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Research Article

Effect of Planting Geometry and Plant Growth Regulators on Growth and Flowering of Chrysanthemum

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Abstract The present investigation was conducted at the experimental field of Dau Kalyan Singh College of Agriculture and Research Station, Bhatapara, under Department of Floriculture and Landscape Architecture, IGKV, Raipur (C.G.) during 2018 - 19 in rabi seasonin factorial randomized block design in three replications with 14 treatments combinations. The experiment comprised of two factors i.e., planting geometry (30x45 and 30x30) and plant growth regulators (GA3 @ 150 and 200 ppm, NAA @ 50 and 100 ppm, MH @ 500 and 750 ppm, with water spray). The study revealed that the planting at 30 x 30 cm increased the plant height and planting spaceat 30 x 45 cm enhanced number of leaves per plant, number of branches per plant, spread of plant, number of flowers per plant, flower size, single flower weight. Among different plant growth regulators, maximum plant height, number of leaves per plant, number of branches per plant, spread of plant, number of flowers per plant, flower size and single flower weight observed from the plants sprayed with treatment containing GA3 @ 200 ppm.The interaction of S2P2 (30 x 30 cm, GA3 @ 200 ppm) recorded higher plant height and treatment combination of S1P2 (30 x 45 cm, GA3 @ 200 ppm) recorded number of leaves per plant, number of branches per plant and plant spread.

Key word: Chrysanthemum, GA3, PGR and Planting space

Introduction

Chrysanthemum (Dendranthema grandiflora), is an annual winter crop belonging to the Asteraceae family (Anderson, 1987). It is a valuable ornamental crop in the international floriculture industry, as a cut flower, loose flower and also as a pot plant. It has origin in the northern hemisphere with a few in other areas , mainly Europe and Asia and being cultivated for over 2000 years. Chrysanthemum is a popular commercial flower crop in many countries. It is next only to rose in importance among the flower crops in the world market. Chrysanthemum is cultivated as a flower-growing crop to satisfy the demand in cut flowers and as an ornamental plant in beds and pots in urban areas. According to the latest taxonomic review, this species complex falls within the Dendrathema genus.

The two principal factors viz., genetic and cultivation (management) factors influences the growth and yield of the plants. Scientists have given due attention to the idea of regulating plant growth as third most important factors in improving the growth, yield and flower quality with application of plant growth regulators in various ways now in the present few years. Plant growth regulators alter the plant physiological process within the plant, which eventually affects plant growth and development. Auxin group NAA increases the growth of the plants by cell division, cell elongation apical dominance. GA3 induced number of levels flowering, number of flower and length of flower stalk. It has been found that Maleic Hydrazide (MH) can limit plant height by reducing internodal length and also concurrently it reduces the formation of lateral shoots thereby plant produces more number of flower bearing shoot in chrysanthemum (Yewaleet al. 1997 and Navaleet al. 2010). Plant spacing is another important factor that has an effective role in the growth and yield of chrysanthemum at its optimum level as it provides for the scope for efficient utilization of solar radiation and nutrients to the plants.

Material and Methods

The field experiment was carried out during the year 2018 - 19 in rabi season at theexperimental field Dau Kalyan Singh College of Agriculture and Research Station, Bhatapara, under Department of Floriculture and Landscape Architecture, IGKV, Raipur (C.G.). Experimental site was situated at 21°43' North latitude and 81° 59' East longitudes having an altitude of about 273 m above Mean sea level (MSL). This experiment was laid out in Factorial Randomized Block Design with 14 treatment combinations with three replications. The experiment comprised of two factors i.e., planting geometry (S1, 30x45 cm and S2, 30x30 cm) and plant growth regulators (GA3 @ 150ppm (P1) and 200 ppm (P2),MH @ 500 ppm(P3) and 750 ppm (P4), NAA @ 50 ppm (P5) and 100 ppm (P6) and water spray (P7). The important growth and flowering parameter viz., plant height (cm) number of leaves per plant, number of branches per plant, spread of plant (cm), number of flowers per plant, flower size (cm) and single flower weight (g) were recorded in five randomly selected and tagged plants per replication in each treatment.

Result and Discussion

The study revealed that all growth parameters viz., plant height, number of branches per plant, number of leaves per plant and plant spread influenced significantly by plant growth regulators and planting space.

Among the planting space, closer space at 30x30 cm found significantly maximum plant height (32.3 cm) while wider space planting at 30x45 cm registered maximum number of leaves per pant (114.8), maximum number of branches per plant (30.6) and plat spread (23.7cm).In regards of different plant growth regulators, plant height (38.3 cm), number of branches per plant (34.1), number of leaves per plant (131.2) and plant spread (33.2 cm) increased with treatment of GA3 @ 200 ppm.The interaction between spacing and growth regulator found significant effect in respect to plant height, number of branches per plant, number of leaves per plant and plant spread. Among the interactions, maximum plant height 39.3 cm was recorded in S2P2 (30 x 30 cm, GA3 @ 200 ppm) which was statistically similar to S2P1 (30 x 30 cm, GA3 @ 150 ppm) while number of leaves per plant (139.0) maximum in treatment combination of 30 x 45 cm space with spraying of GA3 @ 200 ppm (S1P2) which was statistically similar with S1P1 (30 x 45 cm with GA3 @ 150 ppm), significantly maximum number of branches per plant (36.2) andplant spread (36.6 cm) noted with same treatment combination.

Plant height increased with the application of GA3 @ 200 ppm over control could probably be due to "its growth promotional effect in stimulating and accelerating cell division, increased cell elongation and enlargement or both" (Hartmann et al. 1990), Growth might also be increased due to osmotic uptake of water and nutrients under the influence of GA3 which maintain swelling force against the softening of cell wall and thereby increasing the plant height (Lockhart 1960).Our findings are in conformity with results of Gajbhiyeet. al. (2017); Aklade (2009); Dalalet al. (2009) in chrysanthemum, Tamrakar et al. (2018) in gladiolus.

Increased plant height at closer spacing may be due to intense competition for light, resulting in elongation of the main stem, or it could be due to the fact that when plants are crowded, they appear to grow vertically due to the shadowing effect of the plants on one another.Similar results were also observed by Mali et al. (2016); Dorajeerao and Mokashi (2012) in chrysanthemum.

Wider spacing of 30 x 45 cm (S2) produced significantly more number of branches compared to closer spacing of 30 x 30 cm (S1). It might be due to the reason that the total plant population per unit area was less in wider spacing and there was more space available for each of the plants to grow vigorously as they received sufficient light, air and nutrients. The above results are in close conformity with the findings of Mali et al. (2016); Sainath et al. (2014) in annual chrysanthemum

In general, flowering characters i.e., number of flowers per plant, flower weight and flower size influenced significantly by different planting space and plant growth regulators. Wider spacing (30x45 cm) hastened number of flowers per plant (86.8), flower weight (1.25 g) and flower size (4.77 cm). About plant growth regulators, significant maximum number of flowers (94.7) registered in application of GA3 @ 200 ppm which was statistically comparable with GA3 @ 150 ppm. The maximum flower size (4.95 cm) noted with NAA @ 100 ppm but remain at par with GA3 @ 150 ppm. The plant sprayed with MH @ 750 ppm found maximum flower weight (1.33 g) which was at par with GA3 @ 200 ppm and NAA 100 ppm. Interaction effect between spacing and growth regulator did not showed significant effect on number of flowers per plant, flower weight and flower size.

The improvement in flowering parameters may be attributed to the development of a large number of laterals at an early stage of growth, which had enough time to accumulate carbohydrate for proper flower bud differentiation due to the plant's increased reproductive efficiency and photosynthesis restrictive plant type. This result finds support from studies of Mounika et al. (2019); Mohammed (2017).

Table 1: Effect of plant growth regulators and plant geometry

Treat Spacing	Plant height (cm)	Number of leaves	Number of branches	Plant spread (cm)	Number of flowers	Flower size (cm)	Flower weight (g)
S1	29.7	114.8	30.6	27.1	86.8	4.77	1.25
S2	32.3	100.2	28.2	23.7	79.5	4.60	1.17
SEm±	0.51	1.50	0.33	0.42	1.09	0.07	0.02
CD at 5%	1.49	4.36	0.97	1.23	3.18	0.20	0.05
PGR							
P1	34.2	126.2	32.0	28.9	89.2	5.12	1.17
P2	37.2	131.2	34.1	33.2	94.7	4.95	1.28
P3	28.2	92.5	26.5	21.8	77.5	4.46	1.16
P4	25.8	104.3	29.0	25.3	82.0	4.16	1.33
P5	30.8	100.1	27.7	22.3	76.9	4.46	1.13
P6	31.7	109.7	30.2	27.6	87.3	5.43	1.29
P7	29.0	88.5	26.3	18.6	74.4	4.24	1.11
SEm±	0.96	2.81	0.62	0.79	2.04	0.13	0.03
CD at 5%	2.79	8.16	1.81	2.30	5.94	0.37	0.08

Table 2: Interaction effect of plant growth regulators and plant geometry

Treat	Plant height (cm)	Number of leaves	Number of branches	Plant spread (cm)	Number of flowers	Flower size (cm)	Flower weight (g)
S1 P1	31.8	130.7	35.3	31.4	95.7	5.42	1.28
S1 P2	35.0	139.0	36.2	36.6	101.1	5.16	1.30
S1 P3	27.0	99.4	25.9	24.1	79.5	4.50	1.21
S1 P4	23.7	118.3	30.1	25.8	87.0	4.22	1.34
S1 P5	30.3	102.3	28.0	24.6	76.9	4.31	1.16
S1 P6	31.4	120.2	31.6	28.1	92.0	5.53	1.32
S1 P7	28.6	93.8	26.8	18.8	75.7	4.27	1.12
S2 P1	36.5	121.8	28.7	26.3	82.7	4.82	1.05
S2 P2	39.3	123.4	31.9	29.7	88.3	4.74	1.27
S2 P3	29.4	85.5	27.1	19.5	75.5	4.42	1.10
S2 P4	27.9	90.2	27.9	24.8	77.0	4.10	1.32
S2 P5	31.3	97.8	27.4	20.0	76.9	4.61	1.10
S2 P6	32.1	99.3	28.8	27.1	82.7	5.32	1.26
S2 P7	29.5	83.2	25.7	18.3	73.1	4.21	1.11
SEm±	1.36	3.97	0.88	1.12	2.89	0.18	0.05
CD at 5%	3.95	11.54	2.56	3.25	NS	NS	NS

References

Aklade, S. A., Kirti, B., Paramveer, S., Kakade, D. K., & Pathan, A. B. 2009. Effect of PGR's on growth, flowering and flower yield of chrysanthemum (Chrysanthemum indicum L.) cv.'LOCAL WHITE'. Asian Journal of Horticulture, 4(2), 491-493.

Dalal S R, Karale G D and Momin K C. 2009. Effect of growth regulators on growth, yield and quality of chrysanthemum under net house conditions. TheAsian Journal of Horticulture4(1): 161-163.

Dorajeerao, A. V. D., Mokashi, A. N., Patil, V. S., Venugopal, C. K., Lingaraju, S., &Koti, R. V. 2012. Effect of foliar application of growth regulators on growth, yield and economics in garland chrysanthemum (Chrysanthemum coronarium L.). Karnataka Journal of Agricultural Sciences, 25(3), 409-413.

Mali, G. L., Moond, S. K., Choudhary, A., Bola, P. K., & Chaudhary, P. 2016. Effect of planting geometry and nitrogen on growth, flowering and yield of chrysanthemum (Chry san the mum coronarium L.). HortFlora Research Spectrum, 5(1), 48-52.

Navale, M.U., Aklade, S.A., Desai, J.R. and Nannavare, P.V., 2010, Influence of Plant Growth Regulators on Growth, Flowering and Yield of Chrysanthemum (Dendrathema grandiflora Tzvelev) CV. 'IIHR-6', International J. of Pharma and Bio Sci., 1(2).

Sainath A, Uppar D S, Patil V S, Deshpande V K and Hunje R. 2014. Effect of different growth regulators on seed yield and quality attributes in annual chrysanthemum (Chrysanthemum coronarium L.). Karnataka Journal of Agricultural Sciences 27(2): 131-134

Tamrakar, S. K., Singh, P., Kumar, V., &Tirkey, T. (2018). Effect of gibberellic acid, salicylic acid, cow urine and vermiwash on corm production of Gladiolus cv. Candyman. Int. J. Curr. Microbiol. App. Sci, 6, 677-686.

Yewale, A. K., Belorkar, P. V., Chanekar, M. A., Bhattacharya, J. and Chimurkar, B. S., 1997, Effect of growth retardant paclobutrazol on flowering of chrysanthemum. J. Soils and Crops, 8(1): 82-84.