

## POTTED GARDEN CHRYSANTHEMUMS FOR MINNESOTA<sup>1</sup>

R. E. Widmer

Thirty-five years ago, primitive plants with daisy like flowers comprised the primary garden chrysanthemum offering for Minnesota gardeners. Cultivars with good quality flowers matured too late in the fall. Through the work of the late L.E. Longley of the University of Minnesota and others, including E. Lehman of Faribault, gardeners now have an array of early flowering, high quality cultivars available. Golden Jubilee, the University's 1971 introduction, is the 50th cultivar introduced by the Department of Horticultural Science.

### Spring Flowering

In 1950, Kofranek suggested the use of garden chrysanthemums as flowering pot plants for Mother's Day. Others (1,2,8,9,11,12) reported on preferred cultivars and cultural methods for producing spring flowering pot plants of garden chrysanthemums. Numerous commercial firms (3,4,5) also have made recommendations based on their investigations. Today, the largest sale of garden chrysanthemum plants, both flowering and nonflowering, is in the spring.

---

<sup>1</sup>Paper No. 7516, Scientific Journal Series, Minnesota Agricultural Experiment Station, University of Minnesota.

The flowering specimens are in demand from Mother's Day until mid-June.

The objective is a plant 8-12 inches in height with well-spaced sprays of attractive, slow fading flowers on well-proportioned plants with three or more branches from the pinch; stiff stems well covered with dark-green foliage; and uniformity in growth and flowering response; all produced in a minimum period of time. In addition, when cut back following flowering and planted in the garden, the plants should bloom before killing frost in the fall. Average date of killing frost is October 13 in the Twin Cities and earlier in many other portions of the state.

Cultivars. Although this paper is limited to cultivars introduced by the University, there are other satisfactory cultivars available. However, the Upper Midwest grower must be cautious in his selection if he wishes to obtain the proper results. Generally, cultivars classified in the 7 - 8-week response groups and of good plant habit are recommended in commercial catalogs. These criteria alone are not adequate for the Minnesota area. Many such cultivars do not begin to flower in the fall prior to October. Unless fall performance is considered in cultivar selection, the consumer will be disappointed, and sales will lag accordingly. Only cultivars in the 7 - 8-week response groups and which begin flowering by mid-September in an average year should be grown for sale in Minnesota. Even then, flowering may be delayed in some years by any of several factors. These include late pinching of plants in the garden (after July 4), high night temperatures in August, insufficient soil nutrients or moisture, and shady location. Although chrysanthemums flower in response to a shortened photoperiod, shade from trees, shrubs, structures, etc. will decrease the rate of photosynthesis and thereby delay plant growth and development.

Stock Plants. Handling of the stock plants will determine to some extent the nature of the cuttings obtained. Widmer (12) grew 18 University of Minnesota cultivars at a 60° F. minimum temperature for 2 years. He found that all cultivars in the study made less satisfactory growth than did those previously exposed to low temperature (4 or more weeks at 30°-45° F.). Cultivars such as Minnbronze and MinnAutumn primarily produced clusters of rosetted stems and a limited number of slow growing cuttings. Another plant response was limited and spotty flowering. Pinching of terminals improved plant growth to a limited extent.

A long photoperiod generally has been used to keep chrysanthemums vegetative. Because of genetic composition, some of the early flowering cultivars, such as Minnpink and Minnwhite, continued to initiate flower buds in constant light. Seeley (10) reported that the garden cultivars Dr. Longley and Rosa developed flowers to anthesis in all photoperiods, including continuous light. Such cultivars produced vegetative growth following exposure to the aforementioned cold. Thus, cuttings used in University trials generally were taken from unlighted stock that had been exposed to low temperatures prior to forcing into active growth. A comparison of cuttings from unlighted and lighted stock showed that the latter frequently required up to 10 more days to flower in the spring. In some instances, plants from lighted stock failed to bloom unless forced in a short photoperiod.

If you receive budded cuttings, use a good watering and fertilizing program to get fast growth, and pinch "hard" once the plants are established

to encourage vegetative growth from the bottom of the plant.

Soils and Fertilizers. Spring flowering plants can be grown one per 3- or 3½-inch pot, two per 4-inch pot, or five per 6-inch pot. Each spring since 1956 the top selections from the University's breeding program have been tested for their adaptability to spring flowering pot plant culture. Plants in these trials have been grown one per 3-inch pot.

A steam sterilized soil mix of one part silt loam with a medium high nutrient content, one part peat moss, and one part plasterers' sand, plus 2½ pounds of superphosphate and 5½ pounds of a coated (18-9-9) fertilizer per cubic yard of soil mix was selected as a standard. Inclusion of the coated fertilizer eliminated the need for additional fertilizer for most of the trial period. This is important because of the small pot size, fast plant growth, and frequent watering required during bright periods in the spring. Supplemental applications of a balanced liquid fertilizer may be applied in relation to localized conditions. Inadequate fertilization results in small, pale foliage and sparse appearing plants.

Pot and Pinch Dates. Potting of rooted cuttings in the 3rd week of March has been the standard in these trials. Advancing the potting date 1 week has insured bloom for Mother's Day. Some commercial sources recommended planting "medium habit" plants 1 week later than "short habit" plants to control plant height. In addition, 8-week cultivars usually bloomed 1 week later than 7-week cultivars.

Pinching trials have ranged from pinching at the time of potting, March 15, to as late as March 30 for plants grown in a natural photoperiod (12). Flowering was delayed in 20 percent of the comparisons by a March 30 pinch. A primary consideration was that the cutting was of adequate size to have six to eight leaves remaining after the pinch. Pinching at the time of potting was quite satisfactory if cutting size was adequate.

Photoperiod and Temperature. All of the University forcing trials involved natural and short photoperiods. No lighting of plants followed potting, since the objective was to keep the culture as simple as possible. Good quality plants were obtained without such lighting.

A night temperature of 60° F. was maintained in all studies unless prevented by high outside temperatures. Black cloth, pulled at 4:30 p.m., was used to provide short photoperiods. Temperatures were recorded in the open and under the cloth. Extreme temperature differences were not evident, but in some years the difference under the cloth was great enough to reduce flower size up to ½ inch. In addition, plants forced in a short photoperiod often were more uniform in flowering, up to 4 inches shorter, and slightly earlier blooming. Plants forced in the natural photoperiod had stronger stems and slightly better flower color, size, and substance. At least a portion of the plants of a few cultivars failed to bloom in the natural photoperiod.

Carbon Dioxide. Chrysanthemums are quite responsive to injection of CO<sub>2</sub> into the greenhouse atmosphere. Therefore, plants were grown in normal and in CO<sub>2</sub> supplemented atmospheres of 1,000 and 2,000 p.p.m. in both natural and short

photoperiods. Generally, a CO<sub>2</sub> enriched atmosphere resulted in stronger, sturdier plants that were up to 3 inches taller. In some instances, flowering was delayed slightly, and in others it was accelerated slightly. The delay was greatest with late blooming cultivars grown in a natural photoperiod. All factors considered, the use of CO<sub>2</sub> supplemented atmospheres is not recommended. Plant height is a primary factor.

Growth Regulators. No growth regulators were used in any of these trials, but some commercial firms have suggested the foliar application of 0.25 percent B-Nine about 2 weeks after the pinch (when breaks are 1 inch long) for tall cultivars. Royal Pomp, Golden Jubilee, Yellow Glow, Superior, Sunny Glow, and Zonta are cultivars that might benefit from such treatment, especially if grown in natural photoperiods.

Green Plants. Rooted cuttings planted in 2½- to 3-inch pots, or similar containers, in mid-April and pinched should be ready for sale by mid-May. Such plants may not look as attractive as flowering specimens, but they can be sold at a lower price.

#### Summary for Spring Flowering

1. Properly selected cultivars of well-grown, spring flowering garden chrysanthemums in 3-inch pots should sell well. A little publicity will help sales.
2. Such plants serve a dual purpose because they will flower again in the garden in the fall.
3. Cultivars introduced by the University of Minnesota usually start blooming in late August or early September. Many of these cultivars are well-adapted to spring forcing in pots.
4. Although optimal cultural requirements may differ for individual cultivars, a uniform forcing program should give satisfactory results.
5. Recommendations
  - (a) Cultivars (see the table for details)

Golden Jubilee	Royal Pomp
Goldstrike	Sunny Glow
MinnAutumn	Superior
Minnpink	Yellow Glow
Minnwhite	Zonta
  - (b) Treatments
    1. Expose stock plants to low temperatures prior to taking cuttings.
    2. Pot good sized rooted cuttings March 15-20, and pinch at time of potting.
    3. Provide a short photoperiod to insure a uniform plant response and to control plant height. Avoid temperature buildup under the black cloth. A natural photoperiod may be used with selected short growing cultivars if preferred (see the table).
    4. Do not use CO<sub>2</sub> supplementation or, if it is needed for other crops in the greenhouse, use a short photoperiod to limit plant stretch.

### Fall Flowering

Field dug clumps are going the way of flat dug bedding plants. This procedure is laborious, and the flowering life of plants so handled usually is shortened.

Pot grown plants are better adapted to transplanting directly into the flower border, urns, window boxes, etc. They also are useful as patio plants. Rooted cuttings may be planted in 6- to 8-inch pots in June and early July (early planting for maximum size). A good, well-drained soil combined with a slow release fertilizer is suggested. Final pinch date should be July 4. Grow in full to almost full sun. Automate watering or plunge pots or both. The plants may be placed pot-to-pot for most of the summer. No shortened photoperiod is needed unless bloom is desired in late August. In such instances, start shading between July 15 and August 1, but remember that excessive temperatures under the cloth will delay or prevent flower bud initiation and development.

### Home Product

Garden Chrysanthemums developed in your state have been selected for their performance under local conditions. Take advantage of the opportunity to promote your business by producing this attractive, specialized product.

### References

1. \_\_\_\_\_ 1951. Hardy mums in flower for spring sales. Ohio Flor. Assoc. Bull. 256:8, January.
2. \_\_\_\_\_ 1954. A simplified system of producing hardy mums for spring sales. Ohio Flor. Assoc. Bull. 292:5, January.
3. \_\_\_\_\_ 1969. Ball Mums. Tech. Bull. 320:40-41. Geo. J. Ball, Inc., West Chicago, Ill.
4. \_\_\_\_\_ 1969. Chrysanthemum Manual. p.114-15, 139-140. Fred C. Gloeckner & Co., Inc. New York, New York.
5. \_\_\_\_\_ 1970. Grower Circle News. 93:1-8. Yoder Bros., Barberton, Ohio. November.
6. Chan, A.P. 1957. Factors affecting flower bud initiation and differentiation of Chrysanthemum morifolium. Abstract, A.I.B.S. Annual Meeting. Stanford University. August.
7. Kofranek, A.M. 1950. Hardy mum pot plants for Mother's Day. N.Y. State Flower Growers' Bull. 53:6-7.
8. Larson, R.A. and R.E. Widmer. 1956. Minnesota garden chrysanthemums as spring pot plants. Minn. State Flor. Bull. p.1-5. December 1.
9. Seeley, J.G. 1955. Potted Garden chrysanthemums for spring sales. Pa. Flow. Growers' Bull. 58:1.
10. Seeley, J.G. 1966. Response of garden and greenhouse chrysanthemum cultivars to photoperiods of 9 to 24 hours. Pa. Agr. Exp. Sta. Progress Rpt. 267. June.
11. Skou, W. 1951. Hardy mums for spring flowering pot plants. Ohio Flor. Assoc. Bull. 264:2-3.
12. Widmer, R.E. 1963. Early garden mums as spring pot plants for Minnesota. Minn. State Flor. Bull. p.6-13. February 1.

\*\*\*\*\*

Ratings of University of Minnesota introductions most suited to 3-inch spring blooming pot plant culture. All plants, which were from stock that had been exposed to low temperatures, were potted in mid-March and grown at a 60° F. minimum temperature. Data usually based on several years' trials.

Cultivar	Photoperiod treatment (forcing)	Plant height (inches)	Flower color	Flower color rating <sup>1</sup>	Flower diameter (inches)	Flower substance <sup>1</sup>	Stem strength <sup>1</sup>	Foliage color <sup>1</sup>	Uniformity of		Plant habit <sup>1</sup>	Date of bloom
									plant	bloom		
Golden												
Jubilee.....	short	9	bronze gold	VG	2½	VG	VG	VG	VG	VG	E	5/15
	natural	12½	bronze gold	VG	2 3/4	VG	VG	VG	VG	VG	G	5/15
Goldstrike...	short	9½	gold	VG	1 3/4	VG	VG	VG	VG	VG	E	5/16
	natural	11½	gold	VG	2	VG	VG	G+	VG	E	VG	5/16
MinnAutumn...	short	9	red bronze	E	2	VG	E	VG	VG	G+	VG	5/23
Minnpink.....	short	9	pink	G	1½	G	G	VG	VG	VG	VG	5/16
	natural	12	pink	G	2	G+	G+	VG	VG	VG	VG	5/18
Minnwhite....	short	8½	white	E	2	G+	G+	G	VG	G+	VG	5/12
	natural	9½	white	E	2½	VG	G-	G	VG	VG	G+	5/12
Royal Pomp...	short	11½	purple	VG	1½	VG	G+	VG	VG	G+	G-	5/14
	natural	14	purple	E	1½	E	VG	VG	VG	VG	F	5/20
Sunny Glow...	short	13½	orange gold	E	2½	VG	VG	G+	G+	G+	F	5/18
	natural	13½	orange gold	E	2½	VG	VG	G+	VG	G	F	5/18
Superior.....	short	11½	orange	VG	2 3/4	G+	G+	G+	VG	VG	G+	5/14
	natural	12½	orange	VG	2 3/4	G+	G+	G+	VG	VG	G-	5/14
Yellow Glow..	short	12	gold yellow	E	2½	VG	E	VG	VG	VG	G+	5/17
	natural	12	gold yellow	E	3	E	E	VG	VG	VG	G+	5/17
Zonta.....	short	11½	apricot gold	VG	1½	VG	VG	G	VG	VG	G+	5/23
	natural	12½	apricot gold	E	2	VG	VG	G+	VG	VG	G	5/26

<sup>1</sup>Ratings used from top to bottom were: excellent (E), very good (VG), good plus (G+), good (G), good minus (G-), fair (F), and poor (P).