International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 10; Issue 01 (B); January 2021; Page No.23665-23668
DOI: http://dx.doi.org/10.24327/ijcar.2021.23668.4690

Research Article

IMPACT OF GIBBERELIN AND CYCOCEL ON VEGETATIVE GROWTH AND FLOWERING OF GERBERA (GERBERA JAMESONII B.) CV. GOLIATH IN OPEN FIELD CONDITION

Bishnupada Giri and Sashikala Beura

Department of Floriculture and Landscaping, College of Agril. OUAT, Bhubaneswar

A R T I C L E I N F O

Article History:
Received 4th October, 2020
Received in revised form 25th November, 2020
Accepted 18th December, 2020
Published online 28th January, 2021

Key words:
Gibberellin, Cycocel, Amino Acid.

A B S T R A C T

The present investigation entitled "Impact of Plant Bio-regulator on growth and 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 bio-regulators 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. Among vegetative parameters maximum plant spread, leaf length, petiole length, leaf width and leaf area was found in GA_3 @ 150 ppm + Amino Acid while maximum leaf number/plant, number of suckers/plant and chlorophyll content in leaf was found in treatment with cycocel @ 700 ppm+ Amino acid. In flowering parameters maximum number of flowers/plant/m^2 in a year was found in treatment with cycocel @ 700 ppm + 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 Bio-regulators 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)

Corresponding author:* **Bishnupada Giri
Department of Floriculture and Landscaping, College of Agril. OUAT, Bhubaneswar

MATERIALS AND METHOD

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 was 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 was 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 in open field condition. 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 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 liter by adding water in to the beaker 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 liter 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 vegetative parameter like plant spread, number of leaves, leaf length, leaf width , length of petiole, number of suckers/plant, chlorophyll content and floral parameters like number of flower/plant. The data collected were analyzed 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.

Effect of PBR application on Vegetative parameters

Plant Spread

Pooled data from both the years (Table-1) revealed that maximum plant spread (64.17 cm) was found in T_7 receiving GA @ 150 ppm+ Amino Acid which was closely followed by T_6 (GA @ 100 ppm+ Amino Acid). The minimum plant spread (50.9 cm)was recorded in T_5 (Cycocel @ 800ppm). Increase in plant spread in T_7 and T_6 might be due to growth promotive effect of GA_3 resulting cell enlargement and cell elongation (Ei Shafe and Hassan 1978) while minimum plant spread in T_5 might be due to retardation of growth due to application of growth retardant like cycocel. Similar finding have been reported by Nair *et al.* (2002), Sujatha, *et al*. (2002), Dalal, *et al.* (2009) and Jamal *et al.* (2013) who proved that GA_3 @100 ppm/150 ppm increased plant spread in gerbera while application of growth retardant like ethrel reduced plant height in gerbera.

Number of leaves/plant

The pooled data from both the year (Table-1) revealed that maximum number of leaves (27.08) were found in T_8 receiving cycocel @ 700 ppm+ Amino Acid which was closely followed by T_4 (Cycocel @ 700 ppm), T_9 (Cycocel @ 800 ppm + Amino Acid), and T_5 (Cycocel @ 800 ppm) while minimum number of leaves (16.67) were observed in T_1 (Control). Increase in leaf number in T_8, T_9, T_4 and T_5 might be due to cycocel application with or without amino acid. When cycocel was applied in optimum concentration as in T_8, it result dwarfness and bushiness of plants producing more number of leaves while least number of leaves in T_1 (Control) was due to no application of growth regulators. Similar finding of increased leaves number was found in tuberose by dipping bulbs in cycocel @ 5000 ppm for 1 hour which was reported by Ganesh *et al*. (2013).

Leaf length

Pooled data from both the years (Table-1) revealed that maximum leaf length (32.94 cm) was observed in T_7 receiving GA @ 150 ppm + Amino acid which was at par with T_6 (GA @ 100 ppm + Amino acid) and followed by T_3 (GA @ 150 ppm). The minimum leaf length (25.45 cm) was found in T_5 (cycocel @ 700 ppm). Increase in leaf length in T_7, T_6 and T_3 might be due to growth promotive effect of GA_3 resulting cell enlargement and cell elongation (Eishafe and Hassan, 1978). Similar finding have been obtained by Cardoso *et al*. (2012), Patel *et al*. (2013) by application of gibberellin in gerbera.

The minimum leaf length recorded in T_5 (cycocel @ 800 ppm) might be due to application of growth retardant like like cycocel. Similar finding have been obtained by Lin (1991) with respect to application of growth retardant like ethrel in gerbera.

Leaf width

From Table-2 it was evident that the maximum leaf width (11.55 cm) was observed in T_7 (GA @ 150 ppm + Amino Acid) which was at par with T_6 (GA @ 150 ppm+ Amino Acid) and followed by T_3 (GA @ 150 ppm + Amino Acid) while minimum leaf width (8.64 cm) was observed in T_5 (cycocel @ 800 ppm). The increase in leaf width might be due to growth promotive effect of Gibberellin i.e. cell elongation and cell expansion. Similar finding have been obtained by Dogra *et al*., (2012) with respect to application gibberellin @ 200 ppm in gerbera. The minimum leaf width in T_5 might be due to retardation of growth due to cycocel application resulting small, reduced size leaves. Similar finding have been obtained by Kumar *et al.* (2008) who reported that application of growth retardant ethrel in gerbera reduced leaf width.

Length of petiole

From Table-2 it was evident that the maximum length of petiole (9.06 cm) was observed in T_7 (GA @ 150 ppm + Amino Acid) which was at par with T_6 (GA @100 ppm+amino acid) and T_3 (GA @150 ppm) while minimum length of petiole (6.41 cm) was observed in T_5 (cycocel @ 800 ppm). The increase in length of petiole might be due to growth promotive effect of GA_3 like cell elongation resulting longer petiole while decrease in length of petiole might be due to application of cycocel. Similar finding have been obtained by Khan and Chaudhury (2006) with respect to application of gibberellin in gerbera

Number of suckers/plant

From Table-2 it was evident that the maximum number of suckers (3.01) were found in T_8 which was closely followed by T_9 (cycoel @ 800 ppm + amino acid) and T_4 (cycocel @ 700 ppm) while minimum number of suckers (1.25) were found in T_1 (control). The increase in number of suckers in T_8, T_9 and T_4 might be due to break of apical dominance and bushy nature of gerbera when applied with growth retardant like cycocel while lowest number of suckers in T_4 might be due to no application of PBR.

Leaf Area

From Table-3 it was evident that the maximum leaf area (202.02 cm^2) was found in T_7 (GA @ 150 ppm +amino acid)

followed by T_3 (GA @ 100 ppm) and minimum leaf area (133.37 cm^2) was observed in T_5 (cycocel @ 800 ppm) . The increase in leaf area might be due to application of GA which help in cell expansion and cell elongation resulting increase in leaf area. Similar finding have been obtained by Nair *et al*. (2002), Khan and Chaudhury (2006), Jamal *et al*. (2013) and Patel *et al*. (2013) with respect to application of Gibberllin in gerbera.

Decrease in leaf area in T_5 might be due to application of growth retardant like cycocel. Growth retardant inhibit vegetative growth, cell elongation, cell enlargement thereby reducing leaf area.

Chlorophyll content

From Table-3 it was evident that the maximum chlorophyll content (3.41 mg/leaf) was observed in T_8 (cycocel @ 700 ppm + Amino acid) which was at par with T_9 (cycocel @ 800 ppm + Amino Acid), T_6 (GA @ 100 ppm + Amino Acid), T_4 (cycocel @ 700 ppm) and T_5 (cycocel @ 800 ppm). The minimum chlorophyll content (2.27 mg/g leaf) was observed in T_1 (control). The increase in chlorophyll content in T_8, T_9, T_4 and T_5 might be due to application of growth retardant like cycocel. Growth retardant reduce vegetative growth, promote bushiness, compactness thereby increasing chlorophyll content per gram leaf. Similar finding have been obtained by Bekheta *et al*., (2008) with respect to application of growth retardant like paclobutrazole in gerbera. Besides, another treatment T_6 (GA @ 100 ppm + Amino acid) recorded chlorophyll content which was at par with cycocel treatment which corroborates with the finding of Jamal *et al*. (2013) with respect to GA application in gerbera and Sajid *et al*. (2015) with respect to application of GA in gladiolus. Gibberellin promote vegetative growth and increase chlorophyll content in leaf. The minimum chlorophyll content was found in T_1 (control) where no growth regulator was applied.

Effect of PBR application on flowering parameters
Number of flowers/plant/m^2/year

Pooled data from both the year (Table-3) revealed that maximum number of flowers/plant /m^2 (369.30) 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 (188.52) was in T_1 (Control).
Increase in flower number in T_8 and T_4 may be due to application optimum concentration of 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 (1987), Mahamed (1992), Muthumanikam *et al.* (1999) and Kumar *et. al.* (2008) who reported increasing stalk thickness 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 Sekar and Sujata (2001), Nair *et al.,* (2002), Sujata *et al.* (2002), Dalal *et al.*,(2009), Jamal *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..

Table 1 Impact of plant bio regulators on vegetative character i.e. Plant spread, Leaf number/plant and Leaf length (Pooled over years 2015-16 and 2016-17) in hybrid gerbera cv. Goliath

Treatments No.	Characters / Treatments	Plant spread (cm)	Leaf number/plant	Leaf length (cm)
T_1	Control	55.53	16.67	28.35
T_2	GA @ 100 ppm	59.28	21.29	30.35
T_3	GA @ 150 ppm	61.52	19.65	31.55
T_4	Cycocel @ 700 ppm	53.02	25.36	26.74
T_5	Cycocel @ 800 ppm	50.90	24.00	25.45
T_6	GA @ 100 ppm + AA	61.91	23.77	31.73
T_7	GA @ 150 ppm + AA	64.17	21.82	32.94
T_8	Cycocel @ 700 ppm + AA	54.79	27.08	28.61
T_9	Cycocel @ 800 ppm + AA	53.11	25.18	27.54
	SE (m) ±	0.782	0.220	0.557
	CD (0.05)	2.55	0.72	1.82

Table 2 Impact of plant bio regulators on vegetative characters i.e. Leaf width, Length of petiole and Number of Suckers (Pooled over years 2015-16 and 2016-17) in hybrid gerbera cv. Goliath

Treatments No.	Characters / Treatments	Leaf width (cm)	Length of petiole(cm)	Number of suckers/plant/ month
T_1	Control	9.52	7.26	1.25
T_2	GA @ 100 ppm	10.37	8.04	2.11
T_3	GA @ 150 ppm	10.88	8.43	1.84
T_4	Cycocel @ 700 ppm	9.05	6.82	2.63
T_5	Cycocel @ 800 ppm	8.64	6.41	2.37
T_6	GA @ 100 ppm + AA	10.98	8.64	2.34
T_7	GA @ 150 ppm + AA	11.55	9.06	2.05
T_8	Cycocel @ 700 ppm + AA	9.72	7.47	3.01
T_9	Cycocel @ 800 ppm + AA	9.31	7.05	2.63
	SE (m) ±	0.197	0.216	0.045
	CD (0.05)	0.64	0.70	0.13

Table 3 Impact of plant bio regulators on vegetative characters i.e. Leaf area and Chlorophyll content(mg/g leaf) (Pooled over years 2015-16 and 2016-17) in hybrid gerbera cv. Goliath

Treatments No.	Characters / Treatments	Leaf area(m^2)	Chlorophyll content (mg/g leaf)	Number of flowers/plant/m^2/year
T_1	Control	147.94	2.27	188.52
T_2	GA @ 100 ppm	166.81	3.14	289.62
T_3	GA @ 150 ppm	182.10	2.92	253.08
T_4	Cycocel @ 700 ppm	140.42	3.27	338.46
T_5	Cycocel @ 800 ppm	133.37	3.17	296.58
T_6	GA @ 100 ppm + AA	177.13	3.27	321.30
T_7	GA @ 150 ppm + AA	202.02	3.05	290.46
T_8	Cycocel @ 700 ppm + AA	157.39	3.41	369.30
T_9	Cycocel @ 800 ppm + AA	145.99	3.33	331.80
	SE (m) ±	2.791	0.082	4.448
	CD (0.05)	7.95	0.27	12.68

CONCLUSION

From the above investigation it can be concluded that application of GA_3 @ 150 ppm with amino acid recorded maximum plant spread, length of leaf, leaf width, length of

petiole and leaf area while maximum number of suckers/plant, maximum chlorophyll content and maximum number of flowers/plant was found in cycocel @ 700 ppm + Amino acid. The result will be torch bearer for the researcher as well as gerbera grower for enhancing quality and flower production under open field condition.

References

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

Bekheta MA, Abbas SEL, Kobisy OS and Mahgoub MH. 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.

Cardoso JC, Ono, EO and Rodrigues JD. 2012. Gibberellic acid in vegetative and reproductive development of Phalaenopsis orchid hybrid genus. *Horticultura Brasileria*, 30:71-74.

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 gibberelic acid and plant geometry on growth, flowering, production in gerbera under Jammu agroclimate. *International Journal of Pharma and Bio Sciences*, 3(4): 1083-1090.

Ei-shafe T and Hassan A. 1978. Effect of gibberllic acid on growth, flowering, yield and quality of gerbera under polyhouse conditions. *International Journal of Agricultural Sciences*, 37 (2): 25-39.

Ganesh S, Soorianath Sundaram K and Kanan M. 2013. Studies on effect of plant growth regulators and micronutrients on growth, floral characters and yield of tuberose (*Polyanthes tuberosa* L.) cv. Prajwal. *Asian Journal of Horticulture*, 8 (2): 696-700.

Gomez KA and Gomez AA.1984. Statistical procedure for agricultural research. John Willeyl Sons Inc., New York, PP.1-680.

Jamal uddin AFM, Mehraj H, Taufique T, Ona AF and Parvin S. 2014. Foliar Application of Gibberllic Acid on Growth and Flowering of Gerbera Cultivars. *Journal of Bioscience and Agriculture Research*, 02(01):52 -58.

Khan AS and Chaudhry NY. 2006. GA_3 improves flower yield in some cucurbits treated with lead and mercury. *African Journal of Biotechnology*, 5:149-153.

Kumar NP, Reddy YN and Chandra Shekar R. 2008. Effect of growth regulators on flowering, production in gerbera. *Indian Journal of Horticulture*, 65 (1) 73-78.

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

Muthu Kumar S, Ponnuswami V, Jawaharlal M and Ramesh Kumar A. 2012. Effect of plant growth regulators on growth, yield and exportable quality of cut roses. *The Bioscan*, 7 (4): 733 -738.

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

Patel BB, Desai JR, Patel GD and Patel HF. 2013. Influence foliar application of nitrogen and plant growth regulators on growth, flowering of gerbera. *Bioinfolet Journal*, 10 (2A): 415-417.

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.

Sajid M, Anjum MA and Hussain S. 2015. Foliar application of plant growth regulators affects growth, flowering, vase life and corm production of Gladiolus. *Bulgerian Journal of Agricultural Science*, 21 (5): 982-989.

Sekar K and Sujata A. 2001. Effect of growing media and GA_3 on growth and yield of flower of gerbera (*Gerbera jamesonii* B.) under naturally ventilated green house. *South Indian Horticulture*, 49 (special): 338 – 341.

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

How to cite this article:

Bishnupada Giri and Sashikala Beura.2021, Impact of Gibberelin and Cycocel on Vegetative Growth And Flowering of Gerbera (Gerbera Jamesonii B.) CV. Goliath in open Field Condition. *Int J Recent Sci Res.* 10(01), pp. 23665-23668.
DOI: http://dx.doi.org/10.24327/ijrsr.2021.23668.4690

****