Crop: Cyclamen
Scientific Name: Cyclamen persicum Mill. (Primulaceae)

I. Introduction

A. Cyclamen is native to surrounding countries and islands of the Mediterranean.

B. Cyclamen can be forced to flower any time of the year. Although most production is scheduled for marketing during fall and winter.

II. Species, Cultivars, Breeding, Development

A. The first varieties were introduced in 1970 in England.

B. In 1894, 'Salmon Queen' was introduced and probably was the origin for the well-known variety 'Perle von Zehlendorf'.

C. The variety 'Neurosa' was introduced in 1927 by Binneweis in Germany and was a large improvement of earlier varieties.

D. The F_1 varieties are primarily used today. Uniformity has increased with the F_1 varieties.

E. The production time is long for cyclamen and it is advisable to choose early cultivars.

F. The miniature cyclamens have been developed by backcrossing large flowering diploid varieties with the original *C. persicum*. The whole plants and the flowers are smaller than the large flowering varieties. Initially the miniature cyclamens did not gain large popularity due to lack of good varieties. Today many excellent varieties are available and popularity of miniature cyclamen has increased.

H. Novelty varieties with pastel, two-colored or ruffled petals or double flowers are also available.

I. Breeding is aimed at developing varieties with high germination percentage, short developmental time, many and small leaves, nicely shaped flowers, proportional flower stem length, sufficient strong flower stems, uniform flowering, uniform flower color (not a color mix within the variety), good resistance against diseases and good postharvest quality.

III. Flower Induction Requirements

A. Flower bud initiate in the axile of the 6th leaf while the 10th to 13th leaves are initiating.

B. Flowering is not controlled by photoperiod. High light intensities will hasten flower initiation. However, temperatures above 21°C (70°F) slow flower development.

C. Gibberellic acid (GA_3) application hastens flowering and increases the number of flowers open at one time.

1. The GA_3 application is given to plants with about 12-13 unfolded leaves, 45 to 60 days prior to the desired bloom date.

2. The GA_3 solution (with wetting agent) is applied at the rate of 25 ppm for open pollinated varieties, 10 ppm for F_1 hybrids, and 5 ppm for mini varieties. Apply 8 ml (3 plants per fluid ounce) to the crown below the leaves. Do not apply to the leaves. Buds should be about 3/16 inch in size and about 1 inch long at time of application.

D. Light

1. Plants need to be shaded at high light levels to prevent leaf scald. Maximum light level should not exceed 4,000 foot-candles (800 μmol $s^{-1}m^{-2}$).

E. Temperature

1. Plants should be maintained at 20°C (68°F) night temperature from seed sowing until plants average 6 unfolded leaves.

2. At transplanting drop the temperature to 17-18°C (62-64°F).

3. Plants are finished at 16-17°C (60-62°F).

4. Excessively high summer temperatures can delay flowering up to 1 month.

F. Water

1. Cyclamen should be grown moist and never be allowed to dry out.

2. If severe wilting occurs, some leaves will turn yellow in 24-36 hours and flower buds may abort.

G. Nutrition

1. Cyclamen requires a moderate supply of nutrients. Plant symptoms of specific nutrient deficiencies are not readily developed. Slow growth and small leaves are often the first sign of a deficiency.

2. Up through transplanting, apply 100 ppm of N from a 20-20-20 soluble fertilizer every 2 weeks.

3. After transplanting, apply fertilizer as follows:

Month after Potting	Applications per week	Conc. of N and K
2nd	2	100
3rd	3	150
4th	4	200

4. Soil tests should be conducted regularly and nutrients modified as needed.

H. Gases

1. $C0_2$ increases cyclamen growth in the fall, winter and spring.

2. During venting, only small benefit can be expected from CO_2 enrichment of the greenhouse.

V. Cultivation

A. Propagation

1. Cyclamen is propagated by seed.

2. Use fresh seed, as the germination percentage decreases rapidly.

3. Optimum germination occurs at 15 to 16°C (59 to 62°F) and high relative humidity (70%) in the dark. Higher temperatures inhibit germination.

4. Seed germinates in 20-30 days. Plants must be removed from the dark promptly on germination to avoid excessive cotyledon leaf petiole elongation.

5. After germination, place the seed flats in the greenhouse under shade at 20°C (68°F).

B. Medium and planting

1. Sow seeds in a nutrient enriched, well-drained, peat-lite medium.

2. A pH of 6-6.7 is ideal, but the plants will grow in media with pH as low as 5.0.

3. Transplant the seedlings into the final pot when the leaves begin to crowd. Keep the top of the corm at the level of the medium.

4. The larger the pot size, the more time is required for flowering. Less vigorous cultivars should be planted in 12.5 cm (5 inch) or smaller pots.

C. Spacing

1. Several spacing techniques are used depending on how the seeds are sowed.

a. Seeds can be sowed on 7 x 7 cm (3 x 3 inch) centers in a seed flat and left to grow until transplanting to the final pot.

b. Seeds can be sowed in 50 or 84 cell plug sheets and grown until plants become crowded. They are then transplanted to the final pot.

c. Seeds can be sowed in 406 cell plug sheets, then transplanted to 50 or 84 cell plug sheets. Plants are then transplanted to the final pot when they become crowded.

d. Seeds can be sowed in seed flats, then be transplanted to 50 or 84 cell plug sheets after germination. Plants are then transplanted to the final pot when they become crowded.

2. After potting, plants may be grown pot to pot until the foliage reaches the pot rim. Crowding results in petiole elongation and favors the development of diseases and weak growth.

3. Ideal final spacing for 10 cm (4 inch) pots is 25x25 cm (10x20 inches), for 13 cm (5 inch) pots 30x30 cm (12x12 inches) and for 15 cm (6 inch) pots 37x37 cm (15x15 inches).

D. Growth Regulators

1. Gibberellic acid accelerates flowering. See section III C above.

VI. Problems

A. Insects

1. Cyclamen mite and spider mite feed on new plant growth, causing deformed leaves and flowers.

2. Fungus gnats can be a problem in the moist peat.

3. Thrips cause dark green spots on the leaves and brown spots on deformed flowers. They also can spread tomato spot wilt virus to plants.

4. Aphids feed on young leaves and flower buds. The insects are difficult to discover since they hide below the older foliage.

B. Diseases

1. *Botrytis* blight *(Botrytis cinerea)* appears under high humidity, poor air circulation and low temperatures. It causes spots on flowers, or crown and leaf rot.

2. *Fusarium oxysporum* causes leaf yellowing and wilting and can be brought into the greenhouse by symptomless young plants. control by preventive measures such as good sanitation and immediate removal of infected plants.

3. Bacterial soft rot (*Erwinia carotovora*) attacks and causes rotting of the corm. The entire plant suddenly turns yellow and wilts. High temperatures encourage rapid bacteria growth. Soft rot is most common when the corms are completely buried in the medium at transplanting. Shallow transplanting and good greenhouse sanitation will help reduce soft rot losses.

C. Physiological

1. Large grey-brown leaf spots may be caused by sunburn, low irrigation water temperature, or rapid temperature changes.

2. Flowering under the foliage can be caused by irregular watering or fertilization.

3. Pale, young leaves can be a symptom of iron deficiency or when the pale, young leaves are underneath the old foliage, nitrogen deficiency.

4. Deformed leaves may develop under low temperatures, large fluctuations in temperature or relative humidity, or tightly packed media with low air volume.

VII. Harvesting, Handling, and Marketing

A. Plants are sold in full bloom.

B. Plants should be kept in a cool location at home.

C. Wilting decreases postharvest life extensively and the plants should never be allowed to dry out.

VIII. Scheduling

Growing Time for Cultural Segment	Cultural Procedure	Temperature
	Sow seed	20°C (68°F)
4 weeks	↓	
	Move seedling to light	20°C (68°F)
12 weeks	↓	
	Transplant and drop temperature	17-18°C (62-64°F)
4 weeks	↓	
	Space	17-18°C (62-64°F)
4 weeks	↓	
	Lower Temperature, Apply GA_3 (10-12 leaf stage)	16-17°C (60-62°F)
8 weeks	↓	
	Flower*	

*Time to flower varies with pot size. Plants in 15 cm (6 inch pots require 5-9 months, plants in 13 cm (5 inch) pots require 8 months, and plants in 10 cm (4 inch) pots require 7.5 months.