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RESPONSE OF FOUR POINSETTIA CULTIVARS TO DIFFERENT PLASTIC GREENHOUSE COVERS

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Four poinsettia cultivars were grown under four different greenhouse plastic covers, each house having the same growing conditions. The final overall plant quality was substandard because the plants were grown under conditions designed for roses. Plants produced in the double layered covered houses were taller than those in the single layer. There were significant differences in the response of cultivars due to the cover, and within the same greenhouse.

Note: *This is the first of a series of articles concerning plant responses to different plastic greenhouse cover materials as they were observed during the 1982-83 growing season at Colorado State University. Other articles will include responses of pot chrysanthemums and cut roses and the physical properties of the covers tested during the evaluation period.*

Materials and Methods

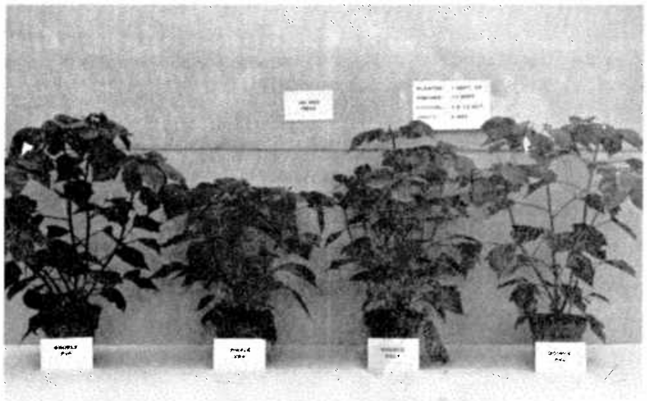
Four quonset greenhouses, each containing 1000 ft^2 ground area, used in the evaluation were described by Sherry (4) and located at the W.D. Holley Plant Environmental Research Center in Fort Collins, CO. The structures were covered with:

DuPont "Tedlar"	Polyvinyl Fluoride (DAR PVF), 4 mil film, double layer on steel frames, 3 years old;
Lascolite	Fiberglass reinforced plastic panels (SGL FRP), 5 oz. single layer, 4 years old;
Monsanto 603	Polyethylene (DBL Poly), 6 mil film, double layer air-inflated, new;
Achilles	Polyvinyl Chloride (PVC) 4 mil film, double layer air-inflated, new.

The environmental conditions were developed for an ongoing rose production experiment:

Day Temperature	71 F
Night Temperature	61 F
Cooling Temperature	80 F
Relative Humidity	50 to 70%
CO_2 Enrichment	1500 ppm

Rooted cuttings of 'Annette Hegg' poinsettia cultivars, 'Top White', 'Dark Red', 'Brilliant Diamond' and 'Hot Pink' were planted in 6-in azalea pots on Sept. 1, 1982, using a 1:2:1 ratio of Fort Collins clay loam, sphagnum peat moss and No. 6 perlite (v/v/v) as the medium. Twenty-five pots of each cultivar were placed on identical bench positions in each house and spaced 1 per 1.2 sq.ft. All plants were pinched on Sept. 15, 1982, and sprayed twice with 3000 ppm Cycocel on Oct. 1, and 15. Natural photoperiodic conditions were used. A constant liquid feed program was used and the plants watered when the growing medium was dry to the touch. A dry application of GroMix micronutrients was added to each pot at a rate of ¼ tsp. per pot on Oct. 15, 1982. The plants were finished at the preset growing conditions and all data taken during the pollen development stage of each cultivar.



PVF FRP POLY PVC

Fig. 1: Response of the poinsettia cultivar Annette Hegg 'Dark Red' grown under four different plastic greenhouse covers.

Results

Number of days to achieve maturity (pollen occurrence): Within each cover treatment, 'Top White' was significantly slower in pollen development than the other cultivars (Table 1). There was no difference between 'Hot Pink' and 'Brilli-

[1] *Graduate research assistant and professor, respectively.*

Table 1: Total number of days between pinch and pollen development of four poinsettia cultivars grown in four different covered greenhouses. HSD 5% = 3 days.

Cultivar/Cover	DBL PVF	SGL FRP	DBL POLY	DBL PVC	AVG
'Top White'	83	87	92	78	88
'Brilliant Diamond'	75	82	82	70	78
'Dark Red'	76	83	85	75	79
'Hot Pink'	75	85	81	71	79
Average	77	85	86	74	

ant Diamond'. 'Dark Red' was slower than 'Brilliant Diamond'. The earliest pollen occurred in the double PVF treatment, but there was no difference in pollen formation of ants in the double Poly and single FRP treatments. All acts were well developed, and the plants at a saleable age when the data were collected.

Total Plant Height: The plant height response varied within each cover treatment between cultivars (Table 2). Each cover treatment had a different effect on the cultivars. There were significant differences in cultivar heights in all houses. The tallest plants were grown in the double PVC, double PVF and double Poly houses, respectively. The single FRP treatment produced significantly shorter plants than the other covering materials.

Total Plant Width: There was no difference in plant width within or between the cover treatments (Table 3). The widest plants, 'Dark Red', were grown in the double PVC house. 'Hot Pink', grown under the same cover treatment, was the smallest.

Bract: The largest bracts of each cultivar were found on plants grown under single FRP, but they were not significantly different than those in the other cover treatments (Table 4). 'Top White' had the largest bracts in all treatments except DBL PVC.

Plant Dry Weight: There was no significant difference in mean dry weight between cultivars nor between cover treatments. 'Brilliant Diamond' and 'Dark Red' cultivars grown in single FRP treatment had the lowest dry weight, as did 'Dark Red' in the double Poly. Among cultivars, 'Top White' had the highest dry weight.

Table 2: Total plant height in cm of four poinsettia cultivars grown in four different covered greenhouses. HSD 5% = 5.0 cm (2 in).

Cultivar/Cover	DBL PVF	SGL FRP	DBL POLY	DBL PVC	AVG
'Top White'	53	47	51	55	52
'Brilliant Diamond'	57	48	52	60	54
'Dark Red'	61	48	62	68	59
'Hot Pink'	57	46	51	60	54
Average	58	47	53	62	

Table 3: Total plant width (cm) of four poinsettia cultivars grown in four different covered greenhouses. HSD 5% = 4 cm.

Cultivar/Cover	DBL PVF	SGL FRP	DBL POLY	DBL PVC	AVG
'Top White'	50	48	50	50	50
'Brilliant Diamond'	48	46	46	49	47
'Dark Red'	52	47	49	54	51
'Hot Pink'	48	47	47	46	47
Average	49	47	48	50	

Table 4: Diameter of the largest bract (cm) for four poinsettia cultivars grown in four different covered greenhouses. HSD 5% = 2 cm.

Cultivar/Cover	DBL PVF	SGL FRP	DBL POLY	DBL PVC	AVG
'Top White'	26	28	27	27	27
'Brilliant Diamond'	25	27	24	25	25
'Dark Red'	26	28	25	27	27
'Hot Pink'	25	27	25	27	26
Average	26	28	25	26	

Table 5: Dry weight (g) of four poinsettia cultivars grown in four different covered greenhouses. HSD 5% = 5 g.

Cultivar/Cover	DBL PVF	SGL FRP	DBL POLY	DBL PVC	AVG
'Top White'	33	28	30	31	30
'Brilliant Diamond'	30	24	23	30	26
'Dark Red'	27	24	28	32	28
'Hot Pink'	31	26	28	27	29
Mean	30	25	28	30	

Discussion

There were significant interactions between cultivar response and greenhouse cover treatments. Responses varied between cultivars for the same parameter from one cover to the other. It appears the cover treatment had the greatest affect on the shape of the final product rather than actual growth because the dry weight data had the least differences.

Cycocel was applied (1) to all plants in each cover treatment because it was anticipated that the rose environment would contribute to excessive poinsettia stem elongation. Two applications were adequate for the plants grown in the FRP treatment, but those in the double layer cover treatments were not retarded enough. Apparently the environment reduced the effectiveness of the growth retardant and a third application should have been considered. The elongation of the stems can also, in part, be attributed to the density of the plants on the bench (1.2 sq.ft. per pot instead of 1.5 as recommended by Ecke (1). However, excellent shaped plants were produced under the FRP cover treatment.

Bract diameter and overall plant size were the main quality parameters, providing the number of bracts are the same (3). According to these criteria, the single FRP treatment provided the best quality overall.

It is normally recommended (1) that growing temperatures for poinsettia be lowered approximately 10°F at least three weeks prior to sale to increase the intensity of color in bracts and foliage. Due to the requirements for rose growing in the same greenhouse, temperatures were not lowered and the bracts with color were faded when they were compared to the same cultivars grown at temperatures 10°F lower.

There are contradictory reports in the literature concerning the use of carbon dioxide in the growth of the poinsettias. Goldsberry (2) found that moderately high levels (800 ppm) did slightly reduce the size of the plant, while other authors (1, 3) associated high levels of CO_2 with stretching.

Another noticeable factor was the latex eruption termed "crud" which affected most of the plants grown in the double layer cover treatments. Crud has been attributed (1, 3) to high humidity in the growing environment. Some crud occurred for a period of time in the double glazed greenhouses.

Pollen occurrence was not a good criteria for indicating maturity because there was a difference in cultivar habit. The 'Top White' cultivar developed pollen after the bracts were mature. The other cultivars produced pollen prior to complete bract development.

Conclusion

Poinsettia cultivars grown under different greenhouse covers, will not all respond in the same manner. It is conjectured that the tighter double glazed greenhouses, caused higher relative humidity and CO_2 levels, and reduced infiltration and light transmission, which contributed to the excessive stem elongation.

Poinsettias can be grown under such conditions if additional growth retardant applications are made and the watering frequencies are reduced. Finishing temperatures must be reduced or moved to a cooler environment in order to insure good intense color and late stem elongation.

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