Research Article

Effect of Biostimulants and Micronutrients Grade on Yield and Quality of Rose cv. Top Secret under Protected condition

Barad R G, Karetha K M, Mishra S* and Yogitha

Department of Horticulture, College of Agriculture, JAU, Junagadh, Gujarat, India

Abstract

Yield and quality are the most important parameters in ornamental crops, more specifically for the queen of flowers or rose. To evaluate the effect of biostimulants and Micronutrients on the yielding and quality parameters of rose cv. Top Secret, the investigation was carried out at JAU, during 2018. The treatment comprised of three different levels of biostimulants *viz.*, Banana enrich sap 1%, Panchgavya 3%, Humic acid 0.2% and three different levels of Grade of Micronutrient IV *viz.*, 0.5%, 1% and 1.5%. The result indicated that application of Panchgavya 3% with 1.5% grade IV micronutrient formulation, first spray at 15 days after pruning and second spray at 30 days after first spray give higher yield *viz*., number of cut flowers per plant, number of cut flowers per m^2 and yield of flowers per ha and quality parameters *viz*., maximum length of bud, diameter of bud, diameter of flower, vase life, *in situ* longevity, fresh weight, dry weight and pedicle length of flower in rose cv. Top Secret.

Keywords: Rose, Top Secret, Biostimulants, Micronutrient grade IV, Yield, Quality, Panchgavya.

***Correspondence**

Author: Mishra S

Email: subhrajyoti.ss235@gmail.com

Introduction

Rose (*Rosa hybrida* L.) belongs to the family Rosaceae and is one of the most important woody perennials including shrubs, bushes of various size ramblers and climbers as well as very small plants known as miniatures [1]. There is a tremendous diversity of growth habit, flower form and colour among it. It is the most popular of all the flowers because of its beauty and fragrance so called as the "Queen of Flowers" [2]. This is immensely important for landscaping and no garden is considered complete without it [3]. Biostimulants are akin to biofertilizers as they also promote crop growth and yield. Biostimulants aid in improved microbial activity in soil and improve soil tilt, thereby also enhancing the effect of biofertilizers. These biostimulants affect different plant parameters such as; root and shoot development, flowering, fruiting, stomatal opening and elongation, stress tolerance and yield parameters such as grain size and grain weight. Floriculture is a fast emerging and highly competitive industry. The importance of micronutrients in Indian agriculture is truly well recognized and their use had significantly contributed to the increased productivity of several crops. The nutrient elements which are required comparatively in small quantities are called as micro or minor nutrients or trace elements. Micronutrients are essentially as important as macronutrients to have better growth, yield and quality in plants. In the past, there was no need of micronutrients because these elements were naturally supplied by soil. But due to intensive cultivation, increase in salinity and soil pH in most of the soils, though these nutrients are present but are not available to plants.

Micronutrients are involved in all metabolic and cellular functions. Plants differ in their need for micronutrients; boron (B), iron (Fe), zinc (Zn), copper (Cu), chloride (Cl), manganese (Mn), molybdenum (Mo) and nickel (Ni). Micronutrients are involved in all metabolic and cellular functions [4]. These elements are active that makes them essential as catalytically active cofactors of enzymes, others have enzyme-activating functions, and yet others fulfill a structural role in stabilizing proteins. Now a days, micronutrients are gradually gaining momentum among the flower growers because of their beneficial nutritional support and at the same time ensure better harvest and returns. Proper plant nutrition is essential for successful production of floricultural crops in open and also under protected conditions. Integrated supply of micronutrients with macronutrients in adequate amount and suitable proportions is one of the most important factors that control the plant growth in flower crops. Hence to standardize the proper dose of biostimulant and micronutrient in rose cv. Top Secret for different yield and quality attributes the present experiment was undertaken.

Materials and Methods

The experiment was conducted during 2018, at Hi-tech Horticulture Park, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat). The trial was laid out in Factorial Completely Randomized Design (FCRD), consisting two factors with three replication and nine treatment combinations. The different treatments were T_1: Banana enrich sap 1% (10mL/L.) + 0.5% grade-IV micronutrient formulations, T_2: Banana enrich sap 1% (10mL/L.) + 1% grade-IV micronutrient formulation, T_3: Banana enrich sap 1% (10mL/L.) + 1.5% grade-IV micronutrient formulation, T_4: Panchgavya 3% (30 mL/L.) + 0.5% grade-IV micronutrient formulation, T_5: Panchgavya 3% (30 mL/L.) + 1% grade-IV micronutrient formulation, T_6: Panchgavya 3% (30 mL/L.) + 1.5% grade-IV micronutrient formulation, T_7: Humic acid 0.2% (2mL/L.) + 0.5% grade-IV micronutrient formulation, T_8: Humic acid 0.2% (2mL/L.) + 1% grade-IV micronutrient formulation, T_9: Humic acid 0.2% (2mL/L.) + 1.5% grade-IV micronutrient formulation. Pruning operation was carried out on March of 2018 at 2ft height just above the ground level (**Figure 1**A) followed by foliar spray of the treatment combinations twice, first being 15 days after pruning and second at 30 days after the first. All the cultural operations *viz*., RDF (40:20:40 g NPK), weeding, irrigation *etc*., were conducted as and when necessary.

The number of flowers was counted in each plucking and average number of flowers per plant was recorded. The total number of cut flowers per m^2 and per hectare was computed by converting the number of flowers per plant, multiplied by total number of plants accommodated in one square meter and one hectare of land respectively. With the help of vernier calipers, length and diameter of three randomLy selected buds from each net plot, was measured at full tight bud condition and fully opened stage.

During peak flowering and just to open stage, fresh cut flowers from each treatment were randomLy harvested, with uniform stem length and kept in conical flask, filled with distilled water up to the neck. The distilled water was added as and when required to maintain the original level. The cut flowers were kept in flasks; till they started withering and the days taken to withering was expressed as vase life of cut flower. The days taken to withering in room temperature was recorded as the *In situ* longevity of flower. The fresh weight of three fully opened flowers at each harvest was recorded from tagged plants and later on the average weight of single flower in grams was recorded. Dry weight of flower from tagged plant, was recorded by air drying under shade in laboratory followed by drying in oven at 60°C temperature till a constant weight. The length of pedicle was recorded, when the flower was harvested.

Results and Discussions

Yield parameters

The Treatment B_2 comprised of Panchgavya 3% recorded significantly maximum number of cut flowers per plant (14.83), number of cut flowers per m^2 (58.83) and yield of flowers per ha (5.83 Lakh/ha). Panchagavya, an organic product, has the potential to play the role of promoting growth and providing immunity in plant system. It contains macronutrients, essential micronutrients, many vitamins, essential amino acids. Flowering and yield of plant increased maight be due to the increased availability and uptake of nutrients, water, increased activity of GA, IAA and cytokinins in Panchgavya. The results of present study are in close conformity with findings of [5], [6] and [7] in gladiolus, tuberose and carnation respectively.

The Treatment M_3 (1.5% grade-IV micronutrient formulation), recorded significantly maximum number of cut flowers per plant (15.03), number of cut flowers per m^2 (59.93) and yield of flowers per ha (5.93 Lakh/ha). The foliar spray of 2 per cent ferrous sulphate [8] was best for promoting early flowering and increased flower diameter and longevity in rose (**Figure 1**B, C). Micronutrient might be helpful in maximizing the yield by enhancing the availability of phytoassimilates to the developing floral bud. The results are in agreement with the reports of [9], [10] and [11] in gladiolus and chrysanthemum respectively.

Quality parameters

The Treatment B_2 (Panchgavya 3%), recorded significantly maximum length of bud (2.22 cm), diameter of bud (1.63 cm), diameter of flower (6.27 cm), vase life of cut flower (8.52 days) (**Figure 2**), *in situ* longevity of flower (8.73 days), fresh weight of flower (11.08 g) (**Figure 3**E), dry weight of flower (3.57 g) (**Figure 3F**) and pedicle length of flower (24.77 cm) (**Figure 1**D). While, significantly lowest values in all the above parameters were recorded under treatment B_1 (Banana enrich sap 1%). Biostimulants affects all the quality parameters of rose. This might be attributed to increased availability of photosynthates due to enhanced vegetative growth of plant, which might have been utilized for the production of better quality flowers of rose. The results obtained are in close agreement with the findings of [12-14] and [15] in flower crops like carnation, tuberose and gladiolus.

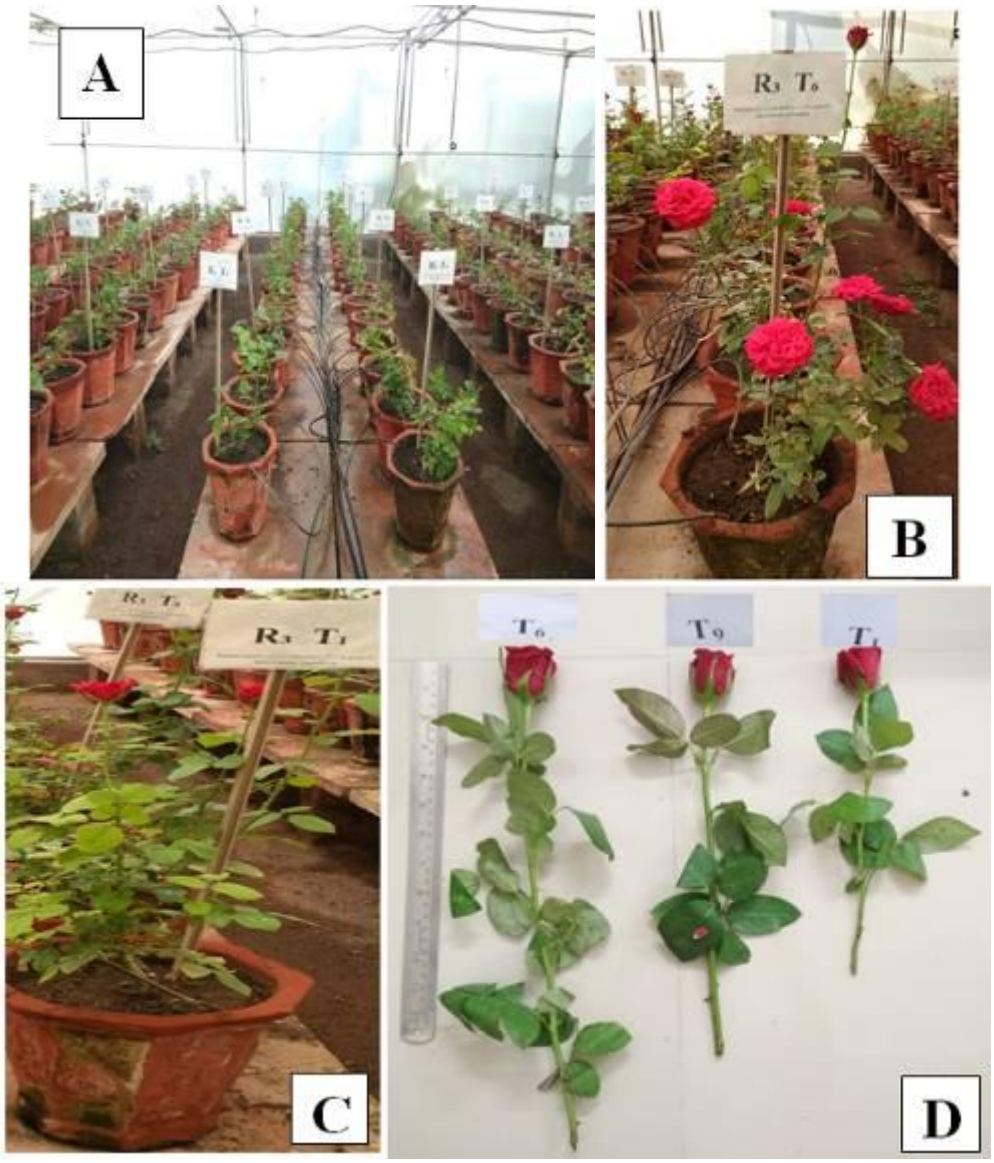

Figure 1 (A) Pruned plants, (B) Plant performance under T_6, (C) Plant performance under T_1, (D) Pedicle length of flower in T_6, T_9 and T_1.

Table 1 Effect of biostimulants and micronutrient grade yield parameters in rose

Treatment	Number of cut flowers per plant	Number of cut flowers per m^2	Yield of cut flowers per ha (lakh/ha)
Biostimulants (B)			
B_1- Banana enrich sap 1%	13.76	55.00	5.50
B_2- Panchgavya 3%	14.83	58.83	5.83
B_3- Humic acid 0.2%	14.27	57.74	5.70
S.Em.±	0.15	0.90	0.03
C.D. at 5%	0.45	2.68	0.10
Micronutrient grade IV (M)			
M_1- 0.5% grade-IV micronutrient formulation	13.74	54.39	5.40
M_2- 1% grade-IV micronutrient formulation	14.08	57.26	5.70
M_3- 1.5% grade-IV micronutrient formulation	15.03	59.93	5.93
S.Em.±	0.15	0.90	0.03
C.D. at 5%	0.45	2.68	0.10
Interaction (B X M)			
S.Em.±	0.26	1.56	0.06
C.D. at 5%	0.77	4.64	0.17
C.V.%	3.16	4.73	1.76

The Treatment M_3 (1.5% grade-IV micronutrient formulation), recorded significantly maximum length of bud (2.25 cm), diameter of bud (1.61 cm), diameter of flower (6.53 cm), vase life of cut flower (8.59 days), *in situ* longevity of flower (8.86 days), fresh weight of flower (11.06 g) (Figure 2E), dry weight of flower (3.53 g) (Figure 2 F) and pedicle length of flower (25.13 cm). Significantly the lowest values were recorded under treatment M_1 (0.5% grade-IV micronutrient formulation). The increase in quality attributes is due to increased supply of zinc, in biosynthesis of Indole Acetic Acid (IAA) and its role in initiation of primordia for reproductive parts and partitioning of photosynthates towards them, which resulted in better flowering.

Figure 2 Vase life of cut flower

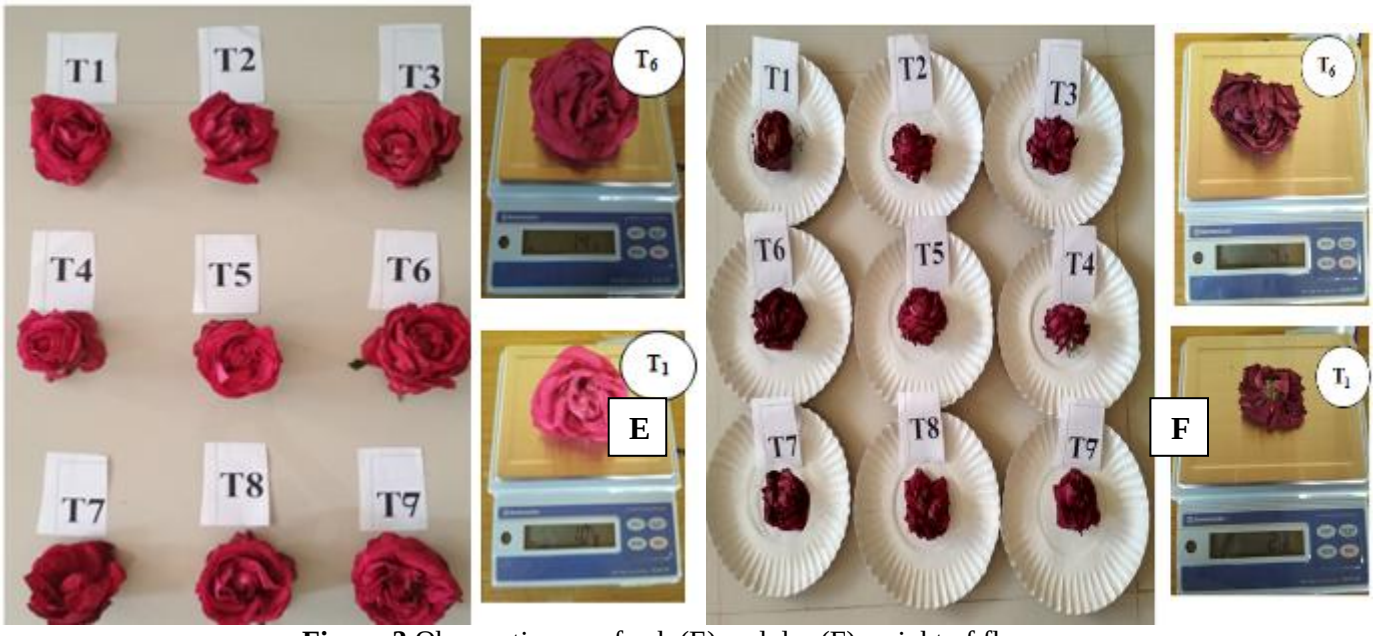

Figure 3 Observations on fresh (E) and dry (F) weight of flowers

Table 2 Effect of biostimulants and micronutrient grade on quality parameters in rose

Treatment	Length of bud (cm)	Diameter of bud (cm)	Diameter of flower (cm)	Vase life of cut flower (Days)	*In situ* longevity of flower (Days)	Fresh weight of flower (g)	Dry weight of flower (g)	Pedicle length of flower (cm)
Biostimulants (B)								
B_1- Banana enrich sap 1 %	2.02	1.50	5.73	7.23	7.62	9.39	3.20	22.88
B_2- Panchgavya 3%	2.22	1.63	6.27	8.52	8.73	11.08	3.57	24.77
B_3- Humic acid 0.2%	2.18	1.53	5.98	8.33	7.69	10.91	3.44	24.64
S.Em.±	0.04	0.03	0.09	0.13	0.12	0.11	0.06	0.40
C.D. at 5%	0.11	0.08	0.28	0.39	0.37	0.31	0.18	1.19
Micronutrient grade IV (M)								
M_1- 0.5% grade-IV micronutrient formulation	1.98	1.48	5.53	7.12	7.34	9.92	3.22	23.12
M_2- 1% grade-IV micronutrient formulation	2.20	1.56	5.91	8.37	7.85	10.40	3.46	24.03
M_3- 1.5% grade-IV micronutrient formulation	2.25	1.61	6.53	8.59	8.86	11.06	3.53	25.13
S.Em.±	0.04	0.03	0.09	0.13	0.12	0.11	0.06	0.40
C.D. at 5%	0.11	0.08	0.28	0.39	0.37	0.31	0.18	1.19
Interaction (B X M)								
S.Em.±	0.06	0.05	0.16	0.23	0.21	0.18	0.11	0.69
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	4.97	5.36	4.70	4.97	4.62	3.03	5.36	4.97

Conclusion

Yield and quality attributes are the most vital parameters for the fruit grower. From the experimental observation it can be concluded that for getting higher yield and quality in rose cv. Top Secret the plant should be sprayed with the combine application of Panchgavya 3% and Grade IV micronutrient formulation 1.5% twice after pruning. The first spray should be at 15 days after pruning and second at 30 days after first spray.

Reference

[1] Encyclopedia Americana, International Inc., Danjbury, Connecticut. 1984, 23: 788-789.

[2] P. Schneider, G. P. Dewolf, Taylor's Guide to Roses. Houghton Mifflin Co. 215 Park Avenue South, New York, USA, 1995.

[3] M. Gibson, Growing roses. Croom Helm Ltd., Provident House, Burrell Row, Beckenham, Kent, England, 1984.

[4] J. B. Edmond, T. L. Sen, F. S. Andrews, R. G. Holfacre, Fundamentals of Horticulture, 4th edition, McGraw Hill Book Co., New York, 1997.

[5] K Raushan, Effect of organic culture on growth and post harvest life of galdious (*Gladious hybrida*) cv. Peter Pears. M.Sc (Agri.) thesis submitted to G.B.P.A.U., Pantnagar, 2008.

[6] B. Singh, R. Srivastava, R. Chandra, Response of panchgavya and manchurian mushroom tea on floral characters in tuberose (*Polianthes tuberosa L.*) cv. Pearl Double. J. Orna. Hort., 2007, 10(4): 250-254.

[7] S. Ranukaradya, C. M. Pradeepkumar, H. M. Santoshkumar, M. Dronachari, R. S. Sashikumar, Effect of integrated system of plant management on growth, yield and flower quality of carnation (*Dianthus caryophyllus L.*) under greenhouse. Asian J. Hort., 2011, 6(1): 106-112.

[8] V. C. Singh, S. K. Bhattacharjee, Effect of pre-harvest micronutrient treatments on post-harvest life of Raktagandha roses. Ann. Agrl. Res., 1997, 18(3): 357-360.

[9] K. P. S. Rao, Influence of iron nutrition on growth, flowering and corm yield in gladiolus. J. Orn. Hort., 2005,

8(4): 293-295.
[10] S. Jauhari, R. Srivastava, P. C. Srivastava, Effect of zinc on growth, flowering, corm attributes, post-harvest life and leaf and corm nutrient status in gladiolus cv. Red Beauty. Progr. Hort., 2005, 37(2): 423-428.
[11] P. N. Kumar, R. L Mishra, S. R. Dhiman, M. Ganga, K. Lalitha, Effect of micronutrient spray on growth and flowering of chrysanthemum. Indian J. Agri. Sci., 2009, 79(6): 426-428.
[12] S. Dharma, Effect of biofertilizer and biostimulants on growth and flowering of carnation (Dianthus caryophyllus Linn.) cv. Sunrise, Ph.D. Thesis, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.), 2006.
[13] B. P. Sharma, A. Gautam, Y. C. Gupta, S. R. Dhiman, R. Bhalla, Effect of foliar sprays of biostimulants on growth and flowering of carnation cv. Sunrise. J. Orn. Hort., 2011, 13(2):101-106.
[14] M. T. Patil, S. B. Gurav, B. R. Singh, S. M. Katwate, S. M. Chaudhary, D. S. Kakade, Post harvest management of tuberose through organic culture. Abstract in National Symposium on Ornamental Bulbous Crops, 2006, Dec. 5-6 pp.
[15] R. Kumar, C. Dekabidyut, A. R. Roy, Effect of bioregulators on vegetative growth, flowering and corm production in gladiolus cv. Candyman. Indian J. Hort., 2011, 8(2): 54-56.

Publication History
Received 10.08.2019
Revised 19.12.2019
Accepted 21.12.2019
Online 23.12.2019