

Short Communication

Evaluation of cut rose varieties for commercial cultivation under humid tropics of Kerala

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Abstract

A study was conducted at Department of Floriculture and Landscaping, College of Horticulture, Vellanikkara, to evaluate the performance of cut flower rose varieties and to select suitable varieties for commercial cultivation in Kerala. Three IIHR varieties *viz.*, Arka Ivory, Arka Pride, and Arka Swadesh, and seven exotic rose varieties *viz.*, Gold Strike, Noblesse, Revival, Taj Mahal, Corvette, Emma and Peach Avalanche were selected for the study. The varieties varied significantly with respect to various vegetative and floral parameters. The variety Taj Mahal was superior with respect to plant height (52.83 cm). Highest number of flowers were recorded in variety Revival (12.45) which was on par with Arka Ivory (11.38), Arka Swadesh (10.10) and Peach Avalanche (9.87). The variety Taj Mahal had highest number of petals (79.54). Vase life was highest for the varieties Revival (4.83 days), Taj Mahal (4.75 days) and Noblesse (4.75 days). The genetic estimates of heritability (%) and genetic advance (%) were found to be high for the characters fresh weight of flower, number of petals per flower and vase life, indicating that the expression of these characters were due to additive gene action. Varieties Taj Mahal and Noblesse, which were superior with respect to these characters, could be selected for further breeding programme.

Key words: Evaluation, Rose, Varieties.

Rose is globally designated as “Queen of flowers” due to its diversity and elegance in colour, grace and fragrance. The word ‘rose’ originated from the Greek word “Rhodon” meaning excellent fragrance. Apart from the landscape value, rose has commercial importance as cut flower and ranks first among the top ten cut flowers in the international market. Roses are in high demand in Kerala on special occasions like marriages, birthdays and in official functions in the form of flower arrangements and bouquets. The demand for this ever beautiful flower is increasing day by day and the requirement is met from other states like Karnataka and Tamil Nadu. Ideal temperature for rose production is 20-28^oC during day and 13-16^oC at night, with 8 hrs of sunlight. High temperature and relative humidity prevailing in the plains of Kerala make these regions unsuitable for rose cultivation under open conditions. However,

naturally ventilated polyhouses can be utilised for the cultivation of roses in plains of Kerala. Selection of suitable varieties is a pre-requisite for commercial cultivation of any flower crop. Hence, the study was proposed with the objective to evaluate the performance of cut flower varieties under naturally ventilated polyhouse and to select suitable varieties for commercial cultivation in the plains of Kerala. The experiment was laid out in completely randomized design with three replications under a naturally ventilated polyhouse in Department of Floriculture and Landscaping, College of Horticulture, Vellanikkara. Treatments consisted of ten cut flower varieties of rose *viz.*, T₁-Arka Ivory, T₂- Arka Pride, T₃- Arka Swadesh, T₄- Gold Strike, T₅- Noblesse, T₆- Revival, T₇- Taj Mahal, T₈- Corvette, T₉- Emma and T₁₀- Peach Avalanche. Six month old budded plants were planted in pots with potting media containing sand, soil and cow dung

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Table 1. Vegetative characters of cut flower varieties of rose

Variety	Plant height (cm)		Number of branches		Number of leaves/branch	
	Flower	Peak	Flower	Peak	Flower	Peak
	emergence	flowering	emergence	flowering	emergence	flowering
T ₁ (Arka Ivory)	28.67	41.92	3.33	4.00	32.50	38.67
T ₂ (Arka Pride)	27.50	44.83	4.67	3.25	24.83	20.50
T ₃ (Arka Swadesh)	31.00	44.00	4.00	3.50	21.83	43.33
T ₄ (Gold Strike)	33.08	41.17	4.50	3.67	33.50	26.50
T ₅ (Noblesse)	37.33	43.32	3.67	2.33	25.33	34.33
T ₆ (Revival)	25.33	43.00	4.50	5.50	27.00	26.50
T ₇ (Taj Mahal)	42.17	52.83	3.50	3.50	31.83	35.33
T ₈ (Corvette)	24.83	38.33	2.50	2.58	11.17	17.67
T ₉ (Emma)	25.33	37.83	3.67	4.50	21.17	21.33
T ₁₀ (Peach Avalanche)	25.50	33.08	6.33	5.00	25.17	27.50
CD (5%)	3.06	NS	0.79	0.87	3.73	2.65
CV	5.97	16.57	11.45	13.54	8.60	5.53

in 2:1:1 ratio. The temperature inside the poly house varied from 30°C to 34°C, relative humidity varied from 32 to 79 per cent and photosynthetically active radiation from 134.05 to 685.36 $\mu\text{mol m}^{-2}\text{s}^{-1}$. The observations on vegetative and floral parameters were recorded from September 2017 to March 2018. Data on the vegetative characters of the cut flower varieties at peak flowering stage are furnished in Table 1. The productivity, vigour and duration of any genotype are associated with plant height which is an important morphological character. Significant variation in plant height was observed among cut flower varieties and the variety Taj Mahal was superior in terms of this parameter. The number of branches was highest in Revival (5.5) which was on par with Peach Avalanche (5.00), whereas lowest

number of branches was recorded in variety Noblesse (2.33) at peak flowering stage. The variety Gold Strike recorded highest number of leaves per branch at flower emergence (33.50), and variety Arka Swadesh reported highest number of leaves (43.33) at peak flowering stage. The variation in vegetative characters might be due to the genetic make up of the varieties which resulted in differential response to the growing conditions. The results are in conformity with the findings of Joshna and Sarkar (2018), Ramzan et al. (2014) and Mohanty et al. (2011), who had reported genetic factors and growing conditions as the main reasons for variation in morphological characters of rose varieties.

Table 2. Floral characters of cut flower varieties of rose

Variety	Days taken for emergence to opening of flower buds	Length of flower stalk (cm)	Length of neck (cm)	Number of petals per flower	Length of flower bud (cm)	Diameter of flower bud (cm)	Number of flowers per plant	Number marketable of flowers	Vase life (days)
T ₁ (Arka Ivory)	13.01	24.45	5.46	22.82	2.77	1.09	11.38	8.45	2.73
T ₂ (Arka Pride)	14.73	30.48	6.37	17.87	2.35	1.08	6.20	4.97	3.58
T ₃ (Arka Swadesh)	13.84	25.78	6.61	25.61	2.53	1.05	10.10	6.62	2.92
T ₄ (Goldstrike)	13.04	21.84	4.31	27.72	2.31	1.24	8.93	6.07	3.61
T ₅ (Noblesse)	12.53	25.99	5.46	38.92	2.28	1.11	7.85	6.25	4.75
T ₆ (Revival)	12.19	23.85	5.07	20.25	2.23	1.05	12.45	7.23	4.83
T ₇ (TajMahal)	12.60	24.50	5.00	79.54	2.53	1.21	9.75	8.28	4.75
T ₈ (Corvette)	13.62	23.29	6.38	18.83	2.08	0.76	4.65	3.07	2.50
T ₉ (Emma)	11.73	31.35	7.36	30.33	2.45	0.90	5.28	3.32	3.92
T ₁₀ (Peach Avalanche)	15.11	25.73	5.73	33.68	2.03	1.01	9.87	6.58	4.3
CD (5%)	1.32	NS	0.77	9.18	0.38	0.16	2.67	1.27	0.67
CV	5.84	16.45	7.81	17.07	9.53	9.04	18.15	12.21	10.39

The number of days taken from emergence to opening of flower bud is an important parameter as it ensures availability of flowers in different time periods. The variety Emma recorded lowest number of days from appearance to opening of flower buds (11.73 days) and highest number of days for this parameter was observed in variety Peach Avalanche (15.11 days) (Table 2). Among cut roses the floral characters like stalk length, stalk thickness, neck length, number of petals, length and diameter of flower bud and vase life are important quality aspects which determine the suitability for cut flower purpose. Cut roses are mainly used in flower arrangements, bouquets and stage decorations which require flowers having long, straight and healthy stalks.

Neck length is an important quality aspect as it sets apart the flower from the foliage, giving good appearance to flowers. Varieties having short neck length are preferred in the market. The shortest neck was reported in Gold Strike (4.31 cm). The number of petals per flower is an important quality aspect for a cut flower as more number of petals provides a characteristic appearance to the cut flower. Slow opening of the petals is preferred for a cut flower for longer vase life. The variety Taj Mahal recorded highest number of petals (79.54) followed by Noblesse (38.92), Peach Avalanche (33.68), and Emma (30.33).

The length of flower bud was greatest in Arka Ivory (2.77 cm), and diameter was greatest in variety Gold

Strike (1.24 cm). Wide variations among varieties were recorded with respect to number of flowers. The highest number of flowers was recorded in varieties Revival (12.45), Arka Ivory (11.38), Arka Swadesh (10.10) and Peach Avalanche (9.87), whereas variety Corvette produced lowest number of flowers (4.65). Highest number of marketable flowers were produced by Arka Ivory (8.45), Taj Mahal (8.28) and Revival (7.23). The lowest marketable yield was observed in Corvette (3.07). The varietal influence on yield parameters of rose was also reported by Dias and Patil (2003), Ramzan et al. (2014), and Zuraw et al. (2015).

Qualitative attributes of various vegetative and floral characters were varied among the cut flower varieties (Table 3). The variety Emma was found to be less thorny on vegetative and floral shoots which was a desirable character. The varieties Arka Pride, Arka Swadesh and Noblesse had high (more than 20) number of thorns per 10 cm vegetative shoot. Arka Ivory and Corvette had high number of thorns on flower shoot. Varieties varied with regard to type of inflorescence. The varieties Noblesse, Revival, Corvette, Emma and Gold Strike produced single flowers while the varieties Arka Ivory, Arka Pride, Arka Swadesh, Taj Mahal and Peach Avalanche produced solitary as well as clustered flowers. Colour is the most attractive attribute of a flower and the consumer preference for colour varies widely. Varieties Arka Ivory, Arka Pride, Noblesse, Revival, Emma and Peach Avalanche were grouped under pink blend group. Arka Swadesh and Taj

Table 3. Qualitative characters of cut flower varieties of rose

Varieties	Amount of prickles on vegetative shoot	Amount of prickles on floral shoot	Inflorescence type	Flower colour (RHSS Colour chart)	Fragrance
Arka Ivory	Many	Many	Solitary and clustered	RHS 2015 159 D (Pale yellowish pink)	Medium
Arka Pride	Many	Medium	Solitary and clustered	RHS 2015 33C (Strong yellowish pink)	Medium
Arka Swadesh	Many	Medium	Solitary and clustered	RHS 2015 52 A (Vivid Red)	Weak
Gold Strike	Medium	Medium	Solitary	RHS 2015 9 A (Vivid yellow)	Medium
Noblesse	Many	Medium	Solitary	RHS 2015 38 A (Strong yellowish pink)	Medium
Revival	Medium	Weak	Solitary	RHS 2015 73 A (Deep purplish pink)	Weak
Taj Mahal	Medium	Weak	Solitary and clustered	RHS 2015 46 B (Vivid Red)	Weak
Corvette	Medium	Many	Solitary	RHS 2015 31 B (Strong reddish orange)	Weak
Emma	Absent	Absent	Solitary	RHS 2015 56 C (Pale purplish pink)	Weak
Peach Avalanche	Few	Weak	Solitary and clustered	RHS 2015 27 A (Light yellowish pink)	Weak

Table 4. Genetic estimates for cut flower of rose

Character	GCV (%)	PCV (%)	H ² (%)	GAM (%)
Days taken for appearance to opening of flower buds	7.47	9.48	62.06	12.12
Number of flowers/plant	18.69	28.3	43.59	25.42
Number of flowers/sprout	24.11	32.30	55.70	37.06
Number of petals per flower	40.08	43.56	84.63	75.95
Neck length	10.63	13.19	65.01	17.66
Stalk length	6.68	13.78	23.50	6.67
Stalk girth of the flower	4.04	12.42	10.59	2.71
Number of marketable flowers	20.74	24.04	74.26	36.82
Fresh weight of the flower	21.19	23.61	80.56	39.18
Vase life	15.70	18.82	69.53	26.96

Mahal were red blend in colour, while Gold Strike was yellow blend in colour. Fragrance is a very important quality attribute that everyone seeks in rose and the variation in fragrance is due to the variation in principal constituents contributing aroma. The varieties Arka Ivory, Arka Pride, Noblesse and Gold Strike recorded medium fragrance while all other varieties recorded weak fragrance. Variation in qualitative attributes were also reported by Ramzan et al. (2011)

Post-harvest characters determine the suitability of a rose to be used as cut flower. There was significant variation among the varieties with respect to vase life. The longest vase life was observed in variety Revival (4.83 days), which was on par with Taj Mahal (4.75 days) and Noblesse (4.75 days) and Peach Avalanche (4.30 days). The vase life was shortest in Corvette (2.5 days), Arka Ivory (2.73 days) and Arka Swadesh (2.92 days). These results are in conformity with the findings reported by Shahrin et al. (2015).

Based on the quality characters like stalk length, length and diameter of flower bud, number of petals per flower, vase life and number of marketable flowers, the overall performance of the varieties were scored (Table 6) and the variety Taj Mahal scored highest rank (1) followed by Noblesse (2). Shahrin et al. (2015) reported Taj Mahal as one of the best varieties for cut flower purpose based on overall performance.

High genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) for a character indicated higher variability for that character among the population and selection would be effective based on this. Among the characters considered for cut flower, a higher value of GCV and PCV (Table 4) were observed for number of flowers per sprout (24.11, 32.30), number of petals per flower (40.08, 43.56), yield of marketable flowers (20.74, 24.04), and fresh weight of the flower (21.19, 23.61). This result revealed the existence of variability among the ten cut flowers and opened wide scope for selection in breeding

Table 5. Overall performance of cut flower varieties of rose

Variety	Stalk length (cm)	Number of petals	Length of bud (cm)	Diameter of bud (cm)	Vase life	Number of marketable flowers	Score	Rank
T ₁ (Arka Ivory)	2	3	1	2	3	1	13	4
T ₂ (Arka Pride)	1	4	2	2	2	2	14	5
T ₃ (Arka Swadesh)	2	3	1	2	3	1	13	4
T ₄ (Gold Strike)	2	3	2	2	2	1	13	4
T ₅ (Noblesse)	2	2	2	2	1	1	11	2
T ₆ (Revival)	2	3	2	2	1	1	12	3
T ₇ (TajMahal)	2	1	1	2	1	1	9	1
T ₈ (Corvette)	2	4	1	2	3	2	14	5
T ₉ (Emma)	1	2	1	2	2	2	12	3
T ₁₀ (Peach Avalanche)	2	2	1	2	3	1	12	3

Table 6. Overall performance- score card

Stalk length (cm)	Number of petals	Length of flower bud (cm)	Diameter of flower bud (cm)	Vase life (days)	Number of marketable flowers
• > 30 - 1	• 40-1	• 2-3 -1	• 1-2- 1	• 4-5- 1	• 5-10- 1
• 20-30- 2	• 30-40-2	• 1-2 - 2		• 3-4-2	• 1-5 - 2
	• 20-30-3	• <1 -3		• 2-3-3	
	• 10-20-4			• 1-2-4	

programme. Similar results of high GCV and PCV for number of petals per flower was reported by Janaki (2013), yield of marketable flowers was reported by Zeinali et al. (2009) and fresh weight of the flower by Janaki (2013) and Panwar et al. (2012).

Heritability represents the portion of phenotypic variation that is due to genetic variation. Selection based on a character will be effective if its heritability is high. Among the cut flower varieties, high heritability was observed for parameters like days taken from emergence to opening of flower buds (62.02), number of petals per flower (84.63), neck length (65.01cm), fresh weight of the flower (80.56 g) and vase life (69.53 days). Similar results for number of petals per flower were reported by Janaki (2013), and fresh weight of the flower was reported by Zeinali et al. (2009).

Genetic gain under selection is represented by genetic advance. It indicates the level of improvement in the performance of progeny in the next generation. The characters number of flowers per sprout (37.06), number of flowers per plant (25.42), number of petals per flower (75.95), fresh weight of the flower (39.18 g) and vase life (26.96 days) exhibited higher genetic advance as per cent of mean. These results were in agreement with the findings of Sewaniya (2009) who reported higher GAM for parameters like number of thorns per 30 cm of stalk, number of leaflets per plant, number of nodes and internodes per 30 cm of stalk, plant canopy, number of flowers per plant and number of leaflets per plant.

High heritability coupled with high genetic advance indicates that the heritability is due to additive gene action and selection will be effective through this

character. Additive gene action due to high heritability along with high genetic advance was expressed by the characters number of petals per flower (84.63, 75.95), fresh weight of the flower (80.56, 39.18) and vase life (69.53, 26.96). The varieties Taj Mahal and Noblesse were seen to have these desirable features.

The overall performance of the varieties Taj Mahal and Noblesse was found to be superior as they could be utilised for cut flower purpose, and due to the additive gene action for superior characters, these varieties could be selected for further breeding programme.

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