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*Research Article*

# Effect of $GA_3$ on Different Varieties of Rose for Growth and Yield

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**ABSTRACT**

*A field investigation entitled "Effect of $GA_3$ 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 $G_1$-control $G_2$- 100ppm $G_3$- 200ppm $G_4$- 300ppm with varieties $V_1$ - Toro, $V_2$ - Double delight, $V_3$ -Gladiator. The result of the present investigation indicated that, significantly maximum vegetative growth in respect of height of plant, branches plant$^{-1}$ leaf area and internodal distance were recorded by variety Gladiator and maximum plant spread were recorded in variety Toro and $GA_3$ 200ppm. Similarly yield parameters, maximum yield plot$^{-1}$, yield ha$^{-1}$ were recorded by variety Gladiator and $GA_3$ 200ppm.Thus, it can be inferred from the present investigation that, the variety Gladiator and $GA_3$ 200ppm was found to be better in respect of vegetative growth and yield and parameters for commercial cultivation under Nagpur conditions.*

***Keywords:*** *Rose, $GA_3$, Growth and Yield.*

## INTRODUCTION

Floriculture is one of the most important branch of horticulture in aesthetic, social to commercial sense. It has been closely associated with Indian culture from Vedic times. Flowers are one of God's most beautiful boons to humankind that bring joy and happiness to all. The flowers are soul of garden that convey the message of nature to man. The major flower growing states in India are Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra, West Bengal, Uttar Pradesh, Haryana, Gujarat and Delhi. The important flowers having more demand are rose, gerbera, carnation, gladiolus, chrysanthemum, marigold, aster, orchid, jasmine etc.

Rose (*Rosa hybrida* L.) belongs to the family Rosaceae and remains a major ornamental plant for cut flower trade all over the world.

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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. 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.

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).

$GA_3$ is a natural growth hormone and is a part of a type of plant hormone called gibberellins. $GA_3$ 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.

## MATERIALS AND METHODS

The investigation entitled "Effect of $GA_3$ 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 $V_1$ - Toro, $V_2$ - Double delight, $V_3$ – Gladiator and the treatments are $G_1$-control $G_2$- 100ppm $G_3$-200ppm $G_4$- 300ppm with twelve treatment combinations replicated thrice. $GA_3$ sprayed twice at 30 and 60 days after pruning. The various observations on growth viz. plant height, number of branches plant$^{-1}$, leaf area ($cm^2$), plant spread (cm), intermodal distance (cm) and yield parameters like yield plant$^{-1}$,yield plot$^{-1}$, yield ha$^{-1}$ were recorded at appropriate stage. The data was analysed statistically as per the method suggested by Panse and Sukhatme (1967).

## RESULT AND DISCUSSION

The data presented in table.1 reveled that, effect of different varieties and $GA_3$ concentrations on growth and yield parameters.

**Growth Parameter**

The data presented in the Table 1 showed that, At 240 days after pruning, significantly maximum plant height was recorded in Gladiator (127.6 cm) which was followed by Toro (126.7 cm), However, Significantly minimum plant height was recorded in Double delight (105.6 cm). Significantly maximum plant height was noticed at 200 ppm (128.6 cm) followed by 100 ppm (127.6 cm), However significantly minimum plant height was recorded in control treatment (103.6 cm). Effect of foliar application on plant with gibberellins stimulates the growth and increment of plant height was recorded in different treatment might be due to the application of $GA_3$ increase the plant height by

increasing inter nodal length and growth stimulant due to $GA_3$ is attributed both cell division and cell enlargement. The result obtained during the investigation are in close agreement with the finding of Kumar et al. (2012) in rose. The interaction effects due to the varieties and $GA_3$ on plant height was found non-significant.

Significantly maximum branches plant$^{-1}$ was recorded in Gladiator (9.72 cm) which was followed by Toro (9.54 cm). However, significantly minimum branches plant$^{-1}$ was recorded in Double delight (5.42 cm). From above result it is indicated that, branches plant$^{-1}$ was higher in variety Gladiator this might be due to the different genetic makeup of all varieties. Similar finding was recorded by Ramzan et al. (2014) in Rose. Branches plant$^{-1}$ was significantly influenced by the application of $GA_3$. Significantly maximum number of branches plant$^{-1}$ was recorded in $GA_3$ 200 ppm (10.16) which was at par with $GA_3$ 100 ppm (10.10). However, minimum number of branches plant$^{-1}$ was recorded in control treatment (3.93). This might be due to fact that, the $GA_3$ enhanced apical dominance indirectly. 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 on number of branches plant$^{-1}$ was found non-significant.

At 50% flowering, significantly maximum leaf area was recorded in variety Gladiator (79.17 cm$^2$) which was followed by Toro (78.57 cm$^2$). However, significantly minimum leaf area was recorded in Double delight (73.00 cm$^2$). The result indicates that maximum leaf area was found in variety Gladiator. This might be due to the fact that different genetic makeup of these varieties. Similar finding was recorded by Nagraj (1996) in rose. Leaf area was significantly influenced by the application of $GA_3$. Significantly maximum leaf area was recorded in $GA_3$ 200ppm (80.78 cm$^2$) fallowed by $GA_3$ 100ppm (77.99 cm$^2$). However, minimum leaf area was recorded in control treatment (71.06 cm$^2$). This might be due to fact that, $GA_3$ stimulate to produce more leaf area as it is responsible for cell division and cell elongation. The result obtained during this investigation is in close agreement with the finding of Goyal and Gupta et al. (1996) in rose. The interaction effects due to the varieties and $GA_3$ was found to be non-significant.

At 50% flowering significantly maximum plant spread was recorded in variety Toro (36.20 cm) which was at par with Gladiator (36.15 cm). However, the minimum plant spread was recorded in variety double delight (31.22 cm). Significantly maximum plant spread was recorded in 200 ppm $GA_3$ (38.25 cm) followed by $GA_3$ 100 ppm (36.75 cm) and $GA_3$ 300 ppm (36.48). However, significantly minimum plant height was recorded in control treatment (26.59 cm). This might be due to fact that, the higher concentration of $GA_3$ enhanced apical dominance indirectly. The result obtained during this investigation is in close agreement with the finding of Sujatha et al. (2002) in gerbera. The interaction effects due to the varieties and $GA_3$ was found to be non-significant.

Significantly maximum inter nodal distance was recorded in Gladiator (7.71 cm) which was followed by Toro (7.51 cm) however significantly minimum inter nodal distance was recorded in Double delight (6.35 cm). Inter nodal distance was significantly superior in variety Gladiator due to fact that genetic makeup in different varieties. Similar result was reported by Santoshini (2014) in rose. Significantly maximum intermodal distance was recorded in $GA_3$ 200 ppm (7.93 cm) followed by $GA_3$ 100 ppm (7.76 cm) and $GA_3$ 300 ppm (7.55 cm). However, minimum of intermodal distance was recorded in control treatment (5.52 cm). This might be due to direct role of gibberellins in the synthesis of florigene under ideal condition. The result obtained during this investigation is in close agreement with the finding of Goyal and Gupta et al. (1996) in rose. The interaction effects due to the varieties was found to be non-significant.

**Yield Parameters**

Significantly maximum yield of flower plant$^{-1}$ was recorded in Toro (20.97) which was statistically at par with Gladiator (20.77). However, significantly minimum yield of flower plant$^{-1}$ was recorded in Double delight (17.51). Significantly maximum yield of flower plant$^{-1}$ was recorded in $GA_3$ 200 ppm (21.94) and it was at par with $GA_3$ 100 ppm (21.29) and $GA_3$ 300 ppm (20.86). However, minimum yield of flower plant$^{-1}$ was recorded in control treatment (14.89). This might be due to greater dry matter accumulation which certainly suggestive to better photosynthesis activity, enhance metabolic activity and timely metabolic activities may takes place due to the application of $GA_3$. The result obtained during this investigation is in close agreement with the finding of Abadi (2010) in Rose. Yield of flowers plant$^{-1}$was significantly superior in variety Toro due to fact that genetic makeup in different varieties. Similar result was reported by palai et al. (2003) in Rose the interaction effects due to the varieties was found to be non-significant.

Significantly maximum yield of flower plot$^{-1}$ was recorded in variety Gladiator (119.81) which was at par with Toro (118.00). However, significantly minimum yield of flower plot$^{-1}$was recorded in Double delight (109.20). Similar result was reported by Palai et al. (2003) in Rose. Significantly maximum yield of flower plot$^{-1}$ was recorded in $GA_3$. 200 ppm (122.82) and it was at par with $GA_3$ 100 ppm (118.21) and $GA_3$ 300 ppm (118.18). However, minimum yield of flower plot$^{-1}$ was recorded in control treatment (103.40). The result obtained during this investigation is in close agreement with the finding of Goyal and Gupta et al. (1996) in rose the interaction effects due to the varieties was found to be non-significant.

Significantly maximum yield of flower ha$^{-1}$ was recorded in Gladiator (15.77 lakh) which was at par with Toro (15.26 lakh). However significantly minimum yield of flower ha$^{-1}$ was recorded in Double delight (11.45 lakh). Yield of flowers ha$^{-1}$was significantly superior in variety Gladiator due to fact that genetic makeup in different varieties. Significantly maximum yield of flower ha$^{-1}$ was recorded in $GA_3$ 200 ppm (17.11 lakh) which was at par with $GA_3$ 100 ppm (14.98) and $GA_3$ 300 ppm (14.45). However, minimum yield of flower ha$^{-1}$ was recorded in control treatment (10.08) the interaction effects due to the varieties was found to be non-significant.

**Table 1: Growth and yield as influenced by varieties of Rose and different $GA_3$ concentrations**

| Treatments<br>A) Varieties (V) | Plant height (cm) 240 Days | Number of branches plant$^{-1}$ | Leaf area (cm$^2$) | Plant spread at 50% flowering | Internodal distance (cm) | Yield plant$^{-1}$ | Yield plot$^{-1}$ | Yield ha$^{-1}$ |
|---|---|---|---|---|---|---|---|---|
| **$V_1$– Toro** | 126.71 | 9.54 | 78.57 | 36.20 | 7.51 | 20.97 | 118.00 | 15.26 |
| **$V_2$ - Double Delight** | 115.59 | 5.42 | 73.00 | 31.22 | 6.35 | 17.51 | 109.20 | 11.45 |
| **$V_3$ – Gladiator** | 127.62 | 9.72 | 79.17 | 36.15 | 7.71 | 20.77 | 119.81 | 15.77 |
| **F test** | Sig | Sig. | Sig | Sig. | Sig | sig | Sig | Sig |
| **SE (m) ±** | 5.91 | 1.06 | 1.6 | 1.40 | 0.38 | 0.95 | 2.88 | 1.00 |
| **CD at 5 %** | 17.50 | 3.11 | 4.8 | 4.11 | 1.14 | 2.81 | 8.46 | 2.94 |
| **B) $GA_3$ (G)** | | | | | | | | |
| **$G_1$ – Control** | 103.58 | 3.93 | 71.06 | 26.59 | 5.52 | 14.89 | 103.40 | 10.08 |
| **$G_1$ - 100 ppm** | 127.61 | 10.10 | 77.99 | 36.75 | 7.76 | 21.29 | 118.21 | 14.98 |
| **$G_1$ - 200 ppm** | 128.60 | 10.16 | 80.78 | 38.25 | 7.93 | 21.94 | 122.82 | 17.11 |
| **$G_1$ - 300 ppm** | 124.54 | 8.78 | 77.80 | 36.48 | 7.55 | 20.86 | 118.18 | 14.45 |
| **F test** | Sig | Sig. | Sig | Sig. | Sig | Sig | Sig | Sig |
| **SE (m) ±** | 6.90 | 1.22 | 1.92 | 1.62 | 0.43 | 1.10 | 3.33 | 1.15 |
| **CD at 5 %** | 20.24 | 3.59 | 5.6 | 4.75 | 1.28 | 3.25 | 9.77 | 3.39 |
| **C) Interaction (VxG)** | | | | | | | | |
| **F test** | **N.S.** | **N.S.** | **N.S** | **N.S.** | **N.S.** | **N.S.** | **N.S.** | **N.S.** |
| **SE (m) ±** | **11.90** | 2.12 | 3.3 | 2.80 | 0.76 | 1.91 | 5.76 | 2.00 |
| **CD at 5%** | -- | -- | -- | -- | -- | -- | -- | -- |

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