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BUD-CUT FLOWERS - A CONCEPT FOR 'ONCE-OVER HARVEST' OF CHRYSANTHEMUMS

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ABSTRACT

Plots for harvest of flowers in bud and open stages were selected at random in a planting of 'Albatross' chrysanthemums about 1 week prior to the commercial harvest stage. All flower buds, regardless of size, were harvested from plots and opened with stems held in 200 ppm 8-hydroxyquinoline citrate + 2% sucrose (8-HQC + S). Bud cut flowers were compared to flowers opened on the plant and harvested from adjacent plots.

Buds held in 8-HQC + S opened as well as buds on the plant. Both groups of buds required 3-5 days from harvest to open to commercial stage of "maturity". The larger the bud at harvest, the larger the flower diameter at "maturity". Buds harvested from the outside rows were larger than buds from the interior rows.

Although flower bud size varied considerably in plots, the concept of bud-cut chrysanthemum flowers might be adapted to a commercial single or "once-over" harvest technique.

INTRODUCTION

Harvesting, handling, and shipping of chrysanthemums are time-consuming and costly (1, 10). In commercial chrysanthemum production usually only open flowers are harvested. Flowers are harvested repeatedly as they open and the total number of harvests depends on climatic conditions.

Marousky (7, 9) demonstrated techniques for opening cut buds of standard and spray chrysanthemums. With this procedure flower growers might harvest and ship flowers in the bud stage rather than fully opened. Bud-cut harvesting might reduce bruising and damage during harvesting, handling, and shipping. Also, transportation costs would be reduced since flowers are shipped by bulk-density rather than bulk-weight (6). Bud-cut carnations have been shipped across the U.S., stored at low temperature, and successfully opened (3).

This technique offers the commercial grower an opportunity to develop and utilize a new harvesting procedure. Conceivably, a grower could harvest flowers as buds at one time (a once-over harvest); the buds could be shipped, stored for future use, or opened on his farm. A single or 'once-over' harvest of a bed would increase handling efficiency and reduce labor costs.

The objective of this study was to determine the feasibility of harvesting open chrysanthemums versus flowers harvested as buds in a single or 'once-over' harvest and opened off the plant.

METHODS AND MATERIALS

On March 19, 1971, a bed of 'Albatross' chrysanthemums (about 1 week from commercial harvest stage) was selected for harvesting studies at a commercial flower farm. The bed was 3.5 ft wide by 130 ft long and was orientated in a north-south position. Plants in the beds were spaced 6 in by 4 in with 7 plants per row across the bed. Plants were grown single stemmed according to recommended commercial practices (12). Starting from

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the northern edge, the beds were marked at three successive 25 to 30 ft. intervals.

A four foot section of the bed was marked at each of these 3 points and used as plots. Each of the three plots was divided into 2 subplots. Each plot consisted of 42 flowers. Flowers from one-half of each plot were harvested at one time as buds ('once-over' harvest). The remaining flowers were allowed to open on the plant and then harvested. Cut flower stems were trimmed to 30-in. length and foliage was removed from lower third of stem. Stems were held in containers in a commercial bulb-curing room maintained at 72-75°F with a relative humidity of 30-70%. Flower buds were held in a 200 ppm 8-hydroxyquinoline citrate plus 2% sucrose (6, 8). Water used had an initial pH of 7.3 and soluble salt content of 253 ppm. Light was supplied continuously by incandescent bulbs and was *circa* 40 ft-c at flower height.

Flower diameters, at the widest point of the bud, were measured initially and after opening. The 1 or 2 reflexed petals on buds were not included in diameter measurements. Flowers were considered open when they reached the "commercial" open stage (5, 12) rather than the fully open stage as previously reported (8). At "commercial" open stage center petals have not fully expanded or lost their green cast. The number of days to open buds to flowers on the plant and detached from the plant was recorded.

Results

Mean flower bud size varied considerably in rows in the various plots (Table 1). Flower buds on plants located on west side of plot (row 1) were larger than buds located in plot centers (row 4). Flower buds on plants located on east side of plot (row 7) were larger than buds in plot center (row 4) but not as large as buds on the west side of plot (row 1). Mean flower bud diameter also varied from plot to plot.

A size distribution of the initial bud diameter is shown in Table 2. Among flowers on plants selected for harvest about 20% of the buds were less than 50 mm in diameter while 43% were greater than 60 mm. Among flowers to be opened on the plant 15% of their buds were less than 50 mm in diameter while 48% were greater than 60 mm. For both groups about 36% of the buds were initially 50-60 mm in diameter.

Flowers harvested as buds and opened in 8-

Table 1. Influence of plant position on initial diameters of Albatross chrysanthemum flowers grown in beds under saran, harvested as buds, and opened in 8-HQC + S or selected as buds and opened on the plant[1].

Opening procedure	Mean initial flower bud diameter (cm) at various plant positions in row[2] 1	2	3	4	5	6	7	Opening procedure mean
Opened in 8-HQC + S	6.8[3]	6.2	6.1	5.2	5.2	5.8	6.3	5.9
Opened on the plant	7.7	6.2	6.3	5.7	5.8	6.0	6.2	6.3
Position mean	7.3	6.2	6.2	5.5	5.5	5.9	6.3	

[1]8-HQC + S = 200 ppm 8-hydroxyquinoline citrate plus 4% sucrose.

[2]Beds orientated North and South, rows orintated east and west, plant 1 on west side of bed.

[3]Each figure represents mean of 18 observations (6 observations from each of 3 plots).

Table 2. Percent distribution of initial diameter of Albatross chrysanthemum flowers harvested as buds and open in 8-HQC + S or selected as buds and opened on the plant.

Opening procedure	% of flowers in respective size classes				
	4.0 cm	4.1-5.0 cm	5.1-6.0 cm	6.1-7.0 cm	7.0 cm
Opened in 8-HQC + S1	2	19	36	29	14
Opened on the plant	1	14	37	22	26

[1]8-HQC + S = 200 ppm 8-hydroxyquinoline citrate plus 2% sucrose.

HQC + S were as large as flowers opened on the plant (Table 3). Flowers harvested from outside rows (row 1 and 7) were slightly larger than flowers from inside rows. No appreciable differences were observed in quality of flowers opened on the plant or in 8-HQC + S.

Flower buds opened in 8-HQC + S or on the plant over a 3-5 day period, (Table 4). Initial bud size greatly influenced the time to opening. After 3 days, more flower buds were open on the plant than on cut stems held in 8-HQC + S. However, buds selected for opening in 8-HQC + S were smaller than those selected for opening on the plant. Mean days required to open buds held in 8-HQC + S were similar to buds opened on the plant.

Discussion

Chrysanthemum flower buds can be harvested in a once-over operation and opened off the plants

Table 3. Influence of plant position on final diameter of Albatross chrysanthemum flowers grown in beds under saran and harvested as buds and opened in 8-HQC + S or selected as buds and opened on the plant[1].

Opening procedure	Open flower diameter (cm) at various plant positions in row							Opening procedure mean
	1	2	3	4	5	6	7	
Opened in 8-HQC + S	11.3[2]	11.3	11.1	10.9	11.0	11.1	11.1	11.1
Opened on the plant	11.6	11.1	11.1	10.9	11.0	11.0	11.3	11.1
Position means	11.5	11.2	11.1	10.9	11.0	11.1	11.2	

[1]8-HQC + S = 200 8-hydroxyquinoline citrate plus 2% sucrose.

[2]Each figure represents mean of 18 observations (6 observations from each of 3 plots).

Table 4. Mean number of days from bud stage to commercial open stage and percent distribution of open flowers by day of Albatross chrysanthemums as influenced by opening procedure.

Opening procedure	Mean days from bud to open flower	Per cent of harvest on[2]			
		3rd day	4th day	5th day	6th day
Opened in 8-HQC + S	3.8[3]	37	51	10	2
Opened on the plant	3.7	49	30	21	0

[1]8-HQC + S = 200 ppm 8-hydroxyquinoline citrate plus 2% sucrose.

[2]Harvest started 3 days after buds were selected.

[3]Mean of 378 flowers.

in 8-HQC + S as satisfactorily as those on the plants. Final flower diameter was influenced by initial bud diameter. Initial flower bud diameters were not uniform and were dependent on plant position in the row. Plants located on outside rows had larger buds than those in the center of beds. Plants which receive more light on outside row or more light through spacing produce earlier and better quality flowers (2, 4, 5). Previous research has shown that chrysanthemum buds harvested when 55 mm in diameter and held in 8-HQC + S produced larger flowers than smaller buds (9). In this experiment 85% of the flower buds were greater than 51 mm. For maximum effectiveness of a single harvest uniform flowering is needed. Optimum spacing, cultivar selection for uniform bloom time and graded cutting at planting would be needed to produce flowers for a single harvest.

Harvesting chrysanthemum flowers as buds might increase flexibility in marketing. In a glutted market flowers might be stored as buds and opened when demand increases. Storage of bud-cut chrysanthemum flowers is feasible for 3 weeks, (7). Most flowers store better in bud-cut stage than open stage (3, 11).

During cold weather, flower development is delayed (12). By harvesting chrysanthemums as buds, a grower might provide consistent flowering in his operation. In the event of a frost, buds could be harvested to prevent freeze damage to the flowers.

An observation during this experiment appears significant. Petals on some flower buds were infected with *Botrytis cinerea* pers. ex Fr. in the field. Petals developed small water-soaked spots which eventually turned brown. When flowers were opened on the plant spot size and tip dieback of petals increased. When flowers were opened off the plant disease developed no further. Possibly 8-HQC or low relative humidity (30-70%) or the combination did not favor continued disease development.

Buds had less petal bruising and damage than open flowers. Bud-cut flowers might be adapted to mechanical harvest or some type of harvesting aid. Development of cultural techniques to produce uniform flowering and a machine to efficiently cut the flowers might make 'once-over' harvest a reality.

Under certain circumstances flowers harvested as buds rapidly wilted and failed to open (8). This was also observed in a preliminary experiment. When 4-6 inches of the stem were re-cut from bud-cut flowers, they opened as well as flowers held on the plant. Laurie *et al* (5) state that woody stems will not absorb water. This aspect deserves careful attention before 'once-over' harvest of bud cut flowers is considered.

Cost analysis should be made to compare capital output for facilities to open buds with costs of repeated harvests of flowers opened in the field.

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PRODUCTION OF CUT-FLOWERS ON SUBIRRIGATED MULCHED BEDS WITH A SINGLE PRE-PLANT FERTILIZER APPLICATION

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ABSTRACT

Chrysanthemums, snapdragons and statice were successfully grown on saranhouse ground beds which received single applications of 6-8-8 dry fertilizer or 14-14-14 (Osmocote) at rates of 300 to 900 pounds N/A on the soil surface prior to mulching and planting. Polyethylene and paper mulches were evaluated and treatments were compared with non-mulched plots receiving weekly liquid or dry fertilizer applications. Osmocote produced plants equivalent to 6-8-8 and 20-20-20 when used at comparable rates and satisfactory crops were produced by all fertilizer materials with and without mulching.

INTRODUCTION

Chrysanthemums are grown in Florida on light sandy soils in "saranhouses" (12) which allow rain penetration and subsequent leaching of nutrients from the soil. Research (3, 4, 6, 11, 13, 15) has established that under these conditions satisfactory flower crops can be produced by supplying 20 to 50 lbs each of N and K_2O/acre/week for 9 to 12 weeks of crop growth (200 to 500 lbs of N and K_2O/acre/crop) either as liquid or dry fertilizer. Greater yields are obtained with high nutrition levels but disease susceptibility is also increased and keeping quality is decreased (9, 10, 11). Satisfactory crops have also been obtained with coated or "slow-release" fertilizer materials (8, 10, 14) at rates of 200 to 1,000 lbs each of N and K_2O with optimum results at 300 lbs of N and K_2O.

All three systems are utilized commercially in Florida, but each may have certain disadvantages. Frequent applications of dry fertilizer requires expensive labor; liquid nutrition systems have low application cost but the soluble nutrients are readily leached from sandy soils and may require frequent application with periods of nutrient unavailability from time of rain until reapplication; and slow-release materials are more expensive initially than other fertilizer sources on a basis of comparable amounts of actual nutrient purchased.

Geraldson (1, 2) has reported use of dry fertilizers banded under mulches and coupled with subirrigation as a system for efficiently growing vegetable crops with a single fertilizer application. The objective of this study was to evaluate this production system for cut flower crops and to compare effectiveness of equivalent amounts of nutrients applied in varying forms and ways.

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