



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.03

TPI 2020; 9(1): 200-203

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www.thepharmajournal.com

Received: 24-11-2019

Accepted: 28-12-2019

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## Enhancing vegetative growth through fertigation and nutrient spray for early flowering in some genotypes of gerbera (*Gerbera jamesonii* Bolus)

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### Abstract

The present study on Enhancing vegetative growth through Fertigation and nutrient spray for early flowering in some genotypes of gerbera (*Gerbera jamesonii* Bolus) was conducted under naturally ventilated Polyhouse at SKUAST-Kashmir, Shalimar campus, Jammu and Kashmir during the years 2017-18. The experiment consisted of twelve treatment combinations comprising four different levels of fertigation F<sub>1</sub> (NPK 19:19:19 @ 1.0g/plant at weekly interval), F<sub>2</sub> (NPK 16:8:24 @ 1.0 g/Plant at weekly interval), F<sub>3</sub> (NPK 19:19:19 @ 1.0g/Plant + commercial nutrient spray @ 1ml/L at weekly interval), F<sub>4</sub> (NPK 16:8:24 @ 1.0 g/Plant+ commercial nutrient spray @ 1ml/L at weekly interval) and three cultivars V<sub>1</sub>(Marzena), V<sub>2</sub>(Konstencja), V<sub>3</sub>(Felicks) replicated four times in a Randomized Complete Block Design. Application of NPK 19:19:19 @ 1.0g/Plant + commercial nutrient spray @ 1ml/L at weekly interval improved early growth in terms plant spread, number of leaves /Plant, leaf area/Plant and chlorophyll content recorded. The study showed that enhanced early vegetative growth resulted in advance of flowering studied in terms of days to flower bud appearance and flower opening. There was cultivar nutrient interaction with CV. Konstencja performing better than the CVS. Felicks and Marzena.

**Keywords:** Fertigation, gerbera, genotype, vegetative growth

### Introduction

Gerbera (*Gerbera jamesonii* Bolus.) commonly known as Transvaal daisy, Barberton daisy and African daisy is widely used as a cut flower besides for beds, pots, borders and rock gardens. Genus gerbera consists of forty species of half-hardy and perennial flowering plants, Gerbera produces attractive flowers known as 'head' or Capitulum. Commercial gerbera is native to South Africa whereas some species are also found in Asiatic regions and all belong to the family Asteraceae. Some species of gerbera in India are distributed in temperate Himalayas from Kashmir to Nepal at an altitude of 1300 to 3200 meters. Only *Gerbera jamesonii* Bolus ex Hook is commercially cultivated as a floricultural crop (Baily, 1963) [13]. In Kashmir valley gerbera cultivation under Polyhouse conditions is becoming popular among the flower growers. Most of the poly houses are 150-200 m<sup>2</sup> in area with drip lines for fertigation and irrigation. Under Kashmir valley conditions gerbera are planted in late September or early October in naturally ventilated poly houses. The temperature from November to January is not conducive for vegetative growth. However, the growth picks up in the 2<sup>nd</sup> fortnight of February. Fertigation is started from early March to take advantage of the favourable growth conditions. Although gerbera stem is highly abbreviated with closely spaced leaves, there is a distinct juvenile stage through which the plant has to pass before some of the vegetative buds become generative. The duration of juvenile period and days to flowering depends upon the minimum number of leaves/nodes. Under valley conditions gerbera plants begin to add suckers or lateral branches as the days become longer and day/night temperature increases from February- March. Older suckers become generative after leaves have attained a critical area and simultaneously new suckers are added. Timely and adequate application of macro and micro nutrients through fertigation at sucker forming stages under Kashmir valley conditions are critical to commencement of early flowering. In India several studies (Ayemi *et al.*, 2017, Soni and Godara 2017, Palanisamy *et al.*, 2017, Kallol and Biradar, 2015) [1, 2, 4] have been conducted to study effect of nutrition through fertigation under naturally ventilated

Poly houses. (Khosa *et al.*, 2011, Soni *et al.*, 2010) [6, 7] studied the effect of nutrition applied as foliar application in gerbera under Polyhouse conditions. However, none of the above cited examples were the combined effect of fertigation and foliar application evaluated on different genotypes of gerbera under naturally ventilated Polyhouse. In Kashmir valley most of the growers follow the nutrient schedule prescribed by the plant material supplier companies which is in disregard for the local environmental conditions. Moreover, some growers use over the counter commercial nutrient formulations as nutrient sprays. There is a need to standardize fertigation and foliar application schedule that allows the gerbera plants to exploit favourable environmental conditions in the early Kashmir spring and hence advance the flowering phase of the crop (Fayaz *et al.*, 2016, Sujatha *et al.*, 2002) [3, 8]. The current experiment was, therefore, designed to ascertain whether supply of macro/micro nutrients through fertigation and nutrient sprays during early juvenile phase can advance transition of gerbera plants into generative phase.

### Materials and Methods

The study entitled “Enhancing vegetative growth through Fertigation and nutrient spray for early flowering in some genotypes of gerbera (*Gerbera jamesonii* Bolus)” was conducted under a naturally ventilated Polyhouse at SKUAST-Kashmir, Shalimar campus, Jammu and Kashmir during years 2017-18. The experiment consisted of twelve treatment combinations comprising four different levels of fertigation F<sub>1</sub>(NPK 19:19:19 @ 1.0g /plant at weekly interval), F<sub>2</sub> (NPK 16:8:24 @ 1.0 g /Plant at weekly interval), F<sub>3</sub> (NPK 19:19:19 @ 1.0g/Plant + commercial nutrient spray @ 1ml/L at weekly interval), F<sub>4</sub> (NPK 16:8:24 @ 1.0 g/Plant+ commercial nutrient spray @ 1ml/L at weekly interval) and three cultivars V<sub>1</sub>(Marzena), V<sub>2</sub>(Konstencja), V<sub>3</sub>(Felicks) replicated four times in a Randomized Complete Block Design. All cultural operations and pest and disease control measures were uniformly followed as per the standard practices.

In the current study Data on plant spread, number of leaves Plant<sup>-1</sup> and leaf area Plant<sup>-1</sup> at 120 and 165 days after planting (DAP), chlorophyll content (SPAD reading) at 150 DAP and number of days to appearance of 1<sup>st</sup> flower bud and 1<sup>st</sup> Flower opening are reported.

### Results and Discussion

In gerbera flower buds are observed after 10-14 leaves have developed in primary leaf whorl and 2 to 6 leaves have developed in the secondary leaf whorl (Dole and Wilkins,

1999). This points to a definite duration of juvenile phase in gerbera before onset of generative phase. In the current study the crop was planted in 1<sup>st</sup> week of October 2017 in a naturally ventilated Polyhouse. The side vents of the poly house were open during the day upto 1<sup>st</sup> week of November and closed day and night there after upto 15 March. This period allowed the crop to get established in terms of root development. Under Kashmir conditions gerbera starts to grow and add suckers as the day length and temperature increases from February onwards. There are reports that leaf area increases with the increases in temperature and is greatest at 25 °C. Erwin *et al.* 1991 reported a day night temperature of 25/14°C optimum for plant dry weight production. A low temperature of 13 °C whether in greenhouse or field favour vegetative axillary shoots and results in higher number of flowers latter (Rojers and Tjia 1990, Lin and French 1985) [11, 12]. In naturally ventilated greenhouse under Kashmir conditions the above day length and temperature regime are prevalent from February to May. Rojers and Tjia (1990) [11] indicated that gerbera plants respond dramatically to light intensity X duration. Under Kashmir conditions light intensity increases from April-June, which promotes flower initiation. Therefore, timely and adequate supply of macro and micro nutrients during this phase (March-May) are critical to allow gerbera crop to exploit the prevalent favourable conditions in Kashmir for early commencement of flowering.

In our study weekly application of 19:19:19 NPK @ 1 g Plant<sup>-1</sup> Week<sup>-1</sup> + Commercial nutrient spray @ 1 ml/L Week<sup>-1</sup> significantly improved the plant spread showed in Table & Fig1. Leaf number showed in Table & fig 2 and leaf area recorded at 120 and 165 days after planting showed in Fig 3. Further plant health in terms of chlorophyll content showed in Fig 4, recorded at 150 was DAP also significantly superior in plant supplied with 19:19:19 NPK @1 g Plant<sup>-1</sup> Week<sup>-1</sup> + Commercial nutrient spray @ 1 ml/L Week<sup>-1</sup>. Our study shows a significant advance in days to first bud appearance and opening of first flower (Table 3, & Fig 5) under nutrient regime of 19:19:19 NPK @1 g Plant<sup>-1</sup> Week<sup>-1</sup> + Commercial nutrient spray @ 1 ml/L Week<sup>-1</sup>. This advance in generative phase is important under Kashmir conditions as flowering in gerbera extends only to November after which it declines because of the low temperatures. Moreover, the study also revealed cultivar x nutrient regime interaction with There was cultivar x nutrient interaction with cv. Konstencja performing better than the CVS Felicks and Marzena in terms of early vegetative growth but days to appearance of 1<sup>st</sup> bud and opening of flower was lowest in cv. Felicks.

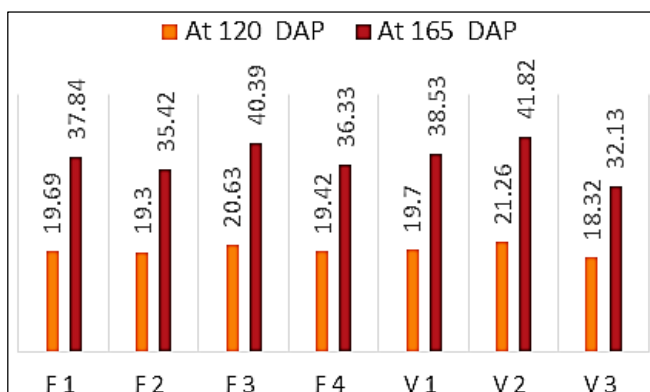


Fig 1: Plant spread (CM)

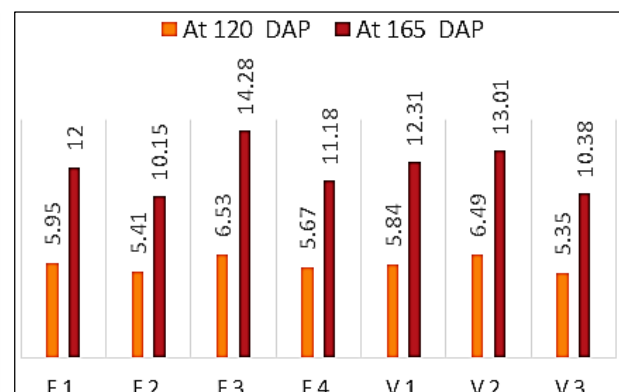


Fig 2: Number of leaves plant<sup>-1</sup>

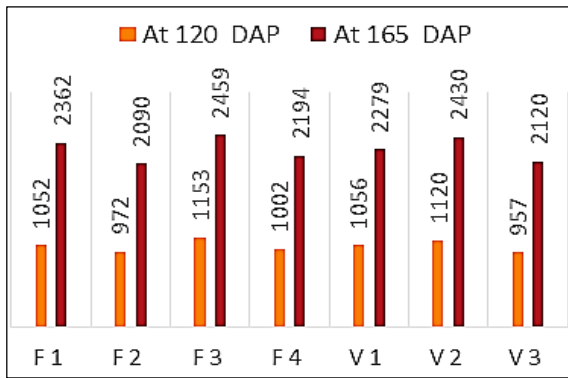


Fig 3: Leaf area (CM<sup>2</sup>)

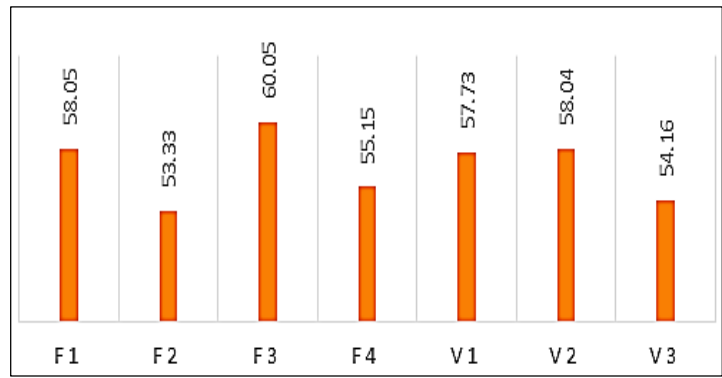


Fig 4: Chlorophyll content by SPAD method at 150 DAP

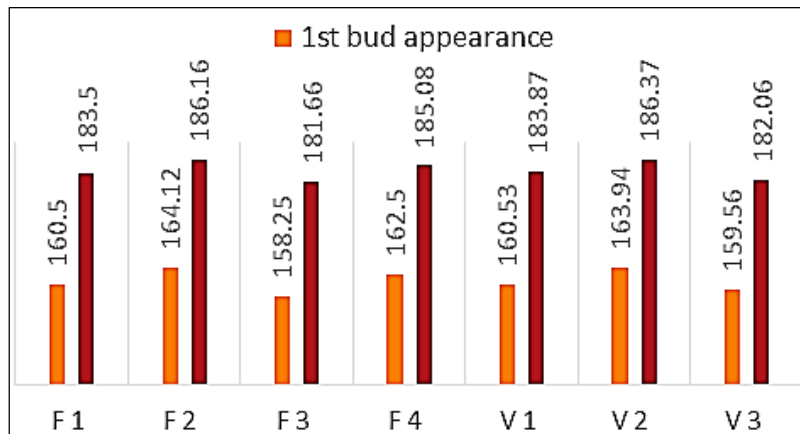


Fig 5: Days to 1<sup>st</sup> BUD and flower opening

Table 1: Effect of Fertigation and Genotype on Plant spread (cm) in Gerbera

Treatments	Plant spread at 120 days after planting				Plant spread at 165 days after planting					
	F <sub>2</sub>	F <sub>3</sub>	F <sub>2</sub>	F <sub>3</sub>	F <sub>2</sub>	F <sub>3</sub>	F <sub>2</sub>	F <sub>3</sub>	F <sub>2</sub>	F <sub>3</sub>
V1	19.45	20.41	19.45	20.41	19.45	20.41	19.45	20.41	19.45	20.41
V2	20.49	22.04	20.49	22.04	20.49	22.04	20.49	22.04	20.49	22.04
V3	17.97	19.45	17.97	19.45	17.97	19.45	17.97	19.45	17.97	19.45
mean	19.30	20.63	19.30	20.63	19.30	20.63	19.30	20.63	19.30	20.63
CD(p< 0.05)	Variety(V)=1.14 Fertigation(F)= 1.32 V×S=N.S					Variety(V)=2.31 Fertigation(F)=2.67 V×S= 4.63				

Table 2: Effect of Fertigation and Genotype on number of leaves Plant<sup>-1</sup> in Gerbera

Treatments	Number of leaves Plant <sup>-1</sup> at 120DAP					Number of leaves Plant <sup>-1</sup> at 165 DAP				
	F1	F2	F3	F4	mean	F1	F2	F3	F4	mean
V1	5.62	5.91	6.24	5.58	5.84	12.50	10.49	14.77	11.49	12.31
V2	6.95	5.66	7.16	6.20	6.49	13.02	10.8	15.92	12.25	13.01
V3	5.29	4.66	6.20	5.24	5.35	10.47	9.1	12.15	9.8	10.38
mean	5.95	5.41	6.53	5.67		12.00	10.15	14.28	11.18	
CD(p< 0.05)	Variety(V)=0.81 Fertigation(F)= 0.93 V×S=N.S					Variety(V)= 1.24 Fertigation(F)=1.43 V×S=2.48				

Table 3: Effect of Fertigation and variety on number of days taken to 1<sup>st</sup> flower bud and flower opening in Gerbera

Treatments	1 <sup>st</sup> Flower bud appearance					1 <sup>st</sup> Flower opening				
	F1	F2	F3	F4	mean	F1	F2	F3	F4	mean
V1	159.50	163.00	157.75	161.87	160.53	183.00	186.00	181.25	185.25	183.87
V2	163.25	167.12	160.27	165.12	163.94	186.00	188.00	184.50	187.00	186.37
V3	158.75	162.25	156.75	160.50	159.56	181.50	184.50	179.25	183.00	182.06
mean	160.50	164.12	158.25	162.50		183.50	186.16	181.66	185.08	
CD(p< 0.05)	Variety(V)=1.34 fertigation(F)= 1.55 V×S=N.S					Variety(V)= 2.03 fertigation(F)=2.34 V×S=NS				

**Conclusion**

Results of the present study showed that application of nutrients as fertigation of NPK 19:19:19 @ 1.0g/Plant + Commercial nutrient spray @ 1ml/L at weekly interval advanced the flowering by 1 week and also significantly improved the vegetative growth of gerbera crop.

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