

## Evaluation of Different Hybrid Tea Roses (*Rosa Xhybrida*) Under Prayagraj Agro-Climatic Conditions

### ABSTRACT

An experiment was carried out in the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, from November, 2022 to March, 2023. The experiment was conducted in Randomized Block Design (RBD) with fifteen hybrids, replicated thrice. It was reported that hybrid H<sub>4</sub> (Fatura) performed better in parameters like plant height (71.2 cm), number of branches (5), stalk length (35.10 cm), stalk girth (5.4 mm), bud diameter (2.7 cm), number of cut flowers per plant (5), vase life of the cut flowers (11 days), number of cut flowers per hectare (1,02,040), gross return (Rs 5,10,200 per ha), net return (Rs -2,36,354 per ha) and benefit cost ratio (0.7:1). However, days taken to first bud initiation (36 days) and days taken to first bud initiation to tight bud stage (13 days) were better in hybrid H<sub>5</sub> (Brazil). Hence for quality cut flower production, vase life, yield, and economics, hybrid Fatura performed better under Prayagraj agro-climatic conditions.

*Keywords:* Hybrid tea rose, Fatura, Malcom Seargent, Evaluation, Flowering, Growth

### INTRODUCTION

Floriculture in India is being viewed as a high growth industry. Commercial floriculture is becoming important from the export angle. The liberalization of industrial and trade policies paved the way for development of export-oriented production of cut flowers. It has been found that commercial floriculture is a potential money-spinner, an economical viable agri-business. Indian floriculture industry has been shifting from traditional flowers to cut flowers for export purposes (Chawla et al., (2016)<sup>[6]</sup>

The cut flower is an important floriculture product. Among all the floricultural crops, roses occupy a pre-eminent position both as garden plants and as cut flowers. As per the recent estimates, rose ranks next only to carnation, followed by chrysanthemum. Among all the cut flowers rose ranks first in the international flower market. Rose

is the most favorite and unchallenged flower which is universally known as "Queen of Flowers" also symbolized love, companionship, sincerity, romance, grace, and spirituality.

Rose contributes 95 percent of total cut flower export from India. The worldwide demand for rose products is growing at the rate of 17 percent per annum. The leading exporters cut flower rose are Ecuador, Kenya and the Netherland. The largest importer of cut flowers is USA importing about \$1.5 Billion which is 17.23% of the global import. India can be a leading Exporter for USA, UK and France by leveraging on the potential of Desi Gulaab or Rosa Moschata. The major rose flower producing states of India at present are West Bengal (63.32 thousand MT), Karnataka (50.72 thousand MT), Gujrat (39.1 thousand MT), Chhattisgarh (37.9 thousand MT), Maharashtra (30.65

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thousand MT). Rose occupies an area of about 29.41 thousand ha with the production of 301.95 thousand MT in India. The quantity of roses exported from India is about 0.03 thousand MT, worth of 141.45 lakh rupees.

In landscape gardening, also rose is an important ornamental plant because of its adaptability to a wide range of climate and the habitats. The great demand for roses is attributed mainly to its different types having beautiful flowers of exquisite shape, different sizes, bewitching colours and most delightful fragrance has made it an important flower for its varied uses such as cut flower, interior decoration, making bouquets, as a garden plant, as pot plant and also for production of extremely high value allied products like rose oil, rose water, gulkand, gulrojan hair oil, rose honey and rose conserve.

Hybrid Teas are group of roses originally developed from crossing between Hybrid Perpetuals and Tea roses. The present-day Hybrid Tea roses by far are the most popular type bearing large, highly scented flowers. The *Rosa* genus belongs to the family Rosaceae with chromosome number  $2n = 4x = 28$ . The present-day beautiful cultivars of exquisite shape, different sizes, bewitching colours and most delightful fragrance have made it an important flower crop. The success of rose culture however, depends on proper choice of type and cultivars of roses.

Selection of hybrids is an important factor for successful cultivation of rose.

Presently there are about 60,000 hybrids of roses, with an addition of more than 10,000 hybrids every year around the globe differing widely in form, shape, size, colour, fragrance and growth habit.

Therefore, it is very much necessary to

assess the performance of available hybrids of rose in order to suggest suitable hybrids for maximizing the production, cost effective cultivation.

## Material and Method

The field experiment entitled Evaluation of different hybrid tea roses (*Rosa xhybrida*) under Prayagraj agro-climatic conditions was carried out at the Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Naini, Prayagraj, during November, 2022 to March, 2023. The experimental field is situated on the left side of Prayagraj - Rewa Road, near the river Yamuna, and approximately 7 km from Prayagraj city.

## Geographical Location and Climate Condition

Geographically, Prayagraj is situated in the south-eastern part of Uttar Pradesh. It lies between the parallels of  $24^{\circ} 77'$  and  $25^{\circ} 47'$  North latitudes and  $81^{\circ} 19'$  and  $82^{\circ} 21'$  East longitudes. The area of Prayagraj district comes under agro climatic zone V (Upper Gangetic Plain region) and sub-zone of Central Plains. The climate ranges from dry sub-humid to semi-arid and the soil is alluvium calcareous sandy loam. The District experiences an average maximum temperature range between  $43^{\circ} - 47^{\circ}\text{C}$  which may go as high as  $48^{\circ}\text{C}$  during peak summers (May-June). The minimum average temperature is  $2-4^{\circ}\text{C}$ , which may fall as low as  $1^{\circ}\text{C}$  during peak winter months (December-January). The average rainfall of the district is 960mm and the monsoon season is spread between July-September.

## Experimental Design

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The trail was laid out in a Randomized block design with fifteen hybrids replicated thrice. Spacing 70 cm x 70 cm. Fifteen different hybrids used were Forty Niner, Barbara, Lilac air, Fatura, Brazil, Best of Friend, Malcom Seargent, Annijibans, Catelione de Monaco, Hibikumar Go, Ochoo, Sun Song, Diplomate, Welcome Home, Las Vegas. Six-month-old budded plant were procured from Puspanjali Nursery Asoke, Jakpur, Kharagpur, West Bengal.

### Data Collection

Plant height, Plant spread, Number of branches per plant, Number of days taken to bud initiation, Number of days taken from bud initiation to tight bud stage, Stalk Length, Stalk Girth, Number of cut flower per plant, Vase life.

## 1. RESULTS AND DISCUSSIONS

### Vegetative Parameter

*Plant height*- Plant height varied from 40.9cm to 71.2cm. significantly taller plants (71.2cm) were recorded in the H<sub>4</sub> hybrid (Fatura) followed by hybrid H<sub>7</sub> (Malcom Seargent 65.8cm) whereas, shorter plants were recorded in hybrids H<sub>3</sub> (Lilac Air, 40.9 cm). Plant height is a genetic character of every species and cultivar. Variation in plant height of different hybrids may be attributed to the fact that this genetic character varied from hybrid to hybrid. Similar findings in variation in plant height were made by Mohanty et al. (2011)<sup>[14]</sup> in rose and

Hussain and Khan (2004)<sup>[11]</sup> in hybrid tea rose.

*Plant Spread*- The plant height varied from (31.3 cm<sup>2</sup> to 45.4 cm<sup>2</sup>). significantly more plant spread (45.4 cm<sup>2</sup>) was recorded in hybrid H<sub>7</sub> (Malcom Seargent) followed by hybrid H<sub>9</sub> (Catelione de Monaco, 41.8 cm<sup>2</sup>) while the lesser plant spread was recorded in hybrid H<sub>3</sub> (Lilac Air, 31.3 cm<sup>2</sup>). The difference in plant spread among the different hybrid may be due to the genetic makeup and development of primary and secondary branches under the existing environment condition giving them different plant spread. A similar type of result in plant spread was obtained by Chandrashekaraiyah, (1973)<sup>[5]</sup>, Dias and Patil (2003)<sup>[7]</sup>, Sharma and Sharma (2003)<sup>[24]</sup> and Mohanty et al. (2011)<sup>[14]</sup> in rose.

*Number of branches*- Number of branch varied from 3 to 5. Significantly more number of branch (5) per plant were recorded in the hybrid H<sub>4</sub> (Fatura) which was statically at par with the hybrid H<sub>7</sub> (Malcom Seargent, 4.1) and H<sub>9</sub> (Catelione de Monaco, 3.9) while lesser number of branches were recorded in hybrid H<sub>3</sub> (Lilac Air, 3.0). The difference in number of branches in different hybrid tea roses may be due to the different genetic makeup character of different hybrids under the existing agro-climatic conditions. Similar variations in the number of branches per plant were reported by Raheel et al. (2002)<sup>[18]</sup>, Qasim et al. (2008)<sup>[17]</sup> in rose

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**Table1.VEGETATIVEPARAMETERS**

<b>Notation</b>	<b>Hybrid</b>	<b>Plant height(cm)</b>	<b>Plant spread (cm<sup>2</sup>)</b>	<b>Number of branches</b>
H <sub>1</sub>	Forty Niner	59.8	35.5	3.6
H <sub>2</sub>	Barbara	53.3	38	3.4
H <sub>3</sub>	Lilac air	40.9	31.3	3
H <sub>4</sub>	Fatura	71.2	41.3	5
H <sub>5</sub>	Brazil	64.1	38.3	3.6
H <sub>6</sub>	Best of Friend	51.8	35.4	3.7
H <sub>7</sub>	Malcom Seargent	65.8	45.5	4.1
H <sub>8</sub>	Annijibans	61.8	38.8	3.5
H <sub>9</sub>	Catelione de Monaco	55.5	41.8	3.9
H <sub>10</sub>	Hibikumar Go	54.6	38.6	3.4
H <sub>11</sub>	Ochoo	61.8	41.1	3.2
H <sub>12</sub>	Sun Song	62.8	39.3	3.3
H <sub>13</sub>	Diplomate	49.4	39.5	3.5
H <sub>14</sub>	Welcome Home	60.3	40.5	3.2
H <sub>15</sub>	Las Vegas	59.2	39.3	3.7
	F-TEST	S	S	S
	SE(d)±	1.77	1.543	0.396
	C D <sub>0.05</sub>	3.644	3.177	0.916

**Table2.Floral,quality and yield parameter of different hybrid tea roses**

Notation	Hybrid	Days taken to bud initiation	Days taken from bud initiation to tight bud stage	Bud diameter(cm)	Stalk length(cm)	Stalk girth(mm)	Vase life	Number of cut flower per plant
H <sub>1</sub>	Forty Niner	42.3	17.3	1.7	23.5	4.7	7	3.6
H <sub>2</sub>	Barbara	39.6	15	2.3	25.1	4.8	7	3.4
H <sub>3</sub>	Lilac air	47	16.6	1.7	21.2	4	8	3
H <sub>4</sub>	Fatura	39	14.6	2.7	35.1	5.4	11	5
H <sub>5</sub>	Brazil	36	13	1.8	29.4	4.4	6	3.6
H <sub>6</sub>	Best of Friend	41.3	16.6	2.4	22.7	4.9	9	3.4
H <sub>7</sub>	Malcom Seargent	43.6	15.6	2.4	32.1	5.1	10	4.1
H <sub>8</sub>	Annijibans	45.6	16	1.7	23.9	4.6	6	3.5
H <sub>9</sub>	Catelione de Monaco	42.6	15.6	2.5	27.2	5	9	4
H <sub>10</sub>	Hibikumar Go	44	15.3	1.7	27.3	4.1	8	3.5
H <sub>11</sub>	Ochoo	40	16.6	2.5	28.3	4.8	9	3.2
H <sub>12</sub>	Sun Song	43.3	16.3	2.3	28.9	5	8	3.4
H <sub>13</sub>	Diplomate	48.3	17.6	1.5	26.3	4.6	5	3.5
H <sub>14</sub>	Welcome Home	40.3	15.6	2.3	28	4.8	7	3.2
H <sub>15</sub>	Las Vegas	43	16	1.6	25.1	4.4	7	3.6
	F-TEST	S	S	S	S	S	S	S
	SE(d)±	1.063	0.637	0.091	0.412	0.067	0.458	0.396
	C D <sub>0.05</sub>	2.188	1.311	0.188	0.849	0.137	0.942	0.916

### 3.1 Floral Parameter

*Days taken to bud initiation* -Significantly lesser number of days (36.3 days) were taken to first bud initiation in hybrid H<sub>5</sub> (Brazil) which was followed by the hybrid H<sub>4</sub> (Fatura, 39.0 days) while more number of days taken to first bud initiation was recorded in the hybrid H<sub>13</sub> (Diplomate, 48.3 days).The variation in early or late flowering seems to be the genetically controlled character in cultivars. The variation in days taken to first flower bud emergence was expected due to genotypes as evidenced by Bhattacharjee *et al.* (1993)<sup>[4]</sup> in rose.

*Days taken from bud initiation to tight bud stage*-Significantly lesser number of days (13 days) were taken from bud initiation to tight bud stage in hybrid H<sub>5</sub> (Brazil) which was followed by the hybrid H<sub>4</sub> (Fatura, 14.6 days) whereas the more number of days were taken from in the hybrid H<sub>13</sub> (Diplomate, 17.6 days).The number of days taken from flower bud initiation to tight bud stage is an important character of rose cut flower, which indicates the early or late flowering habit of any of the cultivars. Both characters like bud stage and tight bud stage are helpful in the availability of flowers for a long among different cultivars. Variation for late or early flowering seems to be the genetically inherent character of different hybrid. Similar results have also been reported by Harshvardhan, (2009)<sup>[10]</sup>, Manjula (2005)<sup>[12]</sup> Bhattacharjee *et al.* (1993)<sup>[4]</sup> in rose.

### 3.2 Quality Parameter

*Flower bud diameter* - Significantly bigger flower bud diameter (2.7 cm) was recorded in hybrid H<sub>4</sub> (Fatura) which was followed by hybrid H<sub>11</sub> (Ochoo, 2.5 cm)

whereas the smaller bud diameter was in hybrid H<sub>13</sub> (Diplomate, 1.5 cm). Variation in flower bud diameter of different hybrid may be attributed to the fact that this genetic character varied from hybrid to hybrid. A similar variation in bud diameter has also been reported by Singh (1995)<sup>[23]</sup> in rose.

*Stalk Length*- Significantly longer stalk length (35.10 cm) was recorded in hybrid H<sub>4</sub> (Fatura) followed by hybrid H<sub>7</sub> (Malcom Seargent, 32.1 cm) whereas the shorter stalk length was recorded in the hybrid H<sub>3</sub> (Lilac Air, 21.2 cm). The differences in stalk different hybrids may be attributed to the fact that this genetic character varied from hybrid to hybrid. Similar findings of Murugesan *et al.* (1991)<sup>[15]</sup>, Bhattacharjee (1993) *et al.*<sup>[4]</sup>. The variation in stalk length might be due to the retarded growth of the plants, low temperature, and low light intensity in winter.

*Stalk Girth* -Significantly thicker stalk girth (5.4 mm) was recorded in hybrid H<sub>4</sub> (Fatura) followed by hybrid H<sub>7</sub> (Malcom Seargent, 5.1 mm) whereas the thinner stalk girth was recorded in the hybrid H<sub>3</sub> (Lilac Air, 4.0 mm). The girth of a rose stalk is a key factor in determining the quality of the flower. A thicker stalk will produce a larger, more robust flower. The ideal girth for a rose stalk is between 1/2 inch and 1 inch. The variation in stalk girth might be due to the genetic inherent character of different hybrid. Similar finding Dias and Patil (2003)<sup>[7]</sup> in rose.

*Vase Life*-Significantly long vase life (11 days) was recorded in hybrid H<sub>4</sub> (Fatura) and followed by hybrid H<sub>7</sub> (Malcom Seargent, 10 days) whereas the shorter period of vase life was recorded in hybrid H<sub>3</sub> (Lilac Air, 5.0 days). The vase life is one of the important characters of

cut flowers which decide their economic value. Longer vase life is very much necessary for an ideal rose-cut flower for the export market. In the present study, the difference in vase life in different hybrid tea roses may be due to genetic inherent character of different hybrid tea roses. Similar results were also reported by Harshvardhan (2009)<sup>[10]</sup> in rose.

### 3.4 Yield Parameter

*Number of cut flowers per plant*—Significantly more number of cut flowers per plant (5) were recorded in hybrid H<sub>4</sub> (Fatura) which was followed by hybrid H<sub>7</sub> (Malcom Seargent, 4.1) whereas the less number of flowers per plant was recorded in the hybrid H<sub>3</sub> (Lilac Air, 3.7). The difference in flower characters might be characterized due to genetic factors as well as soil and environmental factors. The number of leaves is an important factor that directly depends upon the number of flowers per plant. The variation in the number of flowers per plant among different cultivars has also been reported previously by Anderson *et al.* (1992)<sup>[2]</sup>, Singh *et al.* (1994)<sup>[22]</sup>, Shahrinet *al.* (2015)<sup>[21]</sup> in rose.

### 4. CONCLUSION

From the present investigation, it is concluded that among the different hybrid tea roses for cut flower production, hybrid H<sub>4</sub> (Fatura) performed significantly better in plant height, number of branches per plant, stalk length, stalk girth, vase life, number of cut flowers per plant, number of cut flower per hectare, gross returns, net returns and B:C ratio, however number of days taken for bud initiation and number of days taken for bud initiation to tight bud stage were better in hybrid H<sub>5</sub> (Brazil). Hence for quality cut flower production, vase life, yield, and economics, hybrid Fatura performed

better under Prayagraj agro-climatic conditions.

### Future scope

As hybrid tea rose is a perennial crop so farmers invest at a time and can get profit up to 7-8 years. It is used as a cut flower and has more demand in the international flower market. So, growers can get good number of foreign exchanges from it.

### REFERENCES

1. Adan, Y. and Atif, R. (2005). Effect of various hormones and different rootstock on rose propagation. *Journal of Biology and Life Sciences*, 17(1):111-118.
2. Anderson, A. S., Serek, M. and Johnson, P. (1992). The durability of potted roses. *The Scientific Journal, Nordisk*. 74: 83.
3. Baroah, L. and Talukdar, M. C. (2009). Evaluation of different gerbera (*Gerbera jamesonni* Bolus ex Hooker F) cultivars under agroclimatic conditions of Jorhat, Assam. *Journal of Ornamental Horticulture*, 5(2): 11-14.
4. Bhattacharjee, S. K., Singh, V. C. and Saxena, N. K. (1993). Studies on vegetative growth, flowering, flower quality, and vase life of roses. *Singapore Journal of Primary Industries*, 21(2): 67-71.
5. Chandrashekaraiah, T. S. (1973). Studies on evaluation of the hybrid tea roses for cut flowers. M.Sc. (Agriculture) thesis submitted to UAS, Bangalore.
6. Chawla, S.L., Patil, S., Ahlawat, T.R. and Agnihotri, R. 2016. Present status, constraints. and future potential of floriculture in India. *Commercial Horticulture*, 29-38.
7. Dias, S. M. F. and Patil, A. A. (2003). Performance of Elite rose varieties at different population levels under the transitional tract of northern Karnataka. *Karnataka Journal of Agricultural Sciences*, 16(2): 271-275.

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8. Fascella, G. and Zizzo, G.V. (2007). Evaluating the productivity of red rose cultivars in soilless culture. *Acta Horticulture*. 751:138-140.
9. Filiberti D. Hybrid tea roses. available online 2005 <http://www.rosegathering.com/hybridteas.html>. Harshvardhan, M. (2009). Evaluation of greenhouse rose cultivars in open field condition Thesis, MSc., Division of Horticulture, University of Agriculture Science Bangalore.
10. Harshvardhan M. Evaluation of rose (*Rosa hybrida*) varieties for growth, yield, and quality under the eastern dry zone of Karnataka. *Journal of Pharmacognosy and Phytochemistry* 2018;7(5):165-168.
11. Hussain, A. and Khan, M. A. (2004). Effect of growth regulators on stem cutting of *Rosa bourboniana* and *Rosa rugosa*-an-teplitz. *International Journal of Biological Sciences*, 6: 931-932.
12. Manjula, B. (2005). Performance of rose cultivars under naturally ventilated polyhouse. *M.Sc. Thesis*, University of Agricultural Sciences, Dharwad.
13. Marriott, M. (2003). Modern (Post-1800). In: AV Roberts, T Debener, S Gudlin, eds. *Encyclopedia of Rose Science, Volume 1*, Elsevier pp 402-409.
14. Mohanty, C. R., Mohanty, A., Das, A. B. and Kae, S. D. 2011. Comparative performance of some rose varieties under an open and protected environment. *The Asian Journal of Horticulture*, 6: 288-293.
15. Murugesan S, Thamburaj S, Ramani K. Performance of rose cultivars at Yervand. *South Indian Horticulture* 1991:39:359-362.
16. Nadeem, M., Khan, M. A., Riaz, A. and Ahmad, R. (2011). Evaluation of growth and flowering potential of *Rosa hybrida* cultivars under Faisalabad climatic conditions. *Pakistan Journal of Agriculture and Sciences*, 48(4): 283-288.
17. Qasim, M., Ahmed, I. and Ahmed, T. (2008). Optimizing fertigation frequency for *Rosa hybrida*. *Pakistan Journal of Botany*. 40(2): 533-545.
18. Raheela, T., Abdul, G., Kashif, W. and Nadeem, M. A. (2002). Evaluation of rose cultivars as cut flower production. *Asian Journal of Plant Science*, 1(3): 22-26.
19. Roberts, A. V., Debener, T. and Gudlin, S. 2003. Cut rose production. *Encyclopedia of Rose Sciences*, 2:594-600.
20. Salunkhe, D. K., Bhati, N. R. and Desai, B. B. 1990. In: Postharvest biotechnology of flowers and Ornamental Plants. Naya Prakash Publication, Kolkata, pp.2-4.
21. Sharin, S. M. Z., Ronia, K., Taufiquea, T., Mehrajb, H. and Jamal, A. F. M. (2015). Study on flowering characteristics and categorization of rose cultivars for color, fragrance, and usage. *Journal of Bioscience Agriculture Research*, 4(1): 20-30.
22. Singh, B. R., Patil, G. K. and Bhujbal, B. G. (1994). Performance of Indian bred rose cultivars. *Journal of Maharashtra Agricultural University*, 19(3):344-345.
23. Singh, D. (1995). Improvement of roses through controlled and open-pollinated progenies. *M.Sc., Thesis*. Punjab Agricultural University, Ludhiana, India.
24. Sharma, A. and Sharma, S.K. (2003). Scoring technique for rose evaluation. *Journal of Ornamental Horticulture*, 6(1): 50-54.

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