HortScience 18(3):366–367. 1983.

Growth and Flowering of *Exacum affine* at Three Radiant Energy Levels

Sharon Williams, Susan Wolf, and E.J. Holcomb[1]
Department of Horticulture, The Pennsylvania State University, University Park, PA 16802

Additional index words. Persian violet, irradiance

Abstract. ***Exacum affine*** **Balb. plants grown at 85, 183, or 345 µE $m^{-2}s^{-1}$ from fluorescent and incandescent lamps flowered most rapidly at 345 µE $m^{-2}s^{-1}$. Plants grown at 183 µE $m^{-2}s^{-1}$ energy level were slower to flower, but plant forms were more acceptable commercially.**

Exacum affine, a relatively new flowering pot plant in the United States, shows promise for commercial floriculture. The plant is floriferous, fragrant, and free-branching, yet sturdy. Flower colors are violet or white, with striking yellow anthers. Leaves are a glossy dark green, often accented by a deep red stem. Exacum's growth and flowering habits have been described as "commanding great public appeal as a pot plant and an ornamental bedding plant" (3). In a study of flowering potted plants under simulated home conditions, it was reported that exacum can be maintained easily and expected to flower for 4 to 8 weeks in the home (2). Production of exacum has been described as requiring no pinching, disbudding, growth retardants, or blackcloth for flowering (1, 4). The plants have a long shelf-life and require minimal insect control. Control of *Botrytis cinerea* is mandatory, especially during winter months.

Seasonal variation in time required for flowering continues to be a problem for profitable production of exacum. Production time for a 15-cm flowering plant from cuttings is 7 to 8 weeks in summer, but may be as long 12 to 14 weeks in midwinter (4). The objective of this experiment was to determine the amount of radiant energy necessary for most rapid flowering.

Seeds of 2 inbred lines (C78-7-2 and C78-12-6) were obtained from The Pennsylvania State Univ. *Exacum* breeding program. The experiment was repeated 4 times during 1980. Sowing and transplanting dates for all replications are listed in Table 1. Seeds were sown in Styrofoam trays and seedlings were transplanted into 9-cm standard plastic pots. All plants were fertilized daily with 15N–6.9P–13.9K at a rate of 200 ppm N. All plants were given a 16-hr photoperiod and a temperature of 21°C both day and night. Prior to transplanting, all plants were exposed to the same environmental conditions in a growth room.

After transplanting, plants were divided into 3 radiant energy treatments which were applied on adjacent benches in a growth room. Both fluorescent (Sylvania/lifetime/F96T12/CW/VHO) and incandescent (60W/120W) lamps (ratio of 3 to 1) were used. The radiation levels were: 85 µE $m^{-2}s^{-1}$ (lights positioned 90 cm above the bench) for treatment 1; 183 µE $m^{-2}s^{-1}$ (lights positioned 60 cm above the bench) for treatment 2; and 345 µE $m^{-2}s^{-1}$ (lights positioned 30 cm above the bench) for treatment 3.

The number of days to flower was computed from the transplanting date to the day the first flower opened on each plant. After all plants within a treatment had flowered, the number of flowers and fresh weight of each plant were determined. Means of the 4 replications of each treatment are given (Table 2) because results in each replication were similar.

Plants that received the lowest amount of radiant energy (85 µE $m^{-2}s^{-1}$) had the fewest flowers, required the greatest number of days to flower, and had the lowest fresh weight. These plants had leaves that were small, thin, soft, and pale green. Plants that received the highest amount of radiant energy (345 µE $m^{-2}s^{-1}$) flowered first. These plants also produced the greatest number of flowers; however, the mean fresh weight was the same as that of plants exposed to the intermediate radiant energy level. The foliage was overly compact, thick, brittle, and dark green. A similar response has been observed in African violet (5).

Since the lamps were varying distances from the plants, it may have been possible that temperature was interacting with light to produce the observed flowering response. Leaf temperatures were measured periodically; plant temperatures in the 183 µE treatment were 1°C above air temperature. Since the temperature elevation was small, we assume that the predominant factor affecting flowering was radiant energy level.

Plants that were exposed to 183 µE $m^{-2}s^{-1}$ were most attractive. Although these plants required a greater number of days to flower (70 vs. 54 for the blue-flowered line) and produced fewer flowers than those grown at 345 µE, no undesirable foliar characteristics were observed.

This research demonstrated that flowering in *E. affine* is related to radiant energy level. This explains the seasonal variation in flowering time and suggests that production time can be shortened by supplementary radiation. It appears that a level of radiant energy between 183 and 345 µE $m^{-2}s^{-1}$ at 21°C would be optimum when both growth and flowering are considered.

Table 1. Sowing, transplanting, and flowering dates of *Exacum affine* grown at 3 levels (µE $m^{-2}s^{-1}$) of radiant energy.

Replication	Date (1980)		No. of of days to 100% flowering			No. plants per breeding line per treatment
	Sow	Transplant	85 µE	183 µE	345 µE	
1	April 14	June 9	121	103	95	28
2	July 25	Sept. 20	116	77	73	36
3	Sept. 20	Oct. 1	143	129	107	18
4	Nov. 1	Dec. 6	[z]	82	63	30

[z]Data unavailable.

Table 2. The effect of radiant energy level on number of flowers, average number of days to flower, and fresh weight of 2 inbreds of *Exacum affine*.

Irradiance	No. of flowers[z]	Avg. days to flower		Fresh wt (g)	
		C78-7-2[y]	C78-12-6[y]	Violet	White
High	15.6 a	54 a[x]	55 a	15.6 a[x]	16.5 a
Medium	8.0 b	70 a	70 b	19.4 a	16.0 a
Low	3.1 c	94 b[w]	88 c[w]	6.4 b[w]	7.0 b[w]

[z]Average of both lines.
[y]C 78-7-2 is white-flowered; C 78-12-6 is violet-flowered.
[x]Mean separation within a column by Duncan's multiple range test, 5% level.
[w]Replication 4 low-irradiance plants did not flower prior to the end of the experiment so no data were collected. Numbers represent 3 replications.

Received for publication July 24, 1982. Contribution No. 1, Dept. of Horticulture. Paper No. 6485 in the Journal Series of the Pennsylvania Agricultural Experiment Station. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

[1]Undergraduate Student, Graduate Student, and Assistant Professor, respectively.

Literature Cited

1. Hammer, P.A. 1980. Other flowering pot plants, p. 435–475. In: R.A. Larson (ed.). Introduction to floriculture. Academic Press, New York.
2. Harbaugh, B.K. and W.E. Waters. 1979. Evaluation of flowering potted plants under simulated home conditions. HortScience 14:743–745.
3. Kamp, M. and A.E. Nightingale. 1977. Exacum, a durable low maintenance crop. Flor. Rev. 161(4171):98–99.
4. Larson, R.A. 1981. Commercial production of exacum. N.C. Flow. Grow. Bul. 25(4):1–6.
5. Mastalerz, J.W. 1977. The greenhouse environment. Wiley, New York.

HortScience 18(3):367–368. 1983.

Yellow Nutsedge Control in Gladiolus

P.A. Stewart

Stewart Agricultural Research Services, P.O. Box 509, Macon, MO 63552

R.E. Talbert[1] and C.J. Wallinder[2]

Department of Agronomy, Altheimer Laboratory, University of Arkansas, Fayetteville, AR 72701

Additional index words. alachlor, metolachlor, herbicide, *Gladiolus* x *hortulanus*, *Cyperus esculentus*

Abstract. **Preliminary greenhouse and field experiments showed that alachlor [2-chloro-2',6'-diethyl-*N*-(methoxymethyl)acetanilide] and metolachlor [2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)acetamide] were noninjurious to gladiolus (*Gladiolus* x *hortulanus*) and had potential for control of yellow nutsedge (*Cyperus esculentus* L.). In subsequent field experiments both herbicides at 2.2 and 4.5 kg a.i./ha preplant-incorporated gave good nutsedge control for 6 weeks. When alachlor and metolachlor at 2.2 and 4.5 kg/ha preplant-incorporated were repeated at 6 weeks, nutsedge control was extended for longer than 3 months. Little or no injury resulted from either herbicide applied once or repeated. Neither herbicide nor application method affected gladiolus height or flower production.**

Yellow nutsedge thrives in a wide variety of soils and climates and is becoming an increasing problem in nursery crops because of the application of herbicides that control annual weeds (reducing competition) and the decrease in costly handhoeing and mechanical cultivation. Nutsedge infestations can reduce crop yields and quality as well as increase production costs for its control (4, 5). Nutsedge growth and its prolific reproduction have been described by several authors (4, 5, 8, 9).

Ahrens (1, 2) has reported on several herbicides for use in gladiolus; one such study included nutsedge control. Of the herbicides he investigated, alachlor appeared the most promising for nutsedge control. Alachlor, applied preemergence at 4.5 kg/ha, controlled nutsedge for 2 months with little gladiolus injury, but injured gladiolus cormels when applied preplant-incorporated. A preemergence application of alachlor plus diuron [3-(3,4-dichlorophenyl)-1,1-dimethylurea] caused more injury than alachlor alone without improved nutsedge control.

A series of experiments were conducted at the Univ. of Arkansas to evaluate alachlor and a herbicide (metolachlor) of similar chemistry for control of yellow nutsedge and gladiolus tolerance. Results from preliminary greenhouse and field experiments in 1976 and 1977 (not reported) indicated that gladiolus were tolerant to alachlor and metolachlor and that both herbicides controlled yellow nutsedge.

For further evaluation, separate field experiments were conducted in 1978, 1979, and 1981 at the Main Experiment Station, Fayetteville on a Taloka silt loam in an area infested densely with yellow nutsedge. Alachlor and metolachlor were applied preplant at 2.2 and 4.5 kg/ha with a tractor-mounted sprayer and were incorporated into the soil 7 to 8 cm deep. Some herbicide treatments were reapplied and incorporated along each side of the row about 6 weeks after the first application. Gladiolus cultivars were 'T-512' in 1978, 'Christmas Red' in 1979, and 'Intrepid' in 1981. Plot sizes were 1 × 3 m in 1978, 1 × 4 m in 1979, and 1 × 3.5 m in 1981. Plots were arranged in randomized complete blocks with 4 replications. Rainfall and irrigation during the first 2 months after planting totalled 24, 30, and 30 cm for 1978, 1979, and 1981, respectively. Planting and first herbicide application dates were May 31 in 1978 and 1979 and May 29 in 1981. Nutsedge control and gladiolus injury were rated

Table 1. Yellow nutsedge control with alachlor and metolachlor applied preplant-incorporated in field-grown gladiolus in 1978, 1979, and 1981.

Treatment[z]		Yellow nutsedge control (%)[y]		
		Days after first treatment		
Herbicide	Rate (kg/ha)	40–50	70–80	105–115
1978				
Check		19	11	29
Alachlor	2.2	59	36	54
	4.5	56	31	37
Metolachlor	2.2	91	56	55
	4.5	97	51	44
LSD 5%		28	29	23
1979				
Check		0	0	0
Alachlor	4.5 repeated	90	70	84
Metolachlor	2.2 repeated	97	91	98
	4.5 repeated	100	100	100
LSD 5%		9	18	21
1981				
Check		0	0	0
Alachlor	2.2	72	45	44
	2.2 repeated	88	81	33
	4.5	79	11	23
	4.5 repeated	83	92	89
Metolachlor	2.2	97	26	19
	2.2 repeated	90	96	94
	4.5	99	69	11
	4.5 repeated	100	98	98
LSD 5%		17	21	28

[z]Repeated treatments were applied 42 and 45 days after the first application in 1979 and 1981, respectively.

[y]Yellow nutsedge density in check plots at 40–50-day evaluations were: 590/m^2 (1978); 356/m^2 (1979); 372/m^2 (1981).

Received for publication September 24, 1982. Published with permission of the Director of Arkansas Agr. Expt. Sta., Univ. of Arkansas, Fayetteville. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

[1]Professor.

[2]Research Assistant.