

Original Research Article

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Effect of GA₃ on Flowering and Quality of Different Rose Varieties

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ABSTRACT

A field investigation entitled “Effect of GA₃ on growth, yield and quality of different rose varieties” was carried out during *Kharif season* of the year 2016-2017 at Horticulture Section, College of Agriculture, Nagpur with the objectives to study the different rose varieties for growth, flower yield and quality parameters and to find out the suitable scented rose variety for commercial cultivation in Nagpur conditions. The experiment was laid out in Factorial Randomized Block Design with four treatments. The treatments were replicated thrice. The treatments are G₁-control G₂- 100ppm G₃- 200ppm G₄- 300ppm with varieties V₁ - Toro, V₂ -Double delight, V₃ -Gladiator. In respect of flowering parameter like days to first flower bud initiation, 50% flowering, days to first harvesting and flowering span from pruning were recorded in variety Gladiator and GA₃ 200ppm. Regarding quality parameters *viz.* diameter of flower bud, diameter of stalk, stalk length, number of leaves on flower stalk and vase life were recorded maximum in variety Toro and GA₃ 200ppm. Thus, it can be inferred from the present investigation that, the variety Gladiator and GA₃ 200ppm was found to be better in respect of flowering and variety Toro is better in quality parameters for commercial cultivation under Nagpur conditions.

Keywords

Rose, GA₃,
Flowering and
Quality

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Introduction

Rose (*Rosa hybrid* L.) belongs to the family Rosaceae and remains a major ornamental plant for cut flower trade all over the world. It is considered to be an ancient flower and scientists assume that the evolution of rose started 60 million years and originated in Asia. In both Greek and Roman mythology the rose is usually associated with beauty and love. As Hayans has said “Ever since man first beheld it and inhaled its scent, the rose has captured his imagination and taken root in his thoughts” (Pal, 1991). Rose is the most popular of all the flowers because of its

beauty and fragrance and is called the “Queen of Flowers”. Roses are immensely important for landscaping and no garden is considered complete without roses.

Roses were cultivated in India from ancient times, being referred to in old Sanskrit words as ‘Tarunipushpa’, ‘Atimanjula’ and ‘Semantika’. It is woven into the history of India and enjoys a pride of place. In India, it is cultivated commercially for cut flowers, both for traditional flower market and contemporary florist shops. Rose flowers without stalk and loose flower petals are used in traditional markets for making garlands, for

offering in temple, while the cut roses with stalk mainly used for bouquets, interior decoration, religious and social functions and floral arrangements. Besides Damask rose (*Rosada mascena*) and Edward rose (*Rosa bourboniana*) are cultivated for rose attar and other products. Rose petals are used for making candy, wine, gulkand, gulabjal (rose water), rose oil, rose perfume and pankhudi.

The Toro variety of rose is a small headed, mid red rose with a waxy finish. Toro roses have an unusual crinkly petal structure with a good petal count. It is commercially grown for cut flower trade. Double Delight is a hybrid tea rose cultivar. The plant grows about 90 to 150 cm high and blooms repeatedly and has strongly fragrant white flowers with dark red edges.

The flowers have up to 30 petals. Rose cv. Gladiator is grown on a large scale in this region for the production of cut flowers. The variety 'Gladiator' described in Modern Roses as a large flowered climber is now being grown in Maharashtra as a Hybrid Tea commercially for the cut flower trade. The flowers are deep red, well shaped and abundantly produced on long stems (Pal, 1991b).

GA₃ is a natural growth hormone and is a part of a type of plant hormone called gibberellins. GA₃ promote cell division and a number of plant development mechanism and encourages numerous desirable effects such as plant height, uniform flowering, reduced time to flowering and increased flower number and size. GA₃ 200 ppm enhanced vegetative growth and flowering.

Materials and Methods

The investigation entitled "Effect of GA₃ on growth yield and quality of different rose varieties" was carried out at the experimental

field of Horticulture Section, College of Agriculture, Nagpur during June 2016 to February 2017. The experiment was laid out in Factorized Randomized Block Design (FRBD) with four treatments replicated thrice. The two years old rose plants of cv. Toro, Double delight, and Gladiator which was budded on the *Rosa indica* var. *Odorata* rootstock where selected for investigation. Thirty individual plots of 0.9 x 1.20 m size were demarcated in experimental field leaving 50 cm space between two plots and between two replications. Light digging operation was done prior to pruning so as to loosen the soil for better aeration. At the same time well decomposed farmyard manure at the rate of 10 kg (mixed with 100g of Linden powder) per plot applied and mixed uniformly in the soil. For recording the observations five plants will be selected randomly from each plot.

The treatment comprised with three varieties V₁ - Toro, V₂ -Double delight, V₃ -Gladiator and the treatments are G₁-control G₂- 100ppm G₃- 200ppm G₄- 300ppm with twelve treatment combinations replicated thrice. GA₃ sprayed twice at 30 and 60 days after pruning. The various observations of flowering parameter like Days to first flower bud initiation (days), Days to 50% flowering (days), Days to first harvesting, Flowering span and quality parameters like Diameter of flower bud (cm), Diameter of stalk (cm), Stalk length (cm), Number of leaves on flower stalk. Vase life (days) were recorded at appropriate stage. The data was analysed statistically as per the method suggested by Panse and Sukhatme (1967).

Results and Discussion

The data presented in Table 1 revealed that, effect of different varieties and GA₃ concentrations on flowering and quality parameters.

Flowering parameter

The data presented in Table 1 revealed that, Significantly minimum days to first flower bud initiation were recorded in variety Gladiator (43.58) which was significantly at par with variety Toro (43.85). However, significantly maximum days to first flower bud initiation were recorded in Double delight (49.33). First flower bud initiation was significantly superior in variety Gladiator due to fact that genetic makeup in different varieties. Similar result was reported by Mohanty *et al.*, (2008) in Rose. Days to first flower bud initiation was significantly influenced by the application of GA₃. Significantly minimum days to first flower bud initiation was recorded in GA₃ 200ppm (41.58) which was at par with GA₃ 100ppm and GA₃ 300ppm (42.68) & (43.36) respectively. However, the maximum days to first flower bud initiation was recorded in control treatment (54.71). This might be due early production of florigene in GA₃ treated plant as GA₃ is component of florigene which requires for formulation of flowers in plant system. The result obtained during this investigation is in close agreement with the finding of Katkar *et al.*, (2005) in China aster. The interaction effects due to the varieties and GA₃ found to be non-significant.

Significant differences were recorded amongst the rose varieties under study for the 50% flowering. Significantly minimum days to 50% flowering were recorded in variety Gladiator (97.64) which was at par with variety Toro (97.79). However, significantly maximum days to 50% flowering were recorded in Double delight (104.86). 50% flowering was significantly superior in variety Gladiator due to fact that genetic makeup in different varieties. Similar result was reported by Mohanty *et al.*, (2008) in Rose. Significantly minimum days to 50% flowering was recorded in GA₃ 200ppm

(94.44) which was at par with GA₃ 100ppm (97.15) and GA₃ 300ppm (97.62). However, significantly maximum day to 50% flowering was recorded in control treatment (111.16). This might be due to floral role of gibberellins in the synthesis of florigene under ideal conditions resulted in earliness in flowering. The result obtained during this investigation is in close agreement with the finding of Katkar *et al.*, (2005) in China aster. The interaction effects due to the varieties were found to be non-significant.

Significant differences were recorded amongst the rose varieties under study for days to first harvesting. Significantly minimum days to first harvesting were recorded in Gladiator (118.7) which was at par with Toro (118.8). However, significantly maximum days to first harvesting were recorded in Double delight (125.8). Days to first harvesting was significantly superior in variety Gladiator due to fact that genetic makeup in different varieties. Similar result was reported by Mohanty *et al.*, (2008) in Rose. Days to first harvesting was significantly influence by the application of GA₃. Significantly minimum days to first harvesting was recorded in GA₃ 200ppm (115.68) followed by GA₃ 100ppm (117.57) and GA₃ 300ppm (118.04). However, significantly maximum days to first harvesting were recorded in control treatment (133.17). This might be due to GA₃ stimulate to produce more number of floral to produce more number of flower. The result obtained during this investigation is in close agreement with the finding of Sadanand *et al.*, (2000) in Rose. The interaction effects due to the varieties were found to be non-significant.

Significant differences were recorded amongst the rose varieties under study for the flowering span from first harvest to last harvest. Significantly maximum flowering span was recorded in variety Gladiator

(114.29) which was followed by Toro (112.59). However, significantly minimum flowering span was recorded in Double delight (102.20). Flowering span was significantly superior in variety Gladiator due to fact that genetic makeup in different varieties. Similar result was reported by Mohanty *et al.*, (2008) in Rose. Significantly maximum flowering span was recorded in GA₃ 200ppm (118.17) followed by GA₃ 300ppm (111.99) and GA₃ 100ppm (111.90). However, the minimum flowering span was recorded in variety control treatment (96.64). This might be due to greater dry matter accumulation which certainly suggestive to better photosynthesis activity. Other metabolic activity and timely metabolic activities and timely uptake of nutrients. The interaction effects due to the varieties was found to be non-significant.

Quality parameter

The data presented in Table 1 revealed that, significant differences were recorded amongst the rose varieties under study for the diameter of flower bud. Significantly maximum diameter of flower bud was recorded in Toro (7.34 cm) which was followed by Double delight (6.30). However, significantly minimum diameter of flower bud was recorded in Gladiator (5.53). Diameter of flower bud was significantly superior in variety Toro due to fact that genetic makeup in different varieties. Similar result was reported by Parbiati and Santoso (2007) in rose. Significantly maximum diameter of flower bud was recorded in GA₃200ppm (7.46 cm) which was at par with GA₃ 300ppm (7.03 cm) and GA₃100ppm (6.64 cm). However, minimum diameter of flower bud was recorded control treatment (4.44 cm). This might be due to availability of more carbohydrates and elaborate food during the development of flower bud under these treatment. The result obtained during this

investigation is in close agreement with the finding of Sadanand *et al.*, (2000) in rose. The interaction effects due to the varieties were found to be non-significant.

Significantly maximum diameter of stalk was recorded in Toro (0.92 cm) which was followed by Double delight (0.88 cm). However, significantly minimum diameter of stalk was recorded in Gladiator (0.82 cm). Diameter of stalk was significantly superior in variety Toro due to fact that genetic makeup in different varieties. Similar result was reported by Ramzan *et al.*, (2014) in Rose. Significantly maximum diameter of stalk was recorded in GA₃ 200ppm (0.94 cm) which was followed by GA₃ 300ppm (0.91 cm) and GA₃ 100ppm (0.90 cm). However, minimum diameter of stalk was recorded in control treatment (0.74 cm). This might be due to availability of more carbohydrates and elaborate food during the development of flower bud under this treatment by removing apical dominance. The result obtained during this investigation is in close agreement with the finding of Hashemabadi *et al.*, (2010) in rose. The interaction effects due to the varieties were found to be non-significant.

Significant differences were recorded amongst the rose varieties under study for the stalk length. Significantly maximum stalk length was recorded in Toro (111.14 cm) which was followed by Double delight (109.02 cm). However, significantly minimum stalk length was recorded in Gladiator (103.30 cm). Diameter of flower bud was significantly superior in variety Toro due to fact that genetic makeup in different varieties. Similar result was reported by Santoshini (2014) in Rose. Significantly maximum stalk length was recorded in GA₃ 200 ppm (112.65 cm) which was at par with GA₃ 300ppm (110.7 cm) and GA₃ 100ppm (109.53 cm). However, minimum stalk length was recorded in control treatment (98.37 cm).

Table.1 Flowering and Quality as influenced by varieties of Rose and different GA₃ concentrations

Treatments	Days to first flower bud initiation (Days)	Days 50 per cent flowering (Days)	Days to first harvesting(Days)	Flowering span (Days)	Diameter of flower bud (cm)	Diamete r of stalk (cm)	Stalk length (cm)	Numbe r of leaves on flower	Vase life (days)
A) Varieties (V)									
V ₁ – Toro	43.85	97.79	118.84	112.59	7.34	0.92	111.14	19.53	8.86
V ₂ - Double Delight	49.33	104.86	125.80	102.20	6.30	0.88	109.02	18.15	7.94
V ₃ – Gladiator	43.58	97.64	118.75	114.29	5.53	0.82	103.30	16.11	6.97
F test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE (m) ±	1.74	1.93	1.73	3.46	0.45	0.02	2.18	0.87	0.49
CD at 5 %	5.11	5.67	3.44	10.16	1.33	0.07	6.42	2.56	1.44
B) GA₃ (G)									
G ₁ – Control	54.71	111.16	133.17	96.64	4.44	0.74	98.37	13.80	5.44
G ₁ - 100 ppm	42.68	97.15	117.57	111.90	6.64	0.90	109.53	18.44	8.32
G ₁ - 200 ppm	41.58	94.44	115.68	118.17	7.46	0.94	112.65	20.13	9.07
G ₁ - 300 ppm	43.36	97.62	118.04	111.99	7.03	0.91	110.7	19.27	8.87
F test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE (m) ±	2.01	2.23	1.35	4.00	0.52	0.03	2.52	1.00	0.56
CD at 5 %	5.91	6.54	3.97	11.73	1.54	0.08	7.41	2.95	1.66
C) Interaction (VxG)									
F test	N.S	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
SE (m) ±	3.49	3.86	2.34	6.92	0.91	0.05	4.31	1.74	0.98
CD at 5%		–	–	–	–	–	–	–	–

This might be due to the higher concentration of GA₃ enhanced apical dominance indirectly inhibit Auxin content. The result obtained during this investigation is in close agreement with the finding of Devendama *et al.*, (2007) in Tuberose. The interaction effects due to the varieties were found to be non-significant.

Significant differences were recorded amongst the rose varieties under study for the number of leaves on flower stalk at harvest. Significantly maximum number of leaves on flower stalk was recorded in Toro (19.35) which was followed by Double delight (18.15). However, significantly minimum number of leaves on flower stalk was recorded in Gladiator (16.11). Number of leaves on flower stalk was significantly superior in variety Toro due to fact that genetic makeup in different varieties. Similar result was reported by Santoshini (2014) in rose. Significantly maximum number of leaves on flower stalk was recorded in GA₃, 200ppm (20.13) followed by GA₃ 300ppm (19.27) and GA₃ 100ppm (18.44). However, the minimum number of leaves on flower stalk was recorded in variety control treatment (13.80) This might be due to fact that, the difference in genotypic constitution of the varieties. The result obtained during this investigation is in close agreement with the finding of Kumar *et al.*(2012) in rose. The interaction effects due to the varieties was found to be non-significant.

Significant differences were recorded amongst the rose varieties under study for the vase life. Significantly maximum vase life was recorded in Toro (8.86 days) which was followed by Double delight (7.94 days). However, significantly minimum vase life was recorded in Gladiator (6.97 days).Vase life was significantly superior in variety Toro due to fact that genetic makeup in different varieties. Similar result was reported by Tabassum *et al.*, (2002) in rose. Significantly

maximum vase life was recorded in GA₃,200ppm (9.07 days) followed by GA₃,300ppm (8.87 days) and GA₃ 100ppm (8.32 days). However, the minimum vase life was recorded in control treatment (5.44 days). This might be due to higher Auxin activity which has been reported to delay senescence and enhanced translocation of metabolites GA₃ reduce the water loss and has anti senescence property leading to increase in vase life. The result obtained during this investigation is in close agreement with the finding of Hashemabadi *et al.*, (2010) in rose. The interaction effects due to the varieties were found to be non-significant.

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