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Growth, flowering and quality of cut chrysanthemum (*Dendranthema grandiflora* Tzevelev.) cv. Yellow Gold, as influenced by different growth regulators

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Abstract
An experiment was conducted to know the effect of growth regulators on growth, flowering and quality of cut chrysanthemum cv. Yellow Decorative with seven treatments which replicated trice. The growth regulators have been sprayed at 30 and 60 days after planting. Among different growth regulators, spraying of gibberellic acid at 150 ppm recorded significantly maximum (60.22 cm, 17.34 cm, 2.35 cm, 30.33, respectively) plant height, plant spread, internode length, number of leaves per plant, maximum leaf chlorophyll (9.40, 9.29, 23.68 mg/g of chlorophyll 'a', chlorophyll 'b' total chlorophyll, respectively) and carotenoid content (4.99 mg/g), early flowering (61.00 and 71.33 days of days to flower bud initiation and days for first flowering, respectively), longer (60.17 cm, 124.97 g and 3.78 days, respectively) stalk length, maximum weight of flower stalk and longer display life of flower were noticed in plants sprayed with gibberellic acid at 150 ppm. The growth, flowering and flower quality attributes were on par with plant sprayed with brassinosteroid at 0.5 ppm. Whereas, minimum (46.83 cm and 1.78 cm) plant height and internodal length was noticed in plant sprayed with cycocel at 750 ppm. Whereas, minimum (13.81 cm and 24.56, respectively) plant spread, number of leaves were recorded in the control and daminozide at 1000, respectively. Among flowering attributes control plants recorded delayed flowering. Whereas, among quality, the results were minimum in control.

Keywords: Growth regulators, gibberellic acid, cycocel, brassinosteroid, daminozide, uniconazole, salicylic acid, cut chrysanthemum

Introduction
Chrysanthemum is a leading commercial flower crop grown for production of cut flowers, loose flowers and potted plants. It is commonly known as 'Queen of East', 'Autumn Queen' and 'Guldaudi' which ranks second in the International cut flower trade. Chrysanthemums have been successfully bred into a wide variety of colors, shapes, and textures, making them the flower of choice for the mass-market bouquet business (Winogrond, 1999) [7]. Area under flower cultivation in India was 255 thousand hectare with the production of 1754 thousand MT of loose flowers and 543 thousand MT of cut flowers during 2013-14. Area under chrysanthemum cultivation in Karnataka was 30.6 thousand hectare with 211.5 thousand MT of loose flower and 71.5 lakh cut flower production during 2013-14. In Karnataka, major chrysanthemum growing districts are Kolar, Bengaluru, Chitradurga, Haveri, Gadag, Mandya, Hassan, Tumkur, Davanagere and Belgavi (Anonymous, 2015) [1].
The plant growth regulators generally modify the physiological processes of plants and ultimately affect the yield and quality of blooms. Several plant growth regulators have been widely used in many ornamental crops and their efficacy has been demonstrated for nursery production, ornamental foliage plants and/or several other flower crops. The uses of gibberellic acid, cycocel and maleic hydrazide have been reported to be remarkably successful in quality bloom production with several flower and ornamental crops (Sharifuzzaman, *et al*., 2011) [6] although many synthetic growth substances are available in market, their efficiency has not been assessed in particular crop of that agro climatic condition. For this, The present investigation was carried out to know the effect of growth regulators on growth flowering and quality of cut chrysanthemum.

Materials and methods

The experiment was conducted in RBD (randomized block design) during winter season of 2015, in naturally ventilated poly house at Department of Floriculture and Landscape Architecture, Kittur Rani Channamma College of Horticulture, Arabhavi, Karnataka. The experiment consisted of seven treatments (G_1: Gibberellic acid at 150 ppm, G_2: Cycocel at 750 ppm, G_3: Brassinosteroid at 0.5 ppm, G_4: Daminozide at 1000 ppm, G_5: Uniconazole at 20 ppm, G_6: Salicylic acid at 150 ppm, G_7: Control (distilled water) replicated trice. The rooted pot chrysanthemum cv. Yellow gold, cuttings were planted in well prepared raised beds with a distance of 20 cm each. Subsequently, average of each five plants was worked out and recorded the growth, flowering and quality parameters.

Results and discussions

Growth attributes

The growth attributes *viz*., plant height, plant spread, internode length and number of leaves per plant were significantly varied among the different growth regulator treatments (table 1).

In plants sprayed with gibberellic acid at 150 ppm recorded significantly maximum (60.22 cm, 17.34 cm, 2.35 cm, 30.33, respectively) plant height, plant spread, internode length, number of leaves per plant. Which was on par with brassinosteroid at 0.5 ppm (58.06 cm), salicylic acid at 150 ppm (56.89 cm) and uniconazole at 20 ppm (55.56 cm). Whereas, minimum (46.83 cm) plant height was noticed in plant sprayed with cycocel at 750 ppm. The plant spread was on par with brassinosteroid at 0.5 ppm (16.66 cm) while minimum (13.81 cm) plant spread was recorded in the control. Whereas internodal length was on par with brassinosteroid at 0.5 ppm (2.34 cm), uniconazole 20 ppm (2.20 cm) and salicylic acid 150 ppm (2.20 cm). The minimum (1.78 cm) internodal length was recorded in plants sprayed with cycocel 750 ppm and with respect to number of leaves, it was on par with salicylic acid at 150 ppm (29.67) and brassinosteroid at 0.5 ppm (29.00). Whereas, it was minimum (24.56) in plant sprayed with daminozide at 1000 ppm. The enhanced cell division, cell enlargement and promotion of protein synthesis by GA application exogenously, might have resulted in enhanced vegetative growth as reported by Girish (2011) [2] in daisy. These results are in confirmation with that of Kulkarni (2003) [3] in chrysanthemum. GA is known to influence the cell elongation, cell enlargement, primary and secondary branches which in turn influence the plant spread (Kulkarni, 2003) [3].

At grand growth stage, chlorophyll content was significantly varied by spray of different growth regulators (table 2). The maximum (9.40, 9.29 and 23.68 mg/g, respectively) chlorophyll ‘a’, chlorophyll ‘b’ and total chlorophyll content was noticed in plants sprayed gibberellic acid at 150 ppm, which was on par with brassinosteroid at 0.5 ppm (9.22, 8.96 and 22.66 mg/g, respectively) but minimum (7.83, 7.73 and 18.89 mg/g) chlorophyll ‘a’ chlorophyll ‘b’ and total chlorophyll content were recorded in control. Carotenoid content at grand growth stage was also significantly maximum in plants sprayed gibberellic acid at 150 ppm (4.99 mg/g), whereas minimum carotenoid content (3.33 mg/g) was recorded in control. The results are in confirmation with findings of Girish, (2012) [2] and Raveendra *et al.* (2012) [4] in daisy.

Flowering and flower quality attributes

Different growth regulators influenced significantly on flowering and flower quality attributes, *viz.*, days to first flowering, days to 50 per cent flowering, stalk length, weight of flower stalk and vase life (table 3). The days to first flowering and days to 50 per cent flowering was reported significantly early (61.00 and 71.33 days, respectively) in plants sprayed with gibberellic acid at 150 ppm, which was on par with brassinosteroid at 0.5 ppm (62.00 and 73.00 days, respectively). Whereas, delayed (72.67 and 82.00 days, respectively) first flowering and 50 per cent flowering was noticed in control. The results are in confirmation with Kulkarni (2003) [3] in chrysanthemum and Raveendra (2012) [4] in daisy.

The flowering quality parameters largely varied among the different growth regulator treatments (table 3). Significantly longer (60.17 cm, 124.97 g and 3.78 days, respectively) stalk length, maximum weight of flower stalk and longer display life of flower were noticed in plants sprayed with gibberellic acid at 150 ppm, whereas, stalk length was on par with brassinosteroid at 0.5 ppm (59.89 cm) and it was minimum (43.56 cm) in control. The minimum (85.08 g and 1.78 days, respectively) weight of flower stalk and display life of flower were noticed in control. The similar results were noticed in findings of Kulkarni (2003) [3] and Savita (2013) [5] in chrysanthemum.

Table 1: Effect of plant growth regulators on growth attributes of cut chrysanthemum cv. Yellow Gold

Treatment	Plant height (cm)	plant spread (cm)	Internode length (cm)	Number of leaves per plant
Gibberellic acid at 150 ppm	60.22	17.34	2.35	30.33
Cycocel at 750 ppm	46.83	15.08	1.78	24.78
Brassinosteroid at 0.5 ppm	58.06	16.66	2.34	29.00
Daminozide at 1000 ppm	48.44	14.42	1.79	24.56
Uniconazole at 20 ppm	55.56	14.61	2.20	28.56
Salicylic acid at 150 ppm	56.89	14.89	2.20	29.67
Control (distilled water	54.33	13.81	1.92	26.67
SE.m±	1.60	0.24	0.07	0.81
CD at 5%	4.94	0.73	0.21	2.49

Table 2: Effect of plant growth regulators on leaf chlorophyll and carotenoid content of cut chrysanthemum cv. Yellow Gold.

Treatment	Chlorophyll 'a' (mg/g)	Chlorophyll 'b' (mg/g)	Total Chlorophyll	Carotenoid Content (mg/g)
G_1 - Gibberellic acid at 150 ppm	9.40	9.29	23.68	4.99
G_2 - Cycocel at 750 ppm	9.12	8.39	21.75	4.24
G_3 - Brassinosteroid at 0.5 ppm	9.22	8.96	22.66	4.48
G_4 - Daminozide at 1000 ppm	8.87	8.10	21.47	4.51
G_5 - Uniconazole at 20 ppm	8.35	8.25	21.04	4.44
G_6 - Salicylic acid at 150 ppm	8.28	7.94	19.87	3.64
G_7 - Control (distilled water)	7.83	7.73	18.89	3.33
SE.m±	0.17	0.15	0.29	0.11
CD at 5%	0.52	0.46	0.91	0.34

Table 3: Effect of plant growth regulators on flowering and flower quality attributes of cut chrysanthemum cv. Yellow Gold.

Treatment	Days for first flowering	Days for 50% flowering	Stalk length (cm)	Weight of flower stalk (g)	Vase life (days)
Gibberellic acid at 150 ppm	61.00	71.33	60.17	124.97	3.78
Cycocel at 750 ppm	68.33	79.33	45.44	88.22	2.11
Brassinosteroid at 0.5 ppm	62.00	73.00	59.89	120.83	3.67
Daminozide at 1000 ppm	70.67	78.67	43.56	89.01	2.33
Uniconazole at 20 ppm	69.67	78.67	51.17	112.86	2.67
Salicylic acid at 150 ppm	70.33	79.67	51.12	115.26	3.00
Control (distilled water	72.67	82.00	48.58	85.08	1.78
SE.m±	2.02	2.27	1.53	3.16	0.21
CD at 5%	6.24	6.99	4.70	9.72	0.65

Conclusion

Gibberellic acid at 150 ppm and brassinosteroid at 0.5 ppm helps to increase vegetative growth by which increase in photosynthates inturs produce better quality flowers, whereas spraying of daminozide at 1000 took more days to flowering as well as shorten the plants which will be helpful in production of potted plants.

References

1. Anonymous. 2015. https://nhb.gov.in
2. Girish R. Studies on effect of growth regulators on growth and yield of daisy (*Aster amellus* L.) cv. Dwarf Pink. M. Sc Thesis Univ. Hort. Sci., Bagalkot, 2011.
3. Kulkarni BS. Evaluation of varieties and effect of planting date and growth regulators on performance of chrysanthemum (*Dendranthema indicum*) Ph. D Thesis, Univ. Agric. Sci., Dharwad, 2003.
4. Raveendra C. Effect of growth promoters on growth, yield and quality of daisy (*Aster amellus* L.). M. Sc. (Hort.), Thesis Univ. Hort. Sci., Bagalkot, 2012.
5. Savita BP. studies on chrysanthemum cultivars for photoperiodic response under northern dry zone of Karnataka. M. Sc. (Hort.), Thesis, Univ. Hort. Sci., Bagalkot, 2013.
6. Sharifuzzaman SM, Ara KA, Rahman Kabir K, Talukdar MB. Effect of GA_3, CCC and MH on vegetative growth, flower yield and quality of chrysanthemum. Int. J. Expt. Agric. 2011; 2(1):17-20.
7. Winogrond W. Cut flowers on the move, The History of U. S. Floriculture, Greenhouse Grower, Meister Publishing Fall. 1999, 5.