PERFORMANCE OF GERBERA (*Gerbera jamesonii*) CULTIVARS IN TERMS OF QUANTITY AND QUALITY AS A SECOND YEAR CROP UNDER POLYHOUSE

A thesis submitted to the

MAHATMA PHULE KRISHI VIDYAPEETH,
RAHURI- 413 722, DIST. AHMEDNAGAR,
MAHARASHTRA STATE (INDIA)

by

PRAMOD GORAKH NIRMAL
B. Sc. (Agri.)

In partial fulfilment of the requirements for the Degree of

MASTER OF SCIENCE (AGRICULTURE)

in

HORTICULTURE

DEPARTMENT OF HORTICULTURE,
COLLEGE OF AGRICULTURE, PUNE-411005
MAHARASHTRA, INDIA

2004

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CANDIDATE'S DECLARATION

I hereby declare that the thesis entitled **"PERFORMANCE OF GERBERA (*Gerbera jamesonii*) CULTIVARS IN TERMS OF QUANTITY AND QUALITY AS A SECOND YEAR CROP UNDER POLYHOUSE"** or part there of has not been submitted by me or any other person to any other University or Institute for a Degree or Diploma.

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Date : 05 / 08 / 2004

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This is to certify that the thesis entitled, " **PERFORMANCE OF GERBERA (*Gerbera jamesonii*) CULTIVARS IN TERMS OF QUANTITY AND QUALITY AS A SECOND YEAR CROP UNDER POLYHOUSE**", submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE) in HORTICULTURE** embodies the results of a *bonafide* research carried out by **Mr. PRAMOD GORAKH NIRMAL**, under my guidance and supervision and that no part of the thesis has been submitted for any other Degree or Diploma.

The assistance and help rendered during the course of this investigation have been duly acknowledged.

Mulla

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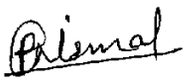
Place :



Date : *(Nirmal P. G.)*

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LIST OF ABBREVIATIONS

%	:	Per cent
/	:	Per
@	:	At the rate of
CD	:	Critical Difference
cm	:	Centimeter (s)
Cv	:	Cultivar
et al.	:	*et alli* (and others)
etc.	:	et cetera (and others)
Fig.	:	Figure
i.e.	:	id est (that is)
m	:	Meter (s)
m^2	:	square meter
mm	:	Milli meter
^0C	:	Degree Centigrade (Celsius)
ppm	:	Parts per million
SE	:	Standard Error
UV	:	Ultra violet
Var	:	Variety
Viz.,	:	Videlicet (namely)

ABSTRACT

PERFORMANCE OF GERBERA (*Gerbera jamesonii*) CULTIVARS IN TERMS OF QUANTITY AND QUALITY AS A SECOND YEAR CROP UNDER POLYHOUSE

By

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Research Guide	:	**Prof. A. L. Mulla**
Department	:	**Horticulture**

The present investigation was undertaken to evaluate the performance of gerbera varieties for second year of their growth under polyhouse condition at Hi-tech Floriculture and Vegetable Project, College of Agriculture, Pune-5 during 21st January, 2003 to 21st August, 2003. The experiment was laid out in Randomized Block Design. One year old plants of eleven varieties propagated by tissue culture *viz.*, 'Marmara', 'Farida', 'Skylina', 'Yanara', 'Charmander', 'Aida', 'Cabana', 'Thalassa', 'Sunway', 'Tonneke' and 'Sangria' were used. The observations for growth characters, yield and flower quality were recorded for seven months.

The varieties 'Sunway', 'Yanara', 'Skylina', 'Sangria' with longer flower stalk length are best suited for export quality cut flower production. Varieties 'Farida', 'Marmara' and Skylina produced higher number of suckers indicating their capacity to give higher sucker yield. The flowers of varieties 'Thalassa', 'Sangria', 'Cabana' and 'Farida'

posses more vase life in large vases and flower pots. The high yielding varieties Farida, Sangria, Marmara are useful for obtaining higher returns under polyhouse for second year. The varieties 'Yanara', 'Sunway', 'Sangria' produced higher percentage of 'A' grade flowers in second year of their growth. Thus, during the investigation period the varieties Sangria, Sunway, Yanara, Marmara and Farida performed well in terms of flower quality and flower yield in second year of their growth and can be recommended for commercial cultivation under polyhouse condition.

Pages 1 to 88

INTRODUCTION

1. INTRODUCTION

Worlds, floriculture trade is reported to be around US $ 60 billion per annum and increasing at 5 per cent per annum. Out of which more than 60 per cent is from cut flowers. Indian contribution to the world trade is less than 1 per cent. In India flowers are grown in an area of 88, 607, hectares with a production of 5.09 lakh tones of loose flowers and 6806 lakh cut flowers. The value of flowers exported was US $ 26.97 million (Singh, 2002).

The demand for traditional flowers like jasmine, marigold, crossandra, tuberose, chrysanthemum is well established in India whereas, the modern flowers like rose, carnation, gerbera, gladiolus, orchids etc. the demand is increasing both in domestic as well as international flower market.

In India the commercial growing of flowers is however confined to a few states *viz.*, Karnataka (29%) Tamil Nadu (21%) and Andhra Pradesh (11%) being the leading states and accounting for about 85 per cent of the total area under flower crops in the year 1999-2000. Maharashtra ranks 5th in terms of area with 6600 ha under floriculture crops. The total loose flower production during 1999-2000 in India was 509194 tonnes, with that of cut flowers was 680 million flowers (Singh. 2002).

Gerbera is an important cut flower suitable both for export and domestic purposes. Gerbera, commonly known as Transvaal Daisy. Barberton Daisy or African daisy produces very attractive flowers. It can be commercially grown through out the world under various climatic conditions. It is ideal for beds, borders, pots and rock gardens available in various colours and forms which suit different purposes. They also have considerable long vase life. Gerbera is named in honour of German

naturalist, Traugott Gerber. The genus Gerbera consists of about forty species of half hardy, perennial flowering nature. It belong to family composit ae which consists of many other important cut flowers like Aster, Dahlias, Chrysanthemum, Gaillardia, Marigold etc. The important gerbera species in studies *G. asplenifolia*, *G. aurantiaca*, *G. Jamesonii*, G. *Kuzeana*, *G. viridfolia* are important. (Bose and Yadav, 1999).

Among all the species *G. jamesonii* is the only species under cultivation. It is native to Natal and Transvaal. The plant of gerbera is stemless, tender, perennial herb. The flower heads are solitary, many flowered, with conspicuous rays in one or more rows, those of inner rows when present at very short, sub tubular and two tipped. The daisy like flowers are in wide range of colours. Based on flower heads they are grouped into single, semi double and double types (Loeser, 1986). The double types having bicoloured flowers are very attractive. The flower stalks are long and leafless (Das and Singh, 1989). Varieties having black centre are being designated as black centered or black headed cultivars.

Gerbera is admired as an ideal cut flower due to its ability to stand the rigour of transportation and its long lasting flower quality. Gerbera cultivars *viz.*, 'Cream', 'Clementine', 'Maroon', 'Flamingo', 'Delphi', 'Vesta', 'Fredeking', 'Nadja', 'Valentine', 'Freddaisy' are of commercial importance throughout the world.

The gerbera crop requires highly porous and well drained soil for better root growth. The soil pH should be between 5.5 to 6.5 to get maximum efficiency in absorption of nutrients. Sunny clear weather and average rainfall (500-625 mm) are suitable for this crop. The gerbera crop requires shading in the summer months. Fluctuations in temperature are harmful to crop. A night temperature of 12^0C is found responsible to increase production of flowers.

In world gerbera is grown in Holland, Italy, Europe and India for cut flower trade. In India it is distributed in the temperate and tropical areas like Jammu and Kashmir, West Bengal, Karnataka, Andhra Pradesh, Tamilnadu, Maharashtra etc. In Maharashtra it is grown in Nashik, Ahmednagar, Sangli, Satara, Kolhapur and Pune districts (Swarup, 1993).

The past five years have seen as proliferation, several export oriented enterprises in the country covering an area about 400 ha under protected cultivation. The protected cultivation is a necessity to protect plants during summer and from frost in winter. With the other advance of good quality of the crop and higher production estimates suggest that the flower trade in India is to the tune of 250 crores. Delhi alone accounts for about Rs. 50 crore of the trade.

Use of flowers is increasing both in developed and developing countries. In India too, consumption of flowers has increased manifold with globalization of trade and better economic development. According to flower promotion centre, demand for cut flowers will rise by 60 per cent by 2005 due to growth in the casual flowers and gift markets. India, Europe and Japan have now emerged, as new big markets due to higher per capita consumption.

With a view to encourage the floriculture industries, several state governments have initiated their own developmental programmes. Maharashtra State Agriculture marketing Board has initiated several steps for technology dissemination and market support in floriculture. Model floriculture centres were set up in different states. Areas around places like Pune, Bangalore, Delhi and Chennai have responded very well. The project called "Green house technology" for small scale farmers sponsored by FAO was implemented in Pune, Bangalore and Srinagar.

Infrastructure and marketing is developing. The cold storage facilities are also developing at several gateway airports for flowers are being set up.

Though there is large demand for rose, carnation and chrysanthemum in market the farmers however, consider gerbera as their first choice for cultivation, mainly due to early returns and easiness in cultivation. The crop being grown on large scale in the country and in Maharashtra necessities the study of important qualitative and quantitative characters of important exotic varieties under cultivation.

A very less studies have been conducted with regards to performance of gerbera cultivars especially under naturally ventilated polyhouse conditions. It is a two year crop. Attempts are made to study the performance of newly planted crop upto one year. However, the performance in second year have not been studied so far. Hence, it is proposed to undertake this kind of study with following objectives;

1. To study the performance of gerbera (*Gerbera jamesonii*) as a second year crop.
2. To study quality of flowers.
3. To study the vase life of flowers.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

Gerbera is one of the most important and attractive flower crop grown mainly for cut flowers. However, very little information is available regarding the performance of different gerbera varieties under polyhouse conditions. With a view to compare the results of the present study, a review of the literature pertaining to the various parameters was done. The relevant literature is presented under following titles:

2.1. Vegetative growth characters

2.2. Flower characters.

2.3. Yield characters.

2.4. Qualitative characters

2.1. Vegetative growth characters

2.1.1. Spread of the plant

Maleek (1997) in the performance of some gerbera varieties under Dapoli conditions reported significantly maximum plant spread (39.63 cm) in variety 'Parijat', while variety 'Pamelo' registered significantly minimum plant spread (23.34 cm).

Kumar and Kumar (2000) observed highest plant spread (32.9 cm) in cultivar 'Goldspot'.

Patil (2001) reported highest plant spread (57.64 cm) in variety Twiggy.

Singh and Mandhar (2001) in their study on varietal trial under low cost naturally ventilated greenhouse found maximum plant spread (72.71 cm) in cultivar 'Linola', while minimum plant spread (62.16 cm) was observed in variety White Sun.

Nair and Medhi (2002) studied twenty five varieties of gerbera at Bay Islands and recorded maximum plant spread (50.66 cm) in cultivars

'Versace', followed by variety 'Nebuloua' (48.20 cm). The minimum plant spread was observed in variety 'General Kaiser (34.13 cm).

Patil *et al.* (2002) recorded maximum plant spread (57.84 cm) in cultivar 'Twiggy', while minimum plant spread (42.00 cm) in cultivar 'Aruba'.

2.1.2. Number of suckers per plant

Bhattacharjee (1981) while studying the gerbera varieties under Bangalore conditions observed that variety 'Perfection' recorded maximum number of suckers (6.6) followed by varieties 'Agnihotri', 'V.P'. and 'Daintiness'. The remaining varieties in the study produced 2 to 4 suckers per plant.

Seventeen varieties were assessed for their performance in which variety 'RCG-5' produced highest (9.33) number of suckers per clump while varieties 'RCG-6', 'RCG-8', 'RCG-12', 'RCG-17' gave the lowest (5.67) average number of clumps per plant. (Anon, 1995).

Maleek (1997) in his study on some gerbera varieties in greenhouse reported that variety 'Fiona' produced higher number of suckers (4.20) per plant while variety 'Pamela' produced least number of suckers (1.65) per plant.

Patil (2001) reported highest number of suckers/plant (6.77) in variety 'Twiggy'.

Singh and Mandhar (2001) recorded maximum number of suckers per plant (4.55) in cultivar 'Linola', while variety 'Tara' produced minimum number of suckers per plant (3.49).

In the studies at Yercad it was found that variety 'G.J. 8' produced the highest number of suckers (11.3) per clump per year, while variety 'G. J. 31' recorded least (5.9) number of suckers per clump per year. Among ten accessions studied for their performance at Yercad the maximum (6.2) and minimum (3.7) number of suckers per plant were

produced in accession number 'G. J. 23' and 'G. J. 41', respectively. (Anon.,, 2001).

Studies on twelve accessions of gerbera at Kahikuchi,revealed that accession 'HRSG BR 8' and 'HRSG BR 3' produced highest (17.50) and lowest (3) number of suckers per clump respectively. (Anon., 2002)

Patil *et al.* (2002) reported that cultivar 'Twiggy' recorded maximum number of suckers (6.77) while Aruba recorded the minimum (3.60) number of suckers.

2.1.3. Number of leaves per plant

Bhattacharjee (1981) in his studies on the performance of different varieties of gerbera under Bangalore conditions reported significantly highest number of leaves per plant in variety 'Hima Devi' (70.4) followed by varieties 'Debendra's Glory' (53.6), 'Indu Kumari' (52.4), 'White perfection' (52.0) and 'Sunrise' (48.0). The least number of leaves were observed in variety 'Lady Mary Herbert' (14.0).

Varieties 'RCG-3' and 'RCG-7' showed highest number of leaves after 6 months (19.67) leaves/plant, while the lowest number of leaves (8.67) per plant were recorded in variety 'RCG-11' among seventeen varieties tested at Shillong. In another experiment among the seventeen varieties assessed at Shillong the mean leaf number after 12 months was highest (56) in variety 'RCG-5', while the lowest number of leaves per plant (18.67) were recorded in variety 'RCG-3' (Anon., 1995).

Kaur *et al.* (1996) reported that plants grown under plastic nets produced twice the number of leaves (37) and flowers (10) with better stem length as compared to plants grown under natural light intensity.

Maleek (1997) while studying the performance of some gerbera varieties under green house reported that variety 'Explosion' recorded significantly maximum number of leaves per plant at 30 days after planting (16), where as significantly minimum number of leaves (8.58)

were produced in variety ' Pascal' at 30 days after planting as compared to all the varieties except 'Mirage' (8.75), 'Pamela' (9.13) and 'Diamond' (9.38) which were at par.

Kumar and Kumar (2000) observed highest leaf number (26.64) in cultivar 'Goldspot'.

Singh and Mandhar (2001) recorded maximum leaf number (46.66) in cultivar 'Linola', where as variety 'Tara' recorded the minimum (28.10) number of leaves per plant.

At Shillong, among 23 varieties the highest number of leaves per plant (88.33) were recorded in variety 'RCG-95' followed by variety 'G.S. Lal' (36.67) while, the minimum number of leaves (11.67) were reported in variety 'RCG-5'. (Anon., 2002).

In another experiment, performance of different gerbera strains at Kahi kuchi revealed highest number of leaves (109.00) in accession 'HRSG-UR 12', followed by 'HRSG-BR 23' (102.00). The least number (20.42) of leaves were reported in accession 'HRSG Y-4' (Anon., 2002).

Nair and Medhi (2002) evaluated twenty five varieties at Bay Island and reported maximum and minimum number of leaves per plant in cultivars 'AVP-07' (51.50) and 'Yellow Queen' (22.70) respectively.

Kandpal *et al.* (2003) in their experiment at G.B.P.U.A. and T., Pantanagar recorded maximum number of leaves per plant in cv. DB- 113 minimum in cv. Sangria (5.94).

2.2. Flowering characters

2.2.1 Flower diameters

Arora and Jana (1978) in their study on flower characters of thirty seven gerbera cultivars reported maximum flower diameter (11.0 cm) in variety 'Yellow star' followed by variety 'Ambica' (10.6 cm). The variety 'Ada' showed the lowest flower diameter (5.3 cm).

Bhattacharjee (1981) in his studies on the performance of thirty one gerbera varieties observed maximum flower diameter (8.4 cm) in variety 'Indu Kumari', while the rest of the varieties had average flower diameter of 7.5 to 8 cm. Variety 'Orange Brown' produced the minimum (4.8 cm) flower diameter.

Parthasarthy and Ashwath (1991) in their trial with twenty one gerbera varieties concluded that variety 'Ambica' produced large bed flowers. They further reported that varieties 'Nebulusa' and 'Evening Bells' produced maximum flower diameter.

At AICFIP, Pune, tissue cultured varieties were evaluated for their performance. Among them variety 'Tropical' gave highest (7.3 cm) flower diameter. (Anon., 1994).

Assessment of performance of gerbera varieties at Shillong gave highest flower diameter in variety 'RCG-4' (10.37 cm), followed by variety 'RCG-9' (10-20 cm). The least flower diameter 7.6 cm was recorded in variety 'RCG-8' (Anon., 1995).

In another experiment a total of 55 accessions were assembled at the Yercaud Centre. A trial conducted on germplasm performance gave highest (8.8 cm) flower diameter in accession 'GJ-19', while the lowest diameter (7 cm) was observed in accession numbers 'GJ-18', 'GJ-20' and 'GJ 43'.

At AICFIP, Hydrabad and variety 'Rejoice' gave maximum average flower diameter of 9.7 cm followed by variety 'Pamela' (9.5 cm), while variety 'SD- 1' showed minimum flower diameter (2.5 cm) (Anon., 1995).

Boztak (1995) reported largest capitulum diameter in cultivars 'Brones' and 'Jaugar'.

Fakhari *et al.* (1995) reported largest flower diameter (11.2 to 12.15 cm) in cultivar 'Fame'.

Shirole *et al.* (1996) reported maximum flower diameter in variety 'Parijat' (10.20 cm).

Maleek (1997) reported that variety 'Aruba' significantly produced large sized flowers (15 cm diameters) than the rest of the varieties *viz.,* 'Apoorva', 'Parijat', 'Nevada', 'Sangria', 'Explosion' and 'Fiono' 3.98, 8.70, 8.66, 8.60, 8.58, 8.40 and 8.43 cm diameter, respectively. The variety 'Diamond' produced the smallest sized flowers (7.49 cm).

At Shillong, among 19 varieties evaluated, variety 'General Kaiser' showed larger average diameter of flower (12.65 mm). Variety 'Red Monarch' showed average smaller flower diameter (10.08 cm). In another trial, varieties 'G.J.23' and 'G.J.41' gave largest (10.7) and smallest (7.7 cm) flower diameter respectively when evaluated at Yercad (Anon., 2000).

In another study conducted at Pune, variety 'Pink Elegance' recorded highest flower diameter (10.70 cm), while variety 'Tavita' recorded lowest flower diameter (7.56 cm) variety 'Thalassa' produced flowers with diameter 8.70 cm (Anon., 2000).

Ambad *et al.* (2001) reported largest flower diameter in gerbera (10 cm) variety 'Parijat'. The variety 'Polar' showed smallest (7.50 cm) flower diameter.

Patil (2001) reported maximum flower diameter (13.8 cm) in variety 'Twiggy'.

Singh and Mandhar (2001) observed maximum flower diameter (10.44 cm) in cultivars 'Thalassa', followed by varieties 'Tara' (10.34 cm) and 'Triamisu' (10.25 cm). The variety 'White Sun' showed the minimum flower diameter (8.66 cm).

Seventeen varieties were collected, maintained and assessed for their performance at Pune. Highest flower diameter was reported in varieties 'Sangria' and 'Pink Elegance' (10.2 cm). Variety 'Thallasa'

produced flower diameter [illegible] cm, while, the lowest flower diameter (7.63 cm) was observed in variety 'Kalika' (Anon., 2001).

Ten promising accessions were studied for their morphological characters at Yercad. The highest flower diameter was observed in accession 'G. J. 23' (10.7 cm) followed by 'G. J. 10' (10.2 cm). The lowest flower diameter was found in accession 'G. J. 23' (10.7 cm) followed by accessions 'G. J. 8' (8.4 cm) and 'G. J. 55' (8.5 cm) (Anon., 2001).

A study at Kalyani regarding morphological characters indicated highest flower diameter in variety 'Calcutta Red' followed by 'Kalimpong' (7.96 cm). Small flowers (5.40 cm) were produced in variety 'Indu Kumari' (Anon., 2001).

Evaluation studies for six characters at shillong recorded highest flower diameter (9.78 cm) in variety 'Popular', followed by variety 'Alasmera' (9.37 cm). Flowers with smallest diameter (3.83 cm) were reported in variety 'Black Heart' (Anon., 2002).

A performance study of twelve varieties of gerbera at Kahikuchi indicated higher quality flowers with larger diameter (11.50 cm) in variety 'HRSG-Y6', while variety 'HRSG-Y4' produced small (5.50 cm) flowers (Anon., 2002).

Evaluation studies in gerbera varieties relating to eleven characters at Ranchi revealed that 'G.B.R.1', 'G.B.R.2' and 'G.B.P.2' produced larger diameter flowers (11.5 cm each) while variety 'G.B.P.4' showed smallest flower diameter (7 cm) (Anon., 2002).

Cultivar 'Dino' produced largest flowers (12.90 cm) followed by variety 'Dingo' (11.75 cm) and 'Pink Elegance' (11.28 cm). Smallest flower size (6.65 cm) was produced by variety ' Cango' at Shrinagar (Anon., 2002).

In an experiment on eleven varieties, varieties 'Diablow' and 'Rosabella' produced largest flowers with (10.5 cm) diameters, while varieties 'Thalassa' and 'Sangria' recorded flowers with (9.2 cm) and (8.5 cm) diameter, respectively. The minimum diameter was produced in variety 'Funda' (7.4 days) (Anon., 2002).

Nair and Medhi (2002) recorded larger flowers in variety 'Versace' (12.30 cm) and smaller flower diameter (6.62 cm) in varieties 'Pinkstar' and 'Calcutta Local'.

Patil *et al.* (2002) recorded maximum flower diameter in variety 'Twiggy' and minimum in 'Aruba' (5.90 cm).

Kandpal *et al.* (2003) recorded highest flower diameter (10.5 cm) in cv. Diablo and Rosabella while lowest (7.1 cm) in DB- 113.

2.2.2 Flower stalk length

Botzak (1995) reported largest and smallest stem length in cultivars 'Pumic Stone' and 'Sand' respectively.

Fakhari *et al.* (1995) reported longest stem length (57.8 to 70.1 cm) in cultivar 'Sunspot'.

Among seventeen varieties assessed at Shillong, variety 'R.C.G. 16' recorded highest stalk length (34.67 cm), while variety 'R.C.G. 10' recorded lowest (22.60 cm) stalk length (Anon., 1995).

At AICFIP Yercad, accession number 'G.J. 19' gave longest (51.2 cm) stalk length, while shortest stalk length of 35 cm was recorded in 'G. J. 19' accession (Anon., 1995).

Studies at AICFIP, Hydrabad reported highest stalk length of 60 cm in variety 'Tropical', followed by 'Sea Pearl' (56 cm). The average shortest (18.3 cm) stalk length was observed in variety 'Sandra' (Anon., 1995).

Maleek (1997) recorded that variety 'Pascal' produced longer flower stalk (51.46 cm) which was superior to rest of the varieties, while

variety 'Andriana' (23.52 cm) produced minimum stalk length which was at par to varieties 'Sangria' and 'Mirage' which produced flowers with 24.82 cm and 25.83 cm stalk length, respectively.

At Yercad varieties 'G. J. 4' and 'G. J. 55' recorded flowers with average tallest (60.5 cm) and shortest (43.2 cm) stalk length among the ten promising accessions evaluated (Anon., 2000).

At Pune, among the ten new gerbera cultivars assessed for their comparative performance, variety 'Diablow' produced longest flower stalk length (57.66 cm) followed by variety Sunanda' (53.33 cm), while variety 'Thalassa' produced stem length of 45.80 cm. The shortest flower stalk length was observed in variety 'Tavita' (35.3 cm) (Anon., 2000).

At Yercad, evaluation of promising cultivars of gerbera was carried out under different growing environments. The highest flower stalk length was observed under low cost polyhouse in variety 'Y.C.D. 1' while the shortest flower stalk length was produced in variety 'G. J. 6' (40.4 cm) (Anon., 2001).

At Pune, variety 'Diablow' gave longest flower stalk length (57.43 cm) followed by variety 'Funda' (54.03 cm). Varieties 'Sangria' and 'Thalassa' produced flower stalk lengths of 42.40 and 47.47 cm, respectively. Variety 'Tavita' produced flowers of 37.50 cm stalk length (Anon., 2001).

Performance of 10 promising accession of gerbera was studied at Yercaud. The highest (62.0 cm) and lowest (42.7 cm) flower stalk length was observed in accessions 'G. J. 51' and G. J. 5' (Anon., 2001).

The performance of the new gerbera cultivars in respect of morphological characters indicated that variety 'Calcutta Yellow' performed well with highest flower stalk length (43.00 cm) as compared to 'Calcutta Pink' (42.33 cm). The shortest flower stalk length was

produced in variety 'Kalimpong Red' and 'Kalimpong Yellow' (10 cm each) (Anon., 2001).

Evaluation of promising cultivars under different growing environments such as open field, shade net and low cost greenhouse was carried out at Yercad. Among them, variety 'G. J. 23' performed better than other accessions. The plants grown under low cost polyhouse produced flower stalks with highest mean length (66.9 cm), followed by 25 per cent shade net (66.6 cm). Accession ' G. J. 11' produced 44.7 and 38.4 cm flower stalk length in low cost polyhouse and 25 per cent shade net respectively (Anon., 2001).

Evaluation of twenty three gerbera varieties under polyhouse conditions at shillong revealed longest flower stalk length (46.87 cm) in variety 'R.C.G. 114'. The shortest flower stalk (28.30 cm) was observed in variety 'R.C.G. 127' (Anon., 2001).

The longest flower stalk (56.50 cm) was produced in accession 'HRSG-OC 1', while shortest stalk length was produced in accession 'HRSG-OR 9' (31.60 cm) at Kahikuchi (Anon., 2001).

Among the gerbera varieties evaluated at Srinagar, maximum stalk length of 51.66 cm and 50 cm was recorded in varieties 'Lilla Billa' and 'Thalassa' respectively. The shortest stalk length of 26.00 cm was recorded in variety 'Rosna' (Anon., 2001).

Patil (2001) reported maximum flower stalk length (64.6 cm) in variety 'Jankfrau'.

Singh and Mandhar (2001) observed maximum flower stalk length (64.00 cm) in cultivar 'Lyonella' followed by variety 'Tara' (53.08 cm), while significantly minimum flower stalk length was observed in variety 'Diablow' (51.04 cm).

Ambad *et al.* (2001) studied six promising varieties of gerbera and reported maximum flower stalk length in variety ' Palermo' (51.00 cm),

followed by 'Polar' (50.50 cm) and 'Parijat' (50.30 cm), while minimum flower stalk length was observed in variety 'Angela' (40.00 cm).

Nair and Medhi (2002) in their studies on 25 gerbera varieties at Bay Islands reported longest stalk length (42.71 cm) in variety 'AVPO8' and shortest flower stalk length of (22.90 cm) in variety 'Divas Memory'.

Eleven varieties were evaluated at Pantnagar for performance variety 'Alasmeera' produced flowers with longest stalk (59.00 cm), while variety 'Devis Memory' produced flowers with shortest stalk (34.5 cm) (Anon., 2002).

Patil *et al.* (2002) recorded maximum stalk length (64.46 cm) in variety 'Aruba'.

2.2.3. Flower stalk thickness

Trial conducted on the performance of germplasm at AICFIP Yercad indicated that 'G. J. 8' produced good quality flowers with thick stem (1.8 cm) which were free from bent neck symptoms. Stem girth was found to be less in varieties 'G. J. 36' and 'G. J. 41' (1.0 cm) (Anon., 1995).

Variety ' Spartan' recorded thicker diameter of stalk (1.2 cm), while variety 'SD 2' recorded thinner diameter of stalk (0.4 cm) at AICRIP Hydrabad (Anon., 1995).

Shirole *et al.* (1996) reported maximum stalk thickness in variety 'Vijay' (0.85 cm).

At Yercad, accession number 'G. J. 23' recorded higher stalk girth (1.92 cm) diameter followed by 'G.J. 19' (1.90 cm). The least flower stalk girth was reported in variety 'G. J. 4' (1.40 cm) (Anon., 2000).

Varietal performance of ten new gerbera cultivars at Pune, revealed thickest stem in varieties 'Ornella' (0.90 cm), followed by variety 'Funda' (0.76 cm). Variety 'Thalassa' produced flower stalk of diameter

0.53 cm. The flowers with thinnest stalk girth were produced in variety 'Sunanda' (0.50 cm) (Anon., 2000).

Among the accessions studied for their morphological performance, accession 'G. J. 23' showed the thickest stalk girth (1.95 cm), followed by accession 'G. J. 19' (1.92 cm). The least flower stalk girth was recorded in accession 'G. J. 1' (1.68 cm) (Anon., 2001).

Patil (2001) reported maximum thickness of stalk (0.93 cm) in variety Jankfrau.'

Singh and Mandhar (2001) reported maximum stalk thickness (0.75 cm diameter) in cultivar 'Tiramisu'.

Evaluation of 23 varieties at shillong in polyhouse reported maximum (0.56 cm) and minimum (0.13 cm) stalk diameter in varieties 'R.C.G. 64' and Pink star' respectively (Anon., 2002).

Studies on the performance of different strains of gerbera at Kahikuchi revealed maximum stalk girth (2.50 cm) in accession 'HRSG-Y 6'. Thinnest stalk girth of 1.20 cm was produced by accession 'HRSG-Y4' (Anon., 2002).

At Ranchi, varieties 'G.B.R. 1' and 'G.B.Y. 1' revealed thicker, while accession 'G.B.P. 3' revealed thinner stalk diameter of 3 cm and 1.75 cm respectively (Anon., 2002).

At Srinagar, cultivars 'Xamena' recorded maximum stalk diameter (0.52 cm), whereas varieties 'Lilla Billa' and 'Optima' recorded stalk diameter of 0.50 cm each. The minimum stalk diameter (0.30 cm) was recorded by variety 'Grizzle' (Anon., 2002).

Among eleven varieties evaluated at Pantanagar, varieties 'Diablow' and 'Alasmeera' produced thicker flower stalk diameter (0.70 cm), while thinner diameter (0.34 cm) was produced in variety 'Orange Glem'. Variety 'Thalassa' and 'Sangria' produced flowers with stalk diameters of 0.65 and 0.75 cm respectively (Anon., 2002).

Patil *et al.* (2002) reported highest stem diameter of (0.93 cm) in variety 'Jankfrau'.

Kandpal *et al.* (2003) in their experiment at Pantanagar recorded 'Diablow' and 'Alasmeera' cultivars having maximum stalk diameter (0.70 cm) and 'Orange Glem' had the least (0.34 cm).

2.2.4. Number of whorls of ray florets per flower

Patil (2001) reported maximum number (9) whorls of ray florets per flower in variety 'Twiggy' followed by 'Detty' (8). The lowest numbers whorls of ray florets (2 each) were observed in varieties 'Jankfrau', 'Fuego' and 'Laurentius'.

Borate (2002) in his study on varietal trial on gerbera under shade net reported maximum (6) rows of ray florets in variety 'Orion' followed by variety 'Tiramisu' (5) and 'Twiggy' (5). Varieties 'Eclips', 'Ringo' and 'Testarossa' had 2 whorls of ray florets each.

2.2.5. Number of ray florets per flower

Nair and Medhi (2002) found maximum number of ray florets per flower (59.10) in variety 'Evening Bells', followed by variety 'Pink star' (57.13). The minimum number of ray florets per flower (29.35) was found in variety 'Calcutta Local'.

2.3 Yield characters

2.3.1 Number of flowers per plant

Papenhagen (1978) studied five most valuable Friesdorf clones of gerbera ('Bolero', 'Adelita', 'Carita', 'Rosamunda' and 'Ursula'). Their productivity of 36-40 flowers per plant was suppressed only by the variety 'Clementive'. Summer production was 40 per cent, winter 15-19 per cent while the spring production 41-51 per cent of the total production.

Grabowska *et al.* (1979) carried out evaluation of eight cultivars and two strains of *Gerbera jamesonii* in Poland and recorded that cvs 'Fermin', 'Zalmora', 'Veronica', Oranje-Nassau' and the 'Bloemfonten' strain were most productive, while cultivars 'Romeo' and 'Sylvia' and the 'Goosen' strain were the least productive.

Bhattacharjee (1981) in his studies at Bangalore observed maximum number of flowers in varieties 'Indu Kumari' and 'Gloriosa' (13.4 each). Variety 'Yellow Mist' (6.4) produced lowest number of flowers.

Reimherr *et al.* (1981) tested the gerbera cultivars of cut flower production at six locations. Varieties 'Saskia', 'Amaranta', 'Labonit', 'Salmrosa' and 'Clivia' gave yields comparable with those of the standard varieties 'Clementine' and 'Apple blossom'. Varieties 'Saskia' and 'Amaranta' produced the highest winter yields.

Eberhardt (1992) studied six newly released gerbera cultivars and reported that varieties 'Enzett Bootes' had significantly lowest yield (15.1 blooms per plant), while variety 'Enzett Orion' gave highest yield of 21 blooms per plant.

Reimherr *et al.* (1983) tested eleven gerbera cultivars for their yield. The highly productive 'Apple Blossom' and 'Clementive' were used as standards. Varieties 'Onyx' and 'Labignon' produced high yields, while varieties 'Veronica', 'Larstens' and 'Hanny' produced poor yields.

Gelder *et al.* (1985) reported highest total flower number/plant in variety 'Apple blossom' followed by variety 'Terrafame'.

Vidalie *et al.* (1985) reported that varieties 'Clementine' and 'Valentine' yielded well, both quantitatively as well as qualitatively.

Loeser (1986) in his experiment grew fifty cultivars of gerbera in greenhouse and recorded highest cut stems yield per plant in varieties 'Alexis' (36), 'Bittis' (33) and 'Salmeasa' (33).

Reimherr *et al.* (1986) reported highest flower yield in varieties 'Labalgo' (30 stems per plant) followed by 'Nadja' and 'Terraqueen' (23 stems/plant each), 'Dusty' (22 stems per plant) and 'Fredeking' (28 stems per plant).

Loeser (1989) reported that cultivars 'Roma', 'Monaco', 'Gelb' and 'Julia' produced maximum number (33-39) of flowers/plant.

Kim *et al.* (1990) reported that variety 'Clementine' produced a total of 79.7 flowers per plant during the second year compared with 64 and 46.4 flowers per plant in varieties 'Terramint' and 'Terraclaypsos' respectively.

Parthsarthy and Ashwath (1991) carried out trials with 21 varieties of gerbera at Barapani and observed that varieties 'Sweet Heart', 'Red monarch' and 'Salmon spray' produced maximum number of flowers per plant.

Among 17 types evaluated at Pune, varieties 'Yellow' and 'Muster' performed well with yields of 40 and 37.2 flowers/plant respectively (Anon., 1994).

At AICFIP Pune, among the 12 tissue cultured varieties tested the variety ' Tropical' performed well in all the floral and yield contributing characters with 36.3 flowers per plant (Anon., 1994).

At AICFIP Pune, assessment of performance of seventeen gerbera varieties indicated that varieties 'R.C.G.1' produced highest number of flowers (16.67) while variety 'R.C.G.14' produced lowest (11.67) flowers (Anon., 1995).

A trial at AICFIP Yercaud, reported highest average flower yield (68 flowers) per year in variety 'G.J.8', while the lowest average yield of flowers per year (52.8 flowers) was observed in 'G.J.43' (Anon., 1995).

Fakhari *et al.* (1995) reported highest (5.96 to 6.2) and lowest (3.42 to 5.46) flowers per plant per month in cultivars 'Fame' and 'Sunspot' respectively.

Trial at Vellanikkara (Kerala) reported that gerbera 'Preseley' gave best performance with regards to flowers yield (21.8 flowers/plant), while variety 'Polar' recorded highest number of flowers (51.0 flowers/plant) in a trial at Pune (Anon., 1998).

Kumar and Kumar (2000) reported highest number of flowers/plant (3.78) and highest number of flowers/unit area (23.56) in cultivar 'Goldspot'.

Evaluation of varieties at Shillong recorded highest flower yield (7 flowers per plant) in variety.

'G. S. Lal' and 'Red Monarch', while variety 'Niyana' recorded only 2 flowers per plant (Anon., 2000).

Performance of some promising gerbera accessions at Yercaud revealed that accession 'G. J. 23' performed well with highest average yield of 60.2 flowers per clump per year, while variety 'G. J. 24' recorded less number of (34.6) flowers per plant (Anon., 2000).

Comparative performance of ten new cultivars at Pune revealed that variety 'Ornella' produced highest (9.2) average flowers per plant followed by 'Diablow' (9.00). Variety 'Thalassa' produced 7.5 flowers. The lowest flowers among the varieties was recorded in variety 'Funda' (5.10 flowers) (Anon., 2000).

Studies on the performance of gerbera varieties at Pune revealed that variety ' Ornella' produced highest number of flowers (34.67) followed by 'Sangria' (33.40), 'Thalassa' produced (29.30) flowers, while the lowest flowering was observed in variety 'Sunanda' (24.67 flowers).

A comparative performance of 10 promising accessions was studied at Yercaud. Highest number of flowers per clump (42.3), while lowest number of flowers (21.4) were observed in accession 'G. J. 23' and 'G. J. 55' (Anon., 2001).

Studies on morphological characters of gerbera varieties at kalyani revealed that variety 'Calcutta Red' performed best with highest yield (45.66 flowers per clump), followed by variety 'Alasmeera' (38.33). Variety 'Kalimpong Red' produced least (8) number of flowers per clump (Anon., 2001).

Evaluation of twenty three varieties under polyhouse condition at Shillong depicted highest number of flowers (5) in variety 'G.S. Lal' (1.89) were reported in variety 'R.C.G.172' (Anon., 2001).

Studies at Srinagar revealed that flower yield was maximum in variety 'Racko' producing 51.69 flowers/plant, followed by variety 'Tir amis u' (34.59 flowers/plant) variety 'Thallasa' produced lowest yield/plant (15.94) (Anon., 2001).

Patil (2001) reported highest yield per plant and per plot (22.50 and 393.5) respectively in varieties 'Twiggy' and lowest yield of corresponding characters in cultivar 'Nevada' (9.68 and 158), respectively.

Ambad *et al.* (2001) in their experiment with six promising varieties reported that variety 'Polar' gave highest number of followed by variety 'Angela' producing 34.5 flowers per plant per year.

Singh and Mandhar (2001) reported highest yield, number of flowers per plant per year in variety 'Diablow' (54.67) and lowest yield variety 'Tara' (21.60).

Performance of 12 different strains of gerbera at Kahikuchi recorded highest number of flowers (24.00) in variety 'HRSG-R7' while

the minimum number of flowers (3.00) were reported in variety 'HRSG-Y4' (Anon., 2002).

Studies on morphological characters of 11 gerbera accessions at Ranchi revealed maximum number of flowers in accession 'GBR-3' (8.2). The minimum number of flowers in accession 'GBR-3' (8.2). The minimum number of flowers (3.2) per plant were reported in accession GBP-3 (Anon., 2002).

Eleven gerbera varieties studied at Pantnagar revealed maximum (5.00) number of flowers per plant in variety 'Orange Glem', while minimum (1.00) number of flowers in variety 'Sunanda'. Varieties 'Thalassa' and 'Sangria' produced 2.25 and 1.50 flowers respectively (Anon., 2002).

Patil *et al.* (2002) recorded highest number of flowers per plant (22.53) in cv. 'Twiggy' while minimum was obtained in 'Aruba' (5.90).

Kandpal *et al.* (2003) reported highest number of flowers per plant in cultivars 'DB- 233' and 'DB- 113' (16.6) followed by 'PG- 2' (13.0) while minimum for cv. 'PG- 3' (2.8) flowers per plant.

2.3.2 Number of flowers per meter square

Lisiecka (1991) reported that cultivars 'Clementine', 'Robijn' and 'Saskia' produced 13.3, 16.6 and 22.2 flowers/m^2.

Pisanu *et al.* (1994) studied the gerbera cultivars 'Solara' and 'Mirage' and reported average yield of 235.8 and 155.4/m^2 respectively.

Lisiecka (1996) reported highest flower yield of 94 and 90 flowers/m in cultivars 'Roulette' and 'Tamara' respectively.

Patil (2001) reported highest (208.85) and lowest (83.5) number of flowers in cvs. 'Twiggy' and 'Nevada' respectively.

Ambad *et al.* (2001) in their experiment with six promising varieties reported that variety 'Polar' gave highest yield

(312.5 flowers/m^2) followed by 'Angela' (226 flowers/m^2). Variety 'Parijat' produced the minimum number of flowers (160.50/m^2).

Nair and Medhi (2002) in their study on twenty five gerbera varieties at Bay Island reported that varieties 'Versace' and Yellow Queen' produced highest (314.98/m^2) and lowest (141.17/m^2) flowers respectively.

2.4. Qualitative characters

2.4.1. Flower colour

Singh and Mandhar (2001) in their studies on flower colour in various gerbera cvs. reported *viz.*, 'Diablow' [Red (45.A)], 'Lyonella' [Yellow (7.A)] 'Ornella' [Orange-red (30.B)], 'Sunset' [Orange-red (30. B)], 'Tara' [Orange (28-A)], 'Thalassa' [Yellow (9.A)], 'Tir amisu' [Yellow orange (19.B)], 'Twiggy' [Red purple (67.A)] and 'White sun' [Pure white].

2.4.2 Flower grade

Loeser (1989) reported maximum percentage (93 to 95 percent) of "A" class flower in varieties 'Roma', 'Monoca', 'Gelf' and 'Jullia'.

Kim *et al.* (1990) reported that gerbera variety 'Clementine' produced the most prolific first grade flowers.

Bontemps (1999) reported that gerbera variety 'Terarosa' produced 80 to 85 percent flowers in grade extra or first grade, while only 10 percent of flowers were found to be unmarketable.

Singh and Mandhar (2001) reported highest first grade (96.42 per cent) and lowest second grade (3.32 per cent) and third grade/unmarketable (0.25 per cent) flowers in 'Twiggy'. The lowest first grade flowers (79.81 per cent) and highest unmarketable flowers (12.51 per cent) were observed in cultivar 'White Sun'.

2.4.3 Vase life

Brandis and Von (1979) suggested that for good vase life cut gerbera flowers (cvs. 'Mandarin' and 'Clone 989') have to be placed immediately after harvest in fresh water or in Chrysal V. B. solution but not in previously used water.

Barendse (1980) showed that water movement in basal portion of the stem is slower than the segment 2 - 3 inches higher. Therefore, the basal 2-3 inches should be removed before placing in vase. Vase solution (used for first 24 hrs) should consist of water (distilled), sucrose (9 per cent) and nontoxic antimicrobial agent such as household bleach (5 per cent sodium hypochloride) at about 7 ml/litre (or 1 tablespoon/gallon) or 8 HQC/8 HQS. at 200 mg/lit.

Brundert and Schmidt (1981) in their studies on six new gerbera cultivars found that varieties 'Geelzwags' and 'Jupitor' had a vase life of more than 15 days.

Nowak (1981) recommended that pretreatment to flowers with a solution containing 25 mg/l $AgNO_3$ + 200 mg/l 8 H.Q.S. +7 per cent sucrose for improving the vase life of gerbera flowers.

Schenk and Brundert (1981) in their experiment with ten gerbera cultivars reported that varieties 'Clementine' and 'Adelita pink' had maximum vase life, while varieties 'Bolero' and 'Flamingo' (Pink) had shortest vase life.

Brundert and Schmidt (1983) in their study in the comparison of 21 new gerbera cultivars reported that cv. 'Delphi' had the longest vase life (30 days) followed by cultivar 'Jolands' (27 days), while the flowers of variety 'Valentine' had the shortest vase life (15 days).

Loeser (1985) tested 108 gerbera cultivars for their vase life at 18-20^{0}C, 100-150 Lux and 45 per cent R. H. in 6 cm of water without

additives and reported that cultivars 'Alexis', 'Fredeking', 'Salmrosa', 'Bilitis' and 'Anke' had vase life of 15 days.

Jang (1985) in a trial on the effect of water quality on vase life of cut gerbera flowers noticed that the flowers held in water contaminated by plant material remained in good condition only for about 6 days, compared to about 14 days in case of fresh clean water.

Tija *et al.* (1987) reported the mean post harvest life of the 20 gerbera cultivars held in fluorinated water (1 mg fluride/lit) deionized water and 8 H.Q.C. (200 mg/lit) + Sucrose (20 g/lit) to be 6, 5.3 and 8.3 days respectively.

Accati and Jana (1989) observed best vase life in different gerbera cultivars in preservative solution mixture of 8 H.Q.C. (200 ppm)+ 300 ppm Ammonium Qxalo Acetic Acid (NAOA) + 10 ml 3, 4, 5-T + 20 gm/ litre sucrose.

Loeser (1989) reported maximum vase life in varieties 'Roma', 'Monaco', 'Gelb', 'Chole' and 'Julia' extending between 10 to 14 days.

Thangaraj *et al.* (1990) in their studies on vase life of twenty four accessions of gerbera, indicated that the accessions G. J. 8, 10, 16, 23 and 44 were suitable for use as cut flowers.

Rodney and Hill (1993) observed significant extension of longevity of cut gerbera flowers in varieties 'Double delight' (13.1) with the solution of preservatives BCDMH (12 mg available chlorine/ lit), while another preservative OICA (50 mg/lit) increased the vase life of cultivar 'Mercy' (15.8 days).

Burzo *et al.* (1993) showed longer vase life in variety 'Marlean' grown in greenhouse in preservative solution (2.5 per cent dextrose + 150 ppm 8 H.Q.C +200 ppm potassium chloride) as compared to distilled water.

At Yercad AICFIP centre among the 55 accession tested variety 'G.J.8' recorded vase life of 13 days while variety 'G.J.43' recorded the shortest vase life of 8 days.

Shirole *et al.* (1996) reported maximum (14 days) and minimum (9 days) vase life in varieties 'Panama' and 'Angela' respectively, in preservative solution (i.e. 3 per cent sucrose + 200 ppm 8 H.Q.C).

Maleek (1997) reported significantly maximum vase life of cut flowers in fresh water in varieties 'Aruba' (8.5 days) and 'Sangria' (8.35 days). The variety 'Nevada' (6.45 days) registered the least vase life.

The study on effect of vase solution on enhancement of vase life of gerbera variety 'Sangria' at Pune indicated that Aluminium Sulphate @ 300 ppm/litre had the highest vase life of 9.62 days with lowest stem and bent neck percentage of 60 per cent along with minimum amount (800 ml) of solution absorbed. The same variety performed poorly in water as compared to preservative with vase life of 6.75 days and 80 per cent bent neck (Anon., 2000).

Patil (2001) reported highest (10.76 days) and lowest (9.5 days) vase life in varieties 'Jankfrau' and 'Kasamattee' respectively. In preservative solution (3 per cent sucrose + 200 ppm 8 H.Q.C.).

Cut flowers of gerbera variety 'Alasmeera' were studied for vase life at Shillong. The treatment of cut stem with $AgNO_3$ $(SO_4)_3$ (200 ppm) + Sucrose (4 per cent) recorded the maximum vase life (13 days) with minimum stem break (10 per cent) and water uptake (140 ml). The minimum vase life (7 days) with stem break 60 per cent and 90 ml water uptake in the same variety (Anon., 2001).

Experiment studying the vase life in gerbera variety 'Thalassa' and 'Lyonella' at Hessar ghutta. In preservation solution $AgNO_3$ $(SO_4)_3$ @ 25 ppm recorded maximum vase life (12.25 days and 11.50 days)

respectively followed by the stems held in a solution containing $Al_2 (SO_4)_3$ (300 ppm) (Anon., 2001).

Cut flower vase life studies in Pune in variety 'Diablow' revealed that holding solution of Aluminum Sulphate (300 ppm) enhanced vase life of gerbera cut flowers by 7.5 days with least flower bent neck (50 per cent) compared to sodium hypochloride @ 25 ppm, Silver nitrate @ 25 ppm, Citric acid @ 300 ppm and control (water) with vase life of 5 to 6.5 days and 70 to 80 per cent bent neck (Anon., 2002).

At Yercad, variety 'Y.C.D.1' recorded higher mean vase life (12.2) days, while variety 'Y.C.D.2' recorded the vase life of 11.3 days. Among the different vase solutions tried, silver nitrate @ 25 ppm concentration recorded the highest vase life of 14.5 days which was 72.6 per cent higher than control in variety 'Y.C.D.5'. The highest vase life of 13.8 days (84 per cent increase over control) was observed in the variety 'Y.C.D.2'. The same vase solution also recorded the lowest percentage of stem break (40 per cent).

At shillong, variety 'Alasmeera' recorded maximum vase life (13 days) with 10 per cent bent neck in vase solution containing $AgNO_3$@ 20 ppm + sucrose @ 4 per cent and 60 per cent bent neck in vase solution of 8 H. QC @ 400 ppm + 4 per cent sucrose.

Evaluation of varieties at Ranchi indicated that varieties 'G.B.R. 1' and 'G.B.P. 1' recorded highest (8.76 days) and lowest (6.14 days) flower vase life.

Nair and Medhi (2002) in their studies recorded highest and lowest vase life of 10.30 and 5.40 days, respectively 'AVP-07' and 'Pink star'.

Patil *et al.* (2002) recorded variety Jankfrau having the maximum vase life of 10.76 days in water and 13.26 in preservative. Whereas 'Rosamette' showed the minimum vase life of 7.66 days in water and 9.50 days in preservative.

Kandpal *et al.* (2003) reported maximum vase life in cultivar 'DB- 232' (10.0 days) followed by cvs. 'DB- 113', 'Davis memory', 'Goldspot'and 'PG- 2' (9.0 days each). The minimum vase life was recorded in cvs. 'Sangria', 'Ornella', 'Evening Bells' and 'Greenish Yellow' (6.0 days).

MATERIAL AND METHODS

3. MATERIAL AND METHODS

The details of the material used and methods followed during the course of the investigation are described in this chapter

3.1 Experimental site

The present investigation was carried out at Research Polyhouse unit of Hi-Tech Floriculture and Vegetable Project, College of Agriculture, Pune – 5 during January 2003 to September 2003 for one season. The polyhouse used was a naturally ventilated polyhouse of 560 m^2 area. One year old well established eleven exotic varieties available with the project, were used for testing their varietal performance.

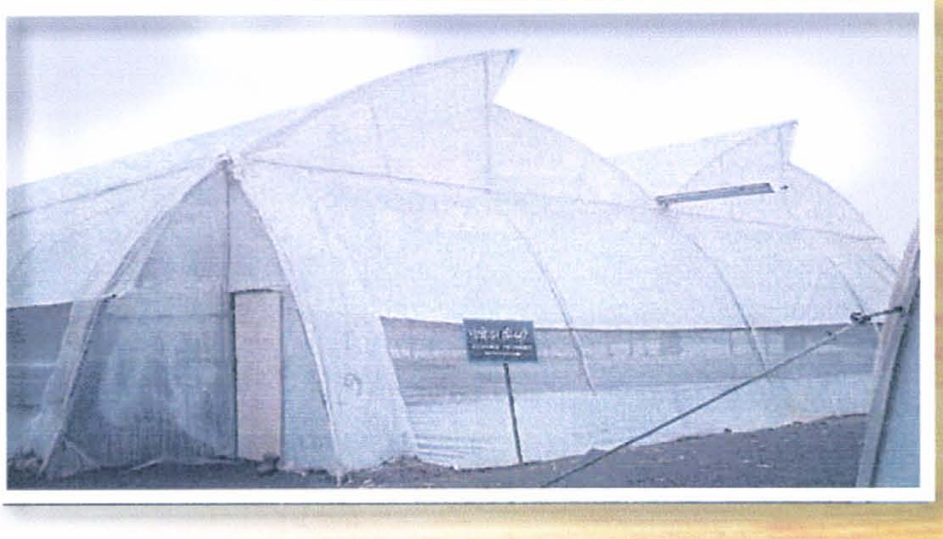
3.2 Geographical location, climate and weather conditions

Pune is situated in mid-west Maharashtra at an altitude of 559 m above mean sea level. It is located in sub-tropical region at 18.32^0 N latitude and 73.51^0 E longitude. The mean annual rainfall at Pune varies between 670-750 mm, normally distributed from June to October. The average maximum and minimum temperature and humidity during the period of experiment were 39.5^0C and 17.6^0C and 93 per cent and 23 per cent, respectively. The data regarding weather conditions prevailing at Pune during the course of the experiment are presented in Appendix 1.

3.3 Polyhouse

The polyhouse installed at Hi-tech Floriculture and Vegetable Project, Pune- 5 for research purpose was used for the investigation. The polyhouse was of gutter connected or ridge and furrow type having a natural ventilation system. Thirty per cent space was uncovered or open from all sides. The polythene film used was of 200 micron, 2.5 mm thick

PLATE - 1



EXPERIMENTAL POLYHOUSE

and UV stabilized. Pots were kept on iron stands of waist height (60 cm) occupying 30 pots on one stand. The clay pots used for planting were 3 litres in volume. The walkway distance between the two stands was of 60 cm. The irrigation and fertigation system was provided in cycles by computer controlled system. Overhead foggers were used for control of high temperature during hot summer days. Shade net (50 per cent) was also used for protecting the plants from excessive sun heat during hot summer.

3.4 Planting material

One year old seedlings of eleven exotic varieties transplanted on 21st January 2002 available with Hi-Tech Floriculture and Vegetable Project, Pune- 5, procured from Kumar Florist, Pune were used for present study.

3.5 Methods

3.5.1. Experimental details

1. Statistical Design : Randomized Block Design.
2. Number of treatments : 11 (varieties as a treatment and 10 plants as a unit).
3. Number of replications : 3
4. Plot size : i) Gross : 2 x 0.90 m.
   ii) Net : 1.8 x 0.70 m.
5. Spacing : 30 X 30 cm
6. Number of plots : 33
7. Number of plants/plot : 10
8. Date of planting : 21st January 2002.
9. Date of first observation : 21st January 2003.
10. Last date of observation : 21st Aug. 2003.

[Use of cultural practices and application of fertilizers were common for all treatments (varieties) as per recommendations].

3.5.2 Treatment details

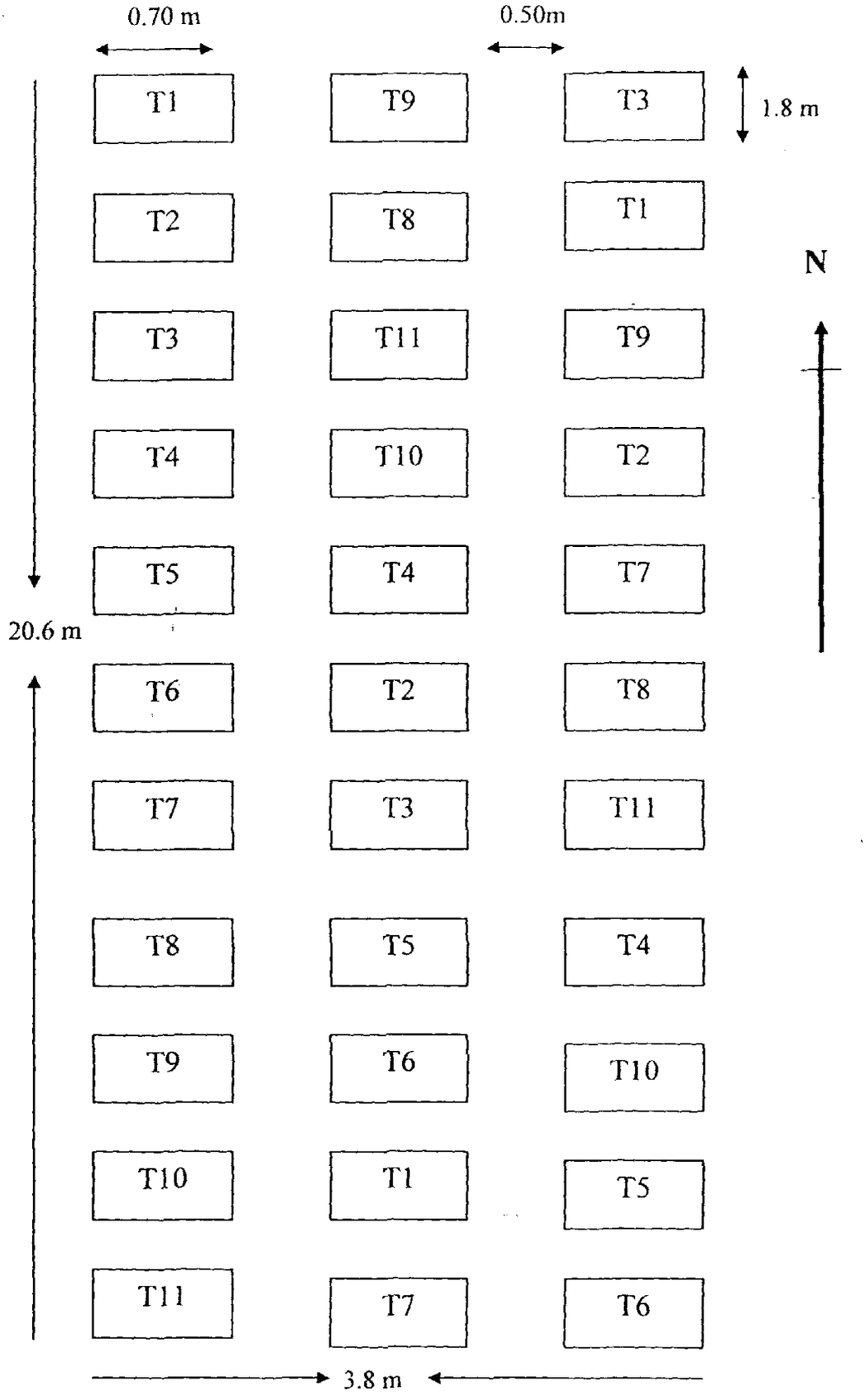
The details of the treatments and the symbols used are presented below.

Table 1 Treatment details

Sr. No.	Treatment	Symbol (variety as a treatment)	Type
1.	Marmara	T1	Semi double with black centre
2.	Farida	T2	Semi double with black centre
3.	Skylina	T3	Semi double
4.	Yanarq	T4	Semi double with black centre
5.	Charmander	T5	Semi double
6.	Aida	T6	Semi double with black centre
7.	Cabana	T7	Semi double with black centre
8.	Thalassa	T8	Semi double with black centre
9.	Sunway	T9	Semi double
10.	Tonneke	T10	Semi double with black centre
11.	Sangria	T11	Semi double with black centre

3.5.3 Plan of layout

The plan of layout along with all necessary details of the experiment are given below:



3.5.4 Sampling method

Five plants per treatment per replication were selected randomly for the purpose of recording growth parameters at 30 days interval from the date of first observation. The parameters like plant spread, number of suckers, number of leaves, number of flowers per plant etc. were recorded in each of the varieties over replications. The flowering characters *viz.*, vase life and qualitative parameters were recorded from plants and flowers in net plots only.

3.6 Package of practices

The detailed information regarding the important cultural operations carried out during present course of investigations were as under.

3.6.1 Fertigation

Fertigation to the gerbera plants was given in 4 to 6 cycles per day. Daily 600 ml water per pot was given. Fertigation was given with the help of computer controlled nutrition system, consisting of Tank A and Tank B mixing tank system with online monitoring and correction mechanism as and when necessary, an continuous basis. Electrical conductivity of the feed solution was kept in between 1.1 to 1.8 mmhos per cm and pH of feed solution was kept between 5.5 to 5.8. Feed solution was delivered to the base of each plant after being filtered through disc and sand filters, via mains, sub main and laterals, *via* 3.75 LPH drippers through 40 cm length micro tubes and supporting pegs. Fertilizer and nitric acid level was adjusted so as not to exceed the EC and pH limits.

3.6.2 Weeding and removal of dried leaves

Pots were kept weed free, dried leaves, if were found promptly removed from the pots by stripping off.

3.6.3 Plant protection measures

Regular plant protection operations were carried out to keep the plants free from diseases and pests.

Insecticides

1. Metasystox 0.1%, Mavrick 0.02% and Parathion were used to control aphids as and when required.
2. Malathion 0.1%, Endosulphan 0.1%, Methomyl, Synthetic pyrethroids, Dichlorovos 0.1% was used to control whiteflies and thrips.
3. Dimethoate 0.03% and Permethrin 0.05% were used to control leaf miner.

Acaricide

Pentac 0.02% and Avermectin 0.02% was used to control mites.

Fungicides

Benomyl and Rhidomil 0.2% and 0.3% respectively were used to control crown rot and root rot.

3.6.4 Harvesting

Harvesting was done at an interval of two to three days. Flowers were harvested, when outer two rows of disc florets were open. The flower stock was bent on either side and plucked. The ends of flowers were given a slanting cut in water to prevent vascular blockage and wilting of flower.

3.7 Observations recorded

3.7.1 Vegetative growth characters

3.7.1.1 Plant Spread

The spread of each plant in the east- west and north-south direction was measured in cm using a meter scale at 30 days interval and average spread was calculated.

3.7.1.2 Number of suckers per plant

Number of suckers produced per plant were counted at the start of season and at the end of season.

3.7.1.3 Number of leaves per plant

The total number of leaves per plant at the start of season and at the end of season were recorded.

3.7.2 Flower characters

3.7.2.1 Flower diameter

Mean flower diameter of five flower heads per plot was recorded. The distance measured from the centre to outermost whorl of the flower was measured as radius and the flower diameter was calculated.

3.7.2.2 Flower stalk length

Five flowers per plot were selected for recording the length of flower stalk in cm from the base of flower stalk to the neck of flower with the help of thread and scale and the mean was recorded.

3.7.2.3 Flower stalk thickness

The thickness of the flower stalk at middle, top and bottom of stalk was recorded. The average of the three was taken as stalk thickness. Five flowers per plot were used to record the observations.

3.7.2.4 Number of whorls of ray florets per flower

Randomly selected five flowers per plot were used for the purpose. The number of whorls of ray florets were counted at full bloom stage.

3.7.2.5 Number of ray florets per flower

Number of ray florets per flower were determined by counting them in five flowers of single plot and average of three plots was considered as treatment average.

3.7.3 Vase life

Five flowers of each variety were randomly selected and harvested by bending them to both side and plucking them. The stalks of harvested flowers were immediately dipped in distilled water. About 1 cm end portion of each stalk was cut in water to avoid air blockage and neck bending. The stalk ends dipped in water were cut about 5mm every alternate day to prevent clogging of vascular bundles. The number of days till the wilting of 50 percent flower petals or bending of the flower neck was observed and recorded. The mean was calculated as the vase life of the flower.

3.7.4 Quantitative characters (yield)

3.7.4.1 Number of flowers per plant per season

Per plant number of flowers of 5 plants for one season from a plot was recorded. An average of 3 plots of treatment was calculated.

3.7.4.2 Number of flowers per square meter

Number of flowers per square meter per season was recorded by considering the average number of flowers per plant per season.

3.7.5 Qualitative characters

3.7.5.1 Flower colour

The flower colour was recorded by comparing the flowers with the Floriculture Colour Chart issued by the British Council in Collaboration with the Royal Floriculture Society in natural light. (Anon. 1938)

3.7.5.2 Flower grade

Cut flowers were graded according to polish gerbera classification. Grades were made with following standards.

i) Grade A : (stalk length >50 cm. diameter of flower >10 cm)

ii) Grade B: (stalk length 30-50 cm. diameter of flower 8-10 cm)

iii)Grade C : (stalk length < 30 cm. attacked by pests and malformed).

3.8 Statistical Analysis

The statistical analysis of the data were done by standard method. Analysis of variance was calculated as per Panse and Sukhatme (1967). The standard error of mean was worked was worked out and the critical difference C.D. at 5 per cent level was calculated wherever the results were significant. The important results have been supported by graphs and plates.

RESULTS

4. RESULTS

The result of performance of eleven exotic gerbera (*Gerbera jamesonii*) varieties *viz.,* Marmara, 'Farida', 'Skylina', 'Yanara', 'Charmander', 'Aida', 'Cabana', Thalassa, 'Sunway', 'Tonneke' and 'Sangria' grown under naturally ventilated polyhouses condition for second year of their growth on various parameters like vegetative characters, flower characters and yield characters are presented and discussed as under;

4.1 Vegetative characters

The observations on the vegetative characters such as plant spread, number of suckers, number of leaves are important features which represent vigour of the plant and directly related to the output of plants.

4.1.1 Spread of the plant

The data regarding the mean spread of the plant at various stages *viz.,* at the start of second year and 30, 60, 90, 120, 150, 180, 210 days from start of second year in the different varieties under study was recorded and present as under;

4.1.1.1 Plant spread at start of second year

The data regarding mean spread of the plant at the start of second year are presented in Table 2 and illustrated in Fig 2, revealed that plant spread varied significantly due to varieties. The variety 'Skylina' (55.30cm) was found to have maximum plant spread at the start of second season, followed by varieties 'Yanara', 'Farida', 'Cabana', 'Marmara', 'Aida', 'Thalassa', 'Sangria', 'Charmander' recorded plant spread of 54.43cm, 53.50cm, 51.73cm, 51.06cm, 50.5cm, 50.43cm, 49.90cm, 49.56cm, 48.36cm respectively. The variety 'Tonneke' (44.53cm) recorded least plant spread at the start of second season.

4.1.1.2 Plant spread after 30 days

The data regarding the mean spread of the plants after 30 days are presented in Table 2 and illustrated in Fig. 2. The results of the data revealed that variety 'Skylina' (56.27cm) had the highest plant spread after 30 days followed by varieties 'Yanara' (55.20cm), 'Farida' (54.53cm) which were at par with each other and significantly superior over rest of varieties under study. Variety 'Tonneke' had the least (45.63cm) plant spread. Varieties 'Cabana', 'Marmara', 'Thalassa', 'Aida', 'Sunway', 'Sangria', 'Charmander' had plant spread of 52.80cm, 52.60cm, 51.50cm, 51.43cm, 51.03cm, 50.70cm, 49.53cm respectively and were found to be at par with each other.

4.1.1.3 Plant spread after 60 days

The data regarding the mean spread of the plant after 60 days after start of second season are presented in Table 2 and illustrated in Fig 2. The results from Table 2 indicate that variety 'Skylina' (57.23cm) had the highest plant spread of 60 days followed by variety 'Farida' (56.20cm) and 'Yanara' (56.16cm) which were at par with each other. Varieties 'Cabana', 'Marmara', 'Aida', 'Thalassa', 'Sunway', 'Sungria', 'Charmander' had 53.90cm, 53.83cm, 52.76cm, 52.66cm, 52.03cm, 51.96cm, 50.56cm plant spread at 60 days after start of second season.

4.1.1.4 Plant spread after 90 days

The data regarding the mean spread of the plant at 90 days after start of second season are presented in Table 2 and illustrated in Fig.2. The results of the data revealed that variety 'Skylina' (58.26cm) had the highest plant spread followed by varieties 'Yanara' (57.73), 'Farida' (57.33cm) which were at par with each other. While varieties 'Marmara' (55.03cm), 'Cabana' (55.96cm), 'Aida' (53.86cm), 'Thalassa' (53.86), 'Sangria' (53.03), 'Sunway' (52.90cm) have plant spread at par with each other. Variety 'Tonneke' had the least (48.26cm) plant spread.

Table 2. Mean spread (cm) of the plant in different gerbera varieties

Treatments	Varieties	At the spread of second year	Days after start of second year (days)						
			30 days	60 days	90 days	120 days	150 days	180 days	210 days
T_1	Marmara	51.06	52.60	53.83	55.03	56.16	57.53	58.80	61.43
T_2	Farida	53.50	54.53	56.20	57.33	58.23	60.00	61.43	62.66
T_3	Skylina	55.30	56.27	57.23	58.26	59.06	59.93	61.10	62.86
T_4	Yanara	54.43	55.20	56.16	57.73	59.16	60.86	62.46	64.13
T_5	Charmander	48.56	49.53	50.56	51.73	52.83	54.00	56.36	58.06
T_6	Aida	50.50	51.43	52.76	53.96	54.83	56.06	57.16	58.53
T_7	Cabana	51.73	52.80	53.90	54.96	55.80	57.36	58.43	59.53
T_8	Thalassa	50.43	51.50	52.66	53.68	54.43	55.56	56.63	57.70
T_9	Sunway	49.90	51.03	52.08	52.90	54.00	56.30	57.56	58.90
T_{10}	Tonneke	44.53	45.63	47.03	48.26	49.13	50.60	52.20	54.03
T_{11}	Sangria	49.56	50.70	51.96	53.03	54.10	55.23	56.53	57.80
C. D at 5%		1.347	1.429	1.633	1.489	1.616	1.765	1.660	1.492
S. E. ±		0.456	0.484	0.553	0.505	0.547	0.598	0.562	0.506

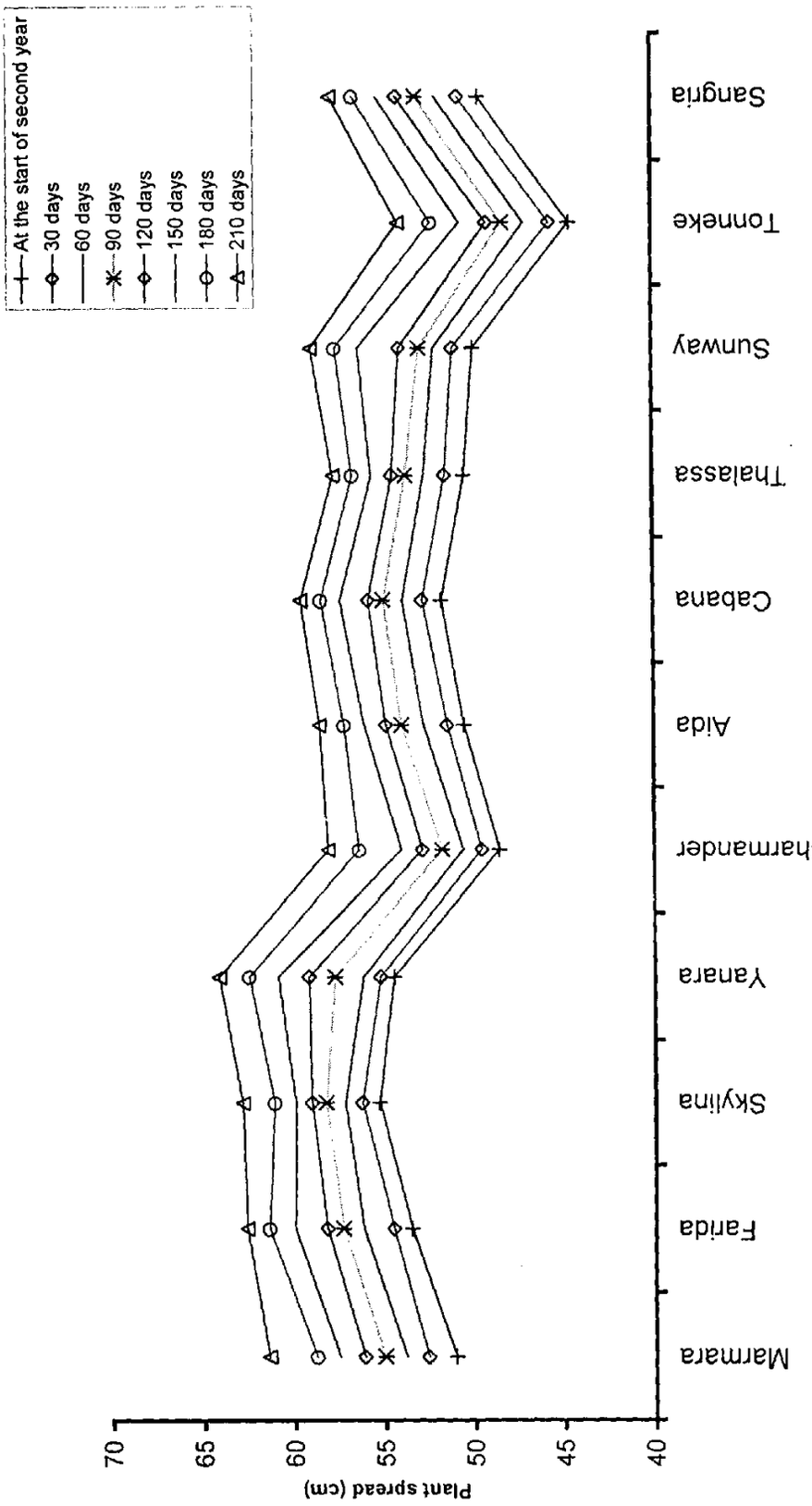


Fig. 2 Mean spread of the plant in different gerbera varieties

4.1.1.5 Plant spread after 120 days

The data regarding the mean spread of the plants at 120 days after start of second season are presented in Table 2 and illustrated in Fig. 2 that variety 'Yanara' (59.16cm) had the highest plant spread at 120 days after start of second season followed by variety 'Skylina' (59.06cm) and 'Farida' (58.23cm) which were at par with each other.Varieties 'Marmara', 'Cabana', 'Aida', 'Thalassa', 'Sangria', 'Sunway', having 56.16cm, 55.80cm, 54.83cm, 54.43cm, 54.10cm, 54.00 cm plant spread at 120 days after start of second season. Variety 'Tonneke' (49.13cm) had the least plant spread.

4.1.1.6 Plant spread after 150 days

The data regarding the mean spread of the plant at 150 days after start of second season are presented in Table 2 and illustrated in Fig. 2. The data from table 2 reveals that variety 'Yanara' (60.86cm) had the highest plant spread at 150 days after start of second season followed by variety 'Farida' (60.00cm) and 'Skylina' (59.93cm) which were at par with each other and significantly superior over the rest of the varieties under study. Variety 'Tonneke' (50.60cm) had the least plant spread after 150 days after start of second season which was at far low with other varieties.

4.1.1.7 Plant spread after 180 days

The data regarding mean spread of plant at 180 days after start of second season are presented in Table 2 and illustrated in Fig.2. The data from Table 2 indicate that variety 'Yanara' (62.46cm) had the highest plant spread at 180 days after start of second season which was significantly superior over the rest of varieties under study. Varieties 'Farida' (61.43cm) which is at par with variety 'Skylina' (61.10cm) both are superior over rest of varieties viz. 'Marmara' (58.70cm), 'Cabana' (58.43), 'Sunway' (57.56cm) which are at par with each other. Variety

'Tonneke' (52.20cm) had the least plant spread at 180 days after start of second season.

4.1.1.8 Plant spread after 210 days

The data regarding the mean spread of plant at 210 days after start of second season are presented in Table 2 and illustrated in Fig. 2. The data from Table 2 indicate that variety 'Yanara' (64.13 cm) had the highest plant spread at 210 days after start of second season, which was significantly superior in plant spread over rest of the varieties under study. Varieties 'Skylina', 'Farida' and 'Marmara' had plant spread of 62.86cm, 62.66cm and 62.43cm respectively were found to be at par with each other. Variety 'Tonneke' (54.03 cm) had the least plant spread at 210 days after start of second season, which was far low than rest of varieties under study.

4.1.2 Number of suckers per plant

The number of suckers produced per plant differed in all gerbera varieties. The suckers continued to emerge throughout the growing period. The data pertaining to production of suckers per plant at the start of second year and at the end of investigation period are presented in Table 3 and illustrated in Fig. 3.

4.1.2.1 Number of suckers present per plant at the start of second year

The data from Table 3 reveal that variety 'Marmara' (4.20) having maximum number of sucker per plant at the start of second year, was superior over rest of the varieties under study. Variety 'Farida' produced 3.86 suckers per plant and was at par with variety 'Skylina' (3.60). Variety 'Sunway' produced significantly minimum number (2.20) of suckers over the rest of the varieties under study at the start of second year.

Table 3. Mean number of suckers per plant in different varieties of gerbera

Treatments	Variety	No. of suckers per plant at the start of second year	No. of suckers per plant at the end of investigation period.
T_1	Marmara	4.20	5.10
T_2	Farida	3.86	5.56
T_3	Skylina	3.60	4.93
T_4	Yanara	3.00	3.90
T_5	Charmander	2.83	4.53
T_6	Aida	3.13	4.86
T_7	Cabana	2.86	3.93
T_8	Thalassa	3.06	3.83
T_9	Sunway	2.20	3.23
T_{10}	Tonneke	2.73	3.70
T_{11}	Sangria	2.80	3.76
C. D at 5%		0.3280	0.774
S. E. ±		0.1110	0.2623

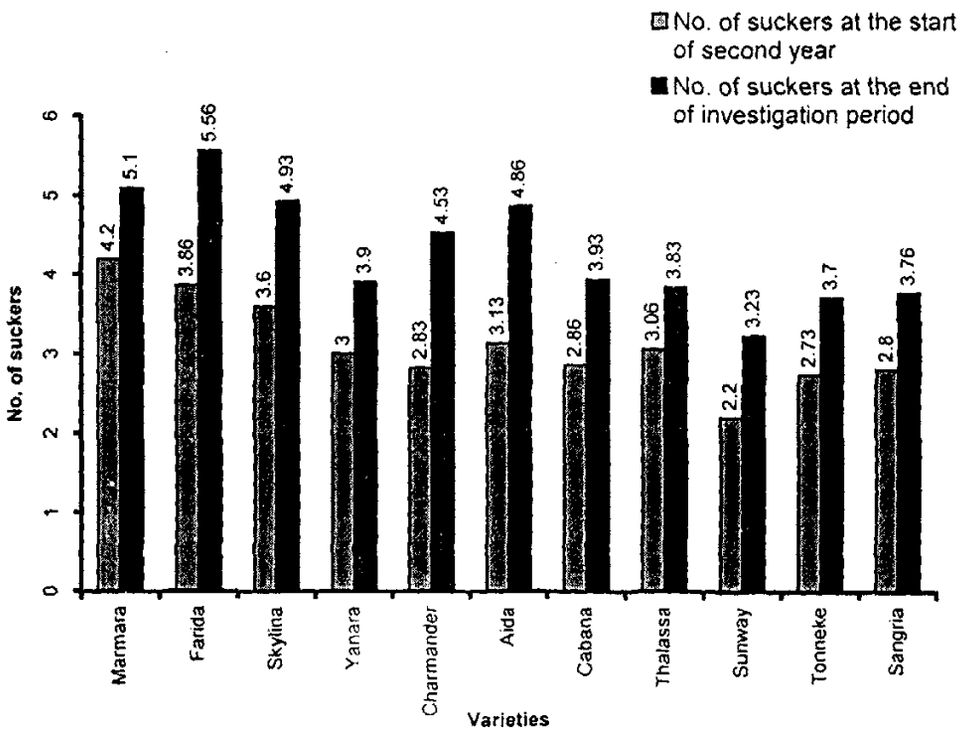


Fig. 3 Mean number of suckers in different varieties of gerbera

4.1.2.2 Number of suckers per plant at the end of investigation period

The data regarding no. of suckers produced per plantat the end of investigation period are presented in Table 3 and illustrated in Fig. 3. The data revealed that the variety 'Farida' (5.56) produced maximum number of suckers per plant followed by variety 'Marmara' (5.10), 'Skylina' (4.93) and 'Aida' (4.86) which are at par with each other and significantly superior over the rest of varieties under study. Variety 'Sunway' had the least (3.23) number of suckersper plant at the end of investigation which was at par with variety 'Tonneke' (3.70).

The pattern of variation at end of season with regards to suckers production per plant was as follows.

'Farida' > 'Marmara' > 'Skylina' > 'Aida' > 'Charmander' > 'Cabana' > 'Yanara' > 'Thalassa' > 'Sangria' > 'Tonneke' > 'Sunway'.

4.1.3 Number of leaves per plant

The development of foliage determines the canopy architecture as well as photosynthetic activity of plant. The number of leaves have also significant effect on yield. The data regarding number of leaves per plant at the start of second year and at the end of investigation period are presented in Table 4 and illustrated in Fig. 4.

4.1.3.1 No. of leaves per plant at the start of second year

The data from Table 4 indicate that variety 'Charmander' (38.46) had the highest number of leaves per plant followed by 'Skylina' (37.93), 'Sunway' (37.73) and 'Marmara' (36.43) which are at par with each other. The variety 'Tonneke' had significantly least (26.20) number of leaves per plant at the start of second season over rest of the varieties under study.

Table 4. Mean number of leaves per plant in different varieties of gerbera

Treatments	Variety	No. of leaves per plant at the start of second year	No. of leaves per plant at the end of investigation period.
T_1	Marmara	36.43	44.13
T_2	Farida	32.90	37.53
T_3	Skylina	37.93	40.33
T_4	Yanara	30.73	33.20
T_5	Charmander	38.46	40.00
T_6	Aida	35.63	37.60
T_7	Cabana	33.46	38.26
T_8	Thalassa	34.86	37.33
T_9	Sunway	37.73	39.26
T_{10}	Tonneke	26.20	30.46
T_{11}	Sangria	31.06	34.96
C. D at 5%		2.2387	2.4850
S. E. ±		0.7588	0.8423

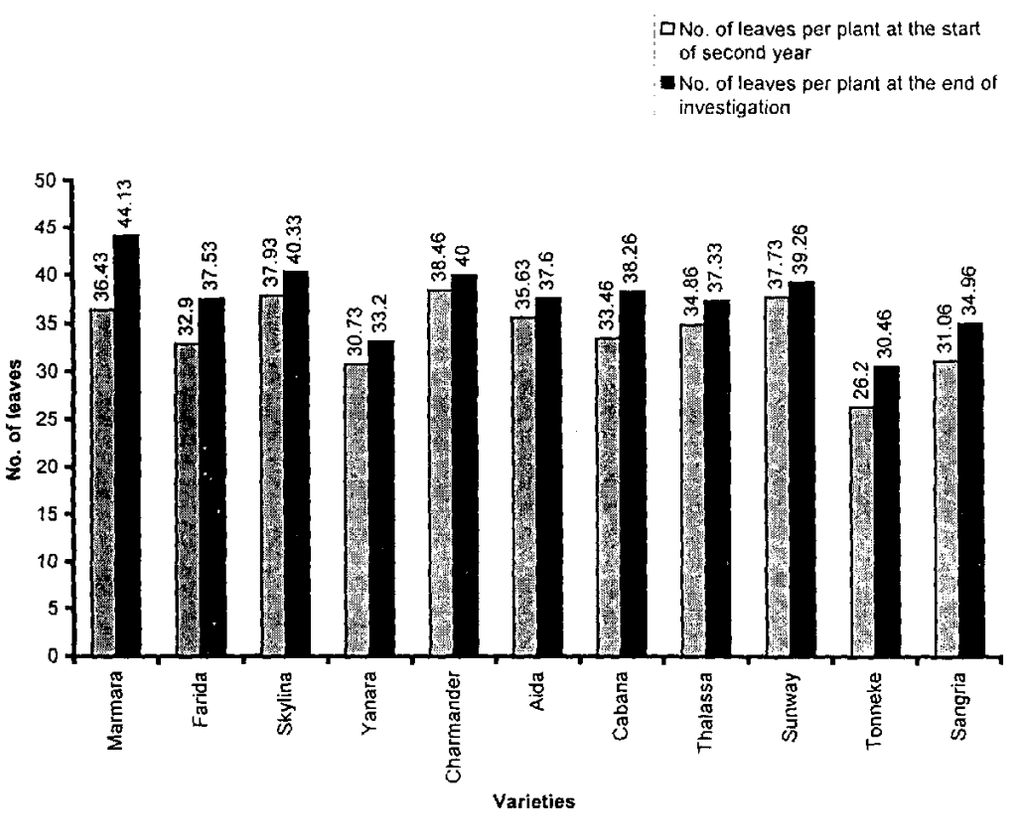


Fig. 4. Mean number of leaves per plant in different varieties of gerbera

4.1.3.2 No. of leaves per plant at the end of investigation period:

The data presented in Table 4 revealed that variety 'Marmara' (44.13) produced highest number of leaves per plant at the end of period of investigation followed by varieties 'Skylina' (40.33), 'Charmander' (40.00) and 'Sunway' (39.26) which are at par with each other and have significantly have higher no. of leaves that rest of varieties under study while variety 'Tonneke' (30.46) recorded least number of leaves per plant.

The pattern of variation of number of leaves per plant at the end of period of investigation was found to be as follows :
'Marmara' > 'Skylina' > 'Charmander' > 'Sunway' > 'Cabana' > 'Aida' > 'Farida' > 'Thalassa' > 'Sangria' > 'Yanara' >'Tonneke' .

4.2 Flower characters

The data pertaining to various flower characters such as flower diameter, flower stalk length and flower stalk thickness are presented in Table 5 and Fig. 5.

4.2.1 Flower diameter

The perusal of data presented in Table 5 and illustrated in Fig.5 clearly indicate that mean flower diameter varied significantly with varieties. The variety 'Sunway' produced big sized flowers (10.89cm diameter) than rest of varieties except varieties 'Yanara' and 'Skylina' (10.61 and 10.43cm diameter respectively) which were at par while the varieties 'Marmara', 'Thalassa', 'Farida', 'Sangria' 'Charmander' produced flowers having 9.89cm, 9.81cm, 9.60cm, 9.50cm and 9.22cm were found to be at par with each other. Significantly smaller sized flowers were produced by variety 'Cabana' (8.49cm) which was at par with variety 'Tonneke' (8.85cm).

Table 5. Mean flower diameter, flower stalk length and flower stalk thickness in different varieties of gerbera

Treatments	Variety	Flower diameter (cm)	Flower stalk length (cm)	Flower stalk thickness (mm)
T_1	Marmara	9.89	56.90	6.67
T_2	Farida	9.60	58.74	6.13
T_3	Skylina	10.43	60.20	6.23
T_4	Yanara	10.61	61.72	7.53
T_5	Charmander	9.22	52.46	6.26
T_6	Aida	9.10	54.23	6.63
T_7	Cabana	8.49	54.79	6.80
T_8	Thalassa	9.81	48.50	6.46
T_9	Sunway	10.89	62.96	6.70
T_{10}	Tonneke	8.86	55.32	6.30
T_{11}	Sangria	9.50	60.40	6.93
C. D at 5%		0.6869	2.7451	0.4973
S. E. ±		0.2328	0.9305	0.1686

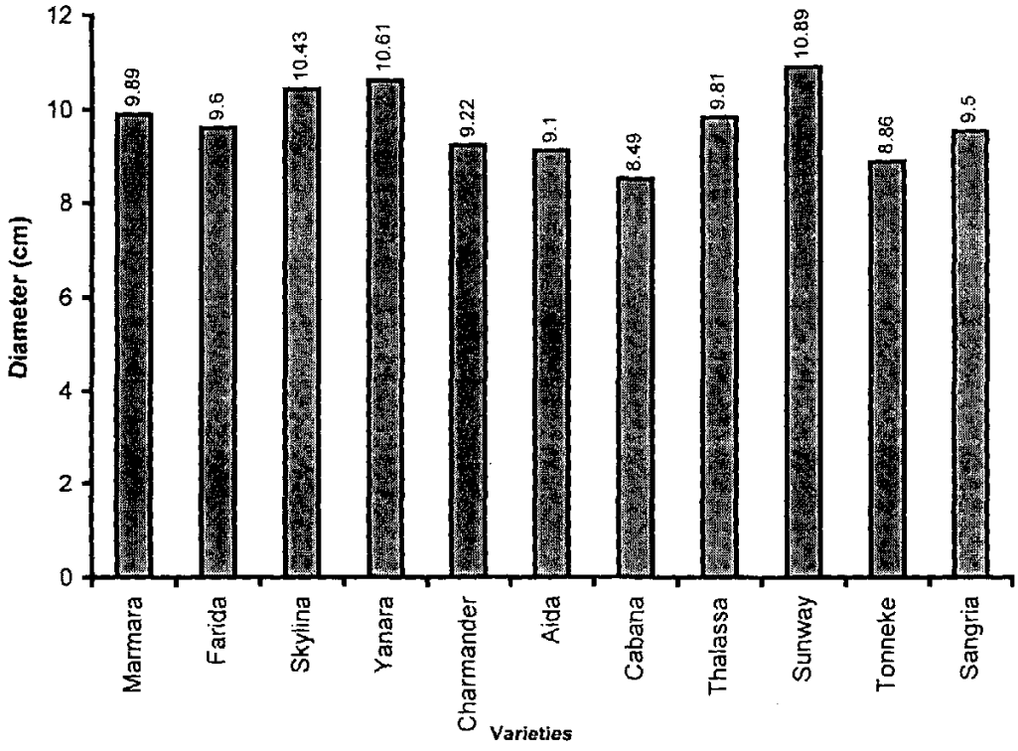


Fig. 5 Mean flower diameter in different varieties of gerbera

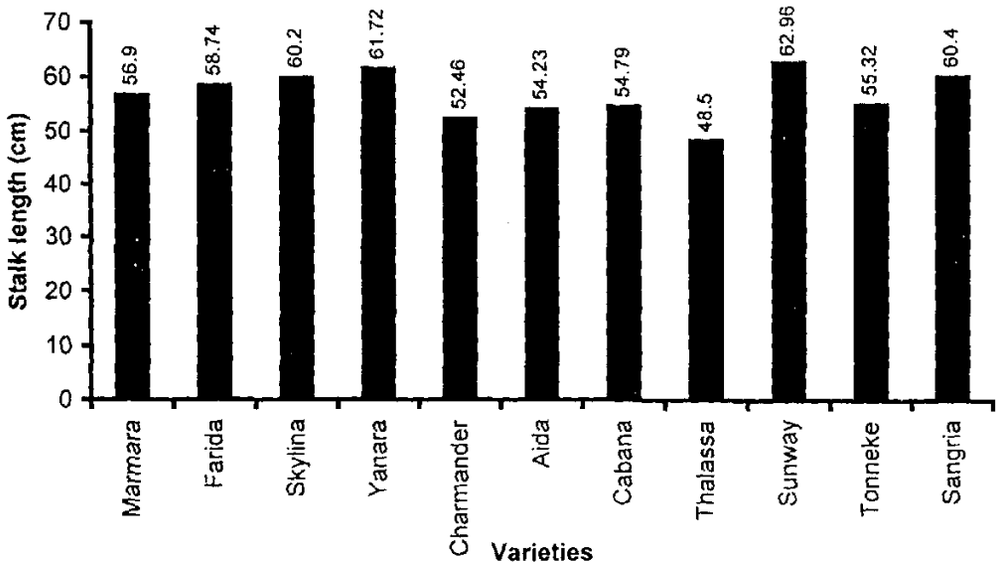


Fig. 6 Mean flower stalk length in different varieties of gerbera

produced significantly lower stalk thickness of 6.13 mm which was at par with varieties 'Tonneke', 'Charamander', 'Skylina' with stalk thickness 6.30mm, 6.26mm, 6.23mm respectively.

4.2.4 Number of whorls of ray florets

The perusal of data regarding number of whorls of ray florets presented in Table 6 and illustrated in Fig. 7 reveals that varieties 'Aida' and 'Sangria' had (8) whorls of ray florets per flower followed by varieties 'Marmara', 'Yanara', 'Cabana', 'Sunway' and 'Tonneke' with (7) whorls of ray florets while varieties 'Skylina', 'Charmander' and 'Thalassa' have (6) whorls of ray florets. Where as variety 'Farida' was having significantly least (2) number of whorls of ray florets among the varieties under study.

4.2.5 Number of ray florets per flower

From the data presented in Table 6 illustrated in Fig. 8 revealed that there was significat difference among varieties under study as regards the number of ray florets per flowers. The variety 'Yanara' was having maximum (244.46) number of ray florets which was significantly higher than other varieties. It was followed by 'Sunway' (234.33) and 'Charmander' (233.66). While varieties 'Cabana', 'Skylina', 'Tonneke', 'Sangria', 'Thalassa'' and produced flowers with 225.33, 224.06, 222.33, 221.26 and 215.66 number at ray florets per flower which are at par with each other. Variety 'Farida' produced flowers with least (154.73) number of ray florets.

Table 6. Mean number of whorls of ray florets per flower and number of ray florets per flower in different varieties of gerbera

Treatments	Variety	No. of whorls of ray florets per flower	No. of ray florets per flower
T_1	Marmara	7	211.20
T_2	Farida	2	154.73
T_3	Skylina	6	224.06
T_4	Yanara	7	244.46
T_5	Charmander	6	233.66
T_6	Aida	8	207.66
T_7	Cabana	7	225.33
T_8	Thalassa	6	215.66
T_9	Sunway	7	234.33
T_{10}	Tonneke	7	222.33
T_{11}	Sangria	8	221.26
C. D at 5%		16.732	17.731
S. E. ±		8.500	6.010

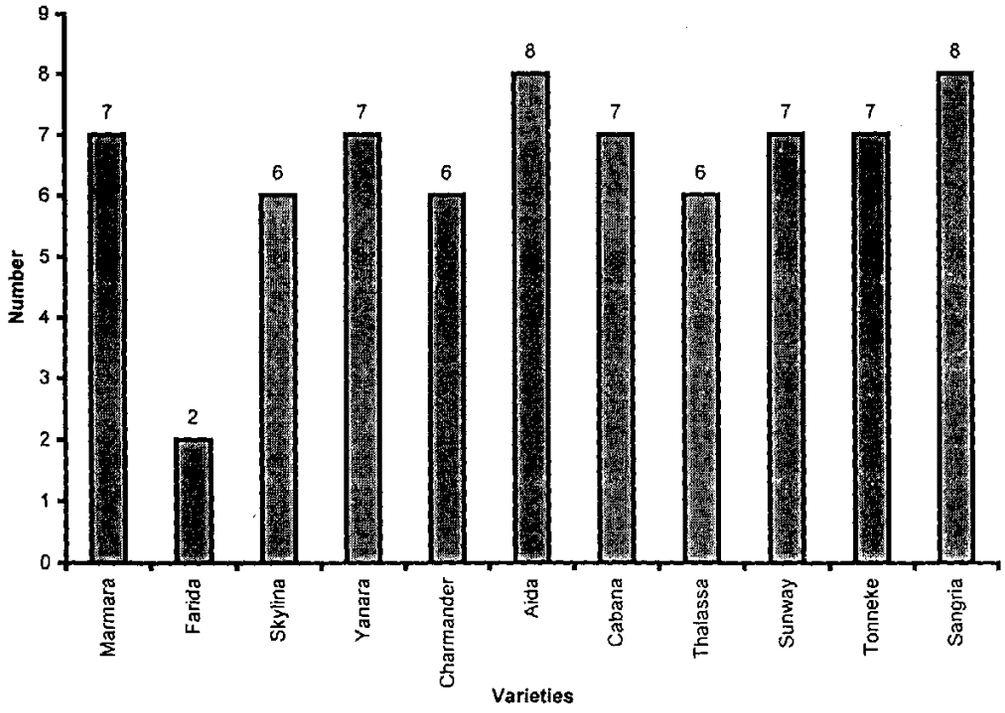


Fig. 7 Number of whorls of ray florets per flower in different varieties of gerbera

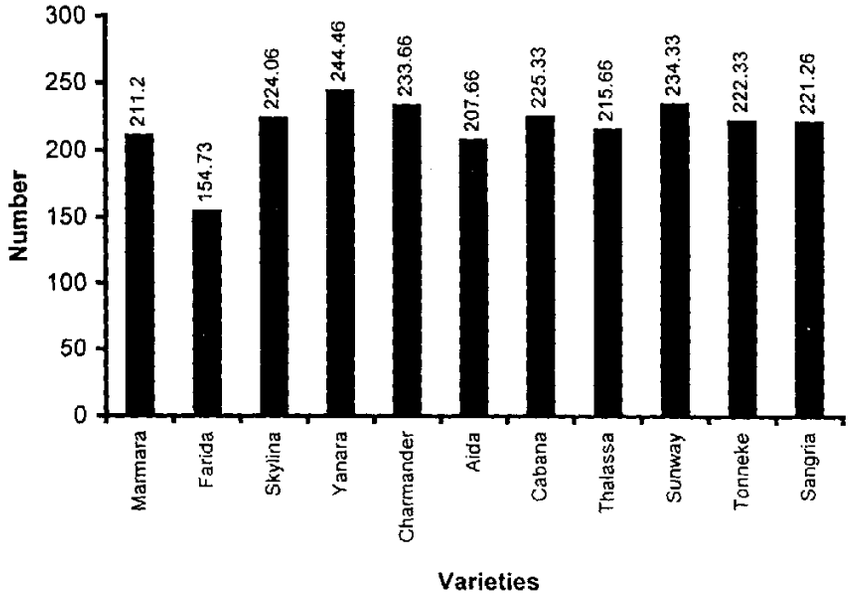


Fig. 8 Mean number of ray florets per flower in different varieties of gerbera

4.3 Yield characters

The parameters pertaining to the yield such as number of flowers per plant per season, number of flowers per meter square per season are presented in Table 7 and illustrated in Fig. 9.

4.3.1 Number of flowers per plant per season

The perusal of data presented in Table 7 revealed that the number of flowers produced per plant per season differed significantly among the varieties under study. Variety 'Farida' produced maximum number of flowers per plant per season (25.43) among all other varieties under study and was significantly superior over all other varieties. Varieties 'Sangria', 'Marmara', 'Aida', 'Thalassa', 'Cabana' and 'Yanara' produced 23.40, 23.13, 22.40, 22.26, 21.70 and 21. 53 number of flowers per plant per season respectively were found to be at par with each other, whereas the variety 'Tonneke' recorded significantly minimum number of flowers per plant (19.73) per season over all other varieties.

4.3.2 Number of flowers per square meter per season

The data presented in Table 7 indicates that variety 'Farida' recorded significantly maximum (160.78) number of flowers per square meter per season followed by varieties 'Marmara', 'Sangria', 'Sunway', 'Cabana' (139.42, 139.05, 132.91, 128.65 flowers per square meter per season) were found to be at par with each other. The variety 'Tonneke' recorded significantly minimum number of flowers (105.19) per square meter per season over all other varieties.

The pattern of variation of yield per square meter per season was as follows :

'Farida' > 'Marmara' > 'Sangria' > 'Sunway' > 'Cabana' > 'Thalassa' > 'Yanara' > 'Aida' > 'Charmander' > 'Skylina' > 'Tonneke'.

Table 7. Mean number of flowers/ plant/season and number of flowers/ m^2/ season in different varieties of gerbera

Treatments	Variety	No. of flowers/ plant / season	No. of flowers/ m^2/ season
T_1	Marmara	23.13	138.42
T_2	Farida	25.43	152.58
T_3	Skylina	21.36	122.64
T_4	Yanara	21.53	127.69
T_5	Charmander	20.63	122.97
T_6	Aida	22.40	127.22
T_7	Cabana	21.70	128.65
T_8	Thalassa	22.26	128.03
T_9	Sunway	21.23	132.91
T_{10}	Tonneke	19.73	105.19
T_{11}	Sangria	23.40	139.05
C. D at 5%		1.4844	8.4851
S. E. ±		0.5031	2.8762

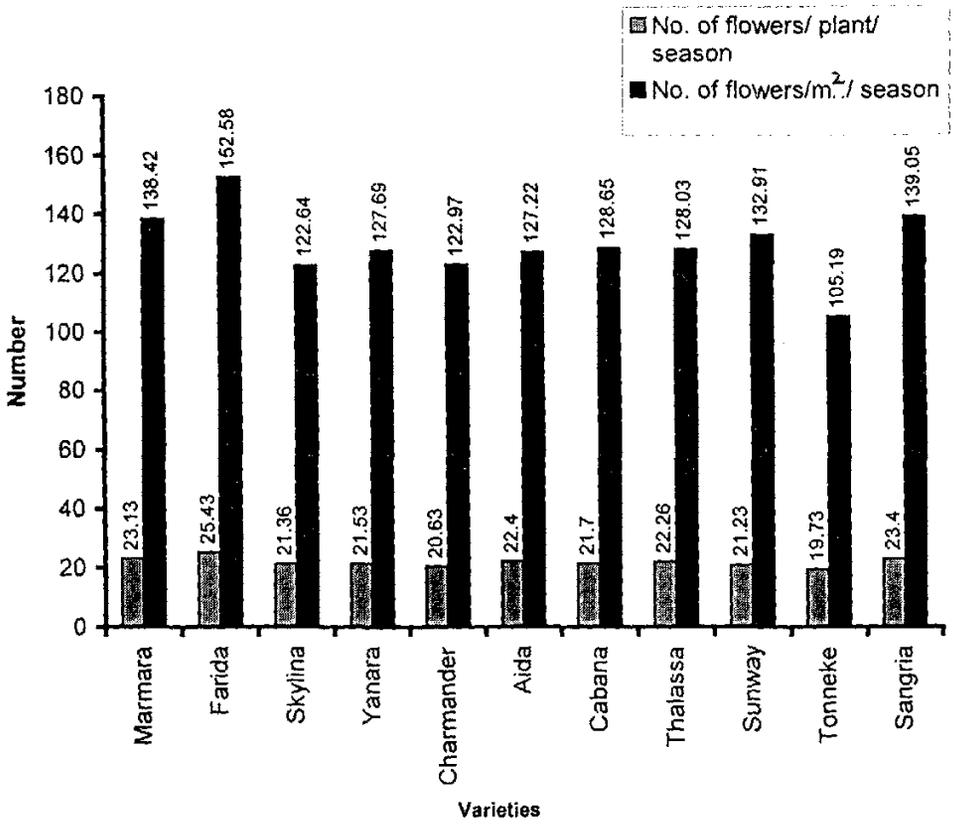


Fig. 9 Number of flowers / plant/ season and number of flowers/ m^2/ season in different varieties of gerbera

4.4 Qualitative Characters :

4.4.1 Flower colour

The different varieties under present investigation showed variation in colour. The information is given in Table '8'. The flower colours were recorded by using the Horticultural Colour Chart issued by British Council in collaboration with the Royal Horticulture Rose society. The observations were recorded in natural light.

The flowers varied in flower colour from orange for 'Skylina', 'Aida' and 'Sunway' to yellow for 'Farida', 'Cabana', 'Tonneke' and 'Thalassa'. Varieties 'Yanara' and 'Sangria' showed red coloured flower, variety 'Charmander' showed rose coloured flowers while variety 'Marmara' showed pinkish flowers.

4.4.2 Flower grade

The data regarding the flower grades of gerbera varieties under investigation are presented in Table 9 and illustrated in Fig. 12. The grading was done according to Polish Gerbera Classification. The results were as under;

4.4.2.1 Grade 'A' flower yield (%)

Data presented in Table 9 indicated that variety 'Yanara' produced significantly maximum (91.26) per cent of grade 'A' flowers, followed by variety 'Sunway' which produced 88.38 per cent grade 'A' flowers. Variety 'Tonneke' produced minimum percent (81.06) of grade 'A' flowers which was at par with variety 'Thalassa' (81.66).

4.4.2.2 Grade 'B' flower yield (%)

Data presented in Table 9 indicated that per cent grade 'B' flowers followed by 'Aida' (11.86) and 'Thalassa' (11.36) which were at par each other. Variety 'Yanara' produced minimum per cent (5.73) of grade 'B' flowers over all the varieties under study.

Table 8.Flower colour in different varieties of gerbera

Treatments	Variety	Colour	Codes
T_1	Marmara	Azalea Pink	618/8
T_2	Farida	Primerose Yellow	301/1
T_3	Skylina	Orpiment Orange	10/1
T_4	Yanara	Current Red	821/1
T_5	Charmindar	Rose Opal	22/2
T_6	Aida	Burnt Orange	14/1
T_7	Cabana	Mimosa Yellow	602
T_8	Thalassa	Mimosa Yellow	602
T_9	Sunway	Indian Orange	713/2
T_{10}	Tonneke	Yellow Orchre	07
T_{11}	Sangria	Dutch Vermilion	717

Table 9. Mean per cent of flowers according to different grades in different varieties of gerbera

Treatments	Variety	Grade 'A' (%)	Grade 'B' (%)	Grade 'C' (%)
T_1	Marmara	85.06	9.46	5.40
T_2	Farida	87.20	8.03	4.76
T_3	Skylina	85.63	8.66	5.36
T_4	Yanara	91.26	5.73	3.00
T_5	Charmindar	85.40	10.06	4.50
T_6	Aida	83.30	11.86	4.76
T_7	Cabana	83.53	9.03	7.55
T_8	Thalassa	81.66	11.36	6.96
T_9	Sunway	88.38	7.80	4.85
T_{10}	Tonneke	81.06	13.26	5.66
T_{11}	Sangria	85.80	8.96	5.22
C. D at 5%		2.8412	2.2991	2.0327
S. E. ±		0.9631	0.7793	0.6890

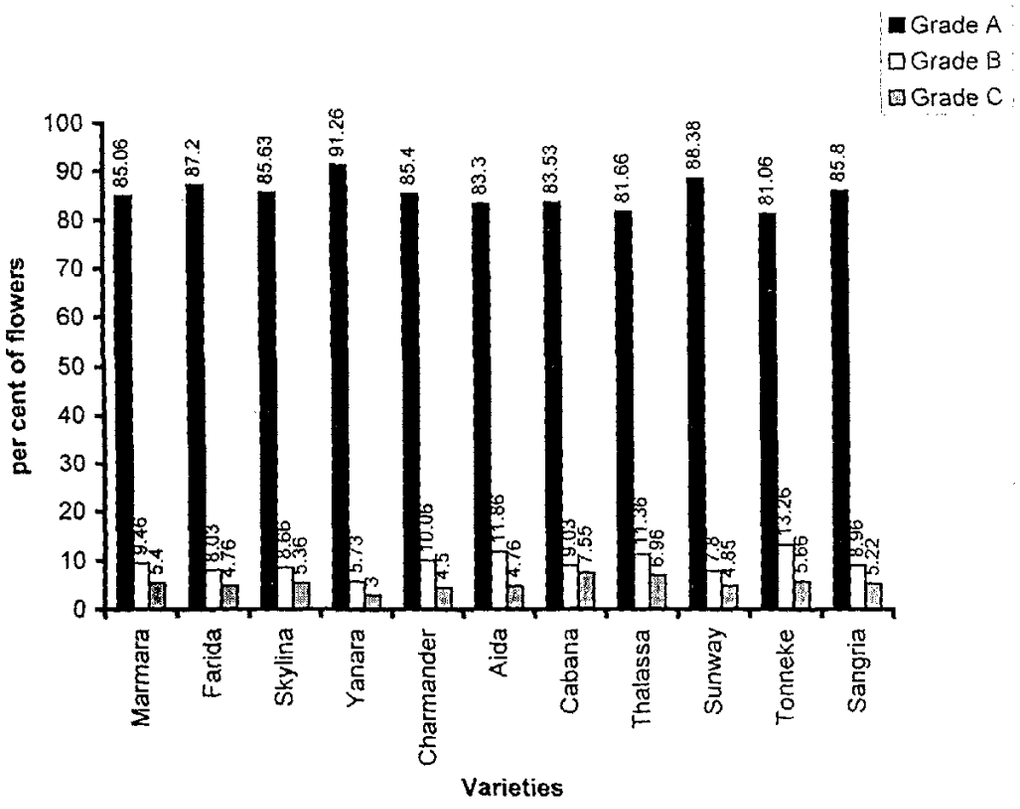


Fig. 10 Per cent of flowers according to different grades in different varieties of gerbera

4.4.2.3 Grade 'C' flower yield (%)

The data from Table 9 reveal that variety 'Cabana' produced maximum (7.55%) grade 'C' flowers which was at par with varieties 'Thalassa' (6.96%) and 'Tonneke' (5.66%). Where as variety 'Yanara' produced significantly minimum (3.00%) grade 'C' flowers over all the varieties under investigation.

4.4.3 Vase life of flowers in plain water (days)

The data regarding vase life of gerbera flowers is presented in Table 10 and illustrated graphically in Fig. 11. The perusal of Table shows variation in vase life of flowers among the different varieties. Significantly maximum vase life of flower in plain water was recorded in variety 'Thalassa' (9.33 days) over all the varieties except varieties 'Cabana' and 'Sangria' (8.66 days each) which were at par.

The variety 'Tonneke' (6.33 days) registered significantly least vase life of cut flowers in plain water which was at par with 'Yanara' (6.66 days) and 'Aida' (7.00 days).

The pattern of variation observed with respect to vase life of cut flowers is as follows:

'Thalassa' > 'Cabana' > 'Sangria' > 'Farida' > 'Skylina' > 'Marmara' > Charmander > 'Sunway' > 'Aida' > 'Yanara' > 'Tonneke'.

Table 10. Mean vase life of flowers in plain water in different varieties of gerbera

Treatments	Variety	Vase life of flowers in plain water (Days)
T_1	Marmara	7.66
T_2	Farida	8.33
T_3	Skylina	8.00
T_4	Yanara	6.66
T_5	Charmander	7.33
T_6	Aida	7.00
T_7	Cabana	8.66
T_8	Thalassa	9.33
T_9	Sunway	7.33
T_{10}	Tonneke	6.33
T_{11}	Sangria	8.66
C. D at 5%	-	17.732
S. E. ±	-	8.500

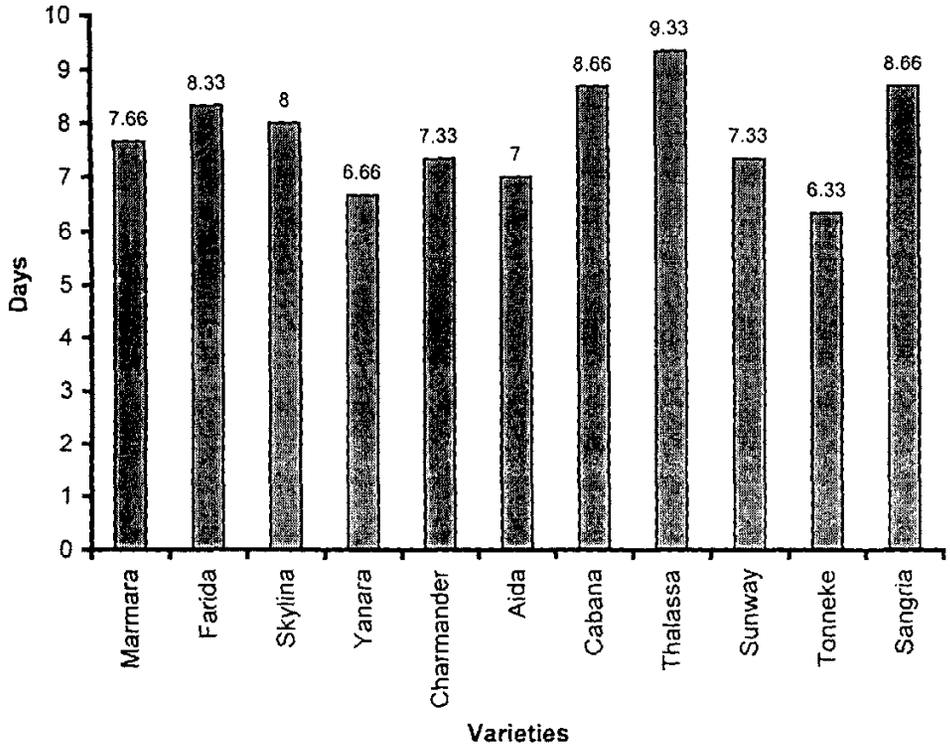


Fig. 11.Vase life of flowers in plain water in different varieties of gerbera

4.5 Correlation studies

The correlation coefficient of number of flowers per plant per season, number of flowers per meter square and vase life of flowers in plain water in different gerbera varieties with different growth and flowering characters in different gerbera varieties were calculated and presented in Table 11.

The data presented in Table-11 revealed that plant spread through out the period of investigation i.e. at 30, 60, 90, 120, 150, 180 and 210 days after start of second year, was found to be positively significant with number of flowers per plant per season. Number of suckers per plant at the start of second year and at the end of investigation was positive and significant with number of flowers per plant per season. In different varieties under study. Number of ray florets per flowers has negative but significant association with number of flowers per plant per season.

The data from Table 11 also revealed that number of suckers per plant at the start of second year and at the end of investigation showed positive and significant association with number of flowers per meter square per season plant spread throughout investigation and flower diameter was positive but non-significant association with number of flowers per meter square per season.

The result of study also revealed that plant spread throughout investigation, number of suckers per plant, number of leaves per plant had positive but non significant association with vase life of flowers in plain water in different gerbera varieties.

The characters, flower diameter, flower stalk length, flower stalk thickness and number of ray florets per flower showed negative but non-significant association with vase life of flowers in plain water in different gerbera varieties.

Table 11. Correlation coefficient of important growth and flowering characters with yield characters and vase life of flowers

Sr. No.	Characters	Correlation coefficient		
		No. of flowers/ plant/ season	No. of flowers/ m^2 / season	Vase life flowers in plain water (days)
1.	Plant spread			
	a. At the start of second season	0.4023*	0.0728	0.2662
	b. 30 days after start of season	0.4164*	0.0813	0.2818
	c. 60 days after start of season	0.4519**	0.1180	0.2860
	d. 90 days after start of season	0.4455**	0.1418	0.2242
	e. 120 days after start of season	0.4434**	0.1170	0.2152
	f. 150 days after start of season	0.4483**	0.1788	0.1960
	g. 180 days after start of season	0.4250*	0.1841	0.1566
	h. 210 days after start of season	0.3967*	0.1944	0.0851
2.	Number of suckers per plant			
	a. At the start of season	0.5547**	0.4329**	0.1969
	b. At the end of season	0.5320**	0.4431**	0.0898
3.	Number of leaves per plant			
	a. At the start of season	-0.0348	-0.0893	0.1565
	b. At the end of season	0.2582	0.0886	0.2822
4.	Flower diameter (cm)	0.4044	0.0330	-0.1303
5.	Flower stalk length (cm)	0.1040	-0.0171	-0.2238
6.	Flower stalk thickness (mm)	0.0354	-0.2645	-0.1323
7	Number of whorls of ray florets per flower	-0.2092	-0.3062	-0.2001
8	Number of ray florets per flower	-0.6802**	-0.6174	-0.2461

*, ** 5 and 1 per cent level of probability, respectively

PLATE -2

T1 MARMARA

T2 FARIDA

T3 SKYLINA

T4 YANARA

T5 CHARMANDER

T6 AIDA

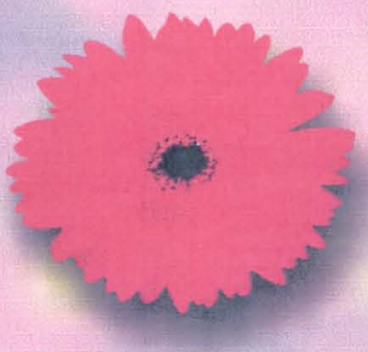
PLATE -3

T7 CABANA

T8 THALASSA

T9 SUNWAY

T10 TONNEKE



T11 SANGRIA

DISCUSSION

5. DISCUSSION

Growth, development and productivity of flowers depends on the interactions between various factors such as genetic constitution of plant, environment factors and cultural or management practices etc. Selection of suitable genotype plays a very important role towards obtaining maximum yields and there by higher returns for becoming commercial floriculture enterprise.

In present investigation evaluation of eleven exotic gerbera varieties for their productivity in terms of flower yield and quality parameters was carried out under naturally ventilated polyhouse condition.The results of growth, flowering, yield and qualitative characters presented in Chapter 4 are discussed in present chapter.

Among the characters that were taken for evaluation of cultivars for cut flowers, the reproductive and qualitative parameters such as flower diameter, stalk length, stalk thickness, vase life and marketable yield are very important so, more weightage should be given to these parameters. However, the vegetative parameters such as plant spread, number of leaves per plant, number of suckers per plant are also equally important. If a variety possess such desirable characters such as more stalk length, flower diameter, stalk thickness, vase life and marketable yield, it would be considered as a good cut flower variety, even though it had one or the other less important characters. The merits and demerits of eleven exotic varieties of gerbera under naturally ventilated polyhouses condition is discussed hereunder.

5.1 Vegetative characters

The growth and development of all crops is governed by genetic factors. Different cultivars under present study, showed significant variation in their growth characters like plant spread at 30 days interval,

number of suckers and number of leaves per plant at beginning of second year till the end of investigation.

Observations recorded at 30 days interval for plant spread was found to have small but steady increase in spread. Highest plant spread of 64.13cm was observed in variety 'Yanara' at 210 days. The other varieties 'Skylina', 'Farida' and 'Marmara' have the plant spread of 62.86 cm, 62.66 cm and 61.43 cm at 210 days i.e. at the end of investigations. While 'Tonneke' variety produced significantly lower plant spread (54.03 cm) over rest of all varieties. The present results are in accordance with Singh and Mandhar (2001) in their study on varietal trial under low cost naturally ventilated greenhouse recorded maximum plant spread (72.71 cm) in cultivar 'Linola', while minimum plant spread (62.16 cm) was observed in variety 'white sun'.

Production of more number of suckers per plant is important for quick and rapid multiplication of the variety. The present findings on number of suckers per plant at the start of second year revealed that variety 'Marmara' produced highest number of suckers (4.20) while variety 'Sunway' produced minimum number at suckers (2.20) per plant while the data regarding number of suckers per plant at the end of investigation period i.e. after 210 days after start of second year indicated that 'Farida' produced maximum (5.56) suckers per plant while variety 'Sunway' had the least (3.23) number of suckers per plant at the end investigation period. The results obtained are in accordance with Singh and Mandhar (2001) who recorded maximum number of suckers per plant (4.55) in cultivar 'Linola', while variety Tara produced minimum number of suckers per plant (3.49). Similar results were also obtained by Bhattacharjee (1981) under Bangalore conditions.

Development of foliage determines the canopy architecture as well as photosynthetic activity of plants and thereby flower yield and sucker

production. In the present investigation the number of leaves per plant at the start of second year and at the end of investigation period varied between 26.20 to 38.58. Thus variety 'Charmander' produced highest leaves per plant (38.58) followed by 'Marmara' (36.43) and variety 'Tonneke' (26.20) had the significantly least number of leaves.

Perusal of data about number of leaves per plant at the end of investigation period revealed that variety 'Marmara' (44.13) produced highest number leaves per plant followed by varieties 'Skylina' (40.33) 'Charmander' (40.00). While 'Tonneke' recorded least number (30.46) of leaves at the end of investigation. Present findings are in accordance with results reported by Singh and Manohar (2001) who recorded maximum leaf number (46.66/plant) in cultivar 'Linola', where as variety 'Tara' recorded the minimum (28.10) number of leaves per plant. Similar results were also obtained by Bhattacharjee (1981).

5.2 Flower characters

Various flower characters such as flower diameter, flower stalk length, stalk thickness, number of whorls of ray florets and number of ray florets per flower which determine the market value of gerbera cut flowers have been recorded for eleven exotic gerbera varieties for their second year of crop growth under naturally ventilated polyhouses conditions.

For getting maximum returns in market for cut flowers of gerbera, larger diameter of flower is desirable therefore, its study was considered as an important aspect of investigation. The data regarding floral diameter revealed that among eleven varieties under study variety 'Sunway' produced the big sized flowers with 10.89 cm diameter followed by Yanara (10.61 cm) and Skylina (10.43 cm) indicating their superiority over rest of the varieties. The variety 'Cabana' produced flowers with

lower diameter (8.49 cm). The present finding were in agreement with Ambad *et al.* (2001), Singh and Mandhar (2001) and Nair and Medhi (2002).

The grades of flowers were also determined by stalk length. Flowers with longer stalk length were preferred in market. Variety 'Sunway' produced flowers with highest stalk length (62.96 cm) giving it superiority over rest of other varieties under study. While varieties 'Yanara' (61.72 cm), Sangria (60.40 cm), Skylina (60.22 cm) were at par with 'Sunway'. The variety 'Thalassa' produced flowers with significantly minimum stalk length (48.5 cm). The present results were in accordance with Singh and Mandhar (2001) reported maximum stalk length in cultivar 'Lyonella' (64.00 cm), while minimum stalk length was observed in variety 'Diablow'. Similar results were obtained by Fakhari *et al.* (1995), Patil (2001), Anonymous, (2002).

The results regarding flower stalk thickness indicated that maximum stalk thickness was found in variety Yanara (7.53 mm) giving it superiority over rest of the varieties, while minimum stalk thickness was observed in variety 'Farida' (6.13 mm). These results were in accordance with those obtained by Shirole *et al.* (1996) who reported that variety 'Vijay' recorded highest stalk thickness (8.5 cm) while least stalk thickness was in 'Polar' (7.0 mm) variety. Kandpal *et al.* (2003) reported maximum stalk thickness (0.70 cm) in cv. 'Alasmeera' and minimum in Orange Glem (0.34 cm).

Findings of present investigation reveal that varieties Aida, Sangria have 8 whorls of ray florets which were highest among all varieties under study. Whereas variety 'Farida' was having minimum i.e. 2 whorls of ray florets. The results of present investigation were similar to those obtained by Patil (2001).

The results regarding number of ray florets per flower in present study showed that variety 'Yanara' was having highest (244.46) number of ray florets per flower followed by Sunway (234.33) and 'Charmander' (233.66) which were at par with each other. While variety 'Farida' number of ray florets per flower were minimum (154.73) among all varieties studied. However findings of present study were differ with Nair and Medhi (2002) who reported maximum number of ray florets per flower (59.10) in variety 'Evening Bells', followed by variety 'Pink Star' (57.13) and minimum (29.35) ray florets per flower in variety 'Calcutta Local'. This is due to the difference in varietal characters.

5.3 Yield characters

Gerbera is a semi-perennial crop and has economically viable productive life of two to two and half years. In the present investigation as the crop is one year old, the yields were found to be somewhat stable and hence study was limited to bring out yield parameters of seven months, referred as season.

In order to obtain the varieties with highest potential in terms of number of flowers per plant per season, observations were recorded to obtain the variety with highest yield per plant per season. The findings of present study indicated that variety 'Farida' produced highest (25.43) number of flowers per plant per season. Varieties 'Sangria' and 'Marmara' produced 23.40 and 23.13 number of flowers per plant per season respectively. While variety 'Tonneke' (19.73) recorded minimum number of flowers per plant per season among all the varieties under study. The findings of present study are similar to those obtained by Patil (2001) who recorded highest yield per plant (22.50) in variety 'Twiggy' minimum in variety 'Nevada'. Similar results were obtained by Loser (1986), Anonymous (2002).

From the results of number of flowers per square meter per season was found that variety 'Farida' produced highest flower yield (160.78) per square meter per season. The variety 'Tonneke' recorded significantly minimum number of flowers (105.19) per square meter per season which was at par with other varieties under investigation. These results were similar to those obtained by Patil (2001) who reported highest (208.85) and lowest (85.5) number of flowers in cultivars 'Twiggy' and 'Nevada' respectively.

5.4 Qualitative characters

Flowers with higher grades earn higher returns. The results of the present investigation reveal that the variety 'Yanara' produced significantly maximum 'A' grade flowers (91.26%). Followed by 'Sunway' (88.38%) while variety 'Tonneke' produced minimum 'A' grade flowers. Further, variety 'Tonneke' produced highest (13.27) 'B' grade flowers while variety 'Yanara' produced minimum per cent 'B' grade (5.73%) flowers over rest of all varieties. Findings of present investigation further reveald that variety 'Cabana' produced maximum (7.55%) grade 'C' flowers which was at par with variety 'Thalassa' (6.96%) whereas variety 'Yanara' produced minimum 'C' grade (3.00%) flowers among all the varieties taken for study. Results have similarity with results of Kim *et al.* (1990) and Singh and Mandhar (2001).

The vase life of flowers was significantly influenced by varieties. In general gerbera cut flowers have longer vase life which increases the commercial importance of gerbera as a cut flower. Varieties with higher vase life in plain water are preferred by the consumers and fetch better price in market. The results of study indicated that the flowers of variety 'Thalassa' have maximum (9.33 days) vase life in plain water giving it significance over the rest of the varieties studied. It was followed by

'Cabana' and 'Sangria' (8.66 days each). The flowers of 'Tonneke' had minimum (6.33 days) vase life in plain water. The findings of present results are in accordance with results of Kandpal et al. (2003) who reported highest vase life (10.0 days) in cultivar DB-232 and minimum (6.0 days) in 'Sangria', 'Ornella' cultivars. Similar results were also reported by Loser (1986).

5.5. Simple correlation

The degree and direction of association between different growth characters can be understood by correlation studies.

The result of present study indicated that plant spread at 30, 60, 90, 120, 150, 180 and 210 days after start of second year was found to be positively and significantly correlated with number of flowers per plant. Similar results were obtained by Anuradha and Narayan Gowda (2002).

The results of the study also indicated that the significant association between different growth and flowering characters with the number of flowers produced per square meter in different gerbera varieties were similar to the results obtained by Patil (2001).

The results of the study also indicated that none of the growth and flowering characters in different gerbera varieties influenced the vase life of flowers in plain water, thereby revealing that these characters did not have any effect on the vase life of flowers in plain water, suggesting some other parameters like field heat or management practices to be responsible for influencing the vase life of flowers in plain water. These results are in contrast with Patil (2001).

SUMMARY AND CONCLUSIONS

6. SUMMARY AND CONCLUSIONS

In the recent years number of exotic flowers are successfully grown in India. Gerbera is one of the important cut flowers grown and is gaining popularity. Considering the scope and potential of gerbera as a cut flower both in domestic as well as in international market, the present study entitled "Performance of gerbera (*Gerbera jamesonii*) cultivars in terms of quality and quantity as a second year crop under polyhouses" was undertaken to determine promising varieties for polyhouse cultivation.

The experiment was carried out at Hi-Tech Floriculture and Vegetable Unit at College of Agriculture, Pune-5 from 21st January 2003 to 21st August 2003. The experiment was conducted in Randomized Block Design with eleven exotic varieties of gerbera, replicated thrice. The findings of the investigation are summarized as below.

6.1 Vegetative characters

The plant spread showed steady but small growth throughout the period of investigation, i. e. at every 30 days interval.

At the end of period of investigation i.e. 210 days after start of second year, variety 'Yanara' recorded significantly maximum plant spread (64.13 cm) followed by 'Skylina' (62.86 cm) and Farida (62.66 cm) which were at par with each other. The variety 'Tonneke' (54.03 cm) had the least plant spread at the end of investigation period.

At the start of second year variety 'Marmara' was having significantly more number of suckers per plant (4.20) while at the end of period of investigation variety Farida' was found to be having highest number of sucker per plant (5.56) followed by varieties 'Marmara' (5.10), and Skylina (4.93) which were at par, whereas variety 'Sunway' was found to be having least number of sucker both at the start of second

year (2.20) and at the end of investigation period (3.23) among all the varieties under study.

At the start of second year the variety 'Charmander' was having highest (38.46) number of leaves per plant while variety 'Tonneke' was found to have least number (28.20) of leaves. Whereas at the end of investigation period variety Marmara (44.13) produced maximum number of leaves per plant while variety 'Tonnete' produced significantly least (30-46) number of leaves per plant among the varieties under study.

6.2 Flower characters

Variety 'Sunway' produced bigger sized flowers with (10.89 cm) diameter followed by 'Yanara (10.61 cm) giving them superiority over rest of the varieties whereas variety 'Cabana' produced flowers with least (8.49 cm) diameter.

The variety 'Sunway' had longest flower stalk (62.96 cm) followed by Yanara (61.72 cm). Significantly minimum length of flower stalk was observed in variety 'Thalassa' (48.50 cm).

The variety 'Yanara' produced flowers with maximum stalk thickness (7.53 mm), while variety 'Farida' produced flowers with least stalk thickness (6.13 mm).

The flowers produced by varieties 'Aida' and 'Sangria' had (8) whorls of ray florets, while flowers of variety 'Farida' had only (2) whorls of ray florets.

The maximum number of ray florets per flower were produced by variety 'Yanara' (244.46), followed by 'Sunway' (234.33) where as minimum number of ray florets per flower have been found in variety 'Farida' (154.73).

6.3 Yield characters

Variety 'Farida' produced significantly maximum flowers (25.43) followed by 'Skylina' (23.42) giving them superiority over rest of the varieties, whereas variety 'Tonneke' produced least number of flowers (19.73) per plant season among all the varieties under study.

Significantly maximum yield of flowers per meter square per season (160.78) was recorded in the variety 'Farida' followed by 'Marmara' (139.42) and 'Sangria' (139.05). The variety Tonneke recorded the significantly lowest yield per meter square per season (105.19 flowers).

6.4 Qualitative characters

The percentage of grade 'A', grade 'B' flowers i.e. marketable flowers were positively influenced by varieties. Maximum percentage of grade 'A' flowers were produced by variety 'Yanara' (91.26%) followed by 'Sunway' (88.38%) while minimum percentage of grade 'A' flowers was observed in variety Tonneke (81.06%) whereas highest percentage of grade 'B' flowers were found in variety 'Tonneke' (13.26%) and least in variety Yanara (5.73%).

Variety 'Thalassa' (6.96%) produced highest percentage of unmarketable flowers i.e. grade 'C' flowers while minimum was in Yanara (3.00%).

Vase life of flowers is one of the important factors. The maximum vase life (9.33 days) was observed in 'Thalassa' followed by variety 'Cabana and Sangria' (8.66 days each) while minimum vase life was observed in flower of Tonneke (6.33 days) in plain water.

6.5 Correlation studies

The study revealed that plant spread throughout investigation and number of suckers per plant had positive and significant association with number of flowers per plant per season in different gerbera varieties

under study. The character number of suckers per plant at the start of season and at the end of season had positive and significant association with number of flowers per meter square produced by different varieties of gerbera.

The vase life of flowers in plain water of different gerbera varieties under study was also not influenced by any of the growth and flowering character studied.

6.6 Conclusion

The present investigation was undertaken to evaluate eleven varieties of gerbera for their performance in terms of quality and quantity for second year of their growth so as to find out suitable variety/varieties for cultivation under naturally ventilated polyhouses.

Among the eleven varieties studied, the varieties 'Sunway', 'Yanara', 'Skylina', 'Sangria' and Marmara with larger flower diameter and longer flower stalk length are best suited for cut flower production. The varieties 'Thalassa', 'Sangria', 'Cabana' and 'Farida' with more vase life in plain water are very useful as cut flowers in large vases and flowerpots. The high yielding varieties 'Farida', 'Sangria', 'Marmara' and Thalassa can be recommended to farmers for obtaining higher yields and higher returns under naturally ventilated polyhouse conditions. The varieties 'Yanara', 'Sunway', 'Farida', and 'Sangria' producing higher per cent of "A" grade flowers can be recommended to obtain higher grade flowers for export purpose under naturally ventilated polyhouses conditions.

Considering the overall performance of the different gerbera varieties under naturally ventilated polyhouse conditions for second year, varieties 'Sunway', 'Sangria', 'Yanara' and 'Farida' may be recommended on the *ad-hoc* basis for cultivation under polyhouse.

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APPENDIX

8. APPENDIX

Meteorological data during the period of investigation Weekly averages of meteorological parameters during the experimental period

m. w.	Meteorological Month & Date	Temperature ^{0}C		Relative humidity %	
		T_{max}	T_{min}	Morning RH-I	Evening RH-II
3	15-1-03 to 21-1-03	28.70	10.18	87.85	32.28
4	22-1-03 to 28-1-03	32.71	13.27	87.42	25.85
5	29-1-03 to 4-2-03	32.48	13.67	88.85	28.57
6	5-2-03 to 11-2-03	32.71	13.58	83.00	23.42
7	12-2-03 to 18-2-03	34.08	12.98	78.00	20.71
8	19-2-03 to 25-2-03	33.37	23.80	85.00	25.00
9	26-2-03 to 4-3-03	35.35	15.35	76.00	21.42
10	5-3.03 to 11-3-03	35.78	14.00	61.28	14.57
11	12-3.03 to 18-3-03	35.87	13.48	67.28	13.57
12	19-3.03 to 25-3-03	36.88	17.22	64.72	19.14
13	26-3.03 to 1-4-03	37.57	17.08	58.85	14.85
14	2-4-03 to 8-4-03	36.64	19.32	72.28	23.71
15	9-4-03 to 15-4-03	38.40	20.22	48.57	20.00
16	16-4-03 to 22-4-03	37.48	20.14	56.71	17.00
17	23-4-03 to 19-4-03	39.84	23.20	53.57	17.71
18	30-4-03 to 6-5-03	38.12	22.02	49.85	20.71
19	7-5-03 to 13-5-03	39.51	21.87	62.00	17.57
20	14-5-03 to 20-5-03	37.41	23.77	64.14	30.71
21	21-5-03 to 27-5-03	37.00	23.54	70.57	29.14
22	28-5-03 to 3-6-03	36.90	24.07	62.71	29.84
23	4-6-03 to 10-6-03	36.47	24.34	70.85	37.42
24	11-6-03 to 17-6-03	32.28	23.34	85.85	64.85
25	18-6-03 to 24-6-03	28.70	22.54	90.42	75.71
26	25-6-03 to 1-7-03	28.37	22.71	85.28	70.57
27	2-7-03 to 8-7-03	39.61	22.97	85.00	66.71
28	9-7-03 to 15-7-03	28.82	22.70	84.42	70.57
29	16-7-03 to 22-7-03	29.04	22.94	83.85	65.71
30	23-7-03 to 29-7-03	27.24	22.58	85.57	79.14
31	30-7-03 to 5-8-03	24.51	22.60	83.42	71.85
32	6-8-03 to 12-8-03	27.70	21.94	90.42	74.14
33	13-8-03 to 19-8-03	27.84	21.47	87.28	76.42
34	20-8-03 to 26-8-03	27.58	21.95	83.14	86.71

VITA

9. VITA

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A candidate for the degree

of

MASTER OF SCIENCE (AGRICULTURE)

in

HORTICULTURE

2004

TITLE OF THESIS

➢ "Performance of gerbera (*Gerbera jamesonii*) cultivars in terms of quantity and quality as a second year crop under polyhouse ".

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