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Flower yield and vase life of Gerbera in response to planting time and organic manures on Alfisol

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ABSTRACT

Variation in planting time and organic substrates are considered as two important attributes influencing performance of Gerbera. An experiment was conducted with three dates of planting (15th May, 15th June and 15th July) and three sources of organic manures (Farmyard manure, Pig manure and vermicompost) on an Alfisol with the aim to find out their suitable combination with respect to growth, floral characteristics, yield and vase life of Gerbera. Different dates of planting showed significant response on leaf area and plant height with 15th May date of planting, whereas vermicompost used as organic nutrient source showed sustained improvements in growth parameters (number of leaves), floral characteristics and flower yield parameters in addition to flower vase life. Among the different dates of planting, 15th June planting exhibited most favourable responses. Vase life of flowers remained unaffected with variation in planting time, while FYM as organic substrate aided in extending it.

1. Introduction

Gerbera (*Gerbera jamesonii* Bolus ex. Hook) commonly known as Transvaal Daisy, Barbeton Daisy or African Daisy, is an important commercial flower crop grown throughout the world in a wide range of soil and climate.

Gerbera is equally in high demand as a cut flower in the world market, with the result, the crop is being agropedologically explored in some of the non-conventional areas. Nagaland is one such northeastern state, although blessed with congenial climatic conditions coupled with rich fertile soil (Keditsu, 2012a). But for successful cultivation of any crop, it should be exposed to optimum climatic conditions during the growth period so as to get máximum production of quality flowers. Difference in planting dates (Meera and Patil, 2002; Keditsu, 2012a) induced large variation in growth, flowering, yield and quality of Gerbera. Similarly, suitable substrate like, organic manures play an important role affecting growth attributes and yield of flower crops (Keditsu 2012b) besides improving fertility and productivity of soil through microbial proliferation (Chandra *et al*., 2003). In this background, the present investigation aims at: i. studying the response of Gerbera to variation in planning time and ii. suitability of different organic manures.

2. Materials and methods

2.1. Experimental set-up

The experiment was conducted at the Experimental Farm of Horticulture, School of Agricultural Sciences and Rural Development, Nagaland, representing typical humid tropical climate characterized by annual rainfall of 120-1145 cm (mean 180 cm) with mean summer and mean winter temperature vary from 24.6 to 32.8^{o}C and 9.9 to 24.8^{o}C, respectively. Soil moisture regime is ustic at places to udic and temperature regime thermic to hyperthermic depending upon elevation. The soil was highly acidic in nature (pH 5.4) and low in soil fertility status ($KMnO_4$-N 112.8 mg/kg, Bray-P 3.1 mg/kg and NH_4OAc-K 94.3 mg/kg) but organic carbon was comparatively high 18.5 mg/kg. The experiment was conducted in factorial randomised block design using three treatments of planting time (D_1- 15th May, D_2 – 15th June, and D_3 - 15th July) and four treatments of organic manure (M_o – control, M_1 – Farmyard manure, M_2 – Pig manure, and M_3 - Vermicompost) replicated three times.

Healthy Gerbera suckers were planted maintaining a spacing of 30 x 30 cm in well prepared beds of 1.2 m x 1.2 m size, accommodating as many as 16 plants in each bed. The beds were raised to a height of 15 cm. Organic manures viz., farmyard manure, Pig manure and vermicompost were added on nitrogen equivalent basis at the rate of 5 t/ha, 2 t/ha, and 3 t/ha, respectively. The chemical composition of all the organic manures (Farmyard manure 0.62 % N, 0.06 % P, and 0.73 % K; Pig manure 2.92 %N, 0.21 % P, 1.32 % K and vermicompost 2.82 % N, 0.16 % P, and 1.94 % K) showed much higher concentration of nutrients in Pig manure compared to rest of the other two manures. Microbial analysis of these manures indicated much higher total microbial load in vermicompost (82 x 10^3 cfu/g soil bacterial count and 51 x 10^3 cfu/g soil fungal count) compared to either farmyard manure (38 x 10^3 cfu/g soil bacterial count and 24 x 10^3 cfu/g soil fungal count) or Pig manure (141 x 10^3 cfu/g soil bacterial count and 30 x 10^3 cfu/g soil fungal count). Planting was done on three different date's i.e, 15th of May, 15th of June and 15th of July as per treatments layout. Irrigation, weeding and earthing up were done at regular intervals.

2.2. Observations and analysis

The flowers were harvested when the outer two rows of the disc florets were fully opened and perpendicular to the stalks. The experimental data recorded during the period of investigation were statistically subjected to analysis of critical difference (Panse and Sukhatme, 1985) and the treatment variance were test against error mean square by applying Fischer Snedecore 'F' test of Probability at 0.05 per cent level of significance.

3. Results and discussion

3.1. Growth characteristics

Both planting time and organic manures, either individually or collectively influenced the growth characteristics (Table 1). The number of leaves at the time of flowering was maximum with D_1 (17.7 cm), besides leaf area/plant (124.3 cm^2) and highest plant height (25.9 cm). Amongst sources of organic manures, M_3 treatment recorded maximum growth attributes (number of leaves 20.3, leaf area 125.6 cm^2 and plant height 26.5 cm) followed by M_2 (number of leaves 18.7, leaf area 124.9 cm^2 and plant height 25.4 cm) and M_1(number of leaves 18.0, leaf area 123.0 cm^2 and plant height 25.0 cm). Earlier studies (Shin *et al*., 1995; Raju *et al*., 2006) suggested difference in performance of Gerbera with respect to various growth features in response to difference

in planting time. These observations should be viewed in the light of compost aiding towards improvements in physical, chemical and biological properties of the soil, thereby, hydraulic properties of soil triggering improvised inflow of both nutrients and water towards improved growth attributes (Ghuge *et al.*, 2007).

Table 1
Effect of planting time and various organic manures on the growth characteristics.

Treatments	Growth attributes			Floral characteristics		
	No. of leaves at first flowering	Leaf area (cm^2)	Plant height at first flowering (cm)	Days taken to bud emergence	Days taken to bud burst	Days taken to full bloom
Planting time (D)						
15th May (D_1)	17.1	112.1	25.9	86.0	94.9	103.4
15th June (D_2)	17.7	119.5	24.1	84.6	93.0	103.1
15th July (D_3)	17.5	124.3	23.6	81.6	91.5	101.0
CD (*P =0.05*)	NS	2.2	1.2	3.0	NS	3.3
Organic manure (M)						
Control (M_0)	12.7	101.1	21.1	87.7	97.2	105.4
FYM (M_1)	18.0	123.0	25.0	82.3	91.5	101.2
Pig manure (M_2)	18.7	124.9	25.4	85.6	95.0	104.0
Vermicompost(M_3)	20.3	125.6	26.5	80.7	88.9	99.5
CD (*P = 0.05*)	1.82	14.1	2.03	3.5	3.5	3.8
Interaction						
M x D	NS	14.9	2.23	4.1	NS	4.2

Table 2
Influence of planting time and various organic manures on the flowering parameters, flower yield and vase life of Gerbera.

Treatments	Stalk length (cm)	Stalk diameter (cm)	No. of ray florets	No. of disc florets	Flower diameter (cm)	No. of flowers/ plant	Vase life (Days)
Planting time (D)							
15th May (D_1)	32.3	0.70	45.6	148.8	8.0	25.3	12.1
15th June (D_2)	37.5	0.61	44.6	141.6	9.0	29.8	11.7
15th July (D_3)	31.8	0.60	43.1	136.1	8.6	25.6	12.2
CD (*P=0.05*)	2.63	0.07	NS	8.9	0.23	1.8	NS
Organic manure(M)							
Control (M_0)	26.7	0.50	43.1	134.0	8.0	12.1	11.0
FYM (M_1)	35.0	0.63	45.1	150.4	8.6	28.6	12.6
Pig manure (M_2)	34.5	0.65	42.8	138.2	8.5	31.0	12.4
Vermicompost(M_3)	39.2	0.76	46.8	146.2	9.1	34.6	13.9
CD (*P=0.05*)	3.04	0.77	2.5	10.3	0.28	1.7	0.84
Interaction							
M x D	3.2	NS	NS	11.3	0.48	NS	NS

3.2. Floral characteristics

Minimum number of days taken for bud emergence (81.6 days), days taken to bud burst (91.5 days), days taken to full bloom (101.0 days) were recorded in 15th July planting. Where as maximum diameter of flower stalk

(0.70 cm), maximum number of ray florets (45.6) and maximum number of disc florets (148.8) were observed in 15th May planting. Length of the flower stalk (37.5 cm) and diameter of the neck (0.40 cm) were maximum in 15th June planting (Table 1) and the variation may be due to the prevailing climatic conditions during the growing period (Kumar and Kumar, 2000). Flower diameter and diameter of the disc floret was seen maximum in 15th June planting. Vermicompost treatment exhibited minimum number of days to bud emergence (80.7 days), bud burst (88.9 days) and days taken to full bloom (99.5 days).

In a cut flower like Gerbera, a large number of flower yield promoting attributes viz., stalk length, stalk diameter, number of ray and disc florets and flower diameter are considered important from the point of view of ensuring high flower yield (Keditsu, 2012a). Length (39.2 cm) and diameter of flower stalk (0.76 cm), number of ray florets (46.86, diameter of the neck (0.45 cm), diameter of the disc floret (6.1 cm) and flower diameter (9.1 cm) were also recorded maximum in vermicompost. The amount of nutrients present in vermicompost are readily available to the plants and led to easy transformation of soil nutrients into more mobile forms accessible to the plants (Vijayanathan *et al.,* 2007).

3.2.1. Flowers yield

The difference in date of planting time dictated in flower yield, with maximum number of flowers per plant (29.8) with 15th June planting (Table 2). Kumar and Kumar (2000) suggested that the difference in number of flowers can be attributed to the difference in temperature prevailing during these months. Amongst organic manures, all the three organic manures expressed their significant response (28.6-34.6 flowers/plant) over control (12.1 flowers/plant). However, vermicompost treatment exhibited highest number of flowers per plant (34.6) followed by Pig manure (31.0). Earlier studies by Togun *et al.* (2003) showed that the number of flowers per plant was increased by different levels of compost.

3.2.2. Vase life

No significant influence of planting time was observed on the vase life of flowers but various organic manures influenced the vase life to varying proportions by altering the nutrient regime of growing medium, thereby, improving the water regulatory properties of flower stalk, responsible for increased vase life. Out of different organic manures vermicompost improved the vase life significantly (13.9 days) compared to control (11.0 days). Singh and Sangama (2002) opined that the difference in vase life is due to the increase in stalk length on account of consequently increased reserved food material.

The study hence revealed that 15th June of planting time was an ideal date of planting under humid tropical climate and vermicompost as promising nutrient source for commercial cultivation of Gerbera under agroclimatic condition of Nagaland.

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