



P-ISSN: 2349-8528
 E-ISSN: 2321-4902
 IJCS 2018; 6(4): 1088-1091
 © 2018 IJCS
 Received: 20-05-2018
 Accepted: 23-06-2018

SR Chaudhari

Department of Floriculture
 ASPEE College of Horticulture
 and Forestry, Gujarat
 Agricultural University, Navsari,
 Gujarat, India

AB Patil

Department of Floriculture
 ASPEE College of Horticulture
 and Forestry, Gujarat
 Agricultural University, Navsari,
 Gujarat, India

Effect of various plant growth regulators on growth and flowering in *Rosa hybrida* L. cv gladiator

SR Chaudhari and AB Patil

Abstract

The experiment on the influence of plant growth regulators on growth and flowering of rose (*Rosa hybrid* L.) cv, "Gladiator" was conducted at Floriculture Research Scheme, Regional Horticulture Research Station, ASPEE College of Horticulture and Forestry, Gujarat Agricultural University, Navsari Campus, Navsari 396450 during 2002-2003, The treatments comprised four different concentrations of GA₃ (100, 150, 200 and 250 mg/l), BA (50, 100, 150 and 200 mg/l) and ethrel (200, 300, 400 and 500 mg/l) including control. The experiment was laid out in a Randomized Block Design (RBD) with thirteen treatments and three replications. Plant height and plant spread was influence with an application of GA₃ 250 mg/l followed by GA₃ 200 mg/l while highest number of branches was obtained with ethrel 300 mg/l. Earlier flower bud initiation (21.6 days) was noted in treatment with GA₃ 150 mg/l while maximum days taken with ethrel 500 mg/l (36.6 days). Largest flower stalk length and flower diameter was noted with treatment GA₃ 250 mg/l and minimum with control.

Keywords: GA₃, BA, ethrel, growth, flowering, rose

Introduction

In India flowers are grown in 86000 ha with a production of 5.5 lakh tones of loose flowers and 6.8 million in number cut flowers while the total value of exports of floriculture product Rs. 120 crores in 2000-2001 from India (Arora and Singh, 2002). The major rose producing states in India are Karnataka, Maharashtra, Punjab, Uttar Pradesh, Delhi, Chandigarh, West Bengal, Himachal Pradesh, Rajasthan, Kashmir and Gujarat. In Gujarat, it is mainly grown in central and South Gujarat region.

The *Rosa hybrida* L. is a vigorous shrub with mild fragrance, foliage soft gray-green, the leaflets oval, usually three to five leaves. Branches very prickly with hooked. Flowers are of large size, bleaming red colour of cv. Gladiator. The growth, yield and quality of flowers were influenced by various parameters viz., varieties, cultivation practices, use of plant growth substances and plant protection. Among them plant growth substances are important factors which improve growth, yield and quality of flowers, Considering the importance of rose as cut flower and its popularity, it was thought worth while to carryout research as on use of plant growth regulators on rose under the agroclimatic conditions of south Gujarat.

Materials and Methods

The present investigation to study the "Effect of various plant growth regulators on growth and flowering of Rose (*Rosa hybrida* L.) cv. "Gladiator" was carried out at the Floriculture Research Scheme, Regional Horticulture Research Station in Block-E, Plot No.-8, ASPEE College of Horticulture and Forestry, Gujarat Agricultural University, Navsari during the year 2002-2003. The soil of Navsari Campus is known as black soil, which is very deep, rich in organic matter and potash, having good water holding capacity with fairly good drainage and reasonably suitable for cultivation of rose. Navsari Campus of the Gujarat Agricultural University where this investigation was carried out is located at 20°57' N latitude and 72°54'E longitude and has on altitude of about 10 meters above the mean sea level. The climate of this region is typically tropical characterized by fairly hot summer, moderately cold winter and most humid and warm monsoon. In general, the monsoon sets during the second fortnight of June and ends by the second fortnight of September. The total precipitation received during the monsoon of 2002 was 1094 mm distributed in 36 rainy days.

Correspondence

SR Chaudhari

Department of Floriculture
 ASPEE College of Horticulture
 and Forestry, Gujarat
 Agricultural University, Navsari,
 Gujarat, India

Two year old rose plant (*Rosa hybrida* L.) cv. "Gladiator" which are well established at experimental Farm of Floriculture Research Scheme, Regional Horticulture Research Station, Gujarat Agricultural University, Navsari were selected for present study. Pruning was done in the first week of November. Farmyard manure @ 15t/ha and NPK @ 150-150-150 kg/ha was given to this crop. FYM, half dose of nitrogen and full dose of phosphorus and potash were applied as a basal dose i.e. after pruning and remaining half dose of nitrogen was applied after one month of first application. Irrigation was given immediately after fertilization of the crop. The irrigation was given at an interval of 15 days and 8-10 days during winter and summer, respectively. Weeding and hoeing were done as and when required and crop kept free from weeds. The experiment was laid out in Randomized Block Design (RBD) with 13 treatments replicated thrice with Ist spray one month after pruning and IInd spray one month after first spray. Gibberellic acid 100, 150, 200 and 250 mg was measured individually and dissolved in a little quantity of 95 percent absolute alcohol in different beakers and final volume was made one litre with distilled water. Benzyl adenine 50, 100, 150 and 200 mg was measured individually and dissolved in a little quantity of 0.1 N NaOH in different beakers and final volume was made one liter by adding

distilled water. Ethrel 0.5, 0.75, 1 and 1.25 ml was measured individually and final volume was made one litre by adding distilled water. Ethrel used was of 40 per cent aqueous solution. Both the surface of the leaves and apical meristem were fully moistened. Tipol was added as a sticky agent. Spraying was done in the morning by means of Ganesh hand sprayer. Three plants in each plot were selected at random from the net plot of each treatment and tagged for recording the observations.

Result and Discussion

The data on effect of different plant growth regulators on height of rose are given in Table-1. It revealed that response of different plant growth regulators on plant height differed significantly. The maximum plant height (106.8 cm) was recorded under GA₃ 250 mg/l. This might be due to stem elongation by increasing cell division in subapical meristem. Gibberellins are known to promote the elongation of stem by cell elongation and cell multiplication. According to Lin *et al.* (1975) [19] the action of gibberellins occurs through enhancement in auxin by proliferating the site of auxin action. The results of present investigation are in accordance with Sable (1992) [26], Bhattacharjee (1993) [5] and Porwal *et al.* (2002) [25] in rose.

Table 1: The influence of various plant growth regulators on growth and flowering of Rose

Treatments	Growth characters				Flowering characters	
	Plant height (cm)	No of branches/plant	Plant spread (cm) N-S	Plant spread (cm) E-W	First Flower bud initiation (days)	Flower Stalk length (cm)
GA ₃ 100 mg/l	88.3	7.5	59.9	70.1	24.6	35.4
GA ₃ 150 mg/l	80.9	7.8	61.6	71.1	21.6	36.4
GA ₃ 200 mg/l	91	8.1	63.0	72.2	23.3	38.0
GA ₃ 250 mg/l	106.8	8.2	66.5	80.3	22.6	41.2
BA 50 mg/l	81.3	6.7	59.5	67.3	25.3	32.1
BA 100 mg/l	84.3	6.1	57.5	68.5	26.3	33.1
BA 150 mg/l	91.1	6.4	58.5	69.1	27.3	34.6
BA 200 mg/l	91.8	5.4	57.8	67.7	28.6	35.0
Ethrel 200 mg/l	75.4	6.4	53.0	58.4	34.3	26.2
Ethrel 300 mg/l	77.4	10.2	54.3	57.7	34.6	24.2
Ethrel 400 mg/l	73.1	6.7	56.3	66.3	35.3	22.7
Ethrel 500 mg/l	70.8	9.7	52.0	60.1	36.6	21.0
Control	67.2	5.5	58.1	65.5	31.3	15.5
CD 5%	14.8	1.3	16.3	12	4.9	5.0
CV %	10.5	16.2	16.5	10.5	10.3	9.7

The results also indicated that the lower plant height was obtained with ethrel. Inhibitory effects of ethrel on vegetative growth of rose was also recorded by Grzesik and Rudnicki (1989) [17] and Anon. (1992) [1] in rose. This might be due to antigibberellin effect of ethrel in reduction of plant height. Similar results were reported by Bhattacharjee and Divakar (1985) [6] in jasmine. Result revealed that there was increase in number of branches with GA₃ application and was presented in Table-1. Bankar and Mukhophadhay (1982) [3], Bhattacharjee (1993) [5] and Dhekney *et al.* (2000) [10, 11] have also noted similar trends in rose. This increased in number of branches may be due to increased number of internode and increased photosynthetic efficiency of the plant due to an increase in chlorophyll. Similar effect of GA on number of branches of other flowering crops were observed by Bhattacharjee (1985) [6] and Gowda and Gowda (1991) [16] in different jasmine species and Elkiey *et al.* (1987) [13] in hibiscus.

Likewise numbers of branches were also increased with various concentrations of BA over control. This might be due to increase in number of internodes. Similar trends was also

observed by Fujii and Sasahi (2000) [14] and Carpenter and Carlson (1972) [9] in chrysanthemum. Considering the effect of ethrel, the branch number was significantly increased. This might be due to increase in the number of internodes and by the restriction of apical meristem activity which in turn induced large number of branches. The results are in agreement with the results observed in rose by Sharma and Farooqi (1990) [27], Bhattacharjee *et al.* (1994) [8] and Bhattacharjee and Singh (1995) [17].

It is clear from the data presented in Table-1 that all the levels of growth regulators application significantly influence the plant spread in East-West direction. The data shown in the Table-1 revealed that plant spread in North-South direction increased with an application of GA₃. The highest plant spread N-S (66.5 cm) and E-W (80.3 cm) were obtained with GA₃ 250 mg/l. This might be due to cell division and cell elongation. These results are corroboratory with the findings of Porwal *et al.* (2002) [25] in rose.

The perusal of data presented in Table-1 indicated that earlier flowering was reported with gibberellin treated plants. The minimum days to bud initiation was recorded with GA₃ 150

mg/l. GA₃ is effective in reducing the juvenile period required for flowering. At the termination of juvenile phase, the shoot apical meristem instead of producing leaves and branches start producing flowers (Krishnamoorthy, 1975) [18]. Earliness in flowering was also reported by Maharana and Pani (1982) [21], Gowda (1988) [15], Bhattacharjee (1993) [5] and Dhekney *et al.* (2000) [10, 11] in rose. Regarding the effect of ethrel there was delayed flowering as compared to control. Similar results were also obtained by Ma *et al.* (1985) [20], Bhattacharjee *et al.* (1994) [8] and Bhattacharjee and Singh (1995) [17] in rose.

The data shown in Table-1 revealed that flower size significantly increased by an application of GA₃ 250 mg/l. The increase in flower size is due to increase in size of petals by increasing cell size. These results are in conformity with the observations of Gowda, (1988) [15], Sable *et al.* (1992) [26] and Bhattacharjee (1993) [5] in rose. There was significant increase in the size of flowers by the utilization of ethrel (200,300,400 and 500 mg/l). Similar trend in the improvement of flower size has been reported previously in rose by Bhattacharjee and Singh (1995) [7] and Singh and Bhattacharjee (1998) in rose.

The perusal of data from Table-1 indicated that growth regulator treatments significantly increased flower stalk length. The maximum flower stalk length (41.2cm) was obtained with an application of GA₃ 250 mg/l. This effect may be due to elongation of cells and cell division under influence of GA₃ (Dutta *et al.*, 1994) [12]. Significant increase in stalk length due to gibberellic acid is also observed by Nagarajaiah and Reddy (1986) [22], Gowda (1988) [15], and Sable *et al.* (1992) [26] in the rose. Likewise, it is apparent from the Table-1 that there was significant effect of BA on stalk length in rose. The increase in stalk length with BA was observed in the present investigation. This result is in agreement with the findings of Patil (2001) [24], while all the concentration of ethrel reduce the stalk length of rose. Similar trends was also observed by Nair (1997) [23] in chrysanthemum. This might be due to the inhibitory effect of ethrel on the growth.

Conclusion

The results obtained from the present study are summarized as the application of GA₃ 250 mg/l influences maximum increase in plant height (106.8 cm), whereas lowest plant height (67.2 cm) was obtained with control. Among various treatments, ethrel at 300 mg/l increased the number of branches per plant (10.2), as compared to control (5.5). The maximum plant spread North-South (66.5 cm) and East-West (80.3 cm) were obtained with an application of GA₃ 250 mg/l whereas minimum was obtained with ethrel 500 mg/l (58.1 cm) and ethrel 300 mg/l (57.7 cm), respectively. Less days (21.6) recorded for first bud initiation of *Rosa hybrida* L. cv. "Gladiator" with an application of GA₃ 150 mg/l, while maximum (36.6) days noted with ethrel 500 mg/l. Maximum flower diameter (14.4 cm) was obtained with an application of GA₃ 250 mg/l while minimum (4.4 cm) was obtained with control. Longest flower stalk length (41.2 cm) was noted with an application of GA₃ 250 mg/l as compared to control (15.5 cm).

Based on these experimental results, it can be concluded that an application of GA₃ 250 mg/l found to be the most effective treatment for increasing plant height, plant spread and number of flowers. Likewise, flower diameter, stalk length, was found maximum with GA₃ 250 mg/l.

References

1. Anonymous. Annual Report, Division of Floriculture and Landscaping, IARI, New Delhi, 1992.
2. Arora LS, Singh K. Pre and post-harvest management of cut flowers. *Indian Hort.* 2002; 46(4):20-30.
3. Bankar GL, Mukhopadhyay A. Gibberellic acid influence growth and flowering of rose cv. 'Queen Elizabeth'. *Indian J Hort.* 1982; 39(1-2):130-133.
4. Bhattacharjee SK. Influence of foliar application of gibberellic acid on growth, flowering and quality and yield of *Jasminum arborescens* Roxb. *Indian J Hort.* 1985; 42(112):130-132.
5. Bhattacharjee SK. Studies on the effect of gibberellic acid on growth, flowering, flower quality and post life of *Rosa hybrida* cv. 'Raktagandha'. *Indian Rose Annual.* 1993; 11:77-83.
6. Bhattacharjee SK, Divakar NG. Growth, flowering and essential oil content of different species of *Jasminum* as affect by ethrel. *Indian J Hort.* 1985; 42(1/2):131-136.
7. Bhattacharjee SK, Singh UC. Growth and flowering response of *Rosa hybrida* cv. 'Raktagandha' to certain growth regulators sprays. *Orissa J Hort.* 1995; 23(1/2):21-25.
8. Bhattacharjee SK, Singh UC, Saxena NK. Effect of ethrel on the development and yield of 'Eiffel Tower' rose. *Indian Rose Annual.* 1994; 12:91-96.
9. Carpenter WL, Carlson WH. The effect of growth regulators on chrysanthemum. *J Amer. Soc. Hort. Sci.* 1972; 97(3):349-351.
10. Dhekney SA, Ashok AD, Rangasamy P. Action of various growth regulators and floral preservatives on vase life of cut rose cv. 'First Red' grown under controlled conditions. *South Indian Hort.* 2000b; 48(1-6):69-71.
11. Dhekney SA, Ashok AD, Rangasamy P. Effect of some growth regulating chemicals on growth and u flowering of rose cv. First red under greenhouse conditions. *J Ornament Hort. New Series.* 2000a; 3(1):51-53.
12. Dutta SC. *Plant Physiology*. Wiley Eastern Limited. New Age International Limited, 1994, 466-558.
13. Elkies T, Haikel M, Nooh A. Application of growth regulators for the adaptation of some perennial plants to container production. *Gartenbauwissens chaft.* 1987; 52(5):210-213.
14. Fujii Y, Sasahi S. Effect of PGR on sprouting of non-branching type chrysanthemum (*Dendranthema grandiflora*). *Bul Nasa Agril. Expt. Stat.* 2000; 31:42-43.
15. Gowda JVN. Effect of Gibberellic acid. on growth and flowering or rose cv. 'American Heritage'. *Indian Rose Annual.* 1988; 7:155-158.
16. Gowda VN, Gowda JVN. Regulation of flowering in gundumalliage by Gibberellic acid spray. *Current Res.* 1991; 20:11-12.
17. Grzesik M, Rudnicki RM. Effect of growth regulators on growth and the branching of roses. 'Sonia' and 'Mercedes'. *Acta Hort.* 1989; 251:411-414.
18. Krishnamoorthy HN. *Gibberellin and Plant growth*. HaIsten Press. John Willey and Sons Inc., New York, 1975.
19. Lin WC, Wilkins HF, Angell M. Exogenous gibberellins and abscisic acid effect on growth and development of *Ulium longiflorum*. *J American Soc. Hort. Sci.* 1975; 100(I):9-16.
20. Ma Z, Hou S, Chang Y. Effects of ethephon and gibberellin on the flowering period and flower yield of Kushai rose. *Acta Hort. Sinica.* 1985; 12(2):125-130.

21. Maharana T, Pani A. Effect of post pruning spraying of different growth regulators on the growth and flowering of hybrid rose. Bangladesh Hort. 1982; 10(I):87-88.
22. Nagarajaiah C, Reddy VT. Quality of 'Queen Elizabeth' cut roses as influenced by Gibberellic acid. Mysore J Agric. Sci. 1986; 20(4):292-295.
23. Nair SR. Effect of PGRs on growth, flowering and flower yield of annual chrysanthemum (*Chrysanthemum coronarium*) cv. Local White M.Sc. Agri. (Hort.) Thesis submitted to G.A.U., S.K. Nagar, 1997.
24. Patil SL. Effect of plant growth regulators on growth flowering and quality of gerbera (*Gerbera jamesonii* Hook.) cv. 'Sangaria' under south Gujarat conditions. M.Sc. (Hort.) thesis submitted to G.A.U., S.K. Nagar, 2001.
25. Porwal R, Nagda CL. Pundir LPS. Influence of plant growth regulators on vegetative growth and flower earliness of damask rose. South Indian Hort. 2002; 50(1-3):119-123.
26. Sable AS, Madhuri Kewte, Wakde MB. Effect of foliar application of nutrients and growth promoters on growth and flowering of rose cv. 'Paradise'. Indian Rose Annual. 1992; 10:113-119.
27. Sharma S, Farooqi AHA. Effect of 2-chloroethyl phosphonic acid on economic yield of damask rose. Indian J Agric. Sci. 1990; 60(10):691-692.