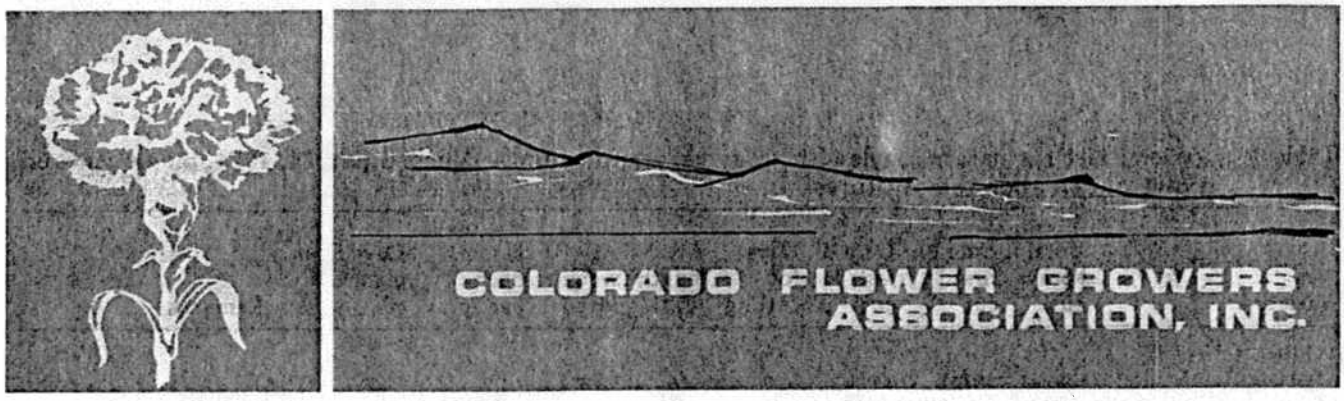

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Spray Chrysanthemums in Colorado. Production at Carnation Temperatures

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Several growers have expressed interest in alternate cut flower crops for Colorado, especially chrysanthemums. However, usual recommendations for growing chrysanthemums include a minumim 60°F night temperature, especially at critical growth stages. This is four to six degrees higher than the usual night temperature for carnations in our climate. At the suggestion of the Research Committee, we undertook a screening program for natural fall and winter produced spray chrysanthemums. With the cooperation of Yoder Brothers and the George J. Ball Company, we tested 39 selections under natural daylength conditions and 26 selections, twice, under winter conditions.

All rooted cuttings were grown in gravel with automatic irrigation, fertilization and CO_2 injection. Night temperatures were 54° to 56°F, heating to 60° to 62°F days, with ventilation starting at 64°F. Each variety was planted in two plots of 12 each, pinched and later pruned to three stems on the outside rows and two stems on the inside.

Results for the natural fall tests were fairly successful (Table 1). Time to first flower from benching on July 24, 1974, averaged 91 days, with a two-week cutting time and a mean production of 77 stems from the two plots of each variety. Of the varieties tested, the following performed best:

Polaris	Tangier	Divinity
Lollipop II	Hurricane	Jupiter
Dark Delight	Flamenco	Valiant
Tuneful	Yel. Divinity	Beauregard
Souvenir	Iceberg	
Inferno	Blue Marble	

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It should be emphasized that July through October is part of the warmest time of the year. Temperatures began to drop in October, by which time budding and development had occurred. Night temperatures of 54° to 56°F were not uncommon.

The picture changed for the two winter crops, one planted October 11, 1974, and the other December 20, 1974. Figures 1 and 2 show typical patterns of no growth (Fig. 1), crown bud formation, reduced and heavy growth, by-passing and double-tiered flowering (Fig. 2). These were the usual symptoms of low temperature effects on chrysanthemums. Those varieties that did flower required an average of 136 days (versus 91 days for the fall crop) to reach production, with extended periods of up to 30 or more days for an entire plot to be cut. Production was severely reduced. More flowers were produced in the second winter crop (Table 3), largely because outside temperatures were beginning to rise. Whether or not any flowers were cut from a particular plot often depended upon the plot's location in the bench. Temperatures were not uniform along the 100-foot benches, and plots sometimes flowered at the warm end and failed to flower where the temperature was one to three degrees cooler. This accounts for the number of plots completely discarded (Tables 2 and 3) even though flowers were cut from the selection.

Of the 26 varieties tested from the crop planted October 11th (Table 2), Hurricane provided acceptable sprays and White Marble second with irregular spray formation. In the second trial (Table 3), Polaris was best, followed by Yel. Polaris, Florida Marble and Deep Telestar. Differences between the first and second trials were probably due to plot location and

Table 1. Varietal test for natural daylength spray chrysanthemums. Benched July 24, 1974. Single pinched, grown at carnation temperatures.

Variety	Total sprays cut	Date of first cut	Date of last cut	Days for cutting	Av. length (in.)	Av. weight (ozs.)	Av. no. blooms open per spray	Days from plant to cut	Remarks
White									
Polaris	86	10/21	11/8	19	46	3.7	4.7	90	
Surfside	85	10/16	11/8	24	39	2.4	3.4	85	Shattered badly
Jupiter II	78	10/18	11/8	22	37	2.5	3.6	87	Opened abnormally
Divinity	78	10/25	11/8	15	46	2.6	3.9	94	
Starburst	78	10/25	11/8	15	40	3.6	8.8	94	Flushing (pink)
Dawn Star	77	10/18	11/8	22	37	1.9	3.9	87	Flushing (pink)
Jupiter	73	10/21	11/8	19	35	2.7	3.5	90	
Iceberg	72	10/25	11/8	15	42	3.1	4.0	94	
Hurricane	67	10/28	11/8	12	45	2.9	5.9	97	
Iceland	61	10/16	11/8	24	39	3.0	3.9	85	Exhibited flushing (pink)
Yellow									
Yel. Shasta No. 2	93	10/14	11/8	25	44	2.2	5.7	83	Burned foliage, necrotic spotting, weak pedicle
Yel. Iceberg	81	10/21	11/8	19	42	2.9	4.2	90	Shattered easily, thin stem
Souvenir	80	10/16	11/5	21	35	2.3	5.3	85	
Yel. Beauregard	78	10/28	11/12	16	39	2.1	5.7	97	Shattered
Yel. Polaris	78	10/18	11/8	22	45	3.3	4.2	87	Shattered
Lollipop II	77	10/28	11/12	15	39	2.3	4.5	97	
No. 2 Shasta	76	10/18	11/5	19	42	1.9	3.8	87	Pedicle collapse, foliar damage, some sprays discarded
Lollipop I	72	11/7	11/12	6	36	2.2	4.0	107	
Yel. Divinity	72	10/21	11/8	19	44	1.9	3.6	90	
Jubilee	71	10/12	11/18	7	52	3.4	3.0	112	Leaf chlorosis, tall
Imp. Yel. Hurricane	67	10/25	11/12	19	45	5.1	7.3	94	Leaf curling, shattered, heavy stem
Northern Lights	48	11/12	11/25	14	56	3.9	2.0	112	Necrotic spotting, chlorosis, crown bud, not all harvested, tall
Pink									
Delmarvel	81	10/25	11/12	19	34	2.7	3.5	94	Dark red-purple leaf margins
Dark Delight	79	10/28	11/18	22	45	3.9	6.5	97	
Valiant	77	10/21	11/7	18	42	4.4	5.9	90	
Blue Marble	73	10/12	10/25	14	34	1.8	3.6	81	
Demure	67	10/21	11/8	19	41	2.8	4.3	90	Faded
Flamenco	65	10/25	11/7	14	44	3.0	3.6	94	
Red-Bronze									
Dk. Red Beauregard	83	11/28	11/8	12	39	2.1	6.0	128	
Thelma	76	10/25	11/12	19	28	1.6	4.7	94	Short stem
Inferno	74	10/25	11/18	25	35	3.1	5.4	94	
Aflame	74	10/12	11/2	22	41	1.9	3.8	81	Shattered easily
Tangier	72	10/16	11/8	24	45	2.8	4.7	85	Orange
Rubiayat	71	11/7	11/18	12	40	2.9	5.9	107	
Stingray	70	10/18	11/5	19	43	3.7	4.3	87	Very open spray
Beauregard	70	10/28	11/8	12	39	2.3	5.2	97	
Rebel	66	11/2	11/8	6	47	3.3	6.9	102	
Rubaiyat II	66	.1/1	11/18	17	43	3.0	3.5	101	Open spray
Tuneful	63	10/25	11/12	19	27	2.9	5.1	94	
MEAN:	74				41	2.9	4.6	91	

Fig. 1. Improved Bluechip, planted Oct. 11, 1974. Picture taken March 17, 1975. No growth occurred after pinching.

time. The extreme irregularity of flowering within some plots suggested that single plant selection for low temperature tolerance might be worth pursuing.

Spray chrysanthemum production in Colorado in the winter and at carnation temperatures is not a viable alternative with present selections.

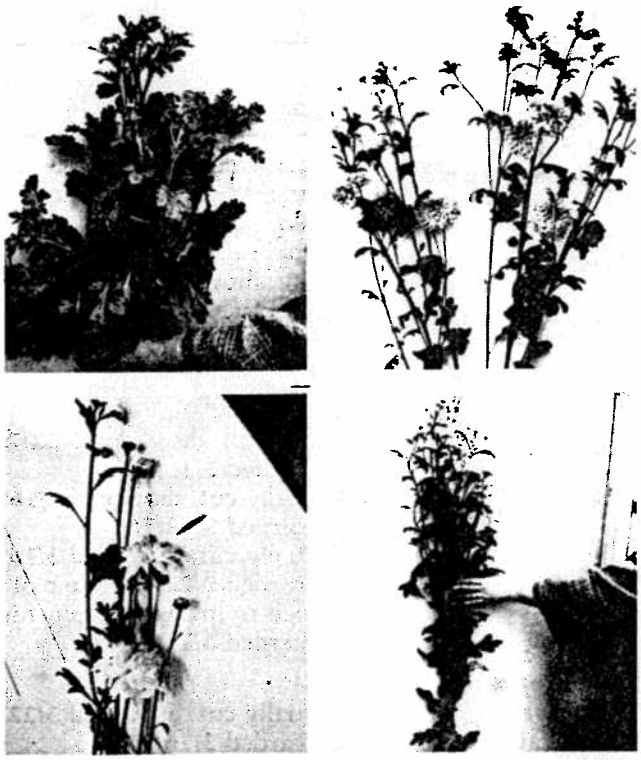

Fig. 2. Various examples of undesirable spray chrysanthemum growth as the result of low temperatures. Pictures of a winter crop taken in April, 1975. Crop was planted Dec. 20, 1974.

Table 2. Varietal test for spray chrysanthemums planted Oct. 11, 1974, and grown at carnation temperatures; 54° to 56°F nights and heated to day temperatures of 60° to 62°F.

Variety	Remarks	Av. length (in.)	Av. weight (ozs.)	Blooms per spray	Days from plant to cut
White					
Hurricane	Total stems cut 61, first cut 2/12, 32 days cutting time	36	2.3	3.5	135
White Marble	Total stems cut 30, first cut 2/24, flushed	23	2.0	3.4	137
Artic	Total stems cut 24, first cut 2/26, plot discarded	27	2.3	3.9	139
Starburst	Total stems cut 12, first cut 3/7, plot discarded	43	3.0	3.7	148
Polaris	All plants discarded 3/16/75, no color showing				
Iceberg	All plants discarded 3/16/75, no color showing				
Nimrod	All plants discarded 3/16/75, no color showing				
Yellow					
Gold. Starburst	Partially cut, discarded 3/22/75, very non-uniform	29	2.5	5.2	125

Table 2, continued.

Variety	Remarks	Av. length (in.)	Av. weight (ozs.)	Blooms per spray	Days from plant to cut
Yel. Beauregard	Partially cut, discarded 3/22/75				
Yel. Polaris	All plants discarded 3/16/75, no color showing				
Yel. Marble	All plants discarded 3/16/75, no color showing				
Imp. Yel. Hurricane	All plants discarded 3/16/75				
Pink					
Telestar	Partially cut, discarded 3/22/75	37	3.3	2.4	137
Blue Marble	Discarded 3/16/75				
Pink Marble	Partial cut, discarded 3/22/75				
Carillon	Discarded 3/16/75				
No. 2 Darkchip	Partially cut, discarded 3/16/75				
Deep Telestar	Discarded 3/22/75				
Bluechip	Partially cut, discarded 3/16/75				
Imp. Bluechip	Discarded 3/22/75, one plot failed to grow after pinching				
Tallyho	Discarded 3/16/75				
Red-Bronze					
Westward Ho	Partially cut, discarded 3/22/75				
Stingray	Discarded 3/16/75				
Dillon Beauregard	Partially cut, discarded 3/22/75				
Beauregard	Discarded 3/16/75				
Dk. Red Beauregard	Discarded 3/22/75				

Table 3. Varietal test for spray chrysanthemums planted Dec. 20, 1974, and grown at carnation temperatures of 54° to 56°F nights and heated to day temperatures of 60 to 62°F.

Variety	Remarks	Av. length (in.)	Av. weight (ozs.)	Blooms per spray	Days from plant to cut
White					
Polaris	Total stems cut 61, first cut 4/26, some discarded	34	3.2	3.4	130
Arctic	First flower 4/29, most discarded, one plot completely.	29	2.7	4.0	133
Nimrod	First flower 4/29, most discarded, one plot completely	31	3.2	3.3	133
Divinity	First flower 5/2, 21 cut on one plot, one discarded	33	3.3	3.5	136
White Marble	First flower 5/5, few discarded, one plot completely	35	2.7	3.4	139
Starburst	All plants discarded 5/17				
Hurricane	All plants discarded 5/17				
Yellow					
Yel. Divinity	First cut 4/26, some discarded, one plot completely	36	2.4	4.0	130
Imp. Yel. Hurricane	34 cut in one plot, other discarded	28	3.6	3.8	133

Table 3, continued.

Variety	Remarks	Av. length (in.)	Av. weight (ozs.)	Blooms per spray	Days from plant to cut
Yel. Polaris	First cut 5/5, few discarded, 42 total stems cut	34	2.9	2.9	139
Yel. Beauregard	All plants discarded 5/17				
Golden Starburst	All plants discarded 5/17				
Pink					
Deep Telestar	45 stems cut, first stem cut 5/2, some discarded	32	3.2	1.9	136
Imp. Blue Chip	Majority discarded, first stem cut 5/5	46	2.5	4.4	139
Flor. Marble	Few discarded, 54 cut, first stem cut 5/5	25	1.9	3.3	139
Pink Marble	First cut 5/2, one plot discarded completely	20	2.5	4.4	136
Darkchip	Some cut, first stem 5/2, one plot discarded	27	2.2	4.1	136
Tallyho	27 stems cut, one plot discarded completely	41	4.4	3.1	136
Carillon	All plants discarded 5/17				
Blue chip	All plants discarded 5/17				
Blue Marble	All plants discarded 5/17				
#2 DarkChip	All plants discarded 5/17				
Red-Bronze					
Showoff	7 stems cut, rest discarded 5/17				
Westward Ho	All discarded 5/17				
Stingray	All stems discarded 5/17				
Dk. Red Beauregard	All plants discarded 5/17				
Dillon Beauregard	All plants discarded 5/7				
Beauregard	All plants discarded 5/17				