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Evaluation and correlation studies of rose cultivars under naturally ventilated polyhouse

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Abstract: Evaluation of rose cultivars under naturally ventilated polyhouse was carried out in College of Horticulture, Mudigere, Karnataka during 2014-15. In respect of flower quality and yield attributes, highest stalk length (66.75 cm), stalk girth (0.96 cm), flower bud diameter (3.91 cm) and vase life (9.22 days) was recorded in Grand Gala. Cv. Tineke recorded maximum number of petals per flower (37.37). Cv. Tajmahal was found to be high yielder with respect to number of flowers per plant (3.58) among the ten cultivars. The phenotypic and genotypic correlation studies were carried out for fourteen characters to know the nature of relationship existing between number of flowers per plant and its other component characters in ten cultivars of rose. In phenotypic correlation studies, number of flowers per plant exhibited highly significant and positive correlation with number of shoots per plant, number of leaves per plant, days to first flower bud initiation, flower diameter, number of petals per flower, days taken to first harvest and number of leaves per shoot. In genotypic correlation studies, number of flowers per plant exhibited highly significant and positive correlation with number of shoots per plant, number of leaves per plant, flower diameter, days to first flower bud initiation, number of petals per flower, days taken to first harvest, number of leaves per shoot and leaf area.

Key words: Rose, Cultivars, Evaluation, NVPH and Correlation

Intoduction

Rosa hybrida L. is one of the natures beautiful creations and is universally acclaimed as "Queen of Flowers" belongs to the family Rosaceae, it is native to temperate regions of northern hemisphere. No other flower is a better symbol of love, adoration, innocence, peace, friendship, affection, passion and other virtues than the rose since thousands of years. Rose ranks first among the top ten cut flowers in the international flower market. It is grown for various purposes, such as garden flowers, for aesthetic value, cut flowers for decoration and loose flowers for garland and also for making various products such as rose oil, rose water, gulkhand, rose attar, *etc.* Yield is polygenically controlled quantitative character which is the total effect of several component factors under which variety is grown, the influence of these factors can be known through the correlation studies. Hence the knowledge on association and interaction among different characters with environment will provide necessary information in understanding the variation. Further, the relationship between various yield parameters and their effect on ultimate productivity of a variety could be ascertained by making correlation studies. Therefore, a investigation was carried out with a view to study the varietal performance and correlation studies of different rose cultivars under NVPH.

Materials and Methods

The present investigation was carried out at the experimental block of the Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere is situated in hill zone of Karnataka at $13^0 7'$ North latitude, $75^0 37'$ East longitude with an altitude of 982 m above mean sea level. It receives an annual mean rainfall of 2350 mm. Ten rose cultivars *viz.*, Grand Gala, Noblesse, Corvetti, First Red, Gold Strike, Shakira, Arka Swadesh, Konfetti, Tineke and Tajmahal were selected to study their phenotypic and genotypic correlation under naturally ventilated polyhouse. This experiment was carried by following Randomized Complete Block Design (RCBD). The treatments comprised of ten varieties and replicated thrice. The experiment was laid out in a naturally ventilated polyhouse. Its frame is made up of galvanized iron pipe and covered with 800 gauge UV stabilized polyethylene film. The shade net with 30 per cent shade was provided above the headspace inside the polyhouse to manage the light intensity and temperature during summer. Both sides are covered with 50 mesh size plastic net for natural ventilation. All the varieties were planted on May 2014. Planting was done at the spacing of 30 cm x 30 cm. Simple correlation coefficients pertaining to the phenotypic and genotypic for various characters of rose cultivars were computed as per Singh and Choudhary (1979). The significance of genotypic and phenotypic correlation coefficient was listed against 'r' values at 5 per cent and 1 per cent level of probability from table 'r' of Fisher and Yates (1963).

Results and Discussion

Flowering characters: Data pertaining to flowering characters at different stages of crop growth are furnished in table 1. Flower quality characters were significantly influenced by cultivars. The cultivar Grand Gala was appreciated for flower quality by recording highest stalk length (66.75 cm), stalk girth (0.96 cm), flower bud diameter (3.91 cm) and vase life (9.22 days). The cultivar Konfetti was found highest flower bud length (4.77 cm), while minimum was recorded in Arka Swadesh (3.45 cm). The cultivar Tineke recorded maximum number of petals per flower (37.37) followed by Cv. Tajmahal (35.96). However, the cultivars Gold Strike, Corvetti, Arka Swadesh, Shakira, Noblesse and Konfetti were recorded minimum stalk length (48.05 cm), stalk girth and vase life (0.58 cm and 6.91 days, respectively), flower bud length (3.45 cm), flower bud diameter (2.88 cm) and number of petals per flower (20.78), respectively. It may be due to accumulation of more dry matter in sink due to enhanced vegetative growth and also genetic makeup of the cultivar. Similar kinds of results were also reported by Manjula (2005), Man Bihari *et al.* (2009), Prashant (2010) and Mohanty *et al.* (2011) in rose. The Cv. Tajmahal was found to be high yielder with respect to number of flowers per plant per (3.58) and flowers per square meter (39.41). While, Cv. Grand Gala was produced least number of flowers per plant (2.34) and per square meter (25.72). In the present study, higher yield might be due to increased morphological parameters like plant height, number of shoots, number of leaves, leaf area and chlorophyll which helps in production of more photosynthates resulting in greater accumulation of dry matter which intern leads to

Table-1: Flowering characters of rose is influenced by different cultivars under Naturally Ventilated Polyhouse (NVPH)

Cultivar	Flower stalk length (cm)	Flower stalk girth (cm)	Flower bud length (cm)	Flower bud diameter (cm)	No. of petals per flower	No. of flowers per plant	Vase life (days)
Grand Gala	66.75	0.96	4.43	3.91	24.46	2.34	9.22
Noblesse	50.91	0.64	4.48	3.18	21.44	2.76	7.40
Corvetti	54.77	0.58	4.31	3.35	20.93	2.87	6.91
First Red	54.26	0.73	4.70	3.28	26.58	2.71	7.68
Gold Strike	48.05	0.67	3.71	3.00	22.53	2.95	7.32
Shakira	57.72	0.77	4.42	2.88	24.96	2.91	7.72
Arka Swadesh	55.32	0.75	3.45	3.05	21.73	2.75	7.33
Konfetti	54.52	0.68	4.77	3.28	20.78	3.01	6.94
Tineke	51.32	0.76	3.89	3.70	37.37	3.04	7.55
Tajmahal	50.48	0.81	3.70	3.02	35.96	3.58	8.73
S. Em±	**1.54**	**0.06**	**0.22**	**0.16**	**0.64**	**0.13**	**0.11**
CD at 5%	**4.58**	**0.19**	**0.65**	**0.46**	**1.91**	**0.40**	**0.32**

production of more number of flowers per plant. Variation among the cultivars with respect to marketable quality flowers has been reported previously by Sindhu and Rameshkumar (2004), Mantur *et al.* (2005) and Prashant (2010) in rose.

Phenotypic correlation study: Knowledge on the degree of association among quantitative characters would helps to know the characters whose selection would automatically result in an overall progress of positively correlated characters and elimination of negatively correlated characters with the yield. The data on phenotypic correlation studies on various characters are presented in Table 2.

Highly significant positive correlation of plant height was observed with stalk girth (0.450) and flower bud diameter (0.380). Significant negatively correlation of plant height was observed with flower stalk length (-0.711) and days taken to first harvest (-0.545). Number of shoots per plant showed highly significant and positive correlation with number of flowers per plant (0.982), number of leaves per plant (0.731), days to first flower bud initiation (0.576) flower diameter (0.519), number of petals per plant (0.505), number of leaves per shoot (0.461), days taken to first harvest (0.446) and leaf area per plant (0.369). Number of leaves per shoot showed highly significant and positive correlation with leaf area per plant (0.923), number of leaves per plant (0.555), flower diameter (0.548), number of shoots per plant (0.461), number of flowers per plant (0.444) and days to first flower bud initiation (0.430). Number of leaves per plant showed highly significant and positive correlation with number of shoots per plant (0.731), number of flowers per plant (0.715), number of petals per flower (0.713), flower diameter (0.582), number of leaves per shoot (0.555), leaf area per plant (0.501) and days to first flower bud initiation (0.429). Leaf area per plant was exhibited highly significant and positive correlation with number of leaves per shoot (0.923), flower diameter (0.521), number of leaves per plant (0.501), days to first flower bud initiation (0.430) and number of shoots per plant (0.369).

Days to first flower bud initiation showed highly significant and positive correlation with days taken to first harvest (0.649), number of shoots per plant (0.576), number of flowers per plant (0.566), leaf area per plant (0.474) number of leaves per shoot (0.430) and number of leaves per plant (0.429). Days taken to first harvest exhibited highly significant and positive correlation with Days to first flower bud initiation (0.649), number of shoots per plant (0.446), and number of flowers per plant (0.566). Flower stalk length exhibited highly significant and positive correlation with flower diameter (0.439) and negatively significant correlation with plant height (-0.711), number of shoots per plant (-0.529), number of flowers per plant (-0.507), days taken to first harvest (-0.413) and days to first flower bud initiation (-0.402). Stalk girth was highly significant and positively correlated with plant height (0.450) and number of petals per flowers (0.377). Flower bud diameter exhibited highly significant and positive correlation with flower stalk length (0.439) and plant height (0.380). Flower bud length was highly significant and negative correlated with number of flowers per plant (-0.404) and number of shoots per plant (-0.385). Flower diameter exhibited highly significant and positive correlation with number of petals per flower (0.601), number of leaves per plant (0.582), number of leaves per shoot (0.548), leaf area (0.521), number of shoots per plant (0.519) and number of flowers per plant (0.510). Number of petals per flower was highly significant and positively correlated with number of leaves per plant (0.713), flower diameter (0.601), number of shoots per plant (0.505), number of flowers per plant (0.488) and stalk girth (0.377). Number of flowers per plant exhibited highly significant and positive correlation with number of shoots per plant (0.982), number of leaves per plant (0.715), days to first flower bud initiation (0.566), flower diameter (0.510), number of petals per flower (0.488), days taken to first harvest (0.459) and number of leaves per shoot (0.444).

Genotypic correlation study: In general, genotypic correlation coefficients were higher than the phenotypic correlation coefficients. This indicates the presence of strong inherent association between various characters. The values of correlation co-efficient at genotypic level for the characters studied with respect to growth, flowering, yield and quality parameters are presented in Table 2. Plant height was significantly correlated in positive direction with flower stalk length (0.875), Stalk girth (0.860), flower bud diameter (0.856) and flower bud length (0.491). Number of shoots per plant showed highly significant and positive correlation with number of flowers per plant (0.995), number of leaves per plant (0.811), flower diameter (0.788), days to first flower bud initiation (0.643), number of petals per plant (0.567), days taken to first harvest (0.507), number of leaves per shoot (0.487) and leaf area per plant (0.430). Number of leaves per shoot showed highly significant and positive correlation with, leaf area per plant (0.988), flower diameter (0.779), number of leaves per plant (0.586), days to first flower bud initiation (0.505), number of flowers per plant (0.497) and number of shoots per plant (0.487). Number of leaves per plant showed highly significant and positive correlation with number of shoots per plant (0.811), number of flowers per plant (0.822), number of petals per flower (0.801), flower diameter (0.860), number of leaves per shoot (0.586), leaf area per plant (0.559) and days to first flower bud initiation (0.482). Leaf area per plant was exhibited highly significant and positive correlation with number of leaves per shoot (0.988), flower diameter (0.677), number of leaves per plant (0.599), days to first flower bud initiation (0.496), number of flowers per plant (0.450), number of shoots per plant (0.438) and days taken to first harvest (0.390).

Days to first flower bud initiation showed highly significant and positive correlation with days taken to first harvest (0.869), number of flowers per plant (0.651), number of shoots per plant (0.643), number of leaves

Table-2: Phenotypic correlation coefficient among various characters in different rose cultivars under NVPH

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	**1.000**	-0.290	-0.001	-0.233	-0.069	-0.356	-0.545**	-0.711**	0.450*	0.380*	0.320	0.150	0.049	-0.292
2		**1.000**	0.461**	0.731**	0.369*	0.576**	0.446*	-0.529**	0.001	-0.357	-0.385*	0.519**	0.505**	0.982**
3			**1.000**	0.555**	0.923**	0.430*	0.259	-0.187	0.156	-0.194	-0.014	0.548**	0.221	0.444*
4				**1.000**	0.501**	0.429*	0.250	-0.334	0.246	-0.017	-0.272	0.582**	0.713**	0.715**
5					**1.000**	0.474**	0.319	-0.199	0.027	-0.079	0.095	0.521**	0.194	0.350
6						**1.000**	0.649**	-0.402*	-0.362*	-0.480**	0.210	0.129	-0.042	0.566**
7							**1.000**	-0.413*	-0.559**	-0.374*	-0.003	-0.025	-0.223	0.459*
8								**1.000**	0.335	0.439*	0.267	-0.154	-0.247	-0.507**
9									**1.000**	0.205	-0.145	0.142	0.377*	0.004
10										**1.000**	0.282	0.182	0.166	-0.366*
11											**1.000**	-0.108	-0.262	-0.404*
12												**1.000**	0.601**	0.510**
13													**1.000**	0.488**
14														**1.000**

Table-3: Genotypic correlation coefficient among various characters in different rose cultivars under NVPH

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	**1.000**	-0.346	-0.008	-0.239	-0.052	-0.489**	-0.659**	0.875**	0.860**	0.856**	0.491**	0.209	0.058	-0.345
2		**1.000**	0.487**	0.811**	0.438*	0.643**	0.507**	-0.608**	-0.181	-0.557**	-0.365*	0.788**	0.567**	0.995**
3			**1.000**	0.586**	0.988**	0.505**	0.268	-0.201	0.200	-0.351	0.018	0.779**	0.236	0.497**
4				1.000	0.559**	0.482**	0.340	-0.399*	0.203	-0.306	-0.392*	0.860**	0.801**	0.822**
5					**1.000**	0.496**	0.390*	-0.220	0.094	-0.231	0.087	0.677**	0.189	0.450*
6						**1.000**	0.869**	-0.484**	-0.520**	-0.827**	0.274	0.127	-0.044	0.651**
7							**1.000**	-0.531**	-0.885**	-0.585**	0.011	-0.014	-0.265	0.500**
8								**1.000**	0.715**	0.832**	0.457*	-0.293	-0.223	-0.623**
9									**1.000**	0.634**	-0.073	0.608**	0.603**	-0.187
10										**1.000**	0.159	-0.135	0.273	-0.549**
11											**1.000**	-0.433*	-0.385*	-0.348
12												**1.000**	0.811**	0.797**
13													**1.000**	0.577**
14														**1.000**

* = Significant at p = 5% probability (0.360); ** = Significant at p = 1% probability (0.462); (1) Plant height (cm) (2) Number of shoots per plant; (3) Number of leaves per shoot ; (4) Number of leaves per plant; (5) Leaf area (cm^2); (6) Days to first flower bud initiation; (7) Days taken to first harvest; (8) Flower stalk length (cm); (9) Stalk girth (cm); (10) Flower bud diameter (cm); (11) Flower bud length (cm); (12) Flower diameter (cm); (13) Number of petals per flower; (14) Number of flowers per plant

per shoot (0.505), leaf area per plant (0.496) and number of leaves per plant (0.482). Highly significant and negative correlation was found with flower bud diameter (-0.827), stalk girth (-0.520), plant height (-0.489) and flower stalk length (-0.484). Days taken to first harvest exhibited highly significant and positive correlation with days to first flower bud initiation (0.869), number of shoots per plant (0.507), number of flowers per plant (0.500) and leaf area (0.390). Flower stalk length exhibited highly significant and positive correlation with plant height (0.875), flower bud diameter (0.832), stalk girth (0.715) and flower bud length (0.457). Stalk girth was highly significant and positively correlated with plant height (0.860), flower stalk length (0.715), flower bud diameter (0.634), flower diameter (0.608) and number of petals per flowers (0.603). Flower bud diameter exhibited highly significant and positive correlation with plant height (0.856), flower stalk length (0.832) and stalk girth (0.634). Flower bud length was highly significant and positive correlated with plant height (0.491) and flower stalk length (0.457). Flower diameter exhibited highly significant and positive correlation with number of leaves per plant (0.860), number of petals per flower (0.811), number of flowers per plant (0.797), number of shoots per plant (0.788), number of leaves per shoot (0.779), leaf area (0.677) and stalk girth (0.608). Number of petals per flower was highly significant and positively correlated with flower diameter (0.811), number of leaves per plant (0.801), stalk girth (0.603), number of flowers per plant (0.577) and number of shoots per plant (0.567). Number of flowers per plant exhibited highly significant and positive correlation with number of shoots per plant (0.995), number of leaves per plant (0.822), flower diameter (0.797), days to first flower bud initiation (0.651), number of petals per flower (0.577), days taken to first harvest (0.500) number of leaves per shoot (0.497) and leaf area (0.450).

Yield is a complex trait, the expression of which depends upon the action and multiple interaction of various components. In the present study, association of different cut flower characters with yield and among themselves were studied. Number of flowers per plant showed significant and positive correlation with number of shoots per plant, number of leaves per shoot, number of leaves per plant, leaf area, days to first flower bud initiation, days taken to first harvest, flower diameter and number of petals per flower. Highly significant and negative correlation was recorded with the flower stalk length, flower bud diameter and flower bud length (Table 2 & 3). It is mainly due to increases in number of shoots enhance the more leaves, which helps in synthesis of more photosynthates, hence more number of flowers were resulted. These results are in agreement with findings of Palai *et al*. (2003) and Manjula (2005) in rose.

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