Minnesota Flower Growers Association Bulletin

Serving The Floriculture Industry In The Upper Midwest

IN THIS ISSUE

September, 1991 Volume 40, Number 5

Pot Gerbera Production

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I. Introduction: Gerbera, or Transvaal daisy, is named after Traugott Gerber who discovered the species in Transvaal, South Africa. Gerbera jamesonii is an evergreen perennial which produces flowers from the leaf axils in the crown of the plant. Individual flowers are born on stems (peduncles) which emerge from the center of the crown.

Gerbera are grown for cut flowers, pot plants, and bedding plants. Cut gerbera production occurs year round. Most gerbera grown for pot and bedding plant culture are grown during the spring, summer and fall of the year. Gerbera are perennial in some climates but are grown as an annual in most areas of the United States and Canada. This article will concentrate on how to grow gerbera as a pot plant crop.

Available Pot Gerbera Mixtures

Mixture	Colors
California Mixed	yellow, orange, white, scarlet, crimson, pink
Double Parade Mix	yellow, cream, plum, pink, salmon, red
Ebony Eyes Hybrid Mix	cream, yellow, white, salmon, rose, pink
Fantasia	
Festival Mixture F1	orange, red, rose, white, yellow
Happipot Mixture	red, rose-pink, salmon, orange, yellow, and cream
Lido Mixture	
Park's Mix	scarlet, yellow, rose, pink, white, crimson, orange
Small's Pot Gerbera	
Sunburst Mixture	red and yellow shades
Tempo Mix	scarlet, orange, yellow, rose, and pink

Gerbera seed germination is enhanced by light. Germination is inhibited if seed are covered even slightly.

Table 1. The effect of supplemental high pressure sodium (HPS) lighting (100 umol s^{-1} m^{-2}) on the percent germination, dry weight per seedling, and the days from germination until visible bud (VB).

	Lighting Treatment	
Parameter	Natural	Natural + HPS
Percent Seed Germination	76	100
Dry Weight/Seedling (mg)	45	125
Days From Germination until VB.	134	113

Maintain seed temperature at approximately 68-74°F after sowing.

Most new gerbera developed for pot plant production are 6-8 inches in height and produce flowers up to 4 inches across. The range of colors available has increased to include a wide array of pastel colors. Some of the more recent introductions are shown in the table on the previous page.

III. Propagation: Gerbera are propagated through division, seed, and more recently, tissue culture. Recent propagation advances emphasize seed and tissue culture to avoid the need for stock plant production.

Seed Propagation: Gerbera seed germination has traditionally been non-uniform. Recent breeding developments have increased the uniformity of seed germination and the percent germination tremendously. Most gerbera will flower from seed within 16 weeks.

Sow seed in a plug tray. The size of the plug which you sow your seed into is a decision which you as a grower must make. The decision is usually based on the availability of space in the seed germination environment. Planting seed into a 48 plug tray will eliminate one transplanting step which may save more money in the long run and increase the quality of your final product.

Gerbera seed germination is enhanced by light (Table 1). Germination is inhibited if seed are covered even slightly. Even a fine coat of vermiculite can significantly reduce germination. Therefore, germinate gerbera seed in a high humidity environment on the surface of the media and irradiate seed with fluorescent or high pressure sodium lights. We have had good results if seed are sown on the media surface and a piece of polyethylene is placed above the flats.

Maintain seed temperature at approximately 68-74°F. Do not allow seed temperature to become higher than 74°F. Gerbera seed will typically germinate in 7-14 days.

Unused seed should be placed back in a sealed packet in a cool, dry environment. This is essential as seed loses its germination potential rapidly.

Tissue Cultured: Currently, 21 commercial and 13 laboratories are propagating gerbera through tissue culture in Europe. In general, tissue cultured gerbera are more uniform in flowering than seed propagated gerbera. Plants can typically be finished in 11 to 16 weeks after transplanting with 'stage III' plants (see below).

Gerbera can be propagated using tissue culture from tissues taken from the leaf midrib, shoot tip, capitulum (base of the flower head) or peduncle (flower stalk). Callus culture and/or shoot proliferation is optimal when irradiance, or light intensity, is maintained at 110 μmol s^{-1} m^{-2} (855 footcandles) for 16 hours. Establish plantlets at light levels maintained between 277 and 925 μmol s^{-1} m^{-2} (1385-4625 footcandles).

Tissue cultured plants are often more uniform in their flowering. However, the cost of tissue cultured plants may limit their use, especially as bedding plants.

Tissue cultured plants arrive in plug trays for planting. Tissue-cultured gerbera are available at 3 different developmental stages: 1) stage III- immediately after test tube culture when plants are ready to be transfered to a soil medium, 2) young plants- established in 1/2 to 2 1/2 inch plugs, or 3) prefinished- young plants which will flower in 4 weeks. Young plants or prefinished plants are usually preferred as losses are usually less.

As mentioned previously, tissue cultured plants are often more uniform in their flowering. However, the cost of tissue cultured plants may limit their use, especially as bedding plants. Interestingly, some commercial growers have recently found that tissue cultured gerbera are less uniform and may be delayed in their flowering.

IV. Media: Most commercial potting media are suitable for gerbera production. It is essential to make sure that the medium is loose and will not retain moisture for extended periods of time which could result in root rot problems.

V. Planting: Do not plant seedlings too deep. The crown must be above the media surface. If the crown is planted too deep, flower abortion can occur. Flower abortion is especially a problem early in seedling development when flowers are initiating, i.e. at the 1 and 2 true leaflet stage.

In addition to affects on flower initiation and abortion, planting seedlings too deep can result in a number of crown rot diseases (see Pests section).

VI. Spacing: Light is critical for normal gerbera flower development. It is essential that seedlings not shade each other. Therefore, space plants to minimize the space requirement while maximizing light interception to the leaves. Plants can be spaced tighter if they are lighted with supplemental lighting using high pressure sodium lamps (100 μmol s^{-1} m^{-2} or 855 footcandles).

Crowding of plants will also affect the appearance of the plant by increasing leaf length, decreasing leaf width, lightening leaf coloration, increasing peduncle length and result in a more upright leaf orientation.

Final plant spacing for 4 inch pot plants should be approximately 7-10 inches or 1.4-3.0 plants per square foot. As mentioned before, your spacing will depend on your plant size.

VII. Nutrition: Fertilize gerbera using a constant liquid feed program. Apply a single application of 300 ppm of nitrogen using a 20-10-20 fertilizer mix after transplanting. After the initial fertilization treatment, fertilize with a 300-0-300 ppm solution composed of calcium and potassium nitrate. If you use another fertilizer, make sure that the percent of nitrogen supplied by ammonium nitrate does not exceed 50%. Higher ammonium nitrate levels are detrimental to gerbera growth.

Gerbera have a high magnesium and iron requirement. A sign of magnesium deficiency is interveinal chlorosis of the lower leaves. A sign of iron deficiency is interveinal chlorosis of the upper leaves. Supplement your gerbera nutritional program with both magnesium and iron. Apply magnesium sulfate monthly at a rate of 1 pound/100 gallons and iron chelate at each watering in the constant liquid feed program at a rate of 1/2 ounce/100 gallons.

Keep an eye on total soluble salts and pH of the media. Media pH should be maintained at 6.0-6.5. Gerbera tend to require frequent watering, therefore, fertilizer and soluble salt levels may change more quickly than what you are used to.

High pH is one of the most common causes of nutritional problems in gerbera. The most common symptom of a high pH problem is interveinal chlorosis. The interveinal chlorosis is due to either an iron or magnesium deficiency which results from these materials not being readily available for plant growth at high soil pH levels. Decrease media pH using an acid drench if necessary.

VII. Flower Initiation: One of the major problems with pot gerbera production is the lack of uniformity in flower initiation which can result in non-uniform flowering. Every gerbera shoot will eventually initiate an inflorescence. Gerbera flower initiation occurs early in development. Most cultivars will initiate flowers while in the plug stage, i.e. when 2-3 true leaves are visible. The key to a successful gerbera crop is to initiate the entire crop uniformly. To do this you have to be aware of how flower initiation is affected by the environment which a crop is grown under.

Flower initiation is affected by light intensity and temperature. Flower initiation occurs earlier under high light intensities. For this reason, higher light intensities are especially important on seed propagated gerbera early in development when flower initiation is occurring.

High temperatures can reduce total flower number or eliminate flowering completely. Do not let plant temperature exceed 76°F during flower initiation. Maintain plants under a 70°F day temperature and a 63°F night temperature.

Do not plant seedlings too deep. It is essential that the crown is above the media surface.

Light is critical for normal seedling development. Therefore, it is essential that seedlings do not shade each other.

Gerbera have a high magnesium and iron requirement.

High pH is one of the most common nutritional problems of gerbera.

Flower initiation occurs earlier under high light conditions.

VIII. Growing On Environment:

The rate of gerbera development increases as average daily temperature increases to approximately 80°F and as photoperiod length decreases to 8 hours.

Development Rate: The rate of gerbera development is influenced by the average daily temperature plants are grown under and the photoperiod. Gerbera development rate from flower initiation until first color hastens as the average daily temperature which gerbera are grown under increases to 80°F (Figure 1). Increasing the average daily temperature which plants are grown under above 76°F will not hasten flowering. The time from visible bud until flower decreased exponentially from 44 to 18 days as the average daily temperature which plants were grown under increases from 55 to 76°F.

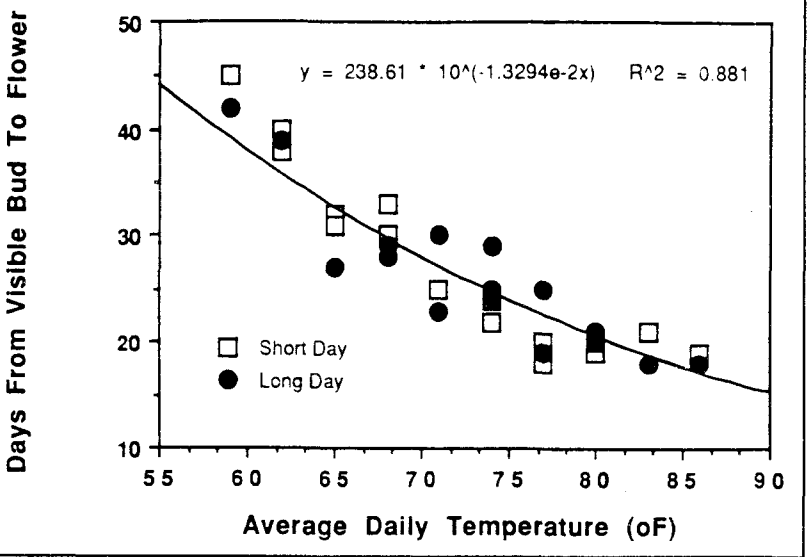

Figure 1. The effect of average daily temperature on the number of days from visible bud until flower of gerbera cv 'Tempo Scarlet'. Plants were considered at flower when pollen was shed.

Gerbera individual leaf area increases as temperature increases to approximately 77°F.

Photoperiod also affects the rate of gerbera flower development. Roh and Lawson (1984) showed that the rate of flower development increased as photoperiod decreased to 8 hours. The effect of photoperiod on the rate of flower development decreased as the night temperature plants were grown under increased. There appears to be no difference in the rate of flower development on plants grown under short and long day grown plants at cooler night temperatures when the 'long day' treatment is delivered as a night interruption using incandescent lamps.

Peduncle length increases as the difference between day and night temperature increases.

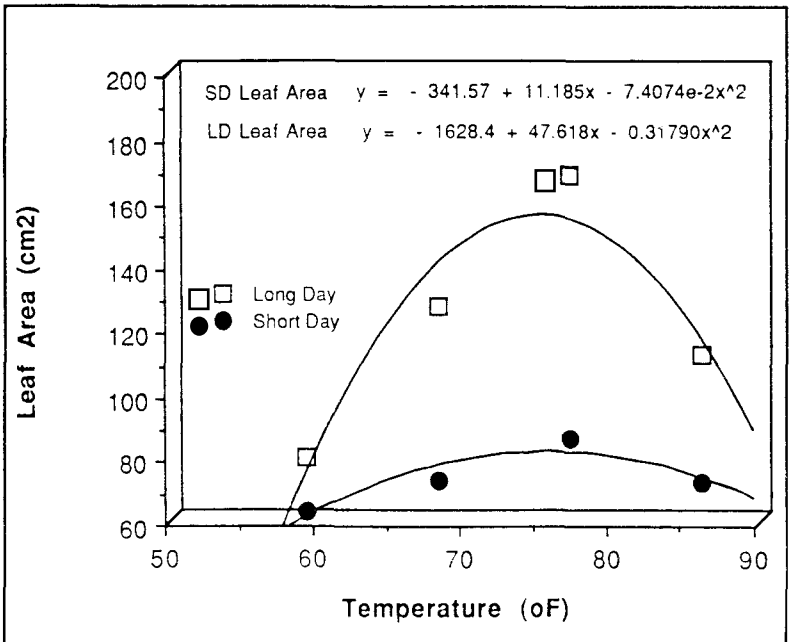

Figure 2. The effect of increasing temperature from 59 to 86°F on gerbera cv 'Tempo Scarlet' individual leaf area.

Morphology: Gerbera leaf development has an optimal temperature. Individual leaf area increases as temperature increases to approximately 77°F (Figure 2). Increasing temperature above 77°F will decrease individual leaf area.

Gerbera peduncle length is influenced by how day and night temperatures are delivered. Peduncle elongation increases as the day temperature plants are grown under increases relative to the night temperature.

gested that GA_3 applications resulted in more uniform flowering rather than hastening flowering.

One B-9 application at a rate of 2,500 ppm is suggested 2 weeks after germination to control stretching.

X. Plant Quality:

One of the primary determinants of plant quality is plant dry weight. Plant dry weight is an indication of the overall size of the plant. In general, the higher the plant dry weight at flower the higher the quality. Of course, the dimensions of a plant are important. However, among plants with similar dimensions we can make some comparisons as to what environments tend to produce a plant with a comparatively superior quality.

GA_3 applications tend to increase the uniformity of flowering.

IX. Growth Regulators:

Gerbera are responsive to B-Nine. One B-Nine application at a concentration of 2,500 ppm is recommended 2 weeks after germination. The growth regulator application will reduce leaf and pedicel expansion and increase the green coloration of the leaves. If plants are grown in an environment with a high day temperature and a low night temperature, i.e. a high +DIF environment, a second application will probably be needed.

Other growth regulators are used by some growers to affect flower number and the time to flower. Dikegulac sodium (Atrinal) has been reported to increase inflorescence number. Application of gibberellins (GA_3) has been reported to increase inflorescence number. Application of GA_3 to young buds hastened flowering by 7 days. Experimentation which we conducted sug-

The day and night temperature which a crop is grown under can have a tremendous impact on the plant dry weight at flower (Figure 3). Gerbera whole plant and flower dry weight are greatest when plants are grown with a 77 and 59°F day and night temperature, respectively.

Whole plant dry weight is greatest when experimental plants were grown with a 77°F day temperature and a 59°F night temperature.

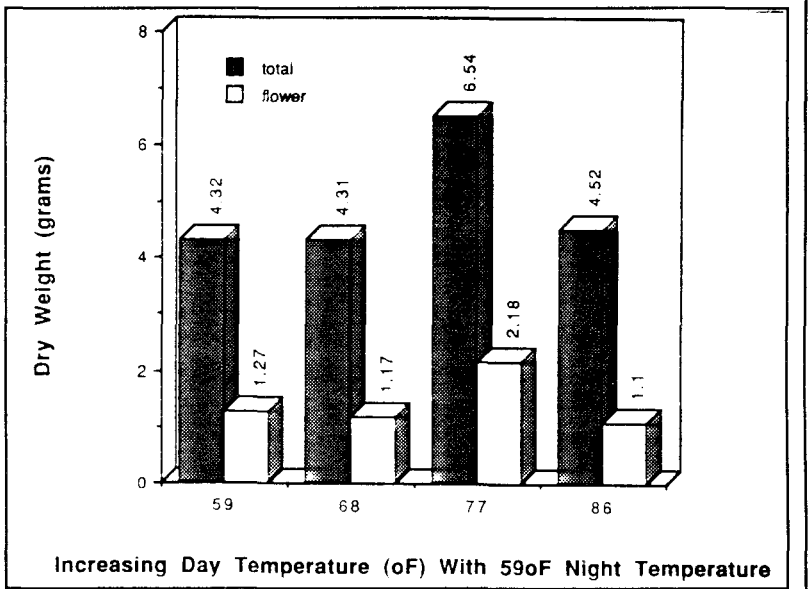

Figure 3. The effect of increasing day temperature from 59 to 86°F while maintaining night temperatures at 59°F on whole plant and flower dry weight of gerbera cv 'Tempo Scarlet' at flower.

Ship pots when the outer row of flowers is showing color on the first inflorescence.

XI. Postharvest: Ship pots when the outer row of flowers is showing color on the first inflorescence. Application of silver nitrate to cut gerberas at a rate of 50 mg/liter increases cut gerbera flower postharvest life. Such an application may be beneficial for pot gerberas. Silver thiosulfate applications would probably also prove beneficial to extend the postharvest life of pot gerbera at similar rates.

Pot gerbera postharvest life is extended in the home if plants are placed in bright, but not direct sunlight. Maximum shelf life is achieved when temperatures are maintained at 70°F day and 63°F night temperature.

Gerbera are suceptible to white fly and aphid infestation.

XII. Pests:

Insects: Gerbera are suceptible to a number of insect and pathogens infestations. The major insect pests are white fly and aphid.

Diseases: Gerbera are susceptible to the following pathogens:

Pythium
Rhizoctonia
Phytophthora
Botrytis
Erysiphe

Apply fungicides monthly to inhibit root and/or crown rot.

Apply fungicides monthly to avoid any difficulties arising from root and/or crown rots.

Literature Cited

Cockshull, K.E. 1985. Gerbera; In CRC Handbook of flowering, CRC Press, Boca Raton, pp. 43-47.

Leffring, L. 1975. Effects of daylength and temperature on shoot and flower production of gerbera. Acta Hort., 51:263-265.

Moe, R., J. Erwin and W. Calson. 1991. Physiological Disorders in *Gerbera Jamesonii* Bolus. Hortscience (in press).

Murashige, T., M. Serpa and J.B. Jones. 1974. Clonal multiplication of Gerbera through tissue culture. Hortscience, 9:175-180.

Nowak, J. and R.M. Rudnicki. 1990. Postharvest handling and storage of cut flowers, florist greens and potted plants. Timber Press, Portland, Oregon, pp. 149, 177.

Riordain, F.O. 1989. The European plant tissue culture industry. In the Proceedings of the National Ornamental Crops Conference, 1989. Kinsealy Research Centre, Dublin, Ireland, pp. 1-11.

Rogers, M. and B.O. Tjia. 1990. Gerbera production. Timber Press, Portland, Oregon, pp. 77-83.

Roh, M. and R. Lawson. 1984. The graces of gerberas. Greenhouse Manager, 3(6):79-88.

Germination research was supported by Sakata Seed Inc.

Financial Support

Sakata Seed Co. Inc. supported research on environmental effects on gerbera seed germination.

The following groups provided support for research on temperature effects on gerbera growth presented in this report:

1) Growers supportive of Michigan State University

2) Michigan State Agriculture Experiment Station

3) University of Minnesota Agriculture Experiment Station

Acknowledgements: The following individuals helped with the experimentation on environmental effects on gerbera germination and growth presented in this report:

Roar Moe
Brian Kovanda
Nathan Lang
Martin Stockton
Mark Smith