herbicide		NS	**	**	NS	NS
Rate-linear		NS	**	**	NS	NS
Rate-quadratic		NS	NS	NS	NS	NS
Herb*-rate-linear		NS	**	**	NS	NS
Herb*-rate-quad		NS	**	NS	NS	NS
Oil effect		NS	NS	NS	NS	NS

[z]Phytotoxicity data were log transformed and subjected to analysis of variance. Contrast data were computed to determine the effects of the three herbicides, with crop oil and oil alone, the linear and quadratic effects of rate, and the corresponding herbicide by rate interactions. NS = $P > .05$, ** = $P \leq .01$.

Table 2. Quality of 'Hershey Red' azaleas as influenced by one application of herbicide on July 11, 1984 (0-10 scale).

Herbicide Treatment	Rate kg/ha (lb/A)	Days after treatment 1	16	36	83	413
Untreated control	—	0.40	0.03	0.10	0.10	0.03
Fusilade 2000	0.25 (0.22)	0.13	0.07	0.03	0.17	0.00
	0.50 (0.45)	0.33	0.10	0.03	0.30	0.07
	1.0 (0.89)	0.23	0.13	0.07	0.27	0.03
Poast	0.25 (0.22)	0.30	0.10	0.03	0.53	0.07
	0.50 (0.45)	0.30	0.10	0.10	0.33	0.07
	1.0 (0.89)	0.40	0.20	0.10	0.57	0.07
PP005	0.25 (0.22)	0.23	0.13	0.00	0.10	0.00
	0.50 (0.45)	0.37	0.20	0.07	0.30	0.03
	1.0 (0.89)	0.27	0.37	0.10	0.20	0.03
Crop oil alone	—	0.23	0.10	0.03	0.67	0.07
Sources of variation[z]						
Herbicide		NS	*	NS	*	NS
Rate-linear		NS	**	NS	NS	NS
Rate-quadratic		NS	NS	NS	NS	NS
Herb*-rate-linear		NS	NS	NS	NS	NS
Herb*-rate-quad		NS	NS	NS	NS	NS
Oil effect		NS	NS	NS	*	NS

[z]Phytotoxicity data were log transformed and subjected to analysis of variance. Contrast data were computed to determine the effects of the three herbicides, with crop oil and oil alone, the linear and quadratic effects of rate, and the corresponding herbicide by rate interactions. NS = $P > .05$, * = $P < .05$, ** = $P < .01$.

Table 3. Increase in size of 'Hinocrimson' azalea following one herbicide application on July 11, 1984.

Herbicide Treatment	Rate kg/ha (lb/A)	Plant height x width (cm^2) Days after treatment 36	83	340	406
Untreated control	—	208	362	997	1222
Fusilade 2000	0.25 (0.22)	74	199	802	1090
	0.50 (0.45)	73	171	786	1090
	1.0 (0.89)	31	131	787	1129
Poast	0.25 (0.22)	151	318	895	1048
	0.50 (0.45)	158	317	908	1118
	1.0 (0.89)	152	330	1076	1201
PP005	0.25 (0.22)	122	236	825	1143
	0.50 (0.45)	34	133	715	1132
	1.0 (0.89)	-13	50	573	886
Crop oil alone	—	173	319	921	1318
Sources of variation[z]					
Herbicide		*	*	*	NS
Rate-linear		*	*	NS	NS
Rate-quadratic		NS	NS	NS	NS
Herb*-rate-linear		*	*	*	*
Herb*-rate-quad		NS	NS	NS	NS
Oil effect		NS	NS	NS	NS

[z]Height x width data were subjected to analysis of variance. Contrast data were computed to determine the effects of the three herbicides, with crop oil and oil alone, the linear and quadratic effects of rate, and the corresponding herbicide by rate interactions. NS = $P > .05$, * = $P < .05$.

and PP005 application rate, the greater the destruction of the epicuticular wax (Figure 1D). The surfaces of the foliage of 'Hershey Red' azaleas treated with Fusilade 2000 at dosages of up to 1.0 kg/ha (0.89 lb/A) were unaffected (Figure 1E) and the leaf surfaces appeared to be the same as that of the untreated control plants. No significant injury was observed on either variety following treatment with Poast at any rate, or crop oil alone.

Energy dispersive X-ray analysis (EDX) spectrum of the untreated control leaves of 'Hinocrimson' indicated a small potassium peak (K) < 3000 counts (Figure 2A). The EDX spectrum analysis of 'Hinocrimson' leaves treated with Fusilade 2000 at 1.0 kg/ha (0.89 lb/A) had significantly higher potassium peaks (K) > 9000 counts (Figure 2B). EDX analysis of 'Hershey Red' foliage showed no significant differences in the potassium peaks (K) found in any of the treated or untreated plants (Figures 2C and 2D).

Treatments of Fusilade 2000 or PP005 at 0.25, 0.50, or 1.0 kg/ha (0.22, 0.45, and 0.89 lb/A) may significantly injure and reduce growth of 'Hinocrimson' azaleas. Rates of 0.125 kg/ha (0.11 lb/A) are not recommended for control of annual grasses in azaleas. No injury was observed on 'Hershey Red' azaleas with treatments of Fusilade 2000, PP005, or Poast at applications rates up to 1.0 kg/ha (0.89 lb/A). Poast did not cause foliar injury to 'Hinocrimson' azaleas at rates up to 1.0 kg/ha (0.89 lb/A). Differences in the effect of each herbicide on the leaf surface of the two azalea varieties may be the result of changes in the amount of wax deposition or the composition of the wax following treatment. The high potassium peak observed with EDX analyses for 'Hinocrimson' azaleas treated with Fusilade 2000 seems to indicate mesophyll or epidermal cellular leakage through cytolosis as the results of treatment.

Significance to the Nursery Industry

Weed control is essential to azaleas which are shallow rooted. Post-emergence grass herbicides can control grasses which escape preemergence herbicide applications. These herbicides usually don't cause injury to broadleaf crops or weeds. Poast at 0.25, 0.50 or 1.0 kg/ha (0.22, 0.45, or 0.89 lb/A) caused no injury to 'Hinocrimson' or 'Hershey Red' azaleas grown in raised beds in the nursery. Fusilade 2000 and PP005 at 0.50 and 1.0 kg/ha (0.45 and 0.89 lb/A) caused extensive foliar injury and reduced the growth of 'Hinocrimson' azalea. Neither compound at these rates caused significant injury to 'Hershey Red' azaleas.

Electron microscope photographs indicate that at treatment both azalea varieties are similar in appearance. 'Hinocrimson' azaleas treated with Fusilade 2000 or PP005 become flaccid and the epicuticular wax is damaged extensively. This varietal difference resulted in crop damage which will reduce crop growth during the two year growth cycle.

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Table 4. Increase in size of 'Hershey Red' azalea following one herbicide application on July 11, 1984.

Herbicide Treatment	Rate kg/ha (lb/A)	Plant height x width (cm^2) Days after treatment 36	83	340	406
Untreated control	—	87	169	406	808
Fusilade 2000	0.25 (0.22)	102	157	420	845
	0.50 (0.45)	97	186	377	779
	1.0 (0.89)	86	161	413	878
Poast	0.25 (0.22)	96	148	377	868
	0.50 (0.45)	84	165	371	849
	1.0 (0.89)	82	149	401	784
PP005	0.25 (0.22)	95	162	423	893
	0.50 (0.45)	74	159	427	752
	1.0 (0.89)	84	176	466	897
Crop oil alone	—	111	158	391	864
Sources of variation[z]					
Herbicide		NS	NS	NS	NS
Rate-linear		*	NS	NS	NS
Rate-quadratic		NS	NS	NS	NS
Herb*-rate-linear		NS	NS	NS	NS
Herb*-rate-quad		NS	NS	NS	NS
Oil effect		*	NS	NS	NS

[z]Height x width data were subjected to analysis of variance. Contrast data were computed to determine the effects of the three herbicides, with crop oil and oil alone, the linear and quadratic effects of rate, and the corresponding herbicide by rate interactions. NS = P > .05, * = P < .05.

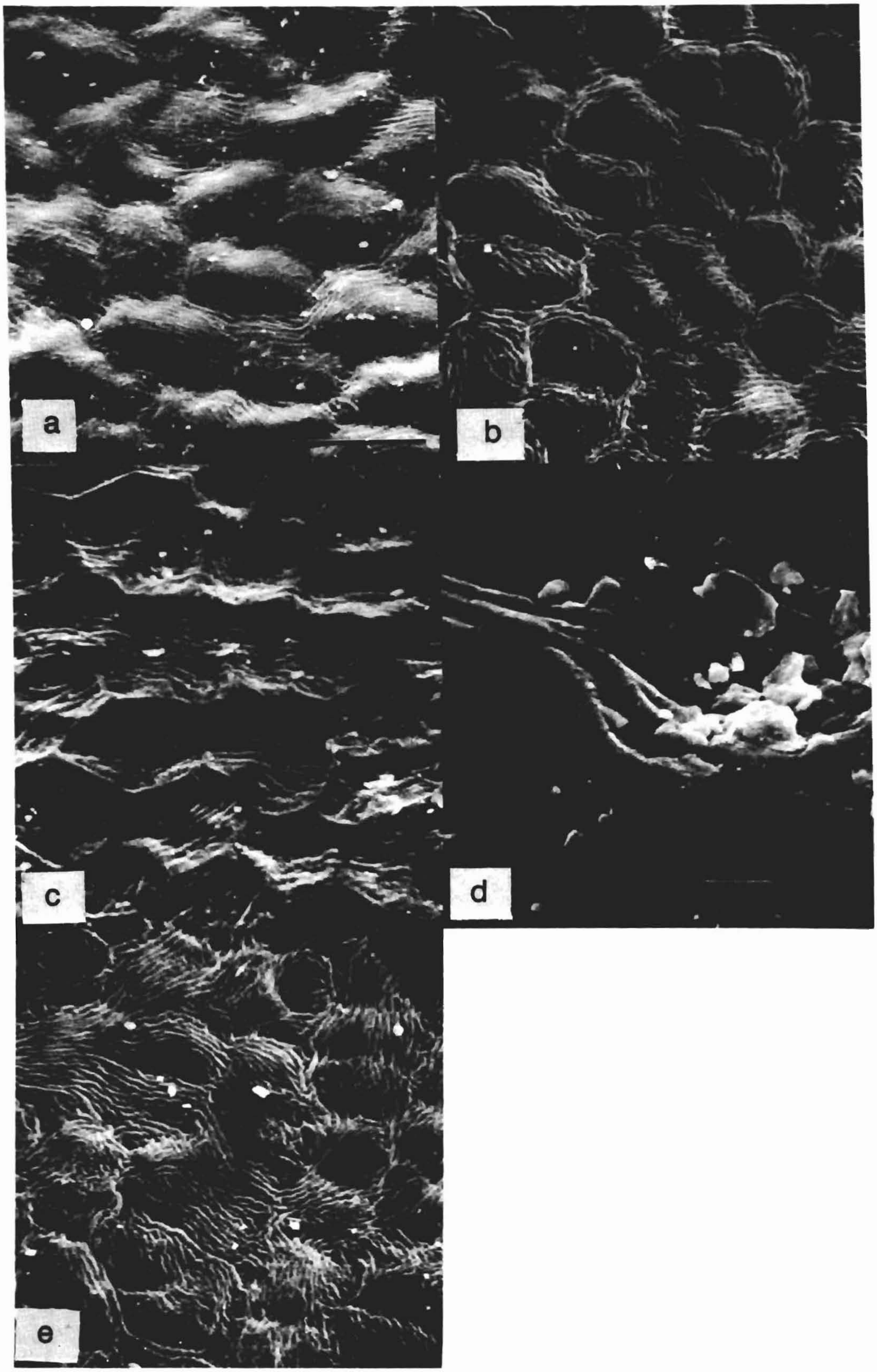

Fig. 1. Scanning electron microscope photograph of the upper leaf surface of azaleas; (A) untreated control of 'Hinocrimson,' bar = 15 um; (B) untreated control plant of 'Hershey Red'; (C) 'Hinocrimson' treated with Fusilade 2000 at 1.0 kg/ha (0.89 lb/A) (note flaccid epidermal cells); (D) 'Hinocrimson' treated with Fusilade 2000 at 1.0 kg/ha (0.89 lb/A), (note destruction of the epicuticular wax) (bar = 2 um); and, (E) 'Hershey Red' treated with Fusilade 2000 at 1.0 kg/ha (0.89 lb/A) (note no damage to epidermal cells or epicuticular wax).

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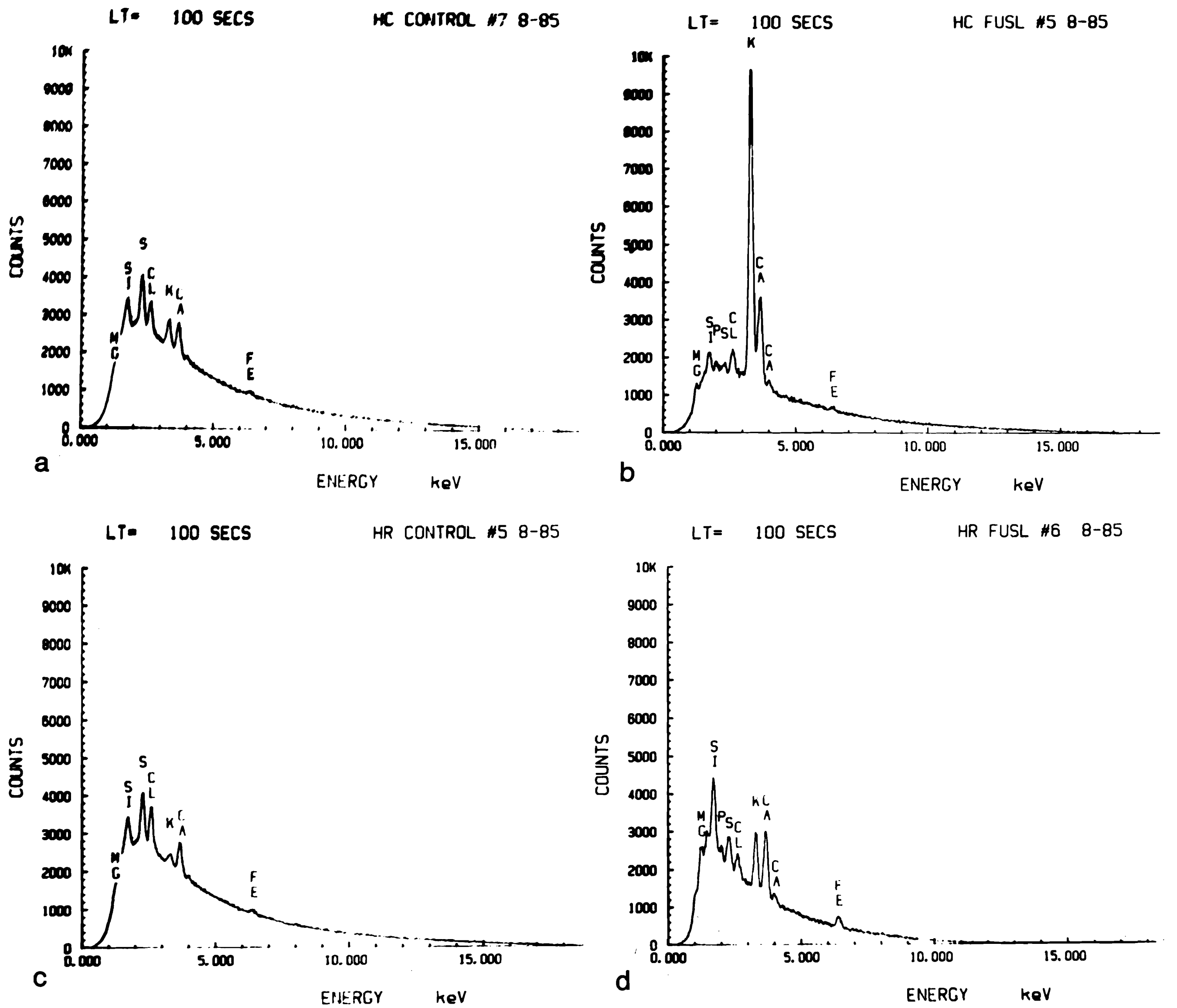

Fig. 2. (A) Energy dispersive X-ray analysis (EDX) spectrum of the untreated control leaf of 'Hinocrimson' azalea (note small potassium (K) peak); (B) 'Hinocrimson' leaf treated with Fusilade 2000 at 1.0 kg/ha (0.89 lb/A) (note large K peak); (C) untreated control leaf of 'Hershey Red' azalea (note small K peak); and, (D) 'Hershey Red' azalea treated with Fusilade 2000 at 1.0 kg/ha (0.89 lb/A) (note small K peak).

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Influence of Chilling Hours on Flower Bud Growth and Rooting Ability of Blueberry Budsticks[1]

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Abstract

Budsticks from 3 rabbiteye blueberry cultivars ('Baldwin,' 'Brightwell,' and 'Tifblue') and 2 highbush blueberry cultivars (TH-275 and 'Georgiagem') were subjected to 0 to 650 hrs at 4.4°C (40°F) to determine the effects of accumulated chilling on terminal flower bud growth and rooting ability. The cultivar X chilling hours interaction was significant for both flower bud growth and rooting ability. The 2 highbush cultivars had wider flower buds than the 3 rabbiteye cultivars. 'Baldwin' and 'Georgiagem' produced the best overall root systems. Chilling requirements ranged from 350 to 550 hr for the rabbiteye cultivars and 350 to 450 hr for the highbush. Except for rooting score of clone TH-275, the functional relationships between flower bud width or rooting score and chilling hours were non-linear. In general, chilling hours enhanced the growth of terminal flower buds and increased the rooting ability.

Index words: *Vaccinium ashei,* rabbiteye, low-chill, highbush, hardwood cuttings

Introduction

Several chilling studies have been made on rabbiteye blueberry (*Vaccinium ashei* Reade), 'Tifblue,' using various techniques (1, 4, 5, 10, 12, 14, 15). Chilling requirements for 'Tifblue' varied from 400 to 650 hrs below 7.2°C (45°F), depending upon the technique used for determination and the range of climatic conditions. Initial tests using terminal flower bud measurements indicated that chilling requirements for 'Brightwell' and 'Baldwin' were 350 to 400 (2) and 450 to 500 hrs (3), resp. In recent studies on rabbiteye blueberries (4), it was concluded that measurements of the terminal flower bud could be used reliably to determine the chilling requirements. Chilling studies have not been reported on highbush clone TH-275 and 'Georgiagem.'

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Poor results have been obtained on rooting rabbiteye blueberry from hardwood cuttings. However, Mainland (6) reported good results from hardwood cuttings of 2 rabbiteye cultivars. Hardwood cuttings of 'Tifblue' produced better root growth after the cuttings were chilled 500 hrs than from cuttings chilled only 250 hrs (13).

Highbush blueberry (*V. corymbosum* L.) 'Blueray' and 'Collins' rooted best and had better root systems after 1220 chilling hrs were accumulated, but the roots were still less than average marketable (11). Highbush clone TH-275 had a higher percentage of cuttings rooted, a higher root rating, and a greater percentage of marketable rooted cuttings when compared with cuttings of 'Tifblue,' regardless of the medium in which they were rooted (8).

The purposes of the present experiment were to: (a) determine growth response of flower buds from 3 rabbiteye cultivars and 2 highbush cultivars to various accumulated chilling periods; and, (b) compare rooting responses of these cultivars to the 10 accumulated chilling periods.