

Original Research Article

<https://doi.org/10.20546/ijcmas.2021.1002.304>

Effect of Paclobutrazol and Daminozide on Floral Attributes of Chrysanthemum (*Dendranthema grandiflora* Tzvelve)

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ABSTRACT

The present investigation was regulate to evaluate the flowering parameters of chrysanthemum cv. Dolly White in response to different concentrations of paclobutrazol and daminozide at Floriculture and Landscaping Block, College of Horticulture, VCSG Uttarakhand University of Horticulture and Forestry, Bharsar, PauriGarwal from June to December, 2019. The experiment was located on Randomized Complete Block Design with nine treatments. The treatments used were control, paclobutrazol @ (30, 60, 90 and 120 ppm) and daminozide @ (250, 500, 750 and 500 ppm). Each treatment was replicated thrice. The cuttings were planted in 15 cm × 15 cm (length and diameter) size pots. Paclobutrazol and daminozide were applied at 30 and 60 days after planting of cuttings. The results of experiment acknowledge that all the applied concentrations of daminozide significantly improve number of days taken to bud appearance and bud showing colour and their results were found statistically at par with each other. However, minimum days taken to full bloom (118.37 ± 0.36 days) were observed from the plants sprayed with daminozide @ 1000 ppm and found statistically at par with daminozide @ 750 ppm (119.17 ± 0.57 days). The maximum flower diameter (3.54 ± 0.05 cm) was recorded in plants sprayed with daminozide 500 ppm and found statistically at par with daminozide 750 ppm (3.41 ± 0.03 cm). Maaximum number of flowers and flower longevity (20.29 ± 0.35 and 16.78 ± 0.58 days, respectively) were recorded from the plants drenched with paclobutrazol @ 90 ppm. Thus, it can be revealed that highest number of flowers and flower longevity, drenching of paclobutrazol @ 90 ppm was found best. However, for getting earliness in flower bloom spray of daminozide @ 750 ppm was found useful and flower diameter was found maximum from plants sprayed with daminozide @ 500 ppm

Keywords

Paclobutrazol,
Daminozide, Dolly
White

Article Info

Accepted:
20 January 2021
Available Online:
10 February 2021

Introduction

Chrysanthemum is one of the beautiful oldest flowering plant, commercially grown in different parts of World (Dole and Wilkins 2005). It is a genus of approximately 30 species of perennial flowering plants which belonging to the family “Asteraceae”, and found in Asia and north eastern Europe and commonly known as “Queen of East” and “AutumnQueen” (Bhattacharjee 2003). It ranks next to rose in the international flower market due to its huge range of shapes and sizes of flowers, brilliant colour tones and long lasting floret life with respect to growth habit of plant, flower shape, size and colour (Singh 2006).

Now a day growth retardants being tried for controlling growth and flowering of chrysanthemum with a view to get compact plants, to stretch-out or retard the rate of plant growth and also to delay the flowering period (Anderson 2006). Growth retardants have an inhibiting effect on cell division and enlargement of cell in plants. Paclobutrazol [(2RS, 3RS)-1-(4-chlorophenyl)-4, 4-dimethyl-2-(1H-1, 2, 4-triazol-1-yl)-pentan-3-ol] is one of the members of triazole family having the property of growth regulating. The growth regulating properties of paclobutrazol are moderate by altering the levels of plant hormones such as gibberellins, abscisic acid (ABA) and cytokinins (Fletcher and Hofstra 1990). Daminozide inhibited gibberellin biosynthesis or action and induced flowering (Halevy, 1986). It was reported that in chrysanthemum, different photoperiods had an important role in yield and quality (Dutta *et al.*, 1993; ByungJoo *et al.*, 2001).

Materials and Methods

A field experiment was laid out at College of Horticulture, VCSG, UHF, Bharsar, Pauri Garhwal, Uttarakhand, India during June-

December, 2019. The experiment consist of ten treatments *viz.*, T₁ Control(Water spray); T₂ Paclobutrazol @ 30 ppm; T₃ Paclobutrazol @ 60 ppm; T₄ Paclobutrazol @ 90 ppm; T₅Paclobutrazol @ 120 ppm; T₆ Daminozide @ 250 ppm; T₇ Daminozide @ 500 ppm; T₈ Daminozide@ 750 ppm; T₉ Daminozide @ 1000 ppm. Paclobutrazol was applied by soil drenching and daminozide was applied by spraying the plants. The treatments were replicated thrice in Randomized Complete Block Design. Vermicompost and farmyard manure were applied as per treatment allocation to the plots uniformly. Inorganic fertilizers were applied in the form of calcium ammonium nitrate, single super phosphate and muriate of potash. Half dose of nitrogen and full dose of phosphorous and potash was applied as a basal dose and remaining half dose of nitrogen was applied 30 days after transplanting. The terminal cuttings of chrysanthemum for experimental purpose were taken from a healthy stock plants maintained at Floriculture and Landscaping Block, Bharsar, Uttarakhand in the month of June. The length of cutting was about 5-7 cm. Cuttings were prepared by removing basal leaves and reducing the leaf area of remaining leaves to half. The basal portion of cuttings were dipped in IBA solution @ 1000 ppm and planted in a raised nursery bed in shady conditions and then transplanted in plastic pots (length 15 cm and diameter 15 cm) under shade condition. The pots were filled with growing media containing sand + soil +FYM + Vermicompost (1:1:1:1). In each pot a single cutting was planted at the centre. In the early morning hours Paclobutrazol and Daminozide were applied 30 and 60 days after transplanting of cuttings.

Results and Discussion

The results revealed that application of different concentrations of daminozide significantly induce earliness in flowering.

The earliness in bud appearance (82.48 ± 0.45 days) were found from the plants sprayed with T₉ (daminozide @ 1000 ppm) and found statistically at par with T₈ (83.45 ± 0.39 days), T₇ (83.60 ± 0.25 days) and T₆ (83.72 ± 0.93 days). Similarly, days taken to appearance of first flower opening were recorded in T₉ (102.83 ± 0.43 days) and found statistically at par with T₈ (103.97 ± 0.36 days), T₇ (103.80 ± 0.48 days) and T₆ (103.85 ± 0.58 days). The earliness in these parameters might be due to application of daminozide reduces the indigenous level of GA to a permissible concentration required for flowering. These results were in close agreement with Dutta *et al.*, (1993) in chrysanthemum and Kumar *et al.*, (2004) in balsam and Kahar (2008) in chrysanthemum. The results also revealed that minimum days taken to 50% flowering (118.37 ± 0.36 days) were recorded from the plant sprayed with Daminozide @ 1000 ppm and found statistically at par with T₈ (119.17 ± 0.57 days). Daminozide inhibited gibberellin biosynthesis or action and induced flowering (Halevy, 1986). It could be attributed due to earliness in bud appearances causes earliness in flowering. The results are in corroborated with findings of Kazaz *et al.*, (2010) and Asrar *et al.*, (2014) in chrysanthemum.

All the concentrations of paclobutrazol significantly delay flowering as compared to control. The delay in flower bud appearance (89.37 ± 0.52 days) was recorded in plants drenched with treatment T₅ (paclobutrazol @ 120 ppm) and found statistically at par with T₄ (88.64 ± 0.77 days) and T₃ (88.40 ± 0.44 days). The maximum days taken to 50% flowering (126.62 ± 0.78 days) was recorded from the plants sprayed with paclobutrazol @ 120 ppm and found statistically at par with T₂ (124.74 ± 0.57 days), T₃ (126.52 ± 0.42 days) and T₄ (126.05 ± 0.78 days). Application of paclobutrazol significantly delayed bud appearance, first flower opening and 50% flowering might be due to the reduced GA

synthesis and prolonged vegetative phase by paclobutrazol application. Delayed in flowering by the application of paclobutrazol has been reported by Gad *et al.*, (1997) in fuschia, Gupta and Kaintura (2017) in fuschia, Foley and Keever (1991) in *Dianthus* spp.

The maximum flower diameter (3.54 ± 0.05 cm) was recorded in T₇ and found statistically at par with T₈ (3.41 ± 0.03 cm). However, minimum flower diameter (2.50 ± 0.02 cm) was recorded in treatment T₅ (paclobutrazol @ 120 ppm). The application of daminozide causes metabolic changes in the cells.

Metabolites are accumulated or conserved in the flowers as the flowers act as a reservoir for metabolites which resulted in increased flower size. Similar findings have been reported by Naidu *et al.*, (2014) in African marigold and Asrar *et al.*, (2014) in chrysanthemum.

The decrease in flower diameter by the application of paclobutrazol was due to its dwarfing effect which reduces the plant height, increases the main and secondary branching there by it increase the flower number with reduction in flower diameter. Similar findings were observed by Haque *et al.*, (2007) in *Chrysanthemum cinerarifolium*, Ecker (1992) in *Matthiolaincana* and Shailaza (2016) in chrysanthemum.

The number of flowers per plant was significantly increased by the different concentrations of daminozide and paclobutrazol. The maximum number of flowers per plant (20.29 ± 0.35) was observed in T₄ paclobutrazol @ 90 ppm followed by T₂ (18.41 ± 0.53) paclobutrazol @ 30 ppm. The results were corroborated with the findings of Haque *et al.*, (2007) in *Chrysanthemum cinerarifoli*. Increase in number of flowers under different concentrations of daminozide might be due more plant spread has been registered under these treatment (Table 1).

Table.1 Effect of different concentrations of paclobutrazol and daminozide on floral attributes of chrysanthemum cv. Dolly White

Treatments	Bud appearance (days) ± S.E(m)	First flower opening (days) ± S.E(m)	50% flowering (days) ± S.E(m)	Flower diameter (cm) ± S.E(m)	Number of flowers per plant ± S.E(m)	Flower longevity (days) ± S.E(mm)
T₁ (Control)	85.66 ± 0.29	105.73 ± 0.68	122.23 ± 0.31	3.02± 0.10	14.16 ± 0.38	11.25± 0.51
T₂ (Paclobutrazol @ 30 ppm)	87.52*± 0.60	108.52*± 0.57	124.74*± 0.57	2.84*± 0.06	18.41* ± 0.53	14.73*± 0.60
T₃ (Paclobutrazol @ 60 ppm)	88.40* ± 0.44	109.15*± 0.48	126.52*± 0.42	2.82*± 0.03	17.32* ± 0.86	14.52*± 0.63
T₄ (Paclobutrazol @ 90 ppm)	88.64*± 0.77	109.39*± 0.62	126.05*± 0.78	2.69*± 0.06	20.29* ± 0.35	16.78*± 0.58
T₅ (Paclobutrazol@120 ppm)	89.37* ± 0.52	109.68*± 0.72	126.62*± 0.16	2.50*± 0.02	16.41* ± 0.41	13.40*± 0.95
T₆ (Daminozide @ 250 ppm)	83.72*± 0.93	103.85*± 0.58	120.11*± 0.33	3.15 ± 0.11	18.12* ± 0.76	14.60*± 0.35
T₇ (Daminozide @ 500 ppm)	83.60*± 0.25	103.80*± 0.48	120.28*± 0.56	3.54*± 0.05	16.69* ± 0.62	13.53*± 0.42
T₈ (Daminozide@ 750 ppm)	83.45*± 0.39	103.97*± 0.36	119.17*± 0.57	3.41*± 0.03	16.18* ± 0.36	13.29*± 0.39
T₉ (Daminozide @ 1000 ppm)	82.48*± 0.45	102.83*± 0.43	118.37*± 0.36	3.27*± 0.09	15.84 ± 0.51	12.98*± 0.49
S.E. (d)	0.81	0.72	0.67	0.06	0.83	0.79
C.D. (0.05)	1.74	1.55	1.43	0.14	1.78	1.70

*significant at 0.05 level of significance

Similar results were also reported by Singh (2001) in chrysanthemum, Maan (2003) in marigold and Subramanian and Kannapan (2002) in *Jasminum sambac*.

Maximum flower longevity was recorded from the plants drenched withstand T₄ (16.78 ± 0.58 days) followed by T₂ (14.73 ± 0.60 days) and T₆ (14.60 ± 0.35 days). Paclobutrazol influences the isoprenoid pathway and changes the status of phytohormones by inhibiting gibberellin synthesis, decreasing ethylene production, and enhancing cytokinin and ABA contents (Kamountsis and Sereli, 1999).

The increase in flower longevity with spraying of daminozide are in close conformity with the findings of Asrar *et al.*, (2014) who also reported increased flower longevity and duration with increasing concentration of daminozide.

The results revealed that for getting earliness in flower bloom all the applied concentration of daminozide was found significantly effective whereas all the applied concentration of paclobutrazol was found effective in delaying flowering as compared to control. Flower diameter was found maximum in plants sprayed with daminozide @ 500 ppm and found statistically at par with daminozide @ 750 ppm. Flower longevity was recorded maximum in daminozide @ 1000 ppm and found statistically at par with paclobutrazol @ 90 ppm and daminozide @ 750 ppm.

Therefore, from the above findings it can be concluded that to get maximum plant spread, number of flowers and flower longevity drenching of paclobutrazol @ 90 ppm can be recommended. Spraying of daminozide @ 750 ppm was found effective in inducing earliness in full bloom and flower diameter was found maximum from plants spread with daminozide @ 500 ppm.

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How to cite this article:

Varun Chauhan, Mamta Bohra, Rohan Tomar and Neha Dobhal. 2021. Effect of Paclobutrazol and Daminozide on Floral Attributes of Chrysanthemum (*Dendranthema grandiflora* Tzvelve). *Int.J.Curr.Microbiol.App.Sci*. 10(02): 2754-2759.
doi: <https://doi.org/10.20546/ijcmas.2021.1002.304>