

## EVALUATION OF POINSETTIA CULTIVARS GROWN ON TWO IRRIGATION SYSTEMS<sup>1</sup>

GARY J. WILFRET AND BRENT K. HARBAUGH  
*IFAS, University of Florida,*  
*Agricultural Research & Education Center,*  
*Bradenton, Florida 33508*

**Abstract.** Twenty-eight poinsettia cultivars were grown on raised beds in a polypropylene (25% shade) house with two irrigation systems (Vattex capillary mat and hand-watering) to evaluate plant growth, development, and marketability. Single plants were grown in 15 cm diameter pots, pinched to 6 nodes, and treated with Cycocel at 1850 ppm as a foliar spray. Mean ht of all cultivars grown on the mat was 43.1 cm as compared to 35.2 cm for the hand-watered plants. Numbers of laterals with colored bracts on December 15 were 5.4 and 4.7 for the hand-watered and capillary mat, respectively. Numbers of bracts in color for individual inflorescences were 8.9 and 5.5 for the hand-watered and capillary mat, respectively. No differences in inflorescence diameter were evident due to irrigation type. Quality plants of most cultivars were produced with both irrigation systems although flower development was delayed with the capillary mat.

Potted poinsettias (*Euphorbia pulcherrima* Willd.), with their bright red bracts and dark green leaves, have been a traditional symbol of the Christmas season since the early 1900's (3). Production of potted poinsettias in Florida has expanded the last few years into a 1,229,000 dollar industry which sold 523,000 units in 1976 (11). These plants were grown under diverse conditions around the state: 1) in temperature-controlled greenhouses; 2) in covered sawtooth or similar structures; 3) in saran or polypropylene shade houses; or 4) in open fields. Most of the cultivars grown in Florida are of the self-branching type (7) which generally exhibits more vigor, greater stem strength, and more freedom from nutritional disorders than the single stem type (10). The majority of the present commercially grown cultivars have developed by mutation and have been selected for specific bract, foliage, and general growth characteristics.

Poinsettia cultivar trials have been conducted at many universities around the U.S. (1, 2, 8, 9, 10) with most plants grown in temperature-controlled greenhouses. This type of structure is expensive to build and does not utilize the favorable climatic conditions of central and southern Florida during the fall. One of the least expensive structures is the polypropylene shade house, which provides a reduction of light, breaks up heavy rainfall, and reduces the migration of insects to the plants from outside areas. Since temperatures cannot be controlled in this structure, plant growth is dependent upon ambient temperature. Response of poinsettia cultivars in this structure would not be expected to be the same as in greenhouses. Watering of plants grown on raised beds in shade houses is usually either by hand or by overhead sprinkling systems; however, some single pot tube systems are utilized. Use of a Chapin<sup>(R)</sup> system requires a water source free of iron and sulfur bacteria, which plug the small "spaghetti" tubes and does not allow uniform water distribution among the pots. Hand-watering is a high labor method and overhead sprinklers are very inefficient.

Recent reports (4, 5, 6) have indicated that the capillary mat is an efficient method of irrigating and that plants grown on this mat matured earlier with larger leaves and flowers, and were of higher quality than those hand-watered.

Purposes of this study were to evaluate poinsettia cultivars grown in a polypropylene shade house and compare their growth when irrigated by a capillary mat or by hand-watering.

### Materials and Methods

Single cuttings of 28 poinsettia cvs. (Table 1), which were established in 5 cm diam. plastic cells, were planted on August 25, 1976, in 15 cm diam. plastic pots (RT-600). The medium consisted of a mixture of Florida Peace River peat, coarse white builder's sand, coarse vermiculite, and Perlite (5:3:3:1, by volume). Each pot had 3 1 cm diam. holes in the bottom and four 1.2 x 1.6 cm holes at the base of the sides. Medium amendments, per cubic meter of soil, were: 5:53 kg Osmocote<sup>(R)</sup> 18-5-5.2, 0.68 kg 6-5-2.6 dry fer-

Table 1. List of poinsettia cultivars evaluated in Bradenton (Fall 1976), with bract color in parenthesis.

Paul Mikkelsen (bright red)
Mikkel Heritage (bright red)
" Imp. Rochford (deep red)
" Super Rochford (bright red)
" Vivid Rochford (bright red)
" Triumph (bright red)
" Pink Rochford (light pink)
" Fantastic (bright pink)
" Imperial (bright pink)
" White Rochford (white)
" Dawn Rochford (pink-white)
Wonder Star (bright red)
Eckespoint C-1 Red (bright red)
Eckespoint C-1 White (white)
Eckespoint Reddy Light (bright red)
Eckespoint Prof. Laurie Pink (clear pink)
Small's Winter Flame (dark red)
Ecke's M-21 (dark red)
Annette Hegg Supreme (bright red)
" Top Star (bright red)
" Dark Red (dark red)
" Red (clear red)
" Lady (dark red)
" Diva (brick red)
" White (cream)
" Marble (white-pink)
" Hot Pink (dark pink)
" Super Star (bright red)

tizer, 3.02 kg dolomite, 1.13 kg hydrated lime, 1.36 kg superphosphate, and 1.13 kg Perk<sup>(R)</sup> (a minor element mixture). Additional applications of a 20-16.7-8.7 soluble fertilizer (400 ppm N) at 200 ml per pot were made on Nov. 15 and 22. Plants were grown in a shade house covered with black polypropylene (25% shade) with ambient temperature and humidity. Pots to be hand-watered were set on 15 cm high raised beds which were covered with 1.5 mil black polyethylene mulch. The capillary beds were covered with the same mulch and two Viaflo<sup>(R)</sup> tubes, spaced 30 cm apart down the length of the bed, were covered with a 39 cm wide Vattex<sup>(R)</sup> capillary mat. Each bed was 0.39 m wide x 22.5 m long and contained 168 pots.

Plants were set 3 across on the beds, with the center row staggered from the outer 2. Pots were spaced on 37 cm centers. Transplants were drenched overhead once with a

<sup>1</sup>Florida Agricultural Experiment Stations Journal Series No. 845. Trade names are included for the benefit of the reader and do not infer any endorsement or recommendation by the authors.

Truban<sup>(R)</sup>-Benlate<sup>(R)</sup> mixture (.45 kg + .23 kg/100 l, respectively) and hand-watered thoroughly to establish capillarity. The poinsettias were misted twice daily for 3 days to reduce desiccation of the leaves. Plants hand-watered were irrigated on demand but before any visible signs of foliage wilting. The Vattex<sup>(R)</sup> mat was irrigated every 2 hours in an amount to thoroughly wet the mat without runoff.

Plants were pinched to 6 nodes on Sept. 16 and sprayed on Oct. 7 with Cycocel<sup>(R)</sup> (1850 ppm) at 20 ml per plant to retard elongation of the stems. The experimental design was a split-plot and each treatment contained 3 replications of 3 pots each. Plants were evaluated on Dec. 15 for marketability. A subjective rating of 1-3 was used, with 1 = marketable, 2 = marketable in 3-4 days, and 3 = marketable  $\cong$  5 days. Plant ht above the soil line, number of laterals which had colored bracts, diameter of terminal inflorescence, and number of colored bracts per inflorescence were recorded. All data were analyzed statistically.

### Results and Discussion

The fall 1976 season was ideal for poinsettia production with daily rainfall and warm nights during the first month of the crop. The plants wilted slightly during midafternoon of the first week but remained turgid thereafter. The capillary mat (8.78 m<sup>2</sup>) was irrigated initially with 94 liters of water per 24 hrs. This amount of water, supplemented by the prevailing rainfall, was sufficient to keep the mat wet the first month. When the rains ceased the last of September, the water was increased to 140 liters per 24 hrs. The plants were not large enough to shade the mats and most of the water probably was lost to evaporation rather than transpiration. When the foliage formed a canopy about

Nov. 5, the Vattex<sup>(R)</sup> mat became over-saturated, precipitating a reduction in water to 120 liters per mat per 24 hrs for the remainder of the crop. The hand-watered beds required 70-75 liters of water every other day for the first month to maintain proper moisture. After the plants were pinched, daily watering was required from 110-130 liters per bed. Many days during the last 3 weeks of the crop, the plants were watered twice daily, which required up to 180 liters of water per bed per day.

Plants grown on the capillary mat, irrespective of cv., were taller than those hand-watered (Table 2). Plants on the Vattex<sup>(R)</sup> mat averaged 43.1 cm while those hand-watered averaged 35.2 cm. The ideal height for plant-pot symmetry would be 30-35 cm, which was the height of most of the hand-watered cvs. Cultivar differences were found. Two, 'Wonder Star' and 'Super Star,' were less than 35 cm tall. These are tetraploids, with short, stocky growth and large inflorescences. Many of the cultivars, such as 'Prof. Laurie Pink,' 'Paul Mikkelsen,' and 'Annette Hegg Red' were top-heavy when grown on the Vattex<sup>(R)</sup> mat and would not remain upright without support. Earlier and more frequent applications of growth retardants are obviously necessary in many cvs. to maintain a short plant when grown on capillary mats under central Florida conditions.

Other indications of the increased and extended vegetative growth of the plants on the mats were the differences in the number of laterals with colored bracts (Table 2) and the number of colored bracts per inflorescence (Table 3). The hand-watered plants averaged 5.4 lateral branches with colored bracts while the mat-irrigated plants had only 4.7. This difference was consistent among the cultivars except for 'Dawn Rochford' and 'Prof. Laurie Pink.' These are 2 early developing cultivars and differences were not evident

Table 2. Effect of irrigation source on height, number of laterals with colored bracts, and inflorescence diameter of 28 poinsettia cvs.

Cultivar	Height (cm)		Number laterals w/color on 12/15		Inflorescence diameter (cm)	
	Hand watered	Vattex mat	Hand watered	Vattex mat	Hand watered	Vattex mat
Paul Mikkelsen	42.2g*	48.5gh	5.2abc	4.1abcd	20.8bcdefghi	21.1abcde
Mikkel Heritage	35.9abcdefg	43.8defgh	5.8abc	5.6cd	19.5abcdef	21.2abcde
" Imp. Rochford	33.1abcde	41.5bcdefg	6.4c	5.9d	19.9abcdefg	20.0abcd
" Super Rochford	35.7abcdefg	44.8efgh	5.4abc	4.6abcd	23.4ghi	23.7defg
" Vivid Rochford	30.8abc	39.9bcdef	5.3abc	4.5abcd	18.3abcd	22.2bcdef
" Triumph	34.0abcdef	44.3efgh	5.0abc	4.7abcd	21.3cdefghi	21.9abcdef
" Pink Rochford	33.6abcdef	44.9efgh	6.0bc	5.3bcd	21.8defghi	23.2cdefg
" Fantastic	34.2abcdef	40.4bcdef	6.5c	5.1abcd	21.4cdefghi	21.5abcdef
" Imperial	31.5abcd	36.1abc	4.7abc	4.6abcd	24.1hi	26.8g
" White Rochford	34.6abcdef	43.1cdefgh	6.0bc	5.5cd	17.7abc	18.7ab
" Dawn Rochford	40.5fg	43.4cdefgh	5.0abc	5.8cd	21.6defghi	22.6cdef
Wonder Star	28.7a	31.9a	5.5abc	4.9abcd	20.3abcdefgh	19.7abc
Eckespoint C-1 Red	37.6cdefg	44.2efgh	4.0a	3.2a	22.6fghi	23.4cdefg
Eckespoint C-1 White	31.8abcd	37.7abcde	5.2abc	4.7abcd	22.5fghi	21.9abcdef
Eckespoint Reddy Light	36.2bcdefg	45.0efgh	4.7abc	3.5ab	22.0defghi	22.5bcdef
Prof. Laurie Pink	38.2defg	49.2h	4.1ab	4.7abcd	23.9hi	23.0efg
Small's Winter Flame	31.9abcde	34.6ab	4.6abc	4.2abcd	20.9bcdefghi	23.6defg
Ecke's M-21	36.9bcdefg	44.8efgh	5.2abc	4.7abcd	18.5abcde	18.1a
Annette Hegg Supreme	31.9abcde	42.0cdefgh	5.2abc	5.0abcd	23.2fghi	24.2efg
" Top Star	35.4abcdefg	48.1gh	6.4c	4.1abcd	23.4ghi	23.1cdefg
" Dark Red	37.0cdefg	48.0gh	5.6abc	4.1abcd	19.4abcdef	21.3abcdef
" Red	37.2bcdefg	49.1h	5.3abc	4.3abcd	19.9abcdefg	22.0bcdef
" Lady	36.5bcdefg	46.3fgh	5.1abc	5.0abcd	22.2efghi	23.6defg
" Diva	37.6cdefg	42.7cdefgh	6.4c	5.0abcd	24.2i	25.1fg
" White	39.2efg	44.2efgh	5.7abc	4.4abcd	16.7a	21.8abcdef
" Marble	34.9abcdefg	45.7fgh	5.9abc	5.3bcd	17.1ab	19.9abcd
" Hot Pink	37.5cdefg	46.0fgh	5.7abc	4.6abcd	20.4abcdefghi	23.1cdefg
" Super Star	29.7ab	36.8abc	4.8abc	3.9abc	20.8bcdefghi	20.7abcde
Mean	35.2a <sup>2</sup>	43.1b	5.4a	4.7b	21.0a	22.1a

\*Mean separation, within columns, by Duncan's multiple range test, 1% level.

<sup>2</sup>Mean separation, between water sources, by Duncan's multiple range test, 1% level.

Table 3. Effect of irrigation source on number of bracts in color and marketability of 28 poinsettia cvs. evaluated on December 15.

Cultivar	Number bracts in color (12/15)		Marketability on 12/15 <sup>a</sup>	
	Hand watered	Vattex mat	Hand watered	Vattex mat
Paul Mikkelson	9.4defg <sup>b</sup>	4.1ab	1.5abc	1.8abcde
Mikkel Heritage	7.7abcdef	4.5ab	1.7abc	1.8abcde
" Imp. Rochford	9.8defg	6.1ab	1.3ab	1.3abc
" Super Rochford	9.3defg	6.3ab	1.2ab	1.3abc
" Vivid Rochford	6.9abcd	5.6ab	1.6abc	1.6abcde
" Triumph	9.3defg	5.2ab	1.0a	1.4abcd
" Pink Rochford	8.4bcdef	4.1ab	1.3ab	1.9abcde
" Fantastic	8.3bcdef	4.1ab	1.6abc	2.1bcde
" Imperial	11.0fgh	7.5b	1.1a	1.2ab
" White Rochford	4.5a	3.5a	2.1bc	2.3de
" Dawn Rochford	9.0cdefg	7.6b	1.4abc	1.3abc
Wonder Star	8.2bcdef	4.5ab	1.0a	1.3abc
Eckespoint C-1 Red	7.2abcde	5.2ab	1.1a	1.4abcd
Eckespoint C-1 White	10.7efgh	4.4ab	1.0a	1.5abcd
Eckespoint Reddy Light	6.7abcd	4.6ab	1.5abc	2.2cde
Prof. Laurie Pink	12.4gh	5.0ab	1.1a	1.2ab
Small's Winter Flame	8.2bcdef	6.4ab	1.1a	1.1a
Ecke's M-21	9.8defg	5.4ab	1.5abc	2.1bcde
Annette Hegg Supreme	10.7efgh	6.8ab	1.0a	1.3abc
" Top Star	13.7h	5.8ab	1.0a	1.7abcde
" Dark Red	9.1cdefg	4.7ab	1.4abc	1.5abcd
" Red	10.0defg	6.0ab	1.2ab	1.4abcd
" Lady	12.3gh	6.5ab	1.0a	1.1a
" Diva	9.9defg	7.1b	1.1a	1.3abc
" White	5.7abc	4.8ab	1.8abc	1.8abcde
" Marble	4.9ab	4.9ab	2.3c	2.5e
" Hot Pink	7.2abcde	6.8ab	1.8abc	1.3abc
" Super Star	7.8abcdef	5.7ab	1.4abc	1.5abcd
Mean	8.9b <sup>a</sup>	5.5a	1.4a	1.6a

<sup>a</sup>Subjective rating of 1-3; 1 = marketable, 2 = marketable in 3-4 days; 3 = marketable  $\geq$  5 days.

<sup>b</sup>Mean separation, within column, by Duncan's multiple range test, 1% level.

<sup>a</sup>Mean separation, between irrigation sources, by Duncan's multiple range test, 1% level.

when the evaluation was made December 15. The controlled pinch to 6 nodes allowed from 4 to 8 laterals to develop, which produced a full and symmetrical plant.

The number of bracts in color per inflorescence (Table 3) averaged 8.9 for the hand-watered and 5.5 for the mat system. This difference was consistent among cultivars. Differences in number of colored bracts were exhibited among the cultivars. Since the plants are sold for their color display, this is of extreme importance in the evaluation. Cultivars which displayed the greatest number of colored bracts on Dec. 15 were 'Top Star,' 'Lady,' 'Prof. Laurie Pink,' and 'Imperial.'

Marketability of the crop by Dec. 15 would indicate whether it should be grown in Florida for out-of-state shipments (Table 3). Plants marketable after this date generally are sold locally. Although no significant differences in marketability were found between the 2 irrigation systems, the plants grown on the capillary mat tended to be less mature, with values of 1.4 and 1.6 for the hand-watered and mat system, respectively. Many of the early cultivars, such as 'Lady' and 'Diva,' were visibly more mature the first week in Dec. when hand-watered but, by Dec. 15, the mat-irrigated plants were marketable although they had fewer

colored bracts. Several late cultivars were: 'Heritage,' 'Vivid Rochford,' 'Fantastic,' 'White Rochford,' 'Annette Hegg Hot Pink,' and 'Annette Hegg White.' The last cv. displayed cream-white bracts which are characteristic of this cultivar grown in Florida. The C-1's, both red and white forms, were unexpectedly marketable by Dec. 15. These cultivars generally require high temperatures to develop properly, and the warm fall was conducive to their development. Although differences in inflorescence diam. (Table 3) were evident among cultivars, there was no effect of irrigation method on this characteristic.

Leaf retention, a characteristic important for the homeowner, was a problem only with 'Prof. Laurie Pink' and the seedling Ecke's M-21. These dropped 30-40% of their leaves in the saran house prior to evaluation. All of the cultivars were placed under reduced light (1000-1500 lux) for 3 weeks and evaluated for bract color and leaf retention. 'Annette Hegg Lady' not only retained most of its leaves but the bracts remained a bright red. 'Paul Mikkelsen' lost few leaves indoors, whereas 'M-21' and 'Prof. Laurie Pink' became leafless stems with terminal colored bracts.

Cultivars which appeared to be more adaptable to culture in a shade house in central Florida were:

Reds: 'Lady,' 'Diva,' 'Supreme,' 'Triumph,' and 'Heritage'  
Pinks: 'Fantastic' and 'Hot Pink'

Whites: 'A. Hegg White' (cream), and 'White Rochford' (late)

Marbles: 'Dawn Rochford' and 'A. Hegg Marble' (late)

Previous reports have indicated that growth rate of plants was faster (4, 6) and maturation was earlier (5) when plants were grown on capillary mats. In this study, the plants grew taller but remained vegetative longer on the capillary mat in comparison to a hand-watered irrigation system. Additional applications of growth retardants would be necessary to maintain the optimum plant ht. Sanitation is also necessary to prevent disease-causing organisms from developing and spreading from one pot to another on the mat. Quality poinsettias can be grown in shade houses in central Florida with the use of the capillary mat, but cultural practices must be modified.

#### Literature Cited

1. Criley, R. A., P. E. Parvin, and F. D. Rauch. 1974. Timing container-grown poinsettias for Christmas market in Hawaii. *Hawaii Agr. Exp. Sta. Dept. Paper* 13. 16 pp.
2. Donnan, V., K. Petusky, and J. W. White. 1971. Multi-branched poinsettias for spring sales. *Penn. Flower Grower's Bull.* 245:4-6.
3. Ecke, P., Jr., ed. 1976. The Poinsettia Manual. Paul Ecke Poinsettias (Encinitas, Calif.). 205 pp.
4. Freeman, R. N. 1974. Poinsettias and capillary watering. *Florists' Rev.* 155(4018):27-29.
5. Hammer, A., and R. W. Langhans. 1972. Something new for capillary watering. *Florists' Rev.* 150(3900):15, 54.
6. Hannings, D. W. 1974. Further studies with the capillary mats. *Florists' Rev.* 154(3982):17, 55.
7. Joiner, J. N., and T. J. Sheehan. 1966. Pot poinsettias can be grown commercially in Florida. *Sunshine State Agr. Rept.* 11(3):3-4.
8. Kiplinger, D. C., and D. E. Miller. 1966. Natural season poinsettia tests in 1965. *Ohio Florist Assn. Bull.* 443:3-6.
9. Shanks, J. B. 1972. Poinsettia cultivar evaluation. *Fla. Flower Grower* 9(6):1-5.
10. Shanks, J. B. 1976. The Maryland Florist reports poinsettias. *Florists' Rev.* 158(4099):25-35, 67-74.
11. USDA. 1977. Flowers and foliage plants. Production and sales, 1975 and 1976. Intentions for 1977. *USDA Statistical Rept. Serv.* SpCr61-1(77). 27 pp.