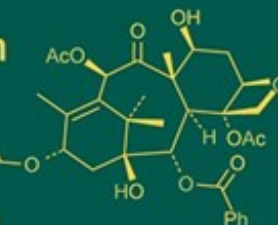


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
Indexing: Embase
IJABR 2026; SP-10(9): 2671-2674
www.biochemjournal.com
Received: 16-07-2026
Accepted: 19-08-2026
Published: 30-09-2026

SK Tamrakar

Assistant Professor,
Department of Floriculture
and Landscaping, Indira
Gandhi Krishi
Vishwavidyalaya, Raipur,
Chhattisgarh, India

Siddhi Bhosale

M.Sc. Scholar, Department of
Floriculture and Landscaping,
Indira Gandhi Krishi
Vishwavidyalaya, Raipur,
Chhattisgarh, India

Varsha Tiwari

Ph.D. Research Scholar,
Department of Floriculture
and Landscaping, Indira
Gandhi Krishi
Vishwavidyalaya, Raipur,
Chhattisgarh, India

Pushparaj

Ph.D. Research Scholar,
Department of Floriculture
and Landscaping, Indira
Gandhi Krishi
Vishwavidyalaya, Raipur,
Chhattisgarh, India

Abhishek Tiwari

Ph.D. Research Scholar,
Department of Floriculture
and Landscaping, Indira
Gandhi Krishi
Vishwavidyalaya, Raipur,
Chhattisgarh, India

Corresponding Author:**SK Tamrakar**

Assistant Professor,
Department of Floriculture
and Landscaping, Indira
Gandhi Krishi
Vishwavidyalaya, Raipur,
Chhattisgarh, India

Effect of different doses of CCC on the growth and flowering of *Canna generalis* for pot culture

SK Tamrakar¹, Siddhi Bhosale², Varsha Tiwari³, Pushparaj⁴, Abhishek Tiwari⁵

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sag.10239>

ABSTRACT

The experiment "Effect of different doses of CCC on the growth and flowering of *Canna generalis* for pot culture" was conducted at Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during 2025-26. The experiment was laid out in a Completely Randomized Design (CRD) with three replications and seven treatments comprising different doses of CCC. The results of study revealed that among the varying levels of different CCC with rhizome dipping with 2000 ppm significantly reduced plant height (56.05 cm), increased stem diameter (21.46 mm), leaves per plant (5.06) and produced minimum numbers of suckers (3.47). Rhizome dipping with 1000 ppm resulted earliest days taken to first bud appearance (83.83 days), opening of first flower (88.03 days), days to 50 % flowering (89.33 days) and maximum flower width (4.34 cm) among all the treatment. Therefore, on the basis of results obtained from the present investigation, it may be suggested that among all the levels of CCC, rhizome dipping with 2000 ppm was found to be optimum dose for vegetative parameter. While rhizome dipping with 1000 ppm found helpful in flowering parameters. The application of CCC found useful in regulation of vegetative and flowering traits of canna.

Keywords: *Canna*, Cycocel, Plant growth regulators, Dipping, Spraying, Rhizome

Introduction

Canna (Canna generalis), member of family Cannaceae (Tanaka *et al.*,^[1]) chromosome number $2n = 18$, is an important minor flower crop to Chhattisgarh, is known for attractive foliage, vibrant flowers, and remarkable adaptability. Among the various species of canna, *Canna generalis* are predominant in India. Its large, asymmetrical blooms occur in striking shades of red, yellow, orange, and mixed colours, making it a preferred choice for public gardens, landscape plantings, and mass displays. In canna, different plant growth regulators are being explored to manipulate plant architecture and flowering behaviour according to production needs. Depending on the type and concentration used, they can promote either taller or more petite plants, accelerate or slow down vegetative growth, and advance or delay flowering. Such regulation enables growers to produce plants with desirable ornamental characteristics. In recent years, the application of cycocel has gained considerable importance as a practical approach for regulating growth and improving plant architecture in ornamental crops. The application of CCC retards stem elongation by preventing cell division in the sub-apical meristem, usually without similarly affecting the apical meristem (Sachs *et al.*,^[2]). Therefore, the evaluation of the effect of CCC at different levels and application methods are essential for developing suitable plants for pot culture.

Materials and methods

The experiment "Effect of different doses of CCC on the growth and flowering of *Canna generalis* for pot culture" was carried out at the Horticultural Research cum Instructional Farm, Department of Floriculture and Landscaping, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during 2025-26. The general climate prevailing in the district Raipur, Chhattisgarh is sub humid to semi-arid with annual rainfall varying from 1200 to 1400 mm. The crop was grown during the winter season. The experiment was laid out with 7 treatments (including control) in CRD and replicated thrice. The pot size was 10 cm X 12 cm. CCC was included with four levels with different application method - Control, Rhizome dipping @ 1000 ppm CCC, Rhizome dipping @ 1000 ppm CCC and 1500 ppm spraying, Rhizome dipping @ 1500 ppm CCC, Rhizome dipping @ 1500 ppm CCC and 1500 ppm spraying, Rhizome dipping @ 2000 ppm CCC and Rhizome dipping @ 2000 ppm CCC and 1500 ppm spraying. Healthy rhizome having 3-5 cm diameter were selected for planting after procurement. The rhizomes were dipped at CCC solution for 24 hours followed by shade drying. Spraying was done at 30 days after planting the rhizome. Observations were

recorded on various growth and flowering, parameters of canna at different stages. The data collected during the course of the experiment were statistically analysed using the standard method of analysis of variance

(ANOVA) as per the procedure outlined for Completely Randomized Design (CRD).

Result and discussion

1. **Vegetative characters** - The data on vegetative characters, viz., plant height, leaves plant⁻¹, leaf blade width and leaf blade length, have been presented in [table 1](#).

Plant height (cm) was found to be negatively related with the increasing concentration of CCC. The minimum plant height (56.05) was observed in rhizome dipping @ 2000 ppm CCC whereas maximum plant height (70.15) was observed in control. Cycocel acted as a growth retardant by inhibiting gibberellin biosynthesis and reducing auxin activity, thereby restricting internodal elongation and vegetative growth, which aligns with the findings of Bruner *et al* (2001) [3] in canna, Khan and Tewari (2003) [4] in dahlia, Shivankar *et al* (2010) [5] in chrysanthemum, and Rajput *et al* (2021) [6] in calendula.

Leaves plant -1

The effect of different levels of CCC found to be non-significant in terms of leaves plant⁻¹. Different level of CCC did not substantially alter number of leaves in canna, leaf blade width was found minimum (8.00) in rhizome dipping @ 1500 ppm CCC and 1500 ppm spraying while maximum leaf blade width (8.70) was observed in rhizome dipping @ 1500 ppm CCC. Cycocel inhibits gibberellin biosynthesis, resulting in reduced cell elongation while simultaneously improving the distribution of photosynthates towards vegetative organs at optimum concentrations. The present findings are in agreement with the observations of Sujatha *et al.* (2002) [7] in gerbera and Kumar *et al.* (2019) [8] in nerium. Leaf blade length was found to be non-significant, different levels of CCC did not statistically differ from each other. However, CCC exerted a significant influence on this trait. The maximum leaf blade length (22.45 cm) was recorded with the application of Cycocel @ 1000 ppm dipping whereas the minimum (20.59 cm) was obtained with rhizome dipping @ 1500 ppm CCC and 1500 ppm spraying CCC.

2. **Flowering characters** - The data pertaining to flower yield characters, viz., first bud appearance (days), opening of first flower (days), 50% flowering (days), flower inflorescence

⁻¹, inflorescence length and flowering duration (days) are presented in [Tables 2](#).

First bud appearance (days)

The effect of CCC on first bud appearance was inversely related with increasing concentration of CCC. The maximum number of days for first bud appearance (109.77 days) was observed under rhizome dipping @ 2000 ppm CCC. In contrast, the earliest first bud appearance (83.83 days) was recorded under rhizome dipping @ 1000 ppm CCC. Higher concentration of CCC shows stronger growth-retarding effect that can slow down vegetative development and delay the physiological transition of the shoot apex from vegetative to reproductive growth. Similar findings were observed by Al humaid *et al.* (2001) [9] in gladiolus.

Opening of first flower (days)

CCC significantly influenced the number of days required for opening of the first flower in canna. The maximum number of days for opening of the first flower (115.30 days) was observed under rhizome dipping @ 2000 ppm CCC. The delay in opening of the first flower at higher concentrations of CCC may be attributed to its inhibitory effect on gibberellin biosynthesis, which slows cell elongation and vegetative growth, thereby postponing the transition from vegetative to reproductive development. The present findings are in close agreement with the observation of Khan and tewari (2003) [4], Joshi *et al* (2006) [10], Navale *et al* (2010) [11].

Days to 50 per cent flowering

The maximum number of days to 50 per cent flowering (116.67 days) was recorded under rhizome dipping @ 2000 ppm CCC. Whereas minimum number of days to 50 per cent flowering (89.33 days) was recorded under rhizome dipping @ 1000 ppm CCC. Higher concentrations of CCC may slow down the development of flower buds, elongation of the flower stalk, and flower opening. As a result, flowers take more time to develop and open, so it takes longer for 50 per cent flowering to be reached. Similar findings were reported by Taksande *et al* (2017) [12] in annual chrysanthemum, Navale *et al* (2010) [11] in chrysanthemum and Ramrao (2010) [13] in gaillardia.

Flower inflorescence -1

The different concentrations of plant growth regulators did not bring about a significant effect on flowers inflorescence⁻¹. Although the differences among the treatments were statistically non-significant, the highest number of flower (6.06) was observed under rhizome dipping with 2000 ppm CCC.

Inflorescence length (cm)

The maximum inflorescence length was obtained in rhizome dipping @ 2000 ppm CCC. The increase in inflorescence length observed under higher concentrations of CCC may be attributed to improved assimilate partitioning towards reproductive organs following the suppression of excessive vegetative growth. CCC inhibits gibberellin biosynthesis, resulting in reduced stem elongation and enhanced accumulation of carbohydrates in developing floral structures, thereby promoting better inflorescence development. Similar findings were reported by Khella (2018) [14] in gladiolus and Sharifuzzaman *et al.* (2011) [15] in chrysanthemum.

Among the different treatments, the maximum flowering duration (97.25 days) was recorded under T₅ (Rhizome dipping with 2000 ppm CCC). The enhancement in flowering duration under higher concentrations of CCC may be attributed to its growth-retarding action, which suppresses gibberellin biosynthesis and reduces excessive vegetative growth, thereby promoting greater accumulation and efficient translocation of photosynthates towards floral organs. This improved source-sink relationship enhances flower longevity and extends the overall flowering period. Similar observations were reported by Sagar *et al* (2005) [16] in tuberose and Giri *et al* (2024) [17] in gerbera and Hirani *et al* (2014) [18] in marigold.

Table 1. Effect of CCC on Vegetative characters

Treatment	Plant height	leaves plant -1	Leaf blade width	Leaf blade length
Control	70.15	5.00	8.16*	21.33
Rhizome Dipping @1000 ppm CCC	69.64	4.76	8.30*	22.45
Rhizome Dipping @1000 ppm CCC and 1500 ppm spraying	65.92	4.58	8.31*	21.81
Rhizome Dipping @1500 ppm CCC	66.16	4.86	8.70	21.10
Rhizome Dipping @1500 ppm CCC and 1500 ppm spraying	64.24*	4.76	8.00	20.59

(continued on next page)

Treatment	Plant height	leaves plant -1	Leaf blade width	Leaf blade length
Rhizome Dipping @ 2000 ppm CCC	56.05	5.06	8.16*	22.32
Rhizome Dipping @2000 ppm CCC and 1500 ppm spraying	59.55*	4.33	8.16*	21.38
CD	9.31	NS	0.35	NS
SEm	3.04	0.26	0.11	0.55

* indicates *at par***Table 2.** Effect of CCC on Flowering characters

Treatment	first bud appearance	opening of first flower	50% flowering	flower inflorescence -1	inflorescence length	Flowering duration
Control	87.53*	92.37*	92.67*	4.86	20.58	85.48
Rhizome Dipping @1000 ppm CCC	83.83	88.03	89.33	4.83	22.40*	88.10*
Rhizome Dipping @1000 ppm CCC and 1500 ppm spraying	86.35*	91.12*	93.67*	4.73	22.27*	91.37
Rhizome Dipping @1500 ppm CCC	93.90	98.27	100.00*	5.41	21.75*	93.52
Rhizome Dipping @1500 ppm CCC and 1500 ppm spraying	100.83	105.00	108.00	4.93	23.01*	94.93
Rhizome Dipping @ 2000 ppm CCC	109.77	115.30	116.67	6.06	26.84	97.25
Rhizome Dipping @2000 ppm CCC and 1500 ppm spraying	98.48	103.23	102.67	5.26	21.42*	96.73
CD	10.00	9.53	12.72	NS	2.54	3.42
SEm	3.26	3.11	4.15	0.33	0.83	1.11

* indicates *at par*

Conclusion

The study demonstrated that different levels and methods of application of CCC significantly influenced the growth and flowering behaviour of *Canna*. Therefore, on the basis of results obtained from the present investigation, it may be concluded that among all the Rhizome dipping with 2000 ppm was found to be optimum dose for vegetative parameters such as reduced plant height (56.05 cm), increased stem diameter (21.46 mm), leaves per plant (5.06) and produced minimum numbers of suckers (3.47). While rhizome dipping with 1000 ppm resulted earliest days taken to first bud appearance (83.83 days), opening of first flower (88.03 days), days to 50 % flowering (89.33 days) and maximum flower width (4.34 cm) and found helpful in hastening the flowering while to delay flowering duration in canna. The application of CCC found useful in regulation of vegetative and flowering traits of canna.

Acknowledgments

It is my privilege to conduct my research under Dr. S.K. Tamrakar (major advisor), Assistant Professor, Department of Floriculture and Landscaping, College of Agriculture, Raipur (C.G) for guidance and sustained support and heartiest thanks to nursery labourer's of horticultural farm for their help during the entire course and experimental period.

References

1. Tanaka N, Uchiyama H, Matoba H. Karyological analysis of the genus *Canna* (Cannaceae). *Plant Syst Evol.* 2009;280:45-51.
2. Sachs RM, Long A, Bretz CF, Roach J. Shoot histogenesis: sub-apical merismatic activity in caulescent plants and the action of gibberellic acid and AMO-1618. *Am. J. Bot.* 1960;47(4):260-6.

3. Bruner LL, Keever GJ, Kessler Jr, Gilliam CH. Growth Retardant Application to *Canna* x *generalis* 'Florence Vaughan'. J. Environ. Hort. 2001;19(3):114-119.
4. Khan FU, Tewari GN. Effect of growth regulators on growth and flowering of dahlia (*Dahlia variabilis* L.). Indian J. Hort. 2003;60(2):192-194.
5. Shivankar S. Effect of pinching and cycocel on growth flowering yield and quality of annual chrysanthemum. M.Sc. Thesis (Unpublished). Dr. Panjab Rao Deshmukh Krishi Vidyapeeth, Akola; 2010.
6. Rajput Y, Tamrakar SK. Response of different plant growth regulators on growth and flower yield of calendula (*Calendula officinalis* L.) cv. Bon Bon Yellow under Raipur condition. M.Sc. (Hort.) thesis Indira Gandhi Krishi Vishwavidyalaya, Raipur; 2021.
7. Sujatha AN, Singh V, Sharma TVRS. Effect of plant growth regulators on yield and quality of gerbera under Bay Island condition. Indian J. Hort. 2002;59(1):100-105.
8. Kumar S, Haripriya K, Kumar S, Kamalakannam S. Effect of cycocel on growth, flowering and yield of *Nerium* (*Nerium odorum* L.). J. Pharmacogn. Phytochem. 2019;8(3):2226-2228.
9. Al-Humaid AI. Physiological responses of *Gladiolus gandavensis* cv. Rose supreme to cycocel (CCC) application. Alexandria J. Agricultural Research. 2001;46(2):89-96.
10. Joshi V, Reddy SA. Effect of cycocel and alar on growth and flowering parameters in China aster (*Callistephus chinensis* L. Nees). J. Ornamental Hort. 2006;9(1):71-72.
11. Navale MU, Aklade SA, Desai JR, Nannavare PV. Influence of plant growth regulators on growth, flowering and yield of chrysanthemum IV References (*Dendrathera grandiflora* Tzvelev) cv. 'IIHR-6'. Int. J. Pharma Bio Sci. 2010;1(2):1-4.
12. Taksande S, Raut VU, Nagre PK. Effect of pinching and cycocel on flowering and flower quality of annual chrysanthemum. J. Soils Crops. 2017;27(1):75-79.
13. Ramrao SM. Effect of growth retardants on growth, yield and quality of gaillardia. M.Sc(Hort.) thesis Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola; 2010.
14. Khella EA. Effect of some growth regulators on flowering, corms and cormlets productivity of different gladiolus cultivars. Middle East J. Agric. Res. 2018;7(3):1165-1176.
15. Sharifuzzaman SM, Ara KA, Rahman MH, Kabir K, Talukdar MB. Effect of GA3, CCC and MH on vegetative growth, flower yield and quality of chrysanthemum. Int. J. Exp. Agric. 2011;2(1):17-20.
16. Sagar NN, Kawarkhe VJ, Deshmukh M, Lokhande BS. Effect of pre planting growth regulator treatment of bulbs on growth and flowering of tuberose (*Polianthus tuberosa* L.) Orissa J. Hort. 2005;33(1):39-42.
17. Giri B, Berua S. Efficacy of growth regulators on flowering of *Gerbera* (*Gerbera jamesonii* B.) cv. Goliath inn open field condition. Agric. Sci. Dig. 2024;44(5):864-867.
18. Hirani AB. Effect of plant growth retardants on growth, flowering and yield of African marigold cv. *Pusa* Narangi Gaiinda. Int. J. Chem. Stud. 2014;5(2):201-204.

How to cite this article: Tamrakar S, Bhosale S, Tiwari V, Pushparaj, Tiwari A. Effect of different doses of CCC on the growth and flowering of *Canna generalis* for pot culture. *International Journal of Advanced Biochemistry Research*. 2026;SP-10(9):2671-2674. doi: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sag.10239>