Plant Growth Regulators on *Kalmia latifolia*

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INTRODUCTION

Mountain laurel (*Kalmia latifolia*) is a popular ericaceous shrub with showy buds and flowers in the spring. However, it is slow to begin flower bud development during container production, often taking 3 or more years to produce a significant floral display. I became interested in the potential for growth regulators to induce earlier flowering when I heard of previous experiments done with *Rhododendron* and *Kalmia* by Tom Ranney and Dick Bir at North Carolina State University (Ranney et al., 1994) and by Martin Gent at the Connecticut Agricultural Experiment Station (Gent, 1993).

FIRST EXPERIMENT

In 1994, I did an experiment comparing spray concentrations of Bonzi (paclobutrazol) at 0, 10, 50, 100, 200, 400, and 600 ppm, and of Sumagic (uniconazole) at 0, 10, 50, 100, 200, and 300 ppm on three cultivars of *Kalmia*: 'Freckles', 'Carol', and 'Bullseye'. The 'Freckles' and 'Carol' plants were in 1-gal containers beginning their second season of growth. The 'Bullseye' plants were in 3-gal containers beginning their third season of growth. The experiment was conducted at Historyland Nursery in Montross, Virginia, on plants that were part of their regular production stock. The treatments were applied on 20 May 1994, following the first growth flush. Five plants per treatment of each cultivar were utilized in a completely randomized design. The sprays were applied with a CO_2-pressurized sprayer set at 34 psi, to wet the foliage and young stems. On 6 Oct 1994, the flower bud clusters were counted and shoot growth was measured. On 15 May 1995 another measurement was made of new shoot growth following the first growth flush for the subsequent spring.

The Bonzi treatments were generally less effective, and less consistent than the Sumagic treatments. Bonzi promoted a slight increase in flowering on 'Freckles' and 'Bullseye', but no increase for 'Carol' (Fig. 1). With Sumagic, there was a slight increase in flowering for 'Carol' and 'Freckles', and a dramatic increase in flower buds for the older 'Bullseye' plants, especially at rates of 50 ppm and above (Fig. 2). Shoot growth decreased correspondingly with increasing concentrations of both Bonzi and Sumagic (Figs. 1 and 2). Sumagic rates of 50 ppm and above also decreased shoot growth for the first flush the following spring (data not shown).

SECOND EXPERIMENT

In the first experiment, application of treatments after the first growth flush retarded growth of the second flush, more or less, depending upon concentrations. It was speculated that if growth regulator treatments could be delayed until after the second growth flush, the benefit of two growth flushes could be obtained prior to initiating flower buds. Therefore, in 1995, the effectiveness of treatments applied after the first and after the second growth flushes were compared. I also compared treatments to plants both 1 year in production and 2 years in production. The plants used were *K. latifolia* 'Nipmuck', 'Olympic Fire', and 'Bullseye'. These were con-

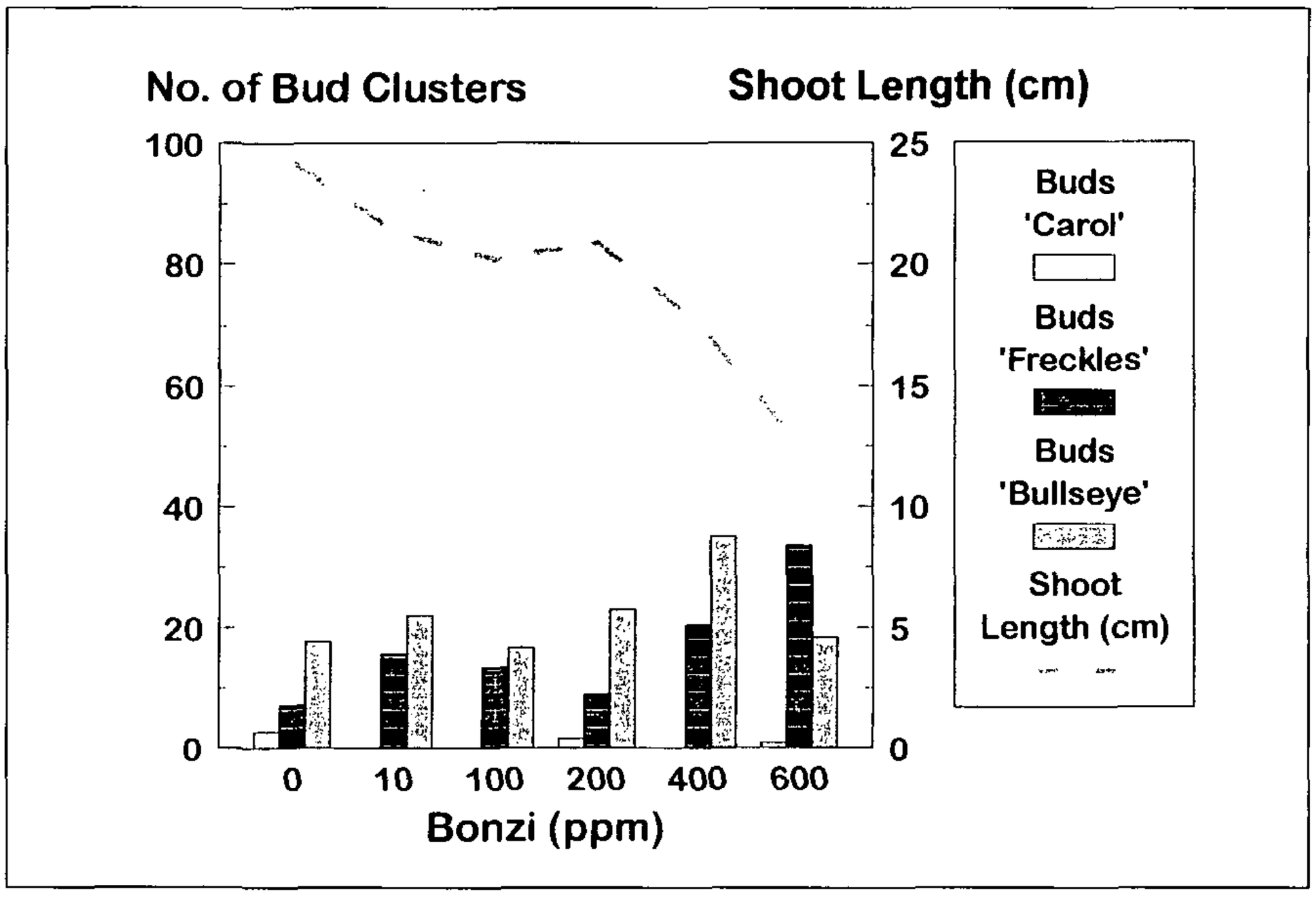

Figure 1. The effect of Bonzi (paclobutrazole) on flower bud initiation and shoot growth of three *Kalmia* cultivars.

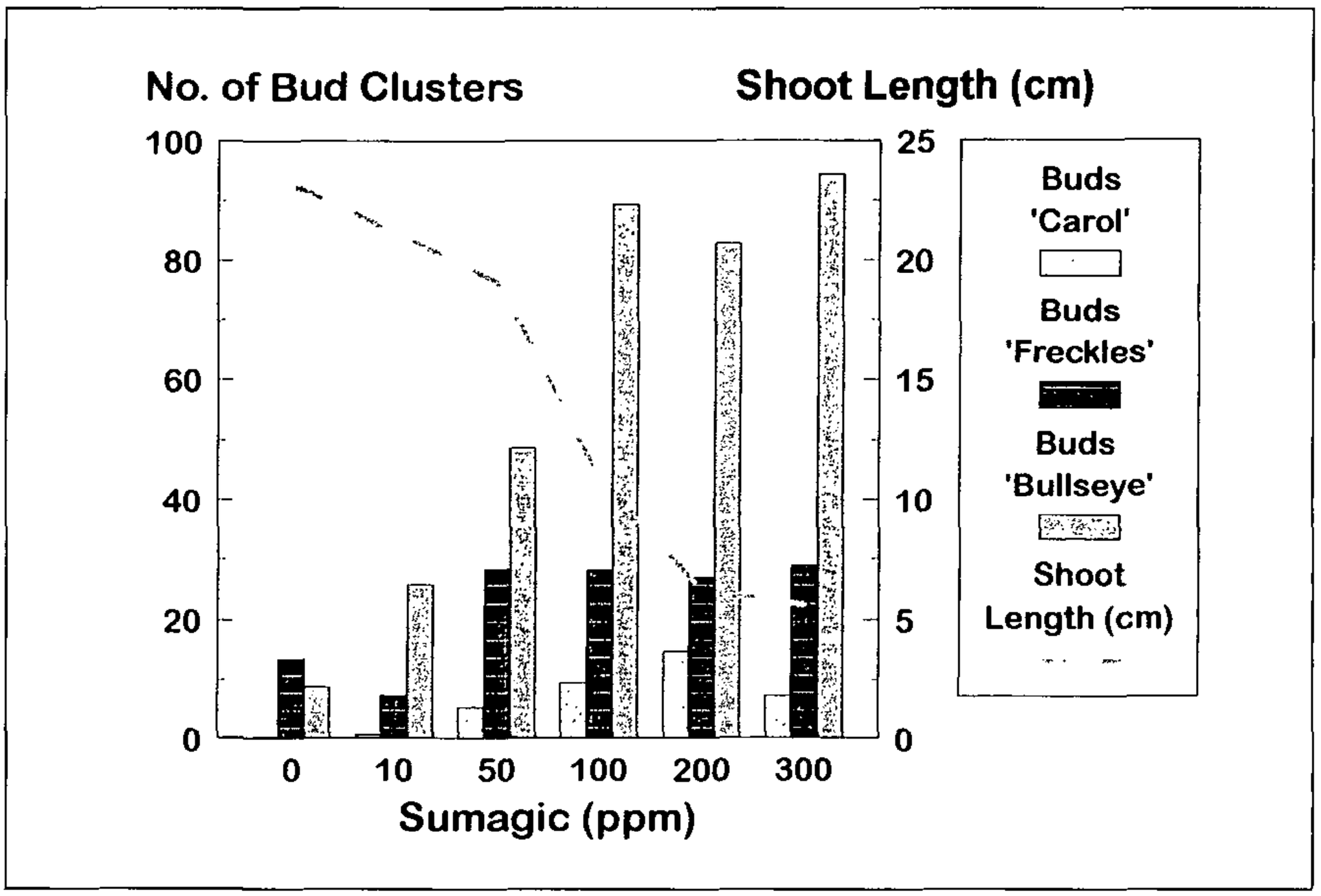

Figure 2. The effect of Sumagic (uniconazole) on flower bud initiation and shoot growth of three *Kalmia* cultivars.

tainer-grown plants in production at Historyland Nursery. Two-gallon (1 year, beginning their second season) and 5-gal (2 year, beginning their third season) plants of each cultivar were used.

On 26 May 1995, following the first growth flush of the season, spray treatments of Sumagic (uniconazole) at concentrations of 0, 25, 50, 100, 150, and 200 ppm were applied as in the first experiment. A completely randomized design was used with five plants per treatment per cultivar for each of the two container sizes. On 20 July 1995, after the second growth flush of the season, the same spray treatments were applied to an additional set of plants of the same age and cultivars as used on 26 May. On 8 Nov. 1995, flower bud set and plant heights were evaluated.

Applications of Sumagic to the first growth flush on the 2-gal plants provided no significant increase in flower buds for any of the three cultivars evaluated (data not shown). However, when applications were made to the second growth flush, there were increases in flower bud initiation for both 'Olympic Fire' and 'Bullseye'. Maximum flowering increase occurred at 50 to 100 ppm depending on the cultivar (Fig. 3). Application of Sumagic to the second flush also resulted in larger plants at the end of the season than application to the first flush (Fig. 3).

When Sumagic was applied to the 5-gal plants, there were large increases in flower buds with increasing rates of Sumagic for both first and second flush applications (Fig. 4). There were no significant differences in bud numbers between the two application times for the 5-gal plants of both 'Nipmuck' and 'Olympic Fire'. However, the size of the plants treated after the second flush were larger when compared with corresponding treatments applied after the first flush (Fig. 4). The 'Bullseye' plants could not be evaluated because of losses apparently due to *Phytophthora*.

THIRD EXPERIMENT

This experiment, conducted in 1996, was very similar to the previous (1995) experiment with slight modifications in the concentrations of Sumagic applied. The cultivars 'Nipmuck', 'Olympic Fire', and 'Bullseye' were again used, both 2-gal and 5-gal sizes. On 6 June 1996, following the first growth flush of the season, spray treatments of Sumagic at active ingredient concentrations of 0, 50, 75, 100, and 150 ppm were applied to wet the leaves and young stems. These same treatment concentrations were again applied on 2 Aug. following the second flush of the season. There were five plants per treatment for each application time and each plant size, in a completely randomized design. On 15 Oct. 1996, flower bud set and plant size were evaluated. The plants were again evaluated on 6 May 1997, to confirm the flower bud set numbers, and to measure the first growth flush for the year following treatment application.

In 1996, none of the second season (2-gal) plants, of any of the cultivars evaluated, produced flower buds regardless of application time. With the third season (5-gal) plants, there was a large increase in flower buds with increasing concentrations of Sumagic when the application was made following the first growth flush. Unlike the previous experiment, there was only a slight increase in flower buds when application was made following the second growth flush (Fig. 5). As with the previous experiment, the plants were larger at the end of the season when applications were made to the second flush rather than the first (Fig. 5), however, there was more growth retardation to the first flush of the season following treatments if the treatments were made after the second flush (Fig. 6).

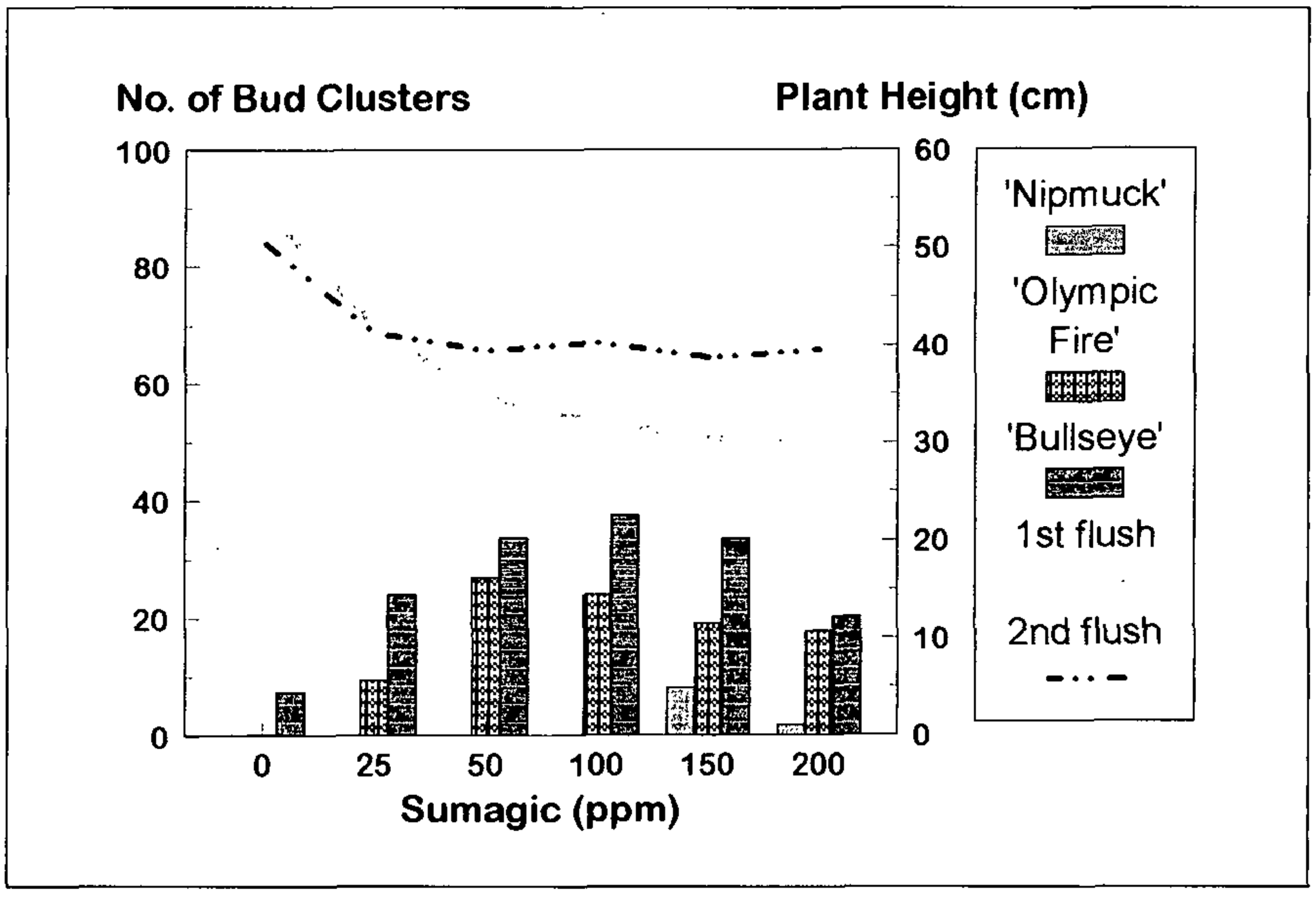

Figure 3. The effect of Sumagic on flower bud initiation when applied to the 2nd growth flush on 2-gal *Kalmia* and on plant height when applied to the 1st or 2nd flush.

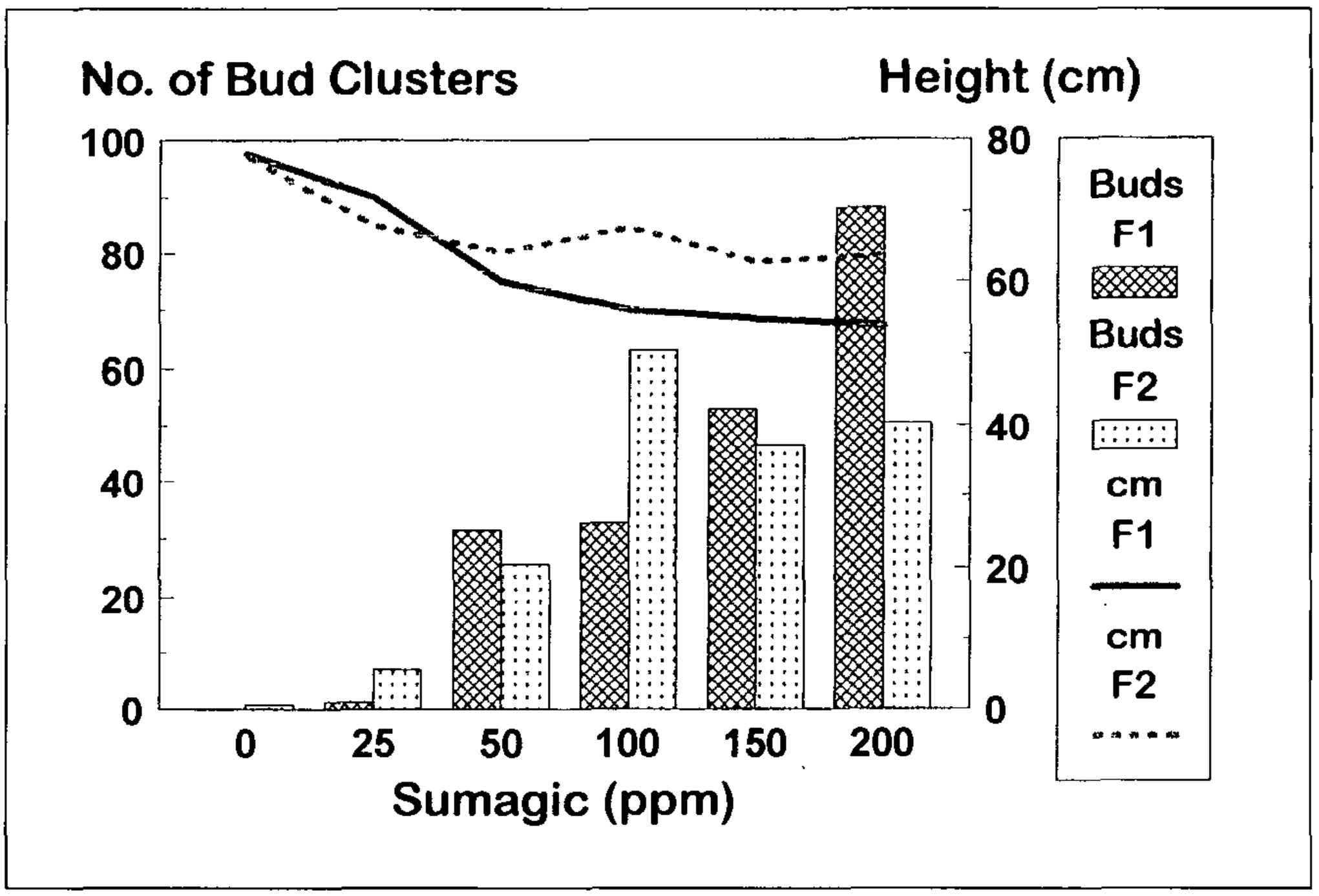

Figure 4. The effect of Sumagic on flower bud initiation and plant height when applied to the 1st (F1) or 2nd (F2) growth flush of *Kalmia* (means of 'Nipmuck' and 'Olympic Fire'.

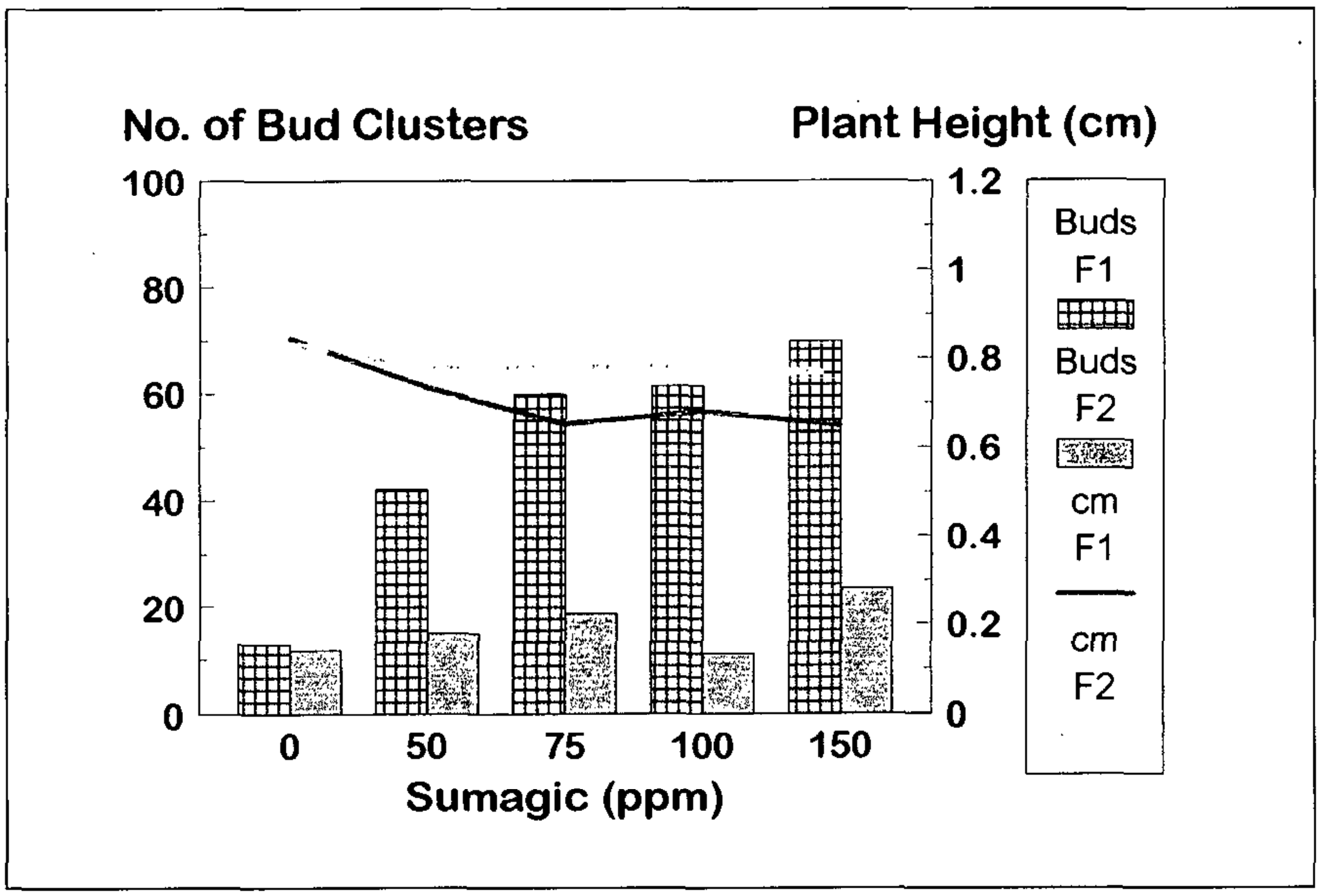

Figure 5. The effect of Sumagic on flower bud initiation and plant height when applied to the first (F1) or second (F2) growth flush of 5-gal *Kalmia* (means of 'Nipmuck', Olympic Fire', and 'Bullseye' (Experiment 3).

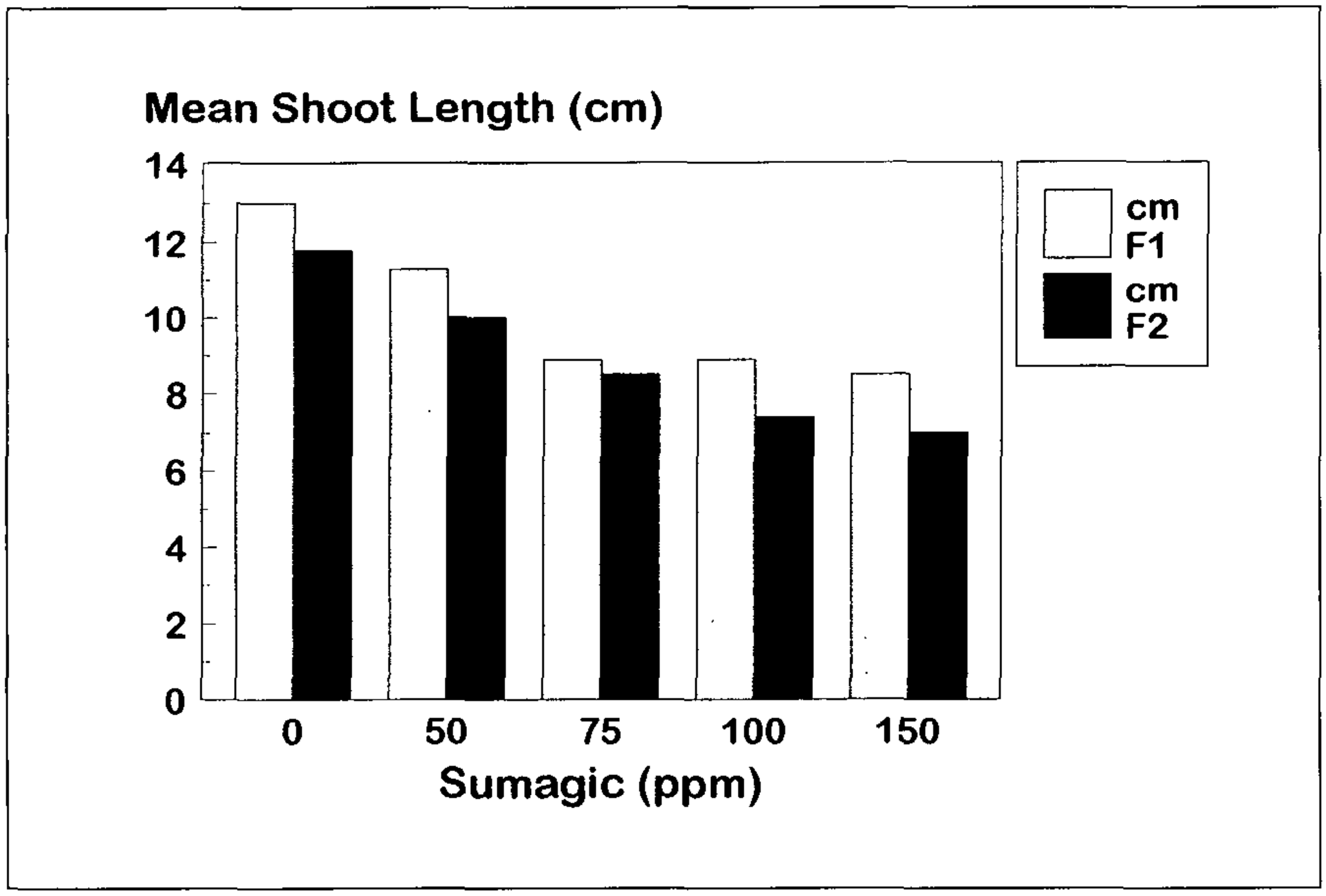

Figure 6. The effect of Sumagic on shoot length of the 1st growth flush of the year when treatments were made to the first flush (F1) or the second flush (F2) of 5-gal *Kalmia* the previous year (mean of 3 cultivars) (Experiment 3).

CONCLUSIONS

Spray applications of Sumagic (uniconazole) may be used to substantially increase flower bud initiation during container production of *K. latifolia*. Bonzi (paclobutrazol) also increased flower bud initiation to a lesser extent. A significant increase in flower buds was obtained with Sumagic on plants as early as the second season of growth following propagation. However, these results on plants this young could not be repeated in one of the three experiments. Consistent increases in flower buds were obtained, however, on plants in their third season of growth when uniconazole was applied at 50 ppm or above. The most consistently satisfactory results were obtained when applications were made following the first growth flush of the season, with uniconazole at 50 to 100 ppm, on plants that were in their third season. There is some reduction in plant growth, however, especially at rates above 50 ppm. These growth reductions may also carry over to the following season, especially at the higher rates.

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