Border Growth Control of Iceplant with Chlorflurenol Sprays[1]

Henry Hield and Stuart Hemstreet[2]
University of California, Riverside

Abstract. **Lateral spread of iceplant (*Carpobrotus edule* L. Bolus) was best reduced by sprays of 2-chloro-9-hydroxyflourene-9-carboxylic acid (chlorflurenol) at 300 ppm; other chemicals tested were ineffective. Addition of 0.1% X-77 adjuvant often improved growth reduction. Greater growth reductions from second treatments suggest an advantage for a continuing spray program.**

Iceplant is a widely used ground cover in southern California where it is planted on approx 2185 ha of freeway right-of-way strips. In metropolitan areas, iceplant is routinely fertilized and sprinkler irrigated, while in rural areas it receives less attention and depends on rainfall for moisture.

The iceplant remains low with younger growth overgrowing the older vegetation which decomposes with time. Unirrigated plantings grow during the winter and spring when rainfall occurs, but in irrigated plantings growth occurs throughout the year. In both situations, there is a need for growth inhibition on borders to prevent infringement on the roadway and into chainlink fences at the rear of plantings.

Contact herbicides, other than diquat and paraquat which translocate in iceplant, are used in rural areas to limit border spread. In metropolitan areas the presence of dead plant material is esthetically objectionable and the iceplant is either trimmed or sprayed with chlorflurenol, a morphactin, to retard growth. The label of the registered chlorflurenol product, Maintain CF125, recommends a 600 ppm spray treatment.

This study was conducted to determine the effectiveness of chlorflurenol applied at varying rates throughout the year. Other growth regulators[3] included in a preliminary screening trial were not as effective as chlorflurenol.

During 1972, chlorflurenol was tested at 150, 300, 450, and 600 ppm alone and with the addition of 0.1% X-77.[4] In 1973, the 600 ppm concn was omitted. Spray treatments were made on 1 to 1.5 m bands along the border and replicated 4 times with 5 marked shoots per plot for growth measurements. The criteria for selecting the most desirable treatment was the lowest concn at the 1% level of significance (Duncan's multiple range test), that did not injure the plant and which was different from the untreated control and yet not different from a higher concn in growth reduction.

The effective concn in 10 experiments (Table 1) show that no concn above 300 ppm was the most desirable treatment according to the chosen criteria. No change in the level of the effective concn with time was found from single applications measured for more than 5 months. The addition of 0.1% X-77 was frequently associated with the treatment showing most desirable growth reduction. Successful growth inhibition was obtained from applications throughout the year, but the need for and frequency of treatment was related to plant vigor.

Averaging the data presented in Table 1, measurements of less than 90 days after treatment showed a 49.5% growth reduction with control growth averaging 36.7 cm. At 90 to 135 days the growth reduction was 58.0% with control growth 64.3 cm, and from 136 to 257 days the growth reduction was 70.5% while control growth averaged 136.7 cm.

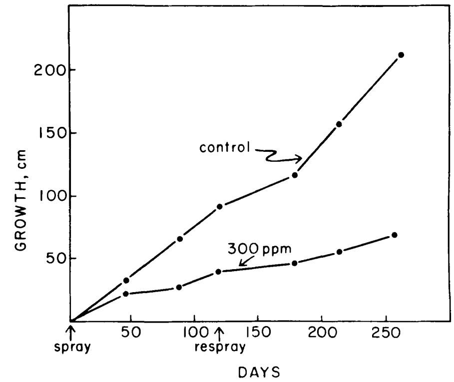

Fig. 1. Cumulative growth of iceplant after a spray of 300 ppm chlorflurenol on Feb. 23, 1973 and retreatment on July 3.

Fig. 1 shows cumulative growth for control and 300 ppm treated plants. Following the Feb. 23, 1973 initial spray, the reduction was 35% at 46 days, 85% for the next 41 days, and 47% for the following 43 days. The plants were then retreated and growth reductions of 75, 75, and 76% were obtained for periods of 49, 45, and 41 days, respectively. The smaller growth reduction following the initial treatment compared with the reduction following the respray treatment (35 vs. 75%) was a typical trend. This may mean that a continued elongation of existing cells diminished the treatment response of

Table 1. Border growth reduction of iceplant at varying application dates and chlorflurenol concn.

Test	Date treated[z]	Most effective concn[y] (ppm)	Days after treatment	Growth reduction (%)	Growth of control (cm)
1	Jan 27, 1972	300[x]	40	73	14
2	June 29, 1972	150[x]	48	22	51
		150[x]	82	45	71
		150[x]	123	41	90
3	Aug 16, 1972	150[x]	89	58	35
4	Nov 29, 1972	300[x]	133	68	37
		300[x]	173	75	63
5	Dec 1, 1972	300	82	24	32
		300[x]	135	58	58
6	Feb 23, 1973	300[x]	87	65	65
	Retreated July 3	300[x]	130	65	91
		300[x]	179 (49)[w]	65 (71)	116 (25)
		300[x]	214 (84)	70 (85)	157 (41)
		300[x]	257 (127)	72 (77)	211 (54)
7	Mar 9, 1973	300[x]	46	65	18
		300[x]	68	78	34
		300[x]	131	67	53
8	Mar 21, 1973	300	62	45	33
		300	92	49	47
		300	128	58	74
	Retreated Aug 15	300	(51)	(60)	(50)
9	July 20, 1973	300	34	39	20
10	July 30, 1973	300	57	30	31

[z]1972 Chlorflurenol concn 150, 300, 450 and 600 ppm. 600 ppm omitted in 1973.
[y]Lowest concn different from control but not different from a higher concn at 1% level of significance.
[x]Treatment included 0.1% X-77.
[w]Values in parentheses from date of respray.

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[2]Department of Plant Sciences.

[3]ethyl hydrogen 1-propylphosphonate (NIA 10656), ammonium ethyl carbamoylphosphonate (Krenite), and 3-trifluoromethylsulfonamido-p-acetotoluidide (Sustar) each at levels from 500 to 5000 ppm; (2-chloroethyl)phosphonic acid (ethephon) from 100 to 2000 ppm, and 2,4-D from 25 to 100 ppm.

[4]Maintain CF125 was furnished by US Borax and Celamerck; X-77 by Colloidal Products.

Fig. 2. Tips of iceplant shoots showing effects of chlorflurenol 144 days after treatment. Left to right: Control, 150 ppm, 300 ppm, 450 ppm and 600 ppm.

the initial measurement, while subsequent greater growth reduction could reflect a dominant influence of reduced cell division (1). A persistent, but decreasing cell division effect might account for a rapid growth reduction on respraying.

Characteristic responses of shoot tips at 144 days after treatment with chlorflurenol are shown in Fig. 2. The tubular leaves are shortened but generally retain their normal shape. Since the appearance of a ground cover mass is a composite of the many parts, the treated areas were similar to the untreated ones except for less new growth and spread, and a few instances where the 600 ppm concn caused chlorosis of older leaves. The growing tips of shoots were not killed, nor was there a large increase of lateral branching. These 2 responses, together with no obvious leaf distortion from a distance, make iceplant well adapted to chlorflurenol treatment.

The 300 ppm chlorflurenol treatment gave effective year-round growth control of iceplant. The growth reduction was as great as with higher rates for a 5-month period and caused no injury. The greater effectiveness of repeated applications indicate advantages for a consistent respray program.

Literature Cited

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Height Control in Greenhouse Chrysanthemum by Mechanical Stress[1]

P. Allen Hammer, Cary A. Mitchell, and Thomas C. Weiler[2]
Purdue University, West Lafayette, Indiana

Abstract. **Mechanical stress, whether from shaking or flexing reduced the elongation of greenhouse chrysanthemums. Stress for 30 seconds once a day was slightly less effective than twice a day. Mechanical stress may be used to reduce excessive stem elongation without the use of chemicals.**

Greenhouse-cultured plants unlike those grown outdoors are usually lush and succulent. Environmental factors contributing to this "greenhouse lushness" include higher relative humidity, less ultraviolet light, lack of temperature extremes, and protection from prevailing winds. This latter factor has recently received considerable attention for its role in influencing the form and character developed by trees in their natural environment (3). In fact, wind may play as important a role in plant morphogenesis as does light, temperature, water, nutrients, and atmospheric composition.

Mechanical manipulation may have effects equivalent to wind, especially in reducing elongation in woody and herbaceous species. Shaking trunks of young sweet gum *(Liquidambar styraciflua)* reduced elongation growth, increased lateral growth, and hastened terminal (dormant) bud set (6). Similarly, increased spacing of container-grown trees in the nursery resulted in more sturdy, marketable plants which required less pruning and no staking when later planted in the landscape (2). The increased wind sway of the spaced-out trees apparently caused greater trunk taper than occurred with rigidly staked material. Noninjurious handling of herbaceous plant material also reduces growth (7) and Jaffe (4) has demonstrated that rubbing of the internodes of a number of herbaceous species for 10 sec once or twice daily, stops elongation growth within 3 min. He suggested that the growth response of a plant to physical contact be called "thigmomorphogenesis." Mitchell et al. (5) have characterized growth inhibition of tomato and several other herbaceous species by mechanical shaking and showed the growth retardation effects to be reversible once the stress was discontinued. They have proposed the term "seismomorphogenesis" to describe effects of shaking (without actual contact) on plant growth.

Long photoperiods, which maintain *Chrysanthemum morifolium* Ramat. in a vegetative state until floral induction, result in undesirable stem elongation. This study explores the potential of mechanical stress to commercial production of potted chrysanthemums.

Two experiments were carried out to determine if mechanical stress could be used to regulate height. 'Bright Golden Anne' and 'Torch' chrysanthemums[3] were potted Oct. 19, 1973 in Jiffy mix[4] to which 4.16 kg of 14.0-6.1-11.6 (N-P-K) Osmocote/m^3 of mix were added. All the plants were capillary watered (1).

Expt. 1. Twenty-five 7.6 cm pots of each cultivar were grown single stem with short photoperiods (8 hr daylength) started Nov. 9. There were 5 treatments: 1) control, 2) shaking[5] for 30 sec once daily, 3) shaking for 30 sec

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[2]Assistant Professor, Floriculture; Assistant Professor, Plant Physiology; and Assistant Professor, Floriculture, respectively, Department of Horticulture.

[3]Cuttings supplied courtesy of Yoder Bros., Barberton, Ohio.

[4]Commercial mixture of sphagnum peat and vermiculite, (1:1) by volume.

[5]The plants were gently shaken from side to side so as to get movement of leaves and stem.