International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
DOI: 10.22192/ijarbs Coden: IJARQG (USA) Volume 7, Issue 11 -2020

Research Article

DOI: http://dx.doi.org/10.22192/ijarbs.2020.07.11.002

Impact of Plant Bioregulators on flowering of gerbera (*Gerbera jamesonii* B.) cv.Goliath in open field condition

Bishnupada Giri[1*] and Sashikala Beura[2]
[1] Ph.D. Scholar, Dept. of Floriculture and Landscaping, College of Agril. OUAT, Bhubaneswar
[2] Professor and Head, Dept. of Floriculture and Landscaping, College of Agril. OUAT, Bhubaneswar
*Corresponding author E mail: *bapugiri8@gail.com*

Abstract

The present investigation entitled "Impact of Plant Bioregulators on flowering of gerbera (*Gerbera jamesonii*, B.) cv. Goliath'' was carried out in premises of Bio-technology cum Tissue Culture Centre, Odisha University of Agriculture and Technology, Bhubaneswar during 2015-16 and 2016-17. The objective of the study was to standardize suitable bioregulators on flower production in gerbera in open field condition. Apart from control eight treatments of growth regulators were used like GA_3 @ 100 ppm, and 150 ppm; Cycocel @ 700 ppm and 800 ppm with or without amino acids as foliar spray. The result revealed that days taken to flower bud initiation and days taken to flowering was minimum in GA_3 @ 100 ppm + Amino Acid. The stalk length of flower was maximum in treatment GA_3 @ 150 ppm+ Amino Acid while largest flower diameter, maximum number of flowers and longest bloom life was observed in treatment with cycocel @ 700 ppm + Amino acid. Maximum stalk thickness was found in treatment with cycocel @ 800 ppm + Amino acid.

Keywords: Gibberellin, Cycocel, Amino Acid.

Introduction

Gerbera (*Gerbera jamesonii*, B.) also known as Transvaal daisy, Barbeton daisy or African daisy belonging to family Asteraceae occupies 5th place as cut flower in international flower trade (Sujatha *et al*. 2002). It is popular because of it's attractive colour, long vase life and suitability for long distant transport (Bose *et al*. 2003 and Chauhan, 2005). It is used for fresh and dry flower arrangement, exhibition, decoration, bouquet preparation (Patra *et al*.,2015). Local and improved cultivar are grown in garden, flower bed, pots, borders, dish garden and rock garden. Flowers are of different colour like white cream, yellow, pink, orange, brick red, scarlet, salmon, maroon and bicolor and are available in single, semi-double or double form.

Application of plant bioregulators at specific concentration modify growth, flowering, flower yield and post harvest quality of flowers. Growth promoters like Auxin, Gibberellin and Cytokinin modify physiological process by accelerating plant growth while growth retardant like cycocel and Abscisic acid inhibit plant growth. Maximum vegetative growth, flower yield and quality was observed in gerbera by application of GA_3 @ 150 ppm. (Dalal *et al*. 2009).

Similarly, application of growth retardant like paclobutrazole @ 25 to 100 ppm in gerbera reduce plant spread, increase leaf number/plant, increase chlorophyll content, decrease in stalk length, increase in stalk thickness, number of flowers and flower quality parameters. (Bekheta *et al*. 2008).

Materials and Methods

The present study was conducted in premises of Bio-technology cum Tissue Culture Centre, Odisha University of Agriculture Technology, Bhubaneswar from Nov. to Oct. 2015-16 and 2016-17 in open condition.

The experimental site is situated 63 km away from Bay of Bengal at an altitude of 25 m above MSL and extended between 20^0 15' North latitude and 85^0 50' East longitude. The average rainfall of the site is 1646 mm. The maximum temperature during the experimental period was 38.8 ^{0}C to 40.8 ^{0}C and minimum temperature was 14.1 ^{0}C to 15.2 ^{0}C. The relative humidity during the experimental period was 37 % to 94 %. The experimental soil was sandy loam with pH 5.83, EC 0.64 ds/m, OC 0.475 %; N 125 kg/ha, P_2O_5 67.1 kg/ha, K_2O 166.6 kg/ha. The growing media was composed of soil, FYM and coco peat in 1: 1: 1 proportion.

Earthen pot with a hole at the bottom were used for planting. The pot were filled with soil mixture. Four leaved tissue culture plantlet of gerbera cv. Goliath a variety suitable for protected cultivation were used for planting. A basal dose of NPK @ 10: 15:20 g per m^2 was applied. The experiment was laid down in Completely Randomized Design (CRD) with nine treatments and three replication per treatments. There were 10 plants per replication and 30 plants per treatment making a total population of 270 plants.

The present experiment comprised with 9 treatments i.e. T_1 (Control), T_2 (GA_3 @ 100 ppm) , T_3 (GA_3 @ 150 ppm) , T_4 (Cycocel @ 700 ppm), T_5 (Cycocel @ 800 ppm), T_6 (GA_3 @ 100 ppm + Amino Acid @ 2 ml/l), T_7 (GA_3 @ 150 ppm + Amino Acid @ 2 ml/l), T_8 (Cycocel @ 700 ppm + Amino Acid @ 2 ml/l), T_9 (Cycocel @ 800 ppm + Amino Acid @ 2 ml/l).

For application of treatments to the plants following concentrations of plant bio regulators solution were prepared. With help of a precision balance 100 mg and 150 mg of GA_3 were measured and taken in two beakers separately. Little quantity of sodium hydroxide was added to the beaker for easy solubility. Then the volume was made to 1 litre by adding water in to the beakers thus preparing 100 ppm and 150 ppm of GA_3 solution. Similarly, 700 mg and 800 mg of cycocel were measured and taken in two beakers separately. Little quantity of alcohol was added to the beaker for easy solubility and then the volume was made to 1 litre by adding water into the beaker. Thus, 700 ppm and 800 ppm cycocel solution were prepared.

The observation were recorded from 5 randomly selected plant within each replication of treatment for different floral parameters like days taken to flower bud initiation after disbudding ,days taken to flowering, stalk length, stalk thickness, number of flower/plant, flower diameter and bloom life. The data collected were analysed statistically following the method of Gomez and Gomez (1984) using one way ANOVA in CRD. A comparison of treatment means were done at 5 % level of significance (P = 0.05).

Results and Discussion

The result of the experiment obtained in the year 2015-16 to 2016-17 were pooled and presented under following headings.

Length of flower stalk

The pooled data from both the year revealed that longest stalk length (57.35 cm) was observed in T_7 (GA @ 150 ppm+ Amino Acid) and T_3 (GA @ 150 ppm) while minimum stalk length (45.05 cm) was observed in T_5 (Cycocel @ 800 ppm). Increase in stalk length in T_7 and T_3 might be due to application of GA @ 150 ppm with or without amino acid. Being a growth promoter Gibberellin induce cell elongation and cell enlargement increasing stalk length. Similar finding was obtained by Pobudkiewicz and Nowak (1992), Sujatha *et al.* (2009), Dalal *et al.* (2009), Dogra *et al.* (2012), Mehraj *et al.* (2013) and Jamaluddin *et al.* (2014) by application GA in gerbera. Decrease in flower stalk length in T_5 (Cycocel @ 800 ppm) may be due to inhibitory effect of cycocel on growth inhibiting cell elongation and cell enlargement which corroborates with the finding of Mohamed (1992) who reported that growth retardant like ethrel decrease stalk length.

Thickness of flower stalk

The pooled data from both the year revealed that maximum stalk thickness (6.86 mm) was observed in T_9 (Cycocel @ 800 ppm + Amino Acid) which was at par with T_8 (Cycocel @ 700 ppm + Amino Acid). Increase in stalk length in T_9 and T_8 might be due to application of cycocel and as a growth retardant it check apical dominance and stem elongation but increase stem thickness.

Table-1 Impact of application of PBRs (Pooled over year 2015-16 and 2016-17) for Length of flower stalk and Thickness of flower stalk of gerbera hybrid cv. Goliath

Treatments number	Characters / Treatments	Length of flower stalk(cm)	Thickness of flower stalk(mm)
T_1	Control	48.45	5.48
T_2	GA @ 100 ppm	51.19	6.22
T_3	GA @ 150 ppm	55.08	6.05
T_4	Cycocel @ 700 ppm	46.75	6.42
T_5	Cycocel @ 800 ppm	45.05	6.60
T_6	GA @ 100 ppm + AA	53.31	6.43
T_7	GA @ 150 ppm + AA	57.35	6.28
T_8	Cycocel @ 700 ppm + AA	49.19	6.64
T_9	Cycocel @ 800 ppm + AA	47.23	6.86
	SE (m) ±	0.875	0.121
	CD (0.05)	2.85	0.40

Table-2 Impact of application of PBRs (Pooled over year 2015-16 and 2016-17) for number of flowers/plant, Flower diameter and Bloom life of gerbera hybrid cv. Goliath

Treatments number	Characters / Treatments	Total number of flowers/plant	Flower diameter (cm)	Bloom life (days)
T_1	Control	20.95	8.88	9.24
T_2	GA @ 100 ppm	32.18	10.12	12.93
T_3	GA @ 150 ppm	28.12	9.76	12.15
T_4	Cycocel @ 700 ppm	37.61	10.46	14.66
T_5	Cycocel @ 800 ppm	32.95	10.11	13.80
T_6	GA @ 100 ppm + AA	35.70	10.43	14.12
T_7	GA @ 150 ppm + AA	32.27	10.04	13.32
T_8	Cycocel @ 700 ppm + AA	41.03	10.76	16.14
T_9	Cycocel @ 800 ppm + AA	36.87	10.41	15.11
	SE (m) ±	0.494	0.152	0.540
	CD (0.05)	1.41	0.50	1.76

Similar finding was also obtained by Lin (1991) and Muthumanickam *et al*. (1999) who stated that application of growth retardant like ethrel increased stalk thickness in gerbera. Thinnest flower stalk (5.48 mm) was observed in T_1(control) where no growth regulators was applied.

Number of flowers/plant

Pooled data from both the year revealed that maximum number of flowers (41.03/plant/year) was found in T_8 (Cycocel @ 700 ppm + Amino Acid) which was closely followed by T_4 (Cycocel @ 700 ppm), T_9 (Cycocel @ 800 ppm + Amino Acid and T_6 (GA @ 100 ppm + Amino Acid) while lowest number of flower (20.95/plant/ year) was recorded in T_1 (Control).

Increase in flower number in T_8 and T_4 may be due to application optimum concentration Cycocel @ 700 ppm with or without amino acid. Being a growth retardant cycocel inhibits apical dominance and induce bushiness/ dwarfness which result in emergence of more number of suckers. When number of suckers increases, the number of flower/plant increases. Similar finding have been obtained by Mohamed (1992), Muthumanikam *et al.* (1999) and Kumar *et al.* (2008) who reported increasing flower number by application of growth retardant like ethrel in gerbera. Besides, Cycocel application another treatment T_6 (GA @ 100 ppm + Amino Acid) produced more number of flowers/plant which was very close to best treatment. Similar finding have been obtained by Nair *et al.* (2002), Sujatha *et al.* (2002), Dalal *et al.* (2009), Jamaluddin *et al.* (2013) in increasing number of flowers/plant in gerbera. The minimum number of flower/plant obtained in T_1 (Control) may be due to no application of growth regulator.

Flower diameter

The pooled data from both of the year revealed that largest flower diameter (10.76 cm) was observed in T_8 (Cycocel @ 700 ppm + Amino Acid) which was at par T_4 (Cycocel @ 700 ppm) while minimum flower diameter (8.88 cm) was observed in T_1 (Control). Increase in flower diameter in T_8 and T_4 might be due to application of optimum concentration of cycocel @ 700 ppm with or without amino acid. Being a growth retardant cycocel result delay flowering which help in accumulation of photosynthates in plant resulting larger flower. Highest chlorophyll content in treatment with cycocel is also an evidence of maximum dry matter production resulting large flower. Similar finding have been obtained by Nair *et al.* (2002) by application of cycocel in gerbera. The role of growth retardant in increasing flower diameter was also proved by Mohamed (1992) with application of ethrel in gerbera. The smallest flower diameter was recorded in T_1 (control) which was due to no application of growth regulator in gerbera.

Bloom life

The pooled data from both the year revealed that maximum bloom life (16.14 days) was observed in T_8 (Cycocel 700 ppm+ Amino Acid) which was at par with T_9 (Cycocel @ 800 ppm+ Amino Acid) while minimum bloom life (9.24 days) was observed in T_1 (Control). Increase in bloom life might be due to application of cycocel. As discussed earlier, due to delay in flowering and more chlorophyll content in treatment with cycocel, there was more reserve of photosynthates in flower which prolong bloom life. Similar finding have been reported by Jamaluddin *et al.* (2014) by application of growth retardant like ethrel in gerbera. The shortest bloom life was observed in T_1 (Control) due to no application of growth regulators.

Conclusion

From the above finding it can be concluded that combination of GA_3 @ 150 ppm and amino acid performed best with respect to days to flower bud initiation and flowering. Maximum stalk length was achieved by application of GA_3 @ 150 ppm+ Amino Acid while maximum number of flowers/plant, diameters of flower and bloom life were observed by application of CCC @ 700 ppm + amino acid. Maximum stalk thickness was found in treatment with cycocel @ 800 ppm+ Amino acid. The result of this study will be torch bearer for the researcher as well as gerbera grower for enhancing flower production under open field condition.

References

Bekheta, M.A.; Abbas, S., EL Kobisy, O.S. and Mahgoub, M.H. (2008). Influence of selenium and paclobutrazole on growth, metabolic activities and anatomical characters of Gerbera. *Australian Journal of Basic and applied Science*, 2(4): 1284 -1297.

Bose TK, Yadav LP, Pal P, Parthasarathy VP and Das P. 2003. Commercial flowers, 2nd Edition, Naya Udyog, Calcutta, India.

Chauhan N. 2005. Performance of gerbera genotype under protected cultivation. Department of Horticulture, College of Agriculture, Dharwad. University of Agriculture Science, Dharwad.

Dalal SR, Somavanshi AV and Karale GD. 2009. Effect of gibberellic acid on growth, flowering, yield and quality of gerbera under polyhouse conditions. *International Journal of Agricultural Sciences*, **5** (2): 355-356.

Dogra S, Pandey RK and Bhat DJ. 2012. Influence of gibberellic acid and plant geometry on growth, flowering and production in gerbera under Jammu agro climate. *International Journal of Pharma and Bio Sciences*, **3**(4): 1083-1090.

Gomez, K.A. and Gomez, A.A.(1984). Statistical procedure for agricultural research. John Willeyl Sons Inc., New York, PP.1-680.

Jamaluddin AFM, Mehraj H, Taufique T, Ona AF and Parvin S. 2014. Foliar application of gibberellic acid on growth and flowering of gerbera cultivars. *Journal of Bioscience and Agriculture Research*, **02**(01):52 -58.

Kumar V, Singh AR, Singh RP and Katyar PN. 2008. Effect of GA_3 and Ethrel on growth, flowering and yield attributes of gerbera. *Annals of Horticulture*, **1**(1):54-57.

Lin RS. 1961. Effect of 1- aminocyclopropane-1 carboxylic acid and Ethrel on *Phalenopsis* plantlets in vitro. *Journal Agricultural Research China*, **41**(2):178-186.

Mehraj H, Taufique T, Ona AF, Roni MZK and Jamal Uddin AFM. 2013. Effect of spraying frequency of gibberllic acid on growth and flowering in gerbera. *Journal of Experimental Biosciences*, **4**(2):7-10.

Mohamed SM. 1992. Influence of some growth regulators on growth and flowering of gerbera. *Journal of Applied Science*, **7**:653-667.

Muthumanickam D, Rajamani K and Jawaharal M. 1999. Effect of micro nutrient on flower production in gerbera. *Journal of Ornamental Horticulture*, **2**(2) 131-132.

Nair SA, Sujatha K and Medhi RP. 2002. Performance of gerbera cultivars in Bay Island. *Indian Journal of Horticulture*, **59**(8):322-325.

Patra SK, Beura S and Sashani T. 2015. Efficacy of GA_3 on growth and flowering regulation of in vitro raised hybrid gerbera under shade net. Agri. Sci. Digest, **35**(3):173-177.

Pobudkiewicz A and Nowak J. 1992. The effect of gibberellic acid on growth and flowering of gerbera. *Folia Horticulture*, **4**(2): 35-42.

Sujatha, K.; Gowda, J.V.N. and Khan, M.M. (2002). Effect of different fertigation level on gerbera under low cost greenhouse. *Journal of Ornamental Horticulture*, 5(1): 54-59.

Access this Article in Online

Website: www.ijarbs.com

Subject: Agricultural Sciences

Quick Response Code

DOI:10.22192/ijarbs.2020.07.11.002

How to cite this article:

Bishnupada Giri and Sashikala Beura. (2020). Impact of Plant Bioregulators on flowering of gerbera (*Gerbera jamesonii* B.) cv.Goliath in open field condition . Int. J. Adv. Res. Biol. Sci. 7(11): 12-16.
DOI: http://dx.doi.org/10.22192/ijarbs.2020.07.11.002