Greenhouse Production of Gerbera Daisies

Introduction

Gerbera daisies (Gerbera jamesonii) are useful as cut flowers, pot crops, and bedding plants planted outdoors in full sun. They can be planted in dish gardens, mixed containers, patio pots, or traditional containers for use as holiday and seasonal gifts. The rich green, leafy foliage gives rise to 3 1/2- to 5-inch blooms that may be red, orange, yellow, salmon, pink, or white.

History

Robert Jameson, a Scotsman, first discovered gerbera daisies while operating a gold mine near Barberton in the Transvaal area of South Africa in 1880. He donated plants to the Durban Botanical Gardens, and the curator of the gardens, John Medley Wood, sent specimens to Harry Bolus in Cape Town, South Africa, for identification. Bolus then sent specimens to the Royal Botanical Gardens at Kew in England, with the suggested scientific name Gerbera jamesonii. Beginning about 1890 in England, Richard Irwin Lynch carried out breeding programs that resulted in many improvements. Gerberas soon became popular in the Netherlands, where much of the modern breeding has been accomplished.

Gerberas were not produced in North America until the early 1920s. Extensive breeding at the University of California at Davis during the 1970s led to many plants suitable for garden use. However, breeding in Florida and Europe focused on developing long-stemmed cultivars for greenhouse cut flower production. In fact, much of the production today in Europe and Japan is for cut-flowers. In the U.S., California and Florida are the leading states in the production of cut flowers and tissue-cultured stock. The majority of cut gerberas, however, come from Columbia and surrounding countries in South America, with substantial quantities coming from the Netherlands.

Happipot was the first seed-propagated cultivar that had flower stems short enough to be used in 5- or 6-inch pots. It was introduced by Sakata Seed Company of Japan in the early 1980s. About the same time, Sunshine Research and Development selected plants for pot culture, resulting in the Sunshine and Sunburst series. These are tissue-cultured cultivars that are marketed through several laboratories. The trend today is toward seed-propagated plants. Cultivars currently available include the Small pot gerberas from Earl J. Small Company, the Nain series from Park Seed Company, and the Valley Heart series from Valley Heart Gardens. Current breeding strives for vigorous growth, compact habit, and continuous flowering on sturdy stems.
Cultivars

Gerbera daisy cultivars for greenhouse production have been developed in different plant sizes to accommodate a wide range of container sizes. Groups of cultivars (cultivar series) have been bred for 1- to 3-gallon containers. These are large plants with 4- to 6-inch-diameter flowers on 18- to 24-inch stems. Series are also available in sizes appropriate for 5- to 6-inch pots and 4- to 5-inch pots.

Several different flower types have been developed in gerberas. Most cultivars have single or daisy-type flowers composed of one or two rows of long outer ray flowers surrounding a tight group of short disk flowers with inconspicuous petals. An intermediate flower type has one or two rows of long outer ray flowers, several rows of medium-length ray flowers, and then a tight group of short disk flowers in the center. Finally, the crested flower type has many ray flowers almost covering the disk flowers, but the outer rows are longer than the inner rows so the flower head is rounded.

When purchasing gerberas for production, choose cultivar sizes based on the container size desired. Also consider fast crop time, ease of shipping, long-lasting quality, and a large selection of flower colors and types. You may choose to select flower colors that are suitable for different seasons—for example, orange and red for fall and winter and yellow, pink, and salmon for spring and summer.

Seed Propagation

Gerbera seeds, of which there are 6,000 to 8,000 seed per ounce, are expensive, delicate, and sensitive to germinating conditions. Considering that the crop requires 14 to 18 weeks from seed to flower, many small- to medium-sized growers order established, plug-grown seedlings from specialist propagators. Seeds should come packed in moisture-proof packages and should be stored under cool conditions away from strong sunlight until sown. Once the package is open, all seeds should be sown at once because they lose their viability very quickly when exposed to room conditions. Though it is not advised, unused seed can be resealed in the package and stored in a refrigerator for a short time. Recommended sowing media varies, but most consists of 40 to 60 percent peat and 40 to 60 percent perlite with a 5.8 to 6.0 pH, 0.8 mmhos/cm E.C. (2:1 extraction method), and some fertility.

Gerbera seed can be sown in open flats or in a variety of plug-flat sizes. However, transplanting from open trays requires more labor and delays establishment in the new containers. The more common practice is to sow into a variety of large plug trays that have 72 to 288 cells per tray. Some growers sow into small-celled trays and then transplant to larger trays or pots. This allows the seedlings to be sorted by size for a more uniform crop but requires more labor. Water the sowing media before sowing, and cover the seed with a thin layer of No. 3 fine-grade vermiculite afterward.

Germinate the seed, using a system that maintains relative humidity as close to 100 percent as possible. Use bottom heat to maintain 70° to 75°F media temperature. Some growers place trays in plastic bags or use fog systems; others use germination chambers at 73° to 75°F for 4 to 5 days. Trays should receive at least 12 hours of incandescent light per day while in germination chambers. Remove the plastic bags and move the seedlings into the greenhouse 7 to 14 days after sowing or when complete germination has occurred.

Night temperatures for growing on seedlings in the greenhouse should be 68° to 72°F. At this point, protect the seedlings from full sun by providing light shade (30 to 40 percent) and a high greenhouse humidity (70 to 75 percent). During dark periods of the year, supplemental high-intensity discharge (HID) lighting will speed seedling growth. Apply HID lighting for at least 14 hours per day at 300 to 500 footcandles (60 to 80 W/m²).

Begin fertilizing the seedlings, using a low ammonium fertilizer (15-5-15) about 10 days after germination at 50 to 75 ppm nitrogen. Gradually increase the fertilizer concentration to 100 to 150 ppm nitrogen. The young foliage is sensitive to fertilizer burn, so rinse the foliage with clear water immediately after fertilizing. Monitor the medium pH to make sure that it does not rise above 6.2 or fall below 5.5. High pH typically results in micronutrient deficiency, and low pH can result in calcium or magnesium deficiency. Some growers transplant seedlings to large cell packs, 2½-inch pots, or Jiffy-Strips about a month after sowing or when the seedlings have two mature leaves.

Growing Plugs

Whether the gerbera crop is started from seed in house or ordered from a specialist propagator, seedlings should be transplanted to the final container 6 to 7 weeks from sowing or when they have four to five mature leaves. An additional week may be required if the crop spends the principal amount of time in the winter. If plugs are received from a specialist propagator, remove the trays from
the shipping boxes, and inspect them for insects and diseases. Then place them in the greenhouse, check to see if they need water, and allow them to acclimate for a day or two before transplanting them. However, transplant the plugs after no more than 2 days so the plants do not become root-bound. Overgrown transplants take longer to finish and are smaller at flowering.

Transplanting depth is very important. Plant the soil ball slightly high so that the crown is not covered with soil after it is watered. Applying a broad-spectrum fungicide drench is a common practice at this time.

**Potting Media**

Potting media used for gerberas should be loose and well drained with a high percentage of organic matter. Many growers use 50 to 80 percent peat with perlite, vermiculite, calcine clay, or coarse sand added for the remaining percentage. Dolomitic limestone should be added to a pH of 5.8 to 6.0. Superphosphate at 4.5 pounds per cubic yard and micronutrients at the manufacturers’ recommended rates are also added. Because gerberas are fairly heavy feeders, a starter charge of calcium and potassium nitrate is often added to the mix at 1 pound of each per cubic yard. Good grades of commercially available peat-lite mixes can also be used.

After potting, place the plants pot-to-pot where they will receive the maximum amount of light. Gerberas can be watered and fertilized overhead for about 4 weeks before they must be placed at final spacing.

**Fertilization**

If a starter amount of fertilizer was added to the medium at mixing, do not begin fertilizing until roots reach the sides and bottom of the pot. Many sources recommend applying a low-ammonium, balanced fertilizer such as 15-16-17 (peat-lite special) or 15-15-18 on a constant liquid fertilization basis. Young plants should be fertilized with 100 to 150 ppm nitrogen for the first 2 to 3 weeks. This rate should be increased to 150 to 200 ppm nitrogen during the winter months or 200 to 250 ppm nitrogen during the summer months. Adjust the nitrogen application rate based on plant growth. Excessive nitrogen can cause the foliage to overgrow and hide the flowers. Excellent results have been obtained using slow-release fertilizer such as Osmocote 14-14-14 (3 to 5 pounds per yard³) in combination with the lower liquid fertilization rate.

Growers should manage the fertility program for gerbera daisies by performing a soil test and tissue analysis at least once a month. Floral crop soil tests provide medium pH, soluble salts, and levels of macro- and micronutrients. The soluble salts for gerberas should be 1.2 to 1.5 mmhos/cm E.C. (2:1 extraction method). Low readings often mean not enough fertilizer is being applied, application is too infrequent, or a combination of both. High readings may mean too much fertilizer is being applied, application is too frequent, not enough water is applied to wet the medium and obtain drainage, drainage is poor, or a combination of these conditions exists. Tissue analysis provides information about what nutrients are being absorbed by the roots and transported to the foliage. Table 1 lists guidelines for plant analysis values.

Many of the fertility problems encountered with gerbers are pH-related. Monitor the medium pH weekly to ensure that it does not rise above 6.2 or fall below 5.5. High pH typically results in micronutrient deficiency, frequently iron. A spray application of iron chelate at the manufacturer’s recommended rate will help alleviate the chlorosis symptoms, but steps must be taken to lower the pH. Repeated applications of an acid residue fertilizer such as 20-10-20 help.

Low pH can result in calcium or magnesium deficiency. Repeated applications of a basic residue fertilizer such as calcium nitrate help. Magnesium deficiency can be alleviated using 1.5 pounds magnesium sulfate (Epsom salts) per 100 gallons as a drench.

**Temperature**

A night temperature of 68° to 70°F is preferable until plants establish a root system, usually in the first 3 to 4 weeks. Temperatures can then be reduced to 65° to 68°F at night for the next 2 to 3 weeks, followed by 60°F to finish. Ventilation can begin during the day at 75°F. Slightly warmer or cooler temperatures

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**Table 1. Plant Analysis Guidelines for Gerbera Daisy (Dry Weight Basis)**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Concentration (percentage)</th>
<th>Nutrient</th>
<th>Concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1.50 to 3.50</td>
<td>B</td>
<td>20 to 60</td>
</tr>
<tr>
<td>P</td>
<td>0.20 to 0.50</td>
<td>Cu</td>
<td>6 to 50</td>
</tr>
<tr>
<td>K</td>
<td>2.50 to 4.50</td>
<td>Fe</td>
<td>50 to 200</td>
</tr>
<tr>
<td>Ca</td>
<td>1.00 to 3.50</td>
<td>Mn</td>
<td>40 to 250</td>
</tr>
<tr>
<td>Mg</td>
<td>0.20 to 0.70</td>
<td>Zn</td>
<td>25 to 200</td>
</tr>
</tbody>
</table>

can be used to speed or slow the crop, but extremely higher or lower temperatures will delay finish. Elongation of the flower stalk is sensitive to positive or negative DIF either applied generally or as an early morning application.

**Relative Humidity**

Botrytis can be a serious problem with gerberas during dark, cool periods in winter when the greenhouse humidity is high. Take steps to keep the humidity below 70 percent during the day and below 85 percent at night. Good internal air circulation in the greenhouse at night and ventilation during the day are essential. High humidity appears to contribute to flower stalk stretching.

**Light**

Gerberas require high light intensities for good-quality plants and high flower bud numbers. For this reason, they are mostly produced in the spring and summer, with the greatest amount of production for the spring market. Plants grow best in full sun during the fall, winter, and spring. Light shade (30 to 40 percent) can be used to reduce excessive greenhouse temperatures in the summer, but be careful not to apply too much. Plants receiving too little light have pale green, stretched foliage and long, weak flower stems. Plants receiving too much light have compact, slightly yellow foliage with short flower stems often hidden in the foliage.

Gerbers appear to respond only slightly to photoperiod. Short days tend to speed flower production, while long days delay flowering. However, many growers produce gerberas with no photoperiod control. Some growers extend the photoperiod from October through March for 4 weeks only to get more vegetative growth before flowering. Extending the photoperiod for longer than 4 weeks can result in excessive foliage growth. During the seedling and pot-to-pot stage in winter, supplemental HID lights can be applied for at least 14 hours per day.

**Watering**

Gerberas should receive a thorough watering and then be allowed to dry somewhat. This limits growth of the flower stem and discourages soilborne diseases. Gerberas should never be allowed to wilt, however. Plants allowed to dry out too much and too frequently have short flower stems that may be hidden in the foliage. It is also a good practice to water early in the day so the foliage is completely dry before evening.

**Plant Spacing**

After 4 weeks pot-to-pot, space the plants so that plenty of light reaches the crown and there is free air movement. Tight spacing can delay flowering and cause leaves to stretch. Exact spacing is difficult to recommend because of differences in pot size and cultivar sizes. However, begin with a 6- by 6-inch minimum for 4- to 4½-inch pots, an 8- by 8-inch minimum for 5-inch pots, and a 10- by 10-inch minimum for 6-inch pots.

**Chemical Growth Retardants**

B-Nine is the growth retardant of choice for gerbera growers. Whether using 4-, 5-, or 6-inch pots, apply the first application as a foliar spray 10 to 14 days after potting to the final container at 2,500 ppm. B-Nine at 1,000 to 1,500 ppm can also be applied in the plug stage when seedlings have 4 to 5 mature leaves. The number of applications depends on the season, cultivar, and pot size (Table 2). A second application of B-Nine may be desirable at 2,500 ppm during the hot summer months, depending on light levels and watering practices. Do not apply B-Nine in the last 4 weeks before flowers open because flower size and shape may be adversely affected.

**Table 2. Seasonal B-Nine Applications to Gerbera Daisy**

<table>
<thead>
<tr>
<th>Pot size (in.)</th>
<th>Period</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4½ to 5</td>
<td>Fall to spring</td>
<td>1 to 2 applications</td>
</tr>
<tr>
<td>6</td>
<td>Fall to spring</td>
<td>1 application</td>
</tr>
<tr>
<td>4½ to 5</td>
<td>Summer</td>
<td>2 to 3 applications</td>
</tr>
<tr>
<td>6</td>
<td>Summer</td>
<td>1 to 2 applications</td>
</tr>
</tbody>
</table>
Crop Scheduling
The timing of Gerbera daisy crops depends on several factors including cultivar, environmental conditions, pot size, and cultural practices. Growers should keep detailed records of crop performance and timing to improve future scheduling efforts. Generally, 4-inch pots require 8 to 11 weeks, 5-inch pots require 9 to 12 weeks, and 6-inch pots require 10 to 13 weeks from transplanting to finish in the summer. An additional week is required during the winter. A general outline of gerbera daisy crop scheduling is shown in Figure 1.

Crop Problems

Insects
Leaf miners, spider mites, cyclamen mites, whiteflies, aphids, and thrips are the main insect pests of gerberas.

Diseases
Powdery mildew, Phytophthora (crown/root rot), Botrytis, impatiens necrotic spot virus, and bacterial blight are the main disease problems of gerberas.

Specific control measures for insect and disease problems can be found in the Alabama Pest Management Handbook, Volumes 1 and 2 (ANR-500A and 500B), or contact your county Extension agent.

Common Problems and Their Causes

✽ Foliage too large or flower stems too long:
  Light intensity too low
  Ammonium fertilizer too high
  Growth retardant too low
  Cultivar selection incorrect

✽ Flower stems too short:
  Growth retardant excessive or late
  Plants too dry
  Soluble salts too high
  Growing temperature too cold

✽ Flowers distorted:
  Cyclamen mite or thrips problem
  Soluble salts too high
  Temperature too high or too low

✽ Plants stunted or failing to grow:
  Drainage or aeration poor; plants too wet
  Soil temperature too low
  Growth retardant too high
  Plants planted too deep

✽ Plants wilting or dying:
  Plants planted too deep—crown rot develops
  Root rot

Gerbera daisies are somewhat more of a challenge to grow than are many greenhouse pot crops produced in the spring. Careful attention to details and accurate crop records can help growers reduce production time and increase product quality. However, gerberas can be worth the effort because demand for a high-quality product has not been met by producers in many markets.

Figure 1. Gerbera Daisy Production Schedule

<table>
<thead>
<tr>
<th>Sow</th>
<th>Germination</th>
<th>Larger Flat</th>
<th>2 to 4 weeks</th>
<th>4 weeks</th>
<th>4 to 6 weeks</th>
<th>Pot-to-pot</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 to 8 weeks</td>
<td>8 to 10 weeks</td>
<td>14 days</td>
<td>2 weeks</td>
<td>2 to 4 weeks</td>
<td>4 weeks</td>
<td>4 to 6 weeks</td>
<td>Finish</td>
</tr>
</tbody>
</table>
J.R. Kessler, Jr., *Extension Horticulturist*, Assistant Professor, Horticulture, Auburn University

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