Original Research Article

Effect of plant growth retartdents on growth and flowering of dahlia (*Dahlia variabilis* L.) cv. Edinburgh

ABSTRACT

The present investigation "Effect of plant growth retartdents on growth and flowering of dahlia (*Dahlia variabilis* L.) cv. Edinburgh" was conducted in Research Field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, during November, 2021 to March, 2022. The seedlings were planted at a spacing of 50cm x 50cm from row to row and plant to plant to accommodate nine plants per 3 meter square area. The experiment was laid out with thirteen treatments replicated thrice in Randomized Block Design. The plants were watered immediately after planting and at weekly intervals during growing period. Based on the present investigation it is concluded that the treatment T_{12} maleic hydrazide@1200ppm found best in terms of plant growth parameters, flower and yield of Dahlia. In terms economics maximum Cost Benefit ratio (1: 2.62) was also found in treatment T_{12} maleic hydrazide@1200ppm whereas minimum Cost benefit ratio (1:1.33) was recorded in treatment T_0 (Control).

Key words:- *retartdents, growth, flowering and Dahlia (Dahlia variablis L.) cv. Edinburgh*

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INTRODUCTION

Dahlia (*Dahlia variabilis* L) is one of the most popular bulbous flowers grown in many parts of the world for its beautiful ornamental blooms of varying shades of colours for the beautification of gardens and cut flowers. It is belonging to the family Asteraceae having its origin in Mexico and received its name by Cavanilles in the year 1791. Dahlia (genus Dahlia), genus of about 40 species of flowering plants in the aster family (Asteraceae). About six of the species in the Dahlia genus have been bred for cultivation as ornamental flowers and are popular in the floral industry and in gardens. The thousands of dahlia cultivars are classed into a variety of types, including single, double, pompon, cactus, waterlily, peony-flowered, and dinner plate dahlias. Dahlias are tuberous perennials, and most have simple leaves that are segmented and toothed or cut. The compound flowers may be white, yellow, red, or purple in colour.

Dahlia (*Dahlia variabilis* L) is a very beautiful flower which by virtue of extra-ordinary quality has attained attention of many people all over the world. It is a perennial, half hardy, herbaceous plant with tuberous root system and erect growing habit **(Marina, 2015)**. In India it is mostly grown as winter flower because of severe climatic conditions during summer. As a member of the Asteraceae the flower head is actually a composite (hence the older name Compositae) with both central disc florets and surrounding ray florets. Each floret is a flower in its own right, but is often incorrectly described as a petal, particularly by horticulturists. In the language of flowers, Dahlias represent dignity and instability, as well as meaning my gratitude exceeds your care **(Connolly, 2004)**. Dahlia offers a most extensive colour range with two colours in same flower, because of accumulation of anthocyanin and other flavonoids in their ray florets.

Dahlias are with advantage for making bouquets and wreaths or vase decorations. The long clean and stiff stocks are very suitable for both handling and decoration purposes Developments after the discovery of growth regulators and their application in agriculture and more especially in floriculture are significant. Regulations of plant growth and development using natural plant hormones for greater production have received the almost attention. Growth and flowering responses of ornamental plant to these chemical substances have been intensively studied with a view to have compact plants with greater number of flowers and also to hasten or delay flowering according to the needs of the grower.

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Plant growth regulators (PGRs) consist of organic molecules produced synthetically and used to alter the growth of plants or plant parts. Although, photosynthesis supplies the carbon and respiration supplies the energy for plant growth, a group of chemicals produced by plants known as plant growth regulators control the growth and development of plants. These chemicals act on plant processes at very low concentrations. They have ability to accelerate or retard the plant growth. PGRs sometimes confused with plant hormones, but there are certain differences among them as the term PGRs is used by agrochemical industry to indicate synthetic plant growth regulators, while plant hormones are a group of naturally occurring, organic substances which influence physiological processes at low concentrations **(Davies, 2010)**.

MATERIALS AND METHEODS

A field experiment entitled "Effect of plant growth retartdents on growth and flowering of dahlia (Dahlia variabilis L.) cv. Edinburgh" was carried out in the Department of Horticulture, Naini, Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences during 2021-2022. The experiment was laid out in randomized block design with thirteen treatments and three replications. The experiment included application of different concentrations of plant growth regulators Ethephon, Alar and Malelic hydrazibe (MH). Treatments were given with concentrations of Ethephon @ 300, 600, 900 and 1200 ppm, Alar @ 300, 600, 900 and 1200 ppm and MH @ 300, 600, 900 and 1200 ppm whereas water was sprayed on control plants. All the package of practices were followed as per recommendation to raise a quality crop. three plants were selected randomly from each treatment per replication and the observations were recorded on various growth, flowering, quality and yield parameters on these plants.

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RESULT AND DISCUSSIONS

The result of the experiment has been presented under the following heading.

A. Vegetative growth parameters:

Due to different concentrations of PGR plant height varies significantly and the maximum plant height (104.45 cm) was recorded in control, followed by treatment T1-ethephon @ 300ppm (104.22 cm) and the shortest is found in the treatment T12-MH @

1200ppm (90.11 cm).The difference in plant height may be due to the inhibition of gibberellin biosynthesis which results in cell elongation and also by the suppression of apical dominance by inhibiting cell division. These results are in accordance with **(Saiyad *et al.*, 2010 and Ahmad, *et al.*, 2019)** in dahlia.

Due to different concentrations of PGR no. of leaves varies significantly and the maximum no. of leaves (138.00) was recorded in T12-MH @ 1200ppm, followed by treatment T11- ethephon @ 900ppm (132.56) and minimum no. of leaves (105.55) is found in the treatment T2-ethephon @ 600ppm. The difference in no. of leaves may be due to the increase in the number of branches. These results are in accordance with **(Nagina *et al.*, (2015)** in chrysanthemum.

Due to different concentrations of PGR no. of branches varies significantly and the maximum no. of branches (8.22) was recorded in T12-MH @ 1200ppm, followed by treatment T11- ethephon @ 900ppm (7.33) and minimum no. of branches (5.78) is found in the control. The difference in no. of branches may be due to suppression of apical dominance by the growth regulators there by diverting the polar transport of auxins towards the basal buds leading to increase in the number of laterals.. These results are in accordance with **(Malik *et al.*, 2017)** in dahlia.

Due to different concentrations of PGR stem diameter varies significantly and the maximum stem diameter (2.05 cm) was recorded in T12-MH @ 1200ppm , followed by treatment T_{11}- ethephon @ 900ppm (2.02 cm) and minimum stem diameter (1.67 cm) is found in T2-ethephon @ 600ppm.The difference in stem diameter may be due to decrease in the plant height by the growth regulators which increases the partition distribution of nutrients towards the lower parts.. These results are in accordance with **(Ahmad, *et al.*, 2019 and Malik *et al.*, 2017)** in dahlia.

Due to different concentrations of PGR the average length of branches varies significantly and the maximum branch length (78.89 cm) was recorded in T2-ethephon @ 600ppm , followed by treatment T_5- alar @ 300ppm (78.11 cm) and minimum branch length (63.00 cm) is found in control. The decrease in branch length with the higher concentrations of growth regulators is due to inhibition of gibberellins biosynthesis which results in decrease in cell elongation while these growth regulators at lower concentration act as growth promoters thus leading to the increase in the length of the branches. These results are in accordance with **(Pinto, A.C.R. 2005)** in Zinnia elegans.

B. Flowering parameters:

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Among the treatments the minimum significant days to 1st flower bud initiation (67.87 days) was recorded in control, followed by T_6 alar @ 600ppm (68.17 days) and maximum days to 1st flower bud initiation (79.36 days) was observed in T_{12} MH @ 1200ppm. This delay in flower bud appearance might be attributed to the suppression of apical dominance and increased vegetative growth in the form of branches by the growth retardants. Delay of flowering is often observed following application of growth retardants, especially at very higher concentration **(Khan *et al.*, 2003)** Similar results were recorded by **(Malik *et al.*, 2017)** in dahlia.

Among the treatments the maximum significant no. of flowers per plant (7.32) was recorded in treatment T_{12} MH @ 1200ppm, followed by T_9 MH @ 300ppm (6.88) and minimum no. of flower per plant (4.58) was observed in treatment T_0 Control. The probable reason for increased in number of flowers per plant in the best treatmentis due to production of more number of branches under the influence of growth retardants**. (Pal *et al.*, 2019)** and **(Masood *et al.*, 2019)** in dahlia.

Among the treatments the maximum significant days to complete opening of flower (12.67) was recorded in control, followed by T_{10} MH @ 600ppm (12.54) and minimum days to complete opening of flower (9.33) was observed in treatment T_{12} MH @ 1200ppm. The probable reason for decrease in flowering duration might be attributed to prolonged vegetative phase resulting in delayed flower bud appearance. **(Arshid, A.L. 2009)** also reported reduction in flowering duration in chrysanthemum following treatment with chemical retardants.

Among the treatments the maximum significant flower diameter (15.89 cm) was recorded in T_{12} MH @ 1200ppm, followed by T_5 alar @ 300ppm (15.22 cm) and minimum flower diameter (12.18 cm) was observed in control.The probable reason for increased in flower diameter. The increase in flower size due to MH and might be due to availability of more carbohydrates during the development of buds. Similar results were obtained by **(Abbas *et al.*, 2007)** in Rosa damascene.

Among the treatments the maximum significant peduncle length (20.45 cm) was recorded in control, followed by T_{10} MH @ 600ppm (20.00 cm) and minimum peduncle length (13.67 cm) was observed in control. The probable reason for decrease in peduncle length may be due to the inhibition of cell elongation by the growth retardants due to their inhibitory effect on gibberrelin biosynthesis. Similar results were obtained by **(Malik *et al.*, 2017)** in dahlia.

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C. Yield parameters:

Among the treatments the maximum significant no. of flower yield per plant (6.16) was recorded in T_{12} MH @ 1200ppm, followed by T_8 alar @ 1200ppm (5.78) and minimum no. of flower yield per plant (3.78) was observed in control.The probable reason for increase in no. of flower yield per plant may be due to the increase in number of branches Similar results were obtained by **(Ghadage et al., 2010)** in gaillardia.

Among the treatments the maximum significant no. of flower yield per hectare (184800) was recorded in T_{12} MH @ 1200ppm, followed by T_8 alar @ 1200ppm (173400) and minimum no. of flower yield per hectare (113400) was observed in control. The probable reason for increase in no. of flower yield per plant may be due to the increase in number of branches Similar results were obtained by **(Kumar *et al.*, 2014)** in marigold and **(Kuldeep *et al.*, 2018)** in dahlia.

CONCLUSION

From the present investigation it is concluded that the plant growth regulator treatments rendered significant effect on almost all the growth, flowering and yield characters as well as quality of dahlia. Treatment T12 i.e. application of maleic hydrazide @ 1200 ppm was found superior in terms of number of leaves (138.00), highest number of branches (8.22), stem diameter (2.05cm), flower diameter (15.89cm), number of flower per plant (7.32), no. of flower yield/plant (6.16), no. of flower yield/hectare (184800), highest gross return (369600), net profit/ha (267772) and cost benefit ratio (2.62) was obtained under the use of MH @ 1200 ppm(T12).

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Table 1: Effect of plant growth retartdents on vegetative parameters of Dahlia (*Dahlia variabilis* L.) cv. Edinburgh

Treatments	Plant height	No. of leaves	No. of branches	Branch length	Stem diameter
Control	104.45	108.44	5.78	63.00	1.69
Ethephon @300ppm	104.22	116.22	7.33	69.44	1.83
Ethephon @600ppm	102.11	105.55	6.67	78.89	1.67
Ethephon @900ppm	93.67	118.89	7.00	68.78	1.79
Ethephon @1200ppm	92.56	120.56	7.22	69.67	1.78
Alar @300ppm	103.89	117.00	7.00	78.11	1.73
Alar @600ppm	99.45	120.44	6.89	73.56	1.70
Alar @900ppm	95.22	124.33	7.11	73.22	1.70
Alar @1200ppm	91.44	125.78	6.00	64.67	1.90
MH @300ppm	95.56	120.00	7.11	71.89	1.67
MH @600ppm	93.44	125.22	7.11	76.67	1.72
MH @900ppm	90.67	132.56	7.33	76.00	2.02
MH @1200ppm	90.11	138.00	8.22	69.45	2.05
F – Test	S	S	S	S	S
S. Ed	4.46	7.76	0.34	4.07	0.10
CD @ 5%	9.2	16.01	0.71	8.4	0.21

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Table 2: Effect of plant growth retartdents on floral parameters of Dahlia (*Dahlia variabilis* L.) cv. Edinburgh

Treatments	Days taken for first flower bud initiation	Complete opening of flower (days)	No. of flowers per plant	Flower diameter (cm)	Peduncle length (cm)
Control	67.87	12.67	4.58	12.18	20.45
Ethephon @300ppm	68.83	10.67	5.87	13.42	19.34
Ethephon @600ppm	68.33	12.33	6.72	13.79	13.67
Ethephon @900ppm	70.53	11.33	6.61	12.42	18.83
Ethephon @1200ppm	77.30	10.36	6.87	14.22	17.78
Alar @300ppm	68.31	10.33	5.91	15.22	16.22
Alar @600ppm	68.17	9.00	6.76	13.42	16.55
Alar @900ppm	71.26	8.67	6.51	13.78	17.00
Alar @1200ppm	69.99	12.47	6.82	14.78	19.56
MH @300ppm	71.94	9.00	6.88	13.50	17.50
MH @600ppm	72.15	12.54	6.71	12.22	20.00
MH @900ppm	70.90	12.00	6.33	13.79	19.00
MH @1200ppm	79.36	9.33	7.32	15.89	18.56
F – Test	S	S	S	S	S
S. Ed	2.17	0.69	0.28	0.9	1.03
CD @ 5%	4.44	1.41	0.58	1.86	2.13

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Table 3: Effect of plant growth retartdents on yield parameters and economics of Dahlia (*Dahlia variabilis* L.)

Treatments	YIELD PARAMETERS		ECONOMICS		
	No. of Flowers per Plant	**No. Flowers per hectare**	**Gross Return per hectare**	**Net Return per hectare**	**Cost benefit ratio**
Control	3.78	113400	226800	129584	1.33
Ethephon @300ppm	4.56	136800	273600	176051	1.80
Ethephon @600ppm	5.56	166800	333600	235718	2.40
Ethephon @900ppm	5.44	163200	326400	228185	2.32
Ethephon @1200ppm	5.00	150000	300000	201452	2.04
Alar @300ppm	4.89	146700	293400	191684	1.88
Alar @600ppm	5.11	153300	306600	200384	1.88
Alar @900ppm	5.00	150000	300000	189284	1.70
Alar @1200ppm	5.78	173400	346800	231584	2.00
MH @300ppm	5.44	163200	326400	228031	2.31
MH @600ppm	5.33	159900	319800	220278	2.21
MH @900ppm	5.67	170100	340200	239525	2.37
MH @1200ppm	6.16	184800	369600	267772	2.62
F – Test	S	S			
S. Ed	15.58	6296.11			
CD @ 5%	31.84	12864.8			

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