

MINNESOTA FAST CROP CYCLAMEN -- 1976¹

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Cyclamen plant production is increasing because of public interest and the availability of a better quality product at a more reasonable price. If properly produced and publicized, cyclamen plant sales should skyrocket.

Minnesota studies on shortening cyclamen production schedules were initiated in 1970 (4, 6, 7, 8, 9). Leads came from European studies, but additional ideas and approaches also were developed and refined. The basic objective has been to produce a top quality product efficiently with better lasting quality and economically in the shortest possible time.

Christmas Production

Currently, production in many areas of the country is aimed at sales from October through Valentine's Day. All too often, a 15-month production schedule is used. If the schedule is reduced to 12 months, a smaller plant is usually produced. Informal consumer inquiries in Minnesota indicate that the majority of individuals desire a sturdy plant up to 15 inches in diameter with a generous number of open flowers and buds produced efficiently in 8-9 months.

A comparison of production costs will help illustrate the need for fast crop production. The retailer pays a price based on the product seen, not the time required to produce the product inefficiently. Bachman (2) reported a greenhouse operating cost of 12.9 cents per square foot per week on a year round basis from September 1, 1974 to August 31, 1975. This figure did not include seeds, bulbs, plants, pots, or soil costs. Costs have risen further in the last 7 months so we will use a rounded off figure of 2 cents per square foot of bench space per day in examples in Table 1.

Note that the plants were pot to pot for 4 weeks after planting in 5- or 6-inch pots. Then, they were figured at a 12 x 12 inch spacing until sold, as the plants develop rapidly at this stage. Using an inbetween spacing for part of the time would reduce costs. If more room were required in the last 4 or 6 weeks, costs would be proportionately higher. Thus, the 12 x 12 spacing after 4 weeks is actually a realistic balanced average.

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Table 1. Cyclamen production costs.

<u>Sowing date</u>	<u>Dec. 1</u>	<u>Feb. 15</u>	<u>Apr. 15</u>
Seed cost	.06	.06	.06
Prop. room (1 month)	.04	.04	.04
Pot and soil	.22	.22	.22
Seedlings spaced 3 x 3 inches	.19	.16	.11
<u>Potted</u>	<u>June 3</u>	<u>July 19</u>	<u>Aug. 15</u>
4 wks. pot to pot	<u>.14</u>	<u>.14</u>	<u>.14</u>
Subtotal	<u>.65</u>	<u>.62</u>	<u>.57</u>
12 x 12" til Oct. 3	<u>1.96</u>	til Oct. 4 <u>.98</u>	
Cost Oct. 3 -----	2.61	Oct. 4 -----	1.60
12 x 12" til Nov. 3	<u>2.58</u>	til Nov. 4 <u>1.60</u>	til Nov. 14 <u>1.26</u>
Cost Nov. 3 -----	3.23	Nov. 4 -----	2.22
			Nov. 14 -----
			1.83
12 x 12" til Dec. 3	<u>3.18</u>	til Dec. 4 <u>2.20</u>	til Dec. 14 <u>1.72</u>
Cost Dec. 3 -----	\$3.83	Dec. 4 -----	\$2.82
			Dec. 14 -----
			\$2.29

Christmas plants started April 15 cost \$2.29; started February 15 cost \$2.82; started December 1 cost \$3.83. Shortening the production cycle of any sowing date by 30 days (at the finishing end) lowers the cost at least 60 cents.

These figures would seem to prove the point, yet many individuals harbor a built-in resistance to change. Either they find excuses to ignore or only partially adopt fast crop culture or they take advantage of an opportunity to eliminate losses. Perhaps this is fortunate. A sudden change by all growers would result in overproduction. Further, we can't ignore retailer resistance or lack of consumer awareness of this fine product. Promotion and large displays in retail outlets are essential. The year-round potted chrysanthemum was a failure until an enterprising grower in North Carolina used this approach. A grower may resist change during affluent times. The wise grower always will consider advances and improved efficiency.

Cultural Procedures

Cultivars -- Early flowering cultivars are essential. The plants should be stocky, vigorous, fairly uniform, and should stand up well in the home and office. We have grown approximately 48 cultivars and selections in the last 6 years and found 10 that met our standards. There are many more which we have not been able to evaluate. The F-1's listed are more uniform than the other cultivars. We recommend the following:

- | | | |
|---------------------|------------|---------------------------|
| Rosa von Zehlendorf | } Tas Type | Albadonna |
| Dark Salmon Red | | F-1 Rosamunde |
| Pure White | | F-1 Salmon Red (Tzigane) |
| Improved Bonfire | | F-1 Merry Widow (scented) |
| Hallo | | F-1 Swan Lake |

Germination -- Sow fresh seed on April 15. Anderson (1) suggested soaking seed in room temperature water for 12 hours, followed by a dip in a 5 percent sodium hypochlorite solution (1 part Chlorox, Hilex, or Purex in 19 parts water) for 20 seconds to 1 minute maximum prior to sowing. Sow seed 1/8 to 1/4 inch deep in flats filled with moist, nutrient-enriched moss peat. A product recommended for seed germination and growth of some plants is commercially available. Some growers may prefer to make their own mix, but one should avoid peat that is too fine and powdery. Additions follow:

Nutrient additions to moss peat

<u>Fertilizer</u>	<u>grams*/bushel</u>	<u>/cubic yard</u>
ground limestone	200	9.7 lb
magnesium sulfate	20	1.0 lb
potassium nitrate	7	5.5 oz
superphosphate	12	10 oz
Osmocote (14-14-14)	16	12.5 oz
Peter's fritted trace element mix	1	.75 oz

* 28.35 grams/ounce

Be sure to mix thoroughly. Compact the moss peat to two-thirds of its fluffed-up volume. Space the seed on 3 x 3 inch (7 x 7 cm) centers. After several years of trials, this method has proven superior to sowing seed in peat discs, in that larger plants develop.

Cyclamen seed germinates best at 68°F (20°C) in the dark (3,5) with a fairly high relative humidity (70 percent). A temperature of 72°F (22°C) may be inhibitory. Such conditions are best obtained in a headhouse or basement room with good air circulation (it can be air conditioned) rather than a greenhouse. The flats should be watered after seed sowing. Allow them to dry for several hours before placement in the germination room to discourage fungus growth on the medium. Keep the peat moist during germination for best results. Water when the peat surface lightens in color. Seeds late to germinate lack vigor and generally produce small, poor plants which should be discarded.

We have had germination percentages up to 95 percent, but 85 percent is a more practical goal for good, vigorous plants. You will not have the same degree of success at all times with all cultivars, judging from our experience.

Move the flats to a humid, shaded greenhouse on May 15 when cotyledons begin to emerge. Placement directly in a bright or sunny location can result in plant loss.

Artificial light -- Several years of study with various types of high intensity lighting showed that supplemental light advanced growth of seedlings. We do not recommend lighting, however, because the results were not adequate to balance the escalating costs involved.

Light -- Shade the plants in summer to provide a maximum of 4000 foot candles.

Temperature -- Maintain a 68°F (20°C) night temperature from seed sowing until October 15 to insure rapid plant growth. Day temperatures should be 5-10°F (3-6°C) higher. Good air circulation is essential. Utilize evaporative pad cooling in summer to avoid summer heat delay. Lower the night temperature to 65°F (18°C) on October 15 and 62°F (17°C) on November 1.

Before high fuel costs cause you to reject the 68°F (20°C) night temperature requirements, consider the fact that it takes little fuel to maintain this temperature from May 15 - October 15. It requires more fuel to start your plants 2 months earlier and provide greenhouse space for them in March and April, if you insist on using a lower temperature.

Fertilization -- Cyclamen require a constant but moderate supply of nutrients to grow at an optimum rate. One can't detect nutrient deficiency symptoms promptly as with chrysanthemums or poinsettias. Instead, the plants usually retain good color but the growth rate slows in proportion to the shortage. No supplemental fertilizer is needed for 2 months after sowing. Have the growth medium analyzed at intervals to determine when fertilizer is required in early growth stages. An application of a solution of 100 ppm nitrogen from a 20-20-20 soluble fertilizer is generally recommended every 2-3 weeks. One month after potting, apply fertilizer as follows:

2nd month (Sept. 15 - Oct. 15)	2 applications/week
3rd month (Oct. 15 - Nov. 15)	3 applications/week
4th month (Nov. 15 - Dec. 15)	4 applications/week

Use 20-20-20 regularly with occasional supplemental applications of potassium. Start with 100 ppm N (from 20-20-20) and increase to 150 ppm (3rd month) and 200 ppm (4th month). Analyze the growth medium at regular intervals and modify the fertilization schedule if necessary.

Substitution of individual fertilizer salts such as potassium nitrate and ammonium phosphate for a 20-20-20 fertilizer which contains some micro-elements, may result in the development of pale green foliage. Doubling the limestone incorporated in the peat moss will have a similar effect. An application of chelated iron will usually result in a greening of the pale foliage.

Watering -- Cyclamen should never be allowed to dry out, but good drainage is essential. A moss peat medium is too dry if it becomes light in color or so dry that one can't squeeze water out of the peat. Always water thoroughly when watering. Failure to water thoroughly encourages salt accumulation in the growth medium and a proportional slowdown in growth. If wilting occurs, some leaves turn yellow in a day or two and some flower buds may abort.

Potting -- The plants are grown in the flats until August 15. After germination is completed and true leaves (not the original cotyledon) start to develop, the blank spots in the flats can be filled with plants from sparsely populated flats. Plants grown in moss peat can be transplanted easily without disturbing their root systems. On August 15, transplant to the same type of nutrient-enriched moss peat in 5-inch (12 1/2 cm) clay or preferably plastic pans. Place some pea rock in the bottom of the pot to provide ballast. Europeans recognize that the larger the pot size, the more time required for flowering. Keep the top of the corm flush with the top of the growth medium.

We prefer a moss peat medium or a mix of 90 percent nutrient-enriched moss peat and 10 percent loam or clay soil for optimum growth (6).

Spacing -- After potting, the plants may be kept pot to pot for a month. Final spacing should be 15 x 15 inches (37 x 37 cm) if the plants are well grown. Most of the plants may require shifting to 6-inch (15 cm) pots prior to sale. Growth is very slow in the seedling stage and accelerates rapidly after potting. Do not underestimate the space required for quality plants.

GA₃ -- Flowering can be significantly advanced, the number of flowers open at one time increased, and uniformity of plant blooming increased by spraying with gibberellic acid and a safe wetting agent 60 days prior to the desired bloom date (7). The spray nozzle is inserted below the leaf canopy to insure wetting the crown where the flower buds are found.

Use a solution of 25 ppm GA₃ for most cultivars and a solution of 15 ppm for the F-1 cultivars which are diploids. The quantity of spray applied is a key point. We use just a squirt of 8 ml per plant (7 plants per 2 fluid ounces of spray). One application will accelerate bloom without weakening the flower stalks. A heavy spray or spraying to runoff may cause weakening of the flower stalks. Try a spray of plain water first to adjust to the quantity of spray desired.

Year-round production -- We have grown cyclamen to bloom in every month of the year. Unfortunately, most of the plants were part of specific experimental studies. Therefore, they were not on rigid fast culture regimes and we can't offer exact schedules. We can estimate that 4-6 extra weeks may be required from seed sown in fall or winter and that 6-8 weeks longer may be required if a 62°F (17°C) night temperature is maintained in place of 68°F (20°C). An important aspect is to remember to lower the night temperature from 68°F (20°C), 2 - 2 1/2 months before bloom during the winter season especially. Failure to do so when the light supply is limiting will result in smaller flowers, poorer quality, and aborted buds.

The senior writer saw German studies which showed that increasing the carbon dioxide (CO₂) level in the greenhouse atmosphere accelerated cyclamen growth. It should be most helpful for production of winter, spring, and summer blooming plants. Since Minnesota greenhouses are vented regularly from March - November, the use of CO₂ for a Christmas crop would be of limited value.

Cyclamen are sold in August in California and in Illinois, proving there is no reason to limit the sales season. Remember that the public desires sturdy 12-15 inch (30-37 cm) plants in 5-6 inch (12-15 cm) pots, not 20-24 inch (50-60 cm) plants in 6-7-8 inch (15-17-20 cm) pots.

Keeping quality -- Well-grown specimens of modern day cyclamen cultivars have excellent keeping quality if properly watered and kept in a bright, cool (65-68°F [18-20°C] nights) location. Individual flowers lasted close to 4 weeks in the greenhouse, home, or office in our trials. The plants should provide a minimum of 6 weeks of enjoyment in the home.

Lack of fertilizer in the growth medium can shorten house life of the cyclamen. Consider making an application of a slow release fertilizer before the plants leave your greenhouse for consumer satisfaction. Coordinate your efforts with your retailers so that an appropriate care card is attached to every plant leaving the shops.

Plastic pots (with drainage) are preferred to clay pots because the growth medium in them remains moist longer, decreasing the chance of plant wilting. The moss peat medium encourages optimum growth and also decreases the possibility of overwatering the plant. If drainage is adequate, the roots obtain

adequate oxygen even when the peat is quite moist. There is no need to mix the moss peat with perlite or vermiculite to "open it up." It is a naturally "open" or porous material.

Remember that keeping quality comments apply to properly grown specimens of modern day cultivars. A little extra effort can pay big dividends.

Failure -- The success of this program requires following the recommended procedures. Be aware of the following possible causes of failure:

1. Not selecting good, early flowering cultivars.
2. Germinating seed in the greenhouse where the sun's rays may heat the germination medium to temperatures above 72°F will inhibit germination.
3. Growth is slower at lower temperatures.
4. Delayed transplanting is detrimental. Root disturbance slows plant development. A peat medium permits transplanting with minimal root disturbance.
5. Using a heavy, poorly drained soil results in slow growing plants with limited root development.
6. Irregular watering and excessive drying are more injurious to cyclamen than to most other plants.
7. Salt accumulation in the growth medium hinders plant growth and flowering.
8. Insufficient or irregular fertilization slows the growth rate, often without causing the development of any indicator signs such as leaf yellowing.
9. Excessive or insufficient light hinders growth and lowers quality.
10. Lack of evaporative pad cooling could delay blooming a month or more.
11. Crowding the plants contributes to stretched or etiolated, unattractive plants with poor keeping quality.
12. Failure to use GA₃ can "stretch out" a crop for an extra 3 months.

DO NOT USE THE FAST CULTURE METHOD UNLESS you are willing to provide proper growing conditions.

Diseases -- Disinfect everything to minimize difficulty.

Mold on seedling flats: Benlate drench of 1 tablespoon per 2 gallons water. Captan inhibits cyclamen seed germination.

Crown Rot or Botrytis: (Botrytis cinerea) Benlate drench; 62°F minimum night temperature; good air circulation; proper spacing.

Bacterial Soft Rot (Erwinia carotovora) sudden wilting and collapse of plant; rot progresses quicker in summer temperatures; discard.

Regular preventive program. Use drench of 8 ounces each of Dexon and Benlate per 100 gallons water monthly.

Insects -- Mites: Kelthane spray or fog.

Fungus gnats: Malathion drench.

Aphids: Vapona fog -- slight flower burn possible
Metasystox-R
Malathion
Pirimor

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