# *Original Research Article*

**Efficacy of plant growth retardants on growth, flowering, yield and shelf life of dahlia (*Dahlia variabilis* L.) cv. Shubhra**


## ABSTRACT

The present investigation **Efficacy of plant growth retardants on growth, flowering, yield and shelf life of dahlia (*Dahlia variabilis* L.) cv. Shubhra** was conducted in Research Field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, during November, 2022 to March, 2023.The seedlings were planted at a spacing of 50cm x 30cm from row to row and plant to plant. Based on the best treatment $T_6$ maleic hydrazide@3000ppm found superior in terms of plant height(70.71) (cm), number of leaves plant$^{-1}$(119.43), number of branches plant$^{-1}$(7.58),stem diameter(2.36)(cm), average of length branches(71.29)(cm), days taken for first flower bud initiation(64.96), complete opening of flower days(7.32), number of flower plant$^{-1}$(17.42), flower diameter(16.07)(cm),flower weight(62.35)(g), plant peduncle length(16.19)(cm), number of flower yield plot$^{-1}$(156.81), number of flower yield ha$^{-1}$ (65.18)(ton.) and shelf life of flower(14.37)(days), highest gross return (3136200), net profit/ha (2731161.50) and cost benefit ratio (1:6.74).



**Key words: -** Plant height, Branches, Flower yield & Shelf life, etc.


## INTRODUCTION

Dahlia *(Dahlia variabilis* L.*)* is a genus of bushy tuberous half hardy herbaceous perennial plant having stout, erect, branched stems bearing pinnate leaves in opposite pairs and terminal brightly colored and capitates type of inflorescences, valued for their gorgeous attractive spectacular flowers. Dahlia also occupies a place of pride in a garden. Dahlias are easy to grow both in field and in pot and all types of dahlias are extensively used for exhibition, garden display and home decoration. This plant is being grown in many parts of the world for its beautiful ornamental blooms of varying shades of colours and for the beautification of gardens, for cut flowers and loose flower.

As per reports 1962 thousand tones loose flower and 823 thousand tones cut flower are produced in 2018-2019. Nearly 95.5 % of the total area is under open cultivation **(NHB, 2018-2019).** India has exported about 19726.57 MT of floriculture products to the world for the value of Rs. 571.38 Cr. in 2018-2019. Major exports destinations (2018-2019) USA, Netherland, UK, Germany and UAE are major importing countries of Indian floriculture **(APEDA, 2018-19).**

Dahlia Tubers have been found to contain a good amount of insulin and fructose and also have some medicinal property as they contain small quantity of medicinal active compound such as phytin and benzoic acid. Whereas, insulin extract from tubers of dahlia is used in diagnosis of renal function **(Shukla *et al.*, 2018).** Seeds are good source of fats and proteins which also contain more than 16 per cent oil and 20.9 to 47.0 per cent protein. The root exudate is nematotoxic and the mortality of the nematode is increasing with increase in the concentration of root exudates **(Manjula *et al.*, 2017).**

It belongs to the family Asteraceae. Stems are mostly erect branched, glabrous or scabrous in nature. In less favorable climate Dahlia is mainly treated as an annual **(Hammett, 1980).**

Evaluation is a necessary pre-requisite for crop improvement and it will provide a rapid, reliable and efficient means of information to augment the utilization of germplasm **(Tejaswini and Bhat, 1994).** Various bulbs/tubers are imported from Netherlands and planted in open field or under shade net during the summer and in unheated polyethylene houses for the September crop in various parts of India (**Malik *et al.*, 2017**).

**Moond and Gehlot (2006 )**reported that CCC at 4000 ppm recorded significantly more number of flowers per plant compared to other concentrations (2000, 6000, 8000 and 10000 ppm) in chrysanthemum. **Kumar *et al*. (2006)** reported that application of 5000ppm CCC in tuberose exhibited superiority with respect to duration of flowering (37.13 days), length of spike (76.68 cm) and number of florets per spike (30.84). **Moond and Gehlot (2006)** reported in chrysanthemum, MH increase in vase life of flowers with increase in levels of MH (250, 500, 750, 1000 and 1250ppm).

## MATERIALS AND METHODS

The experiment was conducted during winter season of the year 2022-2023 in Research field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj. The area is situated on the South of Prayagraj on the right bank of Yamuna at Rewa road at a distance of about 6 km from Prayagraj city. It is situated at 25º.8´N latitude and 81º.50´ E longitudes on elevation of 98 meters from the sea level.

The maximum temperature of the location reaches up to $46^oC – 48^oC$ and seldom falls as low as $4^oC – 5^oC$. The relative humidity ranges between 20 to 94 per cent. The average rainfalls in this area are around 1013.4 mm annually. The meteorological Data from (November, 2022 to February, 2023).

## RESULTS AND DISCUSSION

### Growth parameters

#### 1.Plant height

The plant height among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded minimum increase plant height (70.71). Whereas the maximum increase plant height (96.44) was recorded in the treatment $T_0$ Control.

#### 2.Number of leaves plant$^{-1}$

The number of leaves plant$^{-1}$ among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded maximum increase number of leaves plant$^{-1}$ (119.43). Whereas the minimum increase number of leaves plant$^{-1}$ (91.11) was recorded in the treatment $T_0$ Control.

#### 3.Number of branches plant$^{-1}$

The number of branches plant$^{-1}$ among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded maximum increase number of branches plant$^{-1}$ (7.58). Whereas the minimum increase number of branches plant$^{-1}$ (5.15) was recorded in the treatment $T_0$ Control.

#### 4.Stem diameter

The stem diameter (cm) among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded maximum increase stem diameter (cm) (2.36). Whereas the minimum increase stem diameter (cm) (1.36) was recorded in the treatment $T_0$ Control.

#### 5.Average length of branches

The average of length branches (cm) among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded maximum increase average of length branches (cm) (71.29). Whereas the minimum increase average of length branches (cm) (47.54) was recorded in the treatment $T_0$ Control.

**Floral parameters**

**1.Days taken for first flower bud initiation**

The days taken for first flower bud initiation among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded minimum days taken for first flower bud initiation (64.96). Whereas the maximum days taken for first flower bud initiation (80.41) was recorded in the treatment $T_0$ Control.

**2.Complete opening of flower days**

The complete opening of flower days among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded minimum complete opening of flower days (7.32). Whereas the maximum complete opening of flower days (14.15) was recorded in the treatment $T_0$ Control.

**3.Number of flower plant$^{-1}$**

The number of flower plant$^{-1}$ among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded maximum number of flower plant$^{-1}$ (17.42). Whereas the minimum number of flower plant$^{-1}$ (6.19) was recorded in the treatment $T_0$ Control.

**4.Flower diameter**

The flower diameter (cm) among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded maximum flower diameter (cm) (16.16). Whereas the minimum flower diameter (cm) (12.22) was recorded in the treatment $T_0$ Control.

**5.Flower weight**

The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded maximum flower weight (g) (62.35). Whereas the minimum flower weight (g) (33.64) was recorded in the treatment $T_0$ Control.

**6.Shelf life of flower**

The Shelf life of flower (days) among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded maximum Shelf life of flower (days) (14.37). Whereas the minimum Shelf life of flower (days) (9.56) was recorded in the treatment $T_0$ Control.

**Yield parameters**

**1.Number of flower yield plot$^{-1}$**

The number of flower yield plot$^{-1}$ among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded maximum number of flower yield plot$^{-1}$ (156.81). Whereas the minimum number of flower yield plot$^{-1}$ (55.71) was recorded in the treatment $T_0$ Control.

**2.Number of flower yield ha$^{-1}$**

The number of flower yield ha$^{-1}$ among the different treatments differed significantly. The treatment $T_6$ 3000 ppm Maleic Hydrazide recorded maximum number of flower yield ha$^{-1}$ (11.07). Whereas the minimum number of flower yield ha$^{-1}$ (3.75) was recorded in the treatment $T_0$ Control.

**Table1:-**Growth parameters of dahlia (*Dahlia variabilis* L.) cv. Shubhra

| Treatment | Treatment Combination | Plant height (cm) | Number of leaves per plant | Number of branches plant$^{-1}$ | Stem diameter (cm) | Average of length branches |
|---|---|---|---|---|---|---|
| $T_0$ | Control | 96.44 | 91.11 | 5.15 | 1.36 | 47.54 |
| $T_1$ | 1000 ppm Cycocel | 91.19 | 98.54 | 6.33 | 1.80 | 51.22 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **$T_2$** | 1500 ppm Cycocel | 88.70 | 99.75 | 6.61 | 1.89 | 52.79 |
| **$T_3$** | 2000 ppm Cycocel | 86.81 | 101.92 | 6.65 | 2.07 | 55.08 |
| **$T_4$** | 1000 ppm Maleic Hydrazide | 75.03 | 113.62 | 7.06 | 2.24 | 64.86 |
| **$T_5$** | 2000 ppm Maleic Hydrazide | 72.29 | 116.86 | 7.49 | 2.28 | 67.86 |
| **$T_6$** | 3000 ppm Maleic Hydrazide | 70.71 | 119.43 | 7.58 | 2.36 | 71.29 |
| **$T_7$** | 5O ppm Paclobutrazol | 85.11 | 103.38 | 6.28 | 2.10 | 57.42 |
| **$T_8$** | 100 ppm Paclobutrazol | 82.29 | 106.70 | 7.31 | 2.14 | 59.08 |
| **$T_9$** | 150 ppm Paclobutrazol | 79.40 | 109.35 | 6.71 | 2.19 | 61.15 |
| | **F-test** | **S** | **S** | **S** | **S** | **S** |
| | **S.Ed. (±)** | **0.991** | **0.865** | **0.139** | **0.048** | **0.509** |
| | **CD at 0.5 %** | **2.082** | **1.817** | **0.293** | **0.101** | **1.070** |

**Table2:-** Floral parameters and yield of dahlia (*Dahlia variabilis* L.) cv. Shubhra

| **Treatment** | **Treatment Combination** | **Duration of first flower bud initiation** | **Complete opening of flower days** | **Number of flower plant$^{-1}$** | **Self life** | **Flower diameter (cm)** | **Flower weight (g)** | **Number of flower yield plot$^{-1}$** | **Number of flower yield ha$^{-1}$ (in Tonnes)** |
|---|---|---|---|---|---|---|---|---|---|
| **$T_0$** | Control | 80.41 | 14.15 | 6.19 | 9.56 | 12.22 | 33.64 | 55.71 | 12.61 |
| **$T_1$** | 1000 ppm Cycocel | 77.49 | 13.33 | 8.99 | 10.07 | 13.56 | 36.49 | 80.87 | 19.67 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **$T_2$** | 1500 ppm Cycocel | 76.56 | 12.99 | 9.94 | 10.41 | 13.84 | 39.87 | 89.43 | 23.77 |
| **$T_3$** | 2000 ppm Cycocel | 75.32 | 12.71 | 10.48 | 10.81 | 14.21 | 42.31 | 94.32 | 26.60 |
| **$T_4$** | 1000 ppm Maleic Hydrazide | 68.17 | 9.07 | 13.81 | 13.58 | 15.61 | 55.79 | 124.29 | 46.22 |
| **$T_5$** | 2000 ppm Maleic Hydrazide | 67.42 | 8.27 | 15.70 | 14.20 | 15.83 | 58.22 | 141.30 | 54.82 |
| **$T_6$** | 3000 ppm Maleic Hydrazide | 64.96 | 7.32 | 17.42 | 14.37 | 16.07 | 62.35 | 156.81 | 65.18 |
| **$T_7$** | 5O ppm Paclobutrazol | 74.61 | 12.16 | 11.86 | 11.95 | 14.50 | 46.14 | 106.71 | 32.82 |
| **$T_8$** | 100 ppm Paclobutrazol | 72.27 | 11.09 | 12.38 | 12.34 | 16.68 | 48.25 | 111.42 | 35.84 |
| **$T_9$** | 150 ppm Paclobutrazol | 70.82 | 10.42 | 13.14 | 13.05 | 15.20 | 52.28 | 118.29 | 41.23 |
| | F-test | **S** | **S** | **S** | **S** | **S** | **S** | **S** | **S** |
| | S.Ed. (±) | **0.585** | **1.954** | **0.516** | **0.370** | **0.457** | **1.02** | **4.645** | **0.310** |
| | CD at 0.5 % | **1.230** | **0.384** | **1.084** | **0.778** | **0.961** | **2.140** | **9.759** | **0.651** |



**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 $T_6$ i.e. application of $T_6$ 3000 ppm Maleic Hydrazide was found superior in terms of plant height(70.71) (cm), number of leaves plant$^{-1}$(119.43), number of branches plant$^{-1}$(7.58),stem diameter(2.36)(cm) , average of length branches(71.29)(cm), days taken for first flower bud initiation(64.96), complete opening of flower days(7.32), number of flower plant$^{-1}$ (17.42), flower diameter(16.07)(cm), flower weight(62.35)(g), plant peduncle length(16.19)(cm) , number of flower yield plot$^{-1}$(156.81), number of flower yield ha$^{-1}$ (65.18)(ton.) and shelf life of flower(14.37)(days), highest gross return (3136200), net profit/ha (2731161.50) and cost benefit ratio (1:6.74) was obtained under the use of 3000 ppm Maleic Hydrazide ($T_6$).

**REFERENCES**

**Abou Elhassan L. M. H., Bosila H. A., Hamza M. A., Elateeq A. A., and Abdel-Gawad A. I.(2021).** Effect of Cycocel and Paclobutrazol on the Dwarfing Characteristics of Chrysanthemum indicum. Al-Azhar Journal of Agricultural Research V. (46) No. (2) December (2021) 41-50

**Abrol Amita, SR Dhiman, Qureshi Aqiba, Sharma Preeti and Sharma Shweta (2018).**Effect of growth regulators on potted chrysanthemum (dendranthema grandiflora tzvelve)-a review article. Journal of Emerging Technologies and Innovative Research. 2018,

**Ahmad, M., Ayaz, S., Jadoon, S.A., Alam, M., Rab, A., Khalil, I.H., Ayub, G. and Ali, H. 2019.** Application of maleic hydrazide controlled plant height and ameliorate flower production in local dahlia bioscience research, 16(2): 1882-1890.

**Arshid AL.** Effect of photoperiod and chemical retardants on growth and flowering of chrysanthemum. M.Sc. thesis submitted to Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, Srinagar; 2009.

**Ashwath, G. and Parthasarathy, V. A. 1994.** Genetic variability in some quantitative characters of gladiolus. Oxford and IBH Publishing Co Pvt. Ltd. Calcutta. Pp 34- 36.

**Bhattacharjee SK.** Effect of growth regulating chemicals on growth and tuberous root formation of Dahlia variabilis. *Punjab Horticultural Journal.* 1984;24:138- 144.

**Khan F. U., Malik F. A., Khan1 F. A. and Nelofar (2007).** Effect of pre-harvest application of GA3 and PP333 as bulb dip and foliar spray on quality and vase life of cut tulip cv. Cassini. *J. Hort. Sci.* Vol. 2 (2): 156-158, 2007

**Khan, M.I., Muzamil, S., Abid, M., Hassan, A., Mathew, B. 2012. Effect of different levels of cycocel and maleic hydrazide on growth and flowering of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda. The Asian Journal of Horticulture 7(2): 294-296.**

**Kumar Dilip Mishra and Yadava L.P. (2011)** Infl uence of paclobutrazol application on the fl ower size and yield of China aster (Callistephus chinensis (L.) Nees). Journal of Applied Horticulture, 13(2): 147-149.

**Kumar R, Ahmed N, Singh DB, Sharma OC, Shiv Lal, Salmani MM.** Enhancing blooming period and propagation coefficient of tulip (Tulipa gesneriana L.) using growth regulators. *African Journal of Biotechnology*. 2013;2(2):168-174

**Malik K. M., Wani A.H.and Nazki I. T. (2021).** Effect of growth retardants on growth, flowering and bulb yield of Asiatic Lilium. International Journal of Scientific and Research Publications, Volume 11, Issue 4,

**Malik K.M., Wani A.H.and Nazki I.T. (2021).** Effect of growth retardants on growth, flowering and bulb yield of Asiatic Lilium. International Journal of Scientific and Research Publications, Volume 11, Issue 4, April 2021

**Malik, S. and Rather, Z.A. 2017. Effect of growth regulators on plant growth and flowering in Dahelia (*Dahelia variabillis*) cv. Charmit. Journal of Experimental Agriculture International, 15(3): 1-7.**