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Jagreeti Gupta
 Department of Floriculture
 and Landscaping, Dr. YS
 Parmar University of
 Horticulture and Forestry
 College of Horticulture and
 Forestry, Neri, Hamirpur,
 Himachal Pradesh, India

Shafia Bashir
 Department of Botany,
 Punjab agricultural University
 Ludhiana, Punjab, India

Quality flower production of gerbera: An overview

Jagreeti Gupta and Shafia Bashir

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Abstract

Gerbera is an ornamental plant of Asteraceae family. It is a widely used as a cut flower and grown in protected condition in India. This is a popular cut flower having more vase life and wide range of colour availability and thus plays a pivotal role in the flourishing floriculture industry. This flower is widely used for making different flower arrangements, bouquets, decoration and also used as a pot plant. Considering its more demand in market, this review has been compiled from the works of different authors from 1985 to 2023.

Keywords: Gerbera, cut flower, production

Introduction

The genus Gerbera was founded by Pre-Linnean botanist, Gronovius and named in the honour of German naturalist, Traugott Gerber. Gerbera, commonly known as 'Transvaal daisy', 'Barberton daisy' or 'African daisy' is one of the most important cut flowers in domestic as well as global market, belongs to family asteraceae. It includes 70 species (Noberto, 2010) [13], out of which 7 recorded in India. It ranks sixth among the top ten cut flowers. Gerbera can successfully be grown both in the plains as well as in the hills. In India, its cultivation is confined mostly to Kalimpong, Bangalore and Pune. Gerbera is being grown all over the world for garden decoration and also as cut flowers for interior decoration and for making bouquets. Dwarf cultivars are used as pot plants. Now a days, tissue culture raised gerbera plants are producing flowers of uniform colour and shape. Production of Gerbera in India was 801.59000 T and Maximum flower producing state is Madhya Pradesh accounting 401.52000 T productions (NHB 2021-22) [3].

Botany

- Plants – stemless, tender perennial herbs
- Leaves are radical, deeply lobed, sometimes leathery, narrow at base, wide at the top, arranged in a rosette at the base
- Flower stalks - are long, thin and leafless
- Flower heads - grouped into single, double and semi double cultivars
- Flower colour - many - yellow, orange, cream white, pink, brick red, scarlet, salmon and intermediate shades

Varieties

Some of the important varieties along with their flower colour are listed as under:
 Yellow Fredeking, Gold Spot, Horizon, Marleen.
 Orange Lily, Maron Clementine, Mirage.
 Pink Terraqueen, Valentine, Flamingo, Fredaisy.
 RedBlorosa, Rosabella, Lilabella, Dusty Beauty, Pascal.
 White Delphi, Maria, Presti.
 Lilac Labalgo, Gracia.

External factors influencing plant growth and flowering

- 1) Temperature
- 2) Light
- 3) Carbon dioxide

Corresponding Author:
Jagreeti Gupta
 Department of Floriculture
 and Landscaping, Dr. YS
 Parmar University of
 Horticulture and Forestry
 College of Horticulture and
 Forestry, Neri, Hamirpur,
 Himachal Pradesh, India

4) Application of growth regulators

1) Temperature

The performance of gerbera cultivar varies from season to season due to variation in temperature and other environmental factors. During winter, the flower production decreases and again markedly increases during spring and autumn. However the response to temperature varies with cultivars. Air temperature above 20 °C adversely affects the flower production. A night temperature of 15 °C is ideal for flower production. The highest yield of flowers was obtained when plants were grown at 21 °C (Pettersen and Gislerod, 2003) ^[14].

- Mild climate for its vegetative growth and flowering
- Extreme hot or cold temperatures are not desirable
- Sunny situation in winter and light shade in summer
- CO₂:- 1000-1500 ppm
- RH:- 60-70%
- Low temp. (15-17 °C during night) and short day photoperiod (8 hours) promotes production of lateral shoots and flowering

2) Light: During the winter due to low light intensity the production of inflorescence is reduced. During summers Long day and high temperature retard the growth and production of flowers. With the advent of autumn when day length is shortening and the temperature is becoming moderate, the production of inflorescences increases.

Hence both light and temperature markedly influence the growth and flower production (Cockshull, 1995) ^[6]. Plant requires sunshine in cool weather and shade during summers.

Kumar and Kumar, 2001 ^[8] studied the effect of modified environments on Gerbera. Five cultivars of gerbera viz., Lily, Blorosa, Rosabella, Goldspot and Lilabella were tried under four environments viz., 50% summer shading, overhead winter covering, summer shading followed by winter covering and control using factorial randomized block design with four replications in each treatment. Among the cultivars, Goldspot and among the treatments, summer shading followed by winter covering gave excellent results.

3) Application of Growth regulators

A number of growth regulators viz. GA₃, Kinetin, CCC, Ancymidol, Paclobutrazole etc have been found to influence the plant growth and flowering of gerbera. GA₃ has been found to hasten flowering, increased the flowering, yield, stalk length and longevity of flowers. Kinetin have been reported to promote formation of axillary shoots and auxins induced stem bending. Cut stems placed in vase containing GA₃, delay flower senescence and petal fading (Emongor, 2004) ^[7]. Salem *et al.*, 2016 ^[16] studied the effect of Gibberellia acid spraying on yield and flowers of Gerbera cv. Dennis. Different conc. of GA₃ was used viz., 0, 50, 100, 150 and 200 ppm. The result indicated that maximum yield and quality parameters and days to flower bud emergence and days to first flowering were observed with treatment of GA₃ at 150 ppm.

Propagation

Division of large clumps into smaller units is commercial method of propagation of gerbera. It is practiced in early September when the plants are to be set out in the field.

Division of mother plant at the end of February produces an average of six plants and these starts flowering at the end of May. Before transplanting, the roots and leaves of suckers are trimmed keeping the central shoot intact. Whole planting suckers care must be taken that soil does not cover the central growing point. The division should be practiced after 2-3 years of planting. This is the easiest and commonly followed method for propagation. Best results are obtained if the plants are propagated using micro propagation technique. It results in quick and bulk production of disease-free plantlets.

Soil

A well-drained, rich, light, neutral or slightly alkaline soil is most suitable for gerbera production. The growth of plants is adversely affected in waterlogged soils. In soils with a pH range of 5.0 to 7.2, gerbera produces more flowers with longer stems than when planted in soils with a pH below 5. Soil less media can also be used for its cultivation. A study conducted by Ali *et al.*, 2023 ^[1], observed that the media substrate should involve a mixture of peat moss, sand and vermicompost inoculating with nitrogen fixer bacteria to gain high yield and quality. One more study conducted by Priya *et al.*, 2023 ^[15] reported that the plants of var. Arka Nesara grown under aggregate wick system (AWS) on pots, grow bags and soil bed showed better results compared to the liquid culture systems. AWS with pots on ground exhibited superior vegetative growth, flower stem quality and water use efficiency, while, aggregate wick system on soil bed resulted in earlier harvest and higher production with bigger flowers and longer stalks. Considering the maximum water saving, AWS with pots on ground could be employed as an alternative for conventional soil-based drip system.

Field preparation

Plough the field twice or thrice before planting. Raised beds (15 cm high) of 1.2 m width should be prepared of any length depending upon convenience or the area available for cultivation. Deep ploughing may be given as gerbera roots go as deep as 30 cm.

Planting time and spacing

The best planting time is from September to October and February to March in the plains. The planting distance should be 40 cm from row to row and 30 cm from plant to plant if grown for 3-4 years and 30 x 30 cm if the crop is grown for one to two years.

Manuring and fertilization

Add 20 tonnes well-rotten farm yard manure along with super phosphate 250 kg and muriate of potash at 66 kg per acre as a basal dose at the time of preparation of beds. Before planting iron sulphate at 10 g/sq. meter may also be added in iron-deficient soils to check yellowing of leaves. After 4-weeks of planting i.e. when the plants are well set, CAN (88 kg per acre) should be applied at monthly interval during active growth period of the plants. Amin *et al.*, 2011 ^[2] studied the response of gerbera (*Gerbera jamesonii*) to different levels of phosphorus and potassium and concluded that the combination of 12.5 g P m² and 15 g K₂O m² influenced most of growth and flowering parameters of Gerbera.

Irrigation

Gerbera needs heavy irrigation instead of light sprinkling at short intervals. In summer the crop should be irrigated at 5 days interval and in winter at 10 days interval depending on weather conditions. Over-watering should be avoided as it leads to high incidence of diseases, especially the root rots.

Summer-shading and winter-covering

Quality blooms are produced from November to December and February to March when the beds are provided overhead cover of plastic from November to March. Scorching heat of May-June is harmful for growth and adversely influences flower production. To reduce light intensity the plants should be covered with shading nets from April to September. A two-to-three-fold increase in flower yield may be achieved by following these practices.

Stage of harvest and vase life

Flowers are harvested when the outer two rows of disc florets start opening, i.e. when they are perpendicular to the stalk. For increasing the vase life the flower stalk may immediately be placed in fresh water after cutting the stalk base. The cut flowers placed in solution containing 200 mg hydroxyquinoline citrate and 5% sucrose improve their vase life by 4-5 days. The vase life of gerbera cut flowers in the plain water has been observed to be between 12-15 days depending upon the variety.

Storage

Singh *et al.*, 2013^[17] suggested the Wet storage temp.: 2 °C and Dry storage temp.: 4 °C is good for Gerbera storage.

Insect-pests and diseases

Aphids, leaf-miners, thrips and white flies infest gerbera. These may be controlled by spraying Rogor 30 EC or Metasystox 25 EC each at 0.1% at fortnightly intervals. Root-knot nematode (*Meloidogyne incognita*) may also be serious occasionally. It may be controlled by immersing bare-root plants in hot water.

Alternaria leaf spot: Light brown spots appear at first and later turns dark reddish-brown. The disease causes speckling of ray florets also. The disease can be controlled fairly effectively by Indofil M-45 (0.2%) or Bordeaux mixture (1.0%) sprays.

Cercospora leaf spot: Spots appear olivaceous in the beginning but turn black ultimately. The disease can be controlled by spraying with Benlate (0.1%) or Indofil M-45 (0.2%) at suitable intervals depending upon the severity of infection.

Powdery mildew: The disease appears as white floury patches on the leaves and tender shoots. It can be controlled very effectively by spraying with Benlate (0.1%), Sulfex (0.2%) or Karathane (0.05%).

Foot rot or crown rot: It is a very serious disease of gerbera. It affects the basal parts of the plants and hence named foot rot or crown rot. It is caused by fungi such as *Phytophthora cryptogea*, *Sclerotinia sclerotiorum*, *Sclerotium rolfsii* and *Rhizoctonia solani*. Crown rot due to *Phytophthora* is favoured by high humidity and waterlogged conditions and may be controlled by drenching of soil with

Thiram (0.3%), Ridomil MZ (0.2%) or Dexon (0.2%). The rots due to *Sclerotinia*, *Sclerotium* and *Rhizoctonia* may be controlled effectively by drenching of soil with Brassicol or Terrachlor (0.2 to 0.3%). The fungus *Botrytis cinerea* apart from causing spots on leaves and flowers causes severe crown rot symptoms. Benlate (0.1%) and Kavach (0.2%) may be used to achieve control of this disease.

Root rot: Root rot caused by *Pythium* sp. is very common in gerbera. It can be controlled by soil applications of Ridomil MZ (0.2%) or Thiram (0.3%).

Moyer and Peres, 2008^[10] studied Evaluation of Biofungicides for control of Powdery Mildew of Gerbera Daisy. The effect of calcium silicate, potassium silicate, and the biofungicide products Actigard (acibenzolar-S-methyl), K-phite (phosphorous acid), Milstop (potassium bicarbonate), Tricon (boron, orange oil and organic surfactants), Cease (*Bacillus subtilis*) and AgSil (potassium silicate) were evaluated in highly susceptible ('Snow White' and 'Orange') and moderately susceptible ('Hot Pink' and 'Fuchsia') gerbera cultivars. Results suggested that neither calcium silicate nor potassium silicate were effective in suppressing powdery mildew in gerbera daisy. The biofungicides products Actigard, Agsil, Cease, K phite, Milstop and Tricon, suppressed powdery mildew of gerbera daisy compared with untreated plants; however, these products were not as effective as the fungicide program of Heritage alternated with Eagle. Among the biofungicide products tested K-phite, Millstop and Tricon were the most effective in reducing disease severity. Thus, biofungicide products may be used as an alternative to reduce the use of fungicides for suppressing powdery mildew of gerbera daisy.

Physiological disorders

Stem break in Gerbera: This is most important physiological disorder of Gerbera, which occurs in middle portion of the stem and the major cause of this disorder is water imbalance, due to blockage of bacteria, water uptake is not proper.

Control

- Pre-treatment with Sodium hypochloride or Silver nitrate
- Handling of stems in such a way that water could enter into cavity of stem

Mohammadi *et al.*, 2023^[9] reported that by applying GA₃ and CaCl₂ neck bending can be overcome, extend maintainability, and improve marketability of gerbera 'Stanza' cut flowers.

Nahrabadi *et al.*, 2016^[12] observed that Eucalyptus and *Rosa damascena* essences and combination of them at 200 mg L⁻¹ with 4% sucrose increased the vase life and some qualitative traits of cut Gerbera cv. Alain Ducasse. The results showed that sucrose in combination with herbal essences increased vase life.

Conclusion

- Quality production of flowers is feasible under protected environments, Flowers produced under open field conditions failed to meet quality standards
- 75% of natural light intensity will increase number of leaves, leaf area and number of flowers

- Cut stem placed in vase containing GA₃ will delay flower senescence and petal fading
- Fan pad cooling system was found to be more useful for quality production of gerbera

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