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Evaluation of commercial cultivars of cut gerbera (*Gerbera jamesonii* Bolus ex Hooker F.) under polyhouse in Shevaroy condition of Eastern Ghats

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ABSTRACT

An investigation was carried out to evaluate performance of 36 cultivars of cut gerbera (*Gerbera jamesonii* Bolus ex Hooker F.) in a polyhouse at Horticultural Research Station, Tamil Nadu Agricultural University, Yercaud, during 2008-2010. Significant differences were observed for all the characters studied. Maximum plant-spread (78.02cm) was observed in cv. Robusta. Higher number of leaves was recorded in cv. White Tibet (41.54). Maximum Leaf length and leaf width was recorded in cvs. Golden Gate and Yanara. Maximum number of suckers produced was recorded in cv. Junkfru (7.60). Maximum stalk length was observed in cv. White Tibet (62.62cm), while flower diameter, cut flower production and vase-life were higher in cv. Rosalin. Correlation and path coefficient analysis showed that plant height, number of leaves per plant and number of suckers per plant were the important components of cut-flower yield in gerbera. It may be concluded that cultivars Rosalin, White Tibet, Junkfru and Golden Gate were found to be the best for floral quality and yield, and are recommended for cut-flower production under Shevaroy condition of Eastern Ghats.

Key words: Gerbera, evaluation, correlation, path coefficient

INTRODUCTION

Gerbera (*Gerbera jamesonii* Bolus ex Hooker F.) is one of the most beautiful cut flowers with exquisite shape, size and colour with over 40 species of Asiatic and African origin. Gerbera is a dwarf herbaceous perennial plant belonging to the family Asteraceae. It is a diploid, with somatic chromosome number 2n = 50. The modern gerbera arose from *G. jamesonii* hybridized with *G. viridifolia* and, possibly, other species. Gerbera is among the top ten cut-flowers traded in the global market. There is a good demand for these flowers both in the domestic and export markets. As commercial cultivation of the cut-flowers has a good potential, introduction and popularization of high-yielding cultivars of gerbera has gained importance. However, no systematic efforts have been made in the past to identify cultivars of gerbera suitable for cut-flower production under protected conditions in the Shevaroy hills. Keeping this in view, 36 cultivars of gerbera were collected and evaluated to identify gerbera cultivars suitable for the region.

MATERIAL AND METHODS

An experiment was conducted under polyhouse at Horticultural Research Station, Tamil Nadu Agricultural University, Yercaud, between 2008 and 2010. The experimental site is geographically located between 11°04" and 11°05" North latitude and 78°05" to 78°23" East longitude, at an altitude of 1500m above Mean Sea Level. Average maximum and minimum temperatures are 31.0°C and 12.4°C, respectively. Mean annual rainfall in Yercaud is 1572mm, and average relative humidity 75%. The soil of the experimental plot was laterite in texture, at 0.5 to 1.5m depth, pH 6.25 and EC 0.037 dSm. The plot was thoroughly pulverized and enriched with red soil, sand and well-decomposed farm yard manure in 2:1:1 proportion. The polyhouse was fumigated with methyl bromide (30g/m^2). The experiment was laid out in Randomized Block Design, with three replications. Thirty six cultivars with uniform-sized suckers (4-5 leaves) were collected from different sources (Table 1) and planted in May 2008 at a spacing of 30 x 30cm. Length, breadth and height of the polyhouse was 23m, 12m and 7.5m, respectively. Five plants per replication in each cultivar were used for recording observations on plant spread, leaf length, leaf breadth, number of leaves/plant, number of suckers/plant, days taken to flowering, stalk length, flower diameter, number of flowers/plant/year and vase-life. Genotypic and phenotypic correlation coefficients were calculated as per Panse and Sukhatme (1967). Parameters of variability were calculated

Table 1. Source of gerbera cultivars

Cultivar	Source
Aida	KF Biotech
Amaretto	SPIC Biotech
Arobella	KF Biotech
Avemeria	SPIC Biotech
Blondy	Private Nursery
Bondana	Private Nursery
Dalma	KF Biotech
Dolcerita	Private Nursery
Essandre	SPIC Biotech
Florida	SPIC Biotech
Golden Gate	KF Biotech
Goldy	Private Nursery
Junkfru	Private Nursery
Kalika	Private Nursery
Lily	Private Nursery
Marmara	SPIC Biotech
Marshsal	SPIC Biotech
Mini	Private Nursery
Oilila	Private Nursery
Oranila	KF Biotech
Piton	Private Nursery
Red Bull	Private Nursery
Red Ventura	Private Nursery
Ringo	Private Nursery
Rosalin	KF Biotech
Rosabella	Private Nursery
Ruby Red	Private Nursery
Sunway	KF Biotech
Skylina	SPIC Biotech
Verseck	Private Nursery
Vojavir	Private Nursery
Thalassa	KF Biotech
Tiffany	Private Nursery
White Tibet	Private Nursery
Woman	SPIC Biotech
Yanara	SPIC Biotech

as per the formula of Burton and De Vane (1953). Heritability, genetic advance and expected genetic gain were calculated by the formula suggested by Jhonson *et al* (1955). Mean and Standard Error were worked out as per standard methods, and coefficient of variation was computed. Path coefficient was worked out owing genotypic correlation coefficient.

RESULTS AND DISCUSSION

All the genotypes showed significant differences for vegetative characters (Table 2). Greater plant-spread was recorded in cvs. Rosalin (78.02cm) and White Tibet (71.94cm); minimum was observed in cv. Essandre (37.49cm). Difference among the cultivars could be due to leaf size variation. These results are in accordance with findings of Rajiv Kumar and Yadav (2005), and Thomas *et al* (2004). More number of leaves were produced by cvs. White Tibet (41.54), Rosalin (35.46) and Golden Gate (35.46). Leaf length and leaf width influence flower yield too, as these are important parameters influencing plant spread. Longest leaf was recorded in cv. Golden gate (29.62cm), while the shortest in cv. Goldy (14cm). Cultivar Golden Gate was found to produce broader leaves, and Yanara narrower leaves. Difference in various growth parameters may be attributed to inherent genetic characters of the cultivar (Luna and Mahumita, 2009).

Among the cultivars, higher number of suckers was recorded in cvs. Junkfru, (7.60) and Rosalin (6.90), while

Table 2. Evaluation of gerbera cultivars for growth attributes under Shevaroy conditions

Cultivars	Plant spread (cm)	Leaf length (cm)	Leaf width (cm)	Number of leaves/ plant	Number of suckers/ plant	Days taken to flowering
Aida	56.75	15.00	5.33	16.21	5.58	130.67
Amaretto	59.44	19.00	4.90	18.24	5.58	134.67
Arobella	50.16	21.62	4.00	30.40	5.07	116.67
Avemeria	50.67	22.00	4.50	25.33	4.56	123.67
Blondy	49.76	18.00	3.70	39.52	5.27	139.00
Bondana	42.56	21.00	5.90	27.36	6.49	134.67
Dalma	43.07	15.00	6.10	29.39	5.67	113.67
Dolcerita	38.51	19.50	5.00	31.41	4.05	126.67
Essandre	37.49	21.00	5.00	39.52	3.95	127.67
Florida	58.27	16.50	5.14	22.29	5.98	139.00
Golden Gate	67.04	29.62	7.10	35.46	5.67	115.67
Goldy	59.79	14.00	5.26	29.39	3.55	117.67
Junkfru	66.71	25.00	6.70	38.50	7.60	116.67
Kalika	63.84	16.50	3.50	22.29	3.55	121.33
Lily	42.15	14.10	5.77	29.37	3.98	125.33
Marmara	48.14	16.00	5.90	31.41	4.56	123.67
Marshsal	61.81	23.00	5.50	32.43	3.55	126.67
Mini	53.71	23.00	5.70	25.33	4.56	117.67
Oilila	70.59	25.00	6.40	31.41	6.99	134.67
Oranila	61.98	23.50	3.80	31.41	4.56	109.67
Piton	49.65	21.00	5.40	17.23	3.55	145.00
Red Bull	43.57	23.00	5.90	33.44	4.05	129.67
Red Ventura	63.84	17.50	5.00	23.31	5.32	121.33
Ringo	50.67	21.00	5.10	21.28	4.19	127.67
Rosalin	78.02	23.66	6.50	35.46	6.90	120.33
Rosabella	44.08	22.00	4.40	33.44	3.55	133.67
Ruby Red	59.45	23.00	6.40	33.44	6.48	145.00
Sunway	56.75	17.00	4.83	33.44	4.76	120.33
Skylina	42.56	19.00	5.70	34.45	4.96	129.67
Verseck	45.72	20.00	5.89	24.32	5.21	135.67
Vojavir	50.87	15.25	5.37	20.27	5.20	128.67
Thalassa	57.76	20.00	4.50	29.39	4.66	126.67
Tiffany	38.51	25.00	3.60	21.28	3.55	133.67
White Tibet	71.94	22.50	6.20	41.54	6.18	127.67
Woman	39.52	19.00	4.90	39.52	4.56	134.67
Yanara	41.55	23.50	3.20	23.31	4.05	144.00
SEm	2.3	0.37	0.19	1.27	0.42	5.37
CD *(P=0.05)*	4.7	0.74	0.39	2.53	0.21	10.72

Table 3. Evaluation of gerbera cultivars for floral characters under Shevaroy condition

Cultivars	Stalk length (cm)	Flower diameter (cm)	Number of flowers/plant/ year	Vase-life (days)
Aida	38.91	8.51	24.00	6.00
Amaretto	43.68	9.22	24.00	9.33
Arobella	49.76	5.88	36.00	10.33
Avemeria	43.57	8.51	24.00	10.33
Blondy	46.01	7.29	24.00	7.00
Bondana	48.03	9.02	36.00	9.33
Dalma	35.36	7.91	24.00	9.33
Dolcerita	51.48	8.41	24.00	8.33
Essandre	49.15	8.31	36.00	10.33
Florida	35.77	7.29	24.00	9.33
Golden Gate	50.86	9.50	36.00	8.33
Goldy	46.72	6.99	24.00	9.33
Junkfru	57.05	10.64	36.00	8.33
Kalika	41.35	8.92	24.00	8.33
Lily	42.09	6.51	32.00	7.33
Marmara	42.46	10.13	24.00	9.33
Marshsal	52.39	6.28	24.00	9.33
Mini	38.91	5.47	36.00	8.33
Oilila	54.21	8.51	36.00	10.33
Oranila	54.62	9.32	36.00	9.33
Piton	46.11	8.51	24.00	8.33
Red Bull	39.72	10.33	24.00	10.33
Red Ventura	45.19	10.33	24.00	10.33
Ringo	37.90	8.51	36.00	8.33
Rosalin	58.17	11.75	48.00	10.33
Rosabella	39.72	7.60	36.00	9.33
Ruby Red	50.66	7.39	36.00	10.33
Sunway	48.74	8.11	24.00	8.33
Skylina	41.95	9.53	24.00	10.33
Verseck	40.84	10.03	36.00	10.33
Vojavir	38.10	9.63	24.00	9.33
Thalassa	51.78	6.59	24.00	9.33
Tiffany	50.87	8.51	24.00	10.33
White Tibet	62.62	11.45	40.00	10.33
Woman	47.93	9.83	36.00	10.33
Yanara	42.86	8.11	24.00	9.33
SEm	2.20	0.42	1.29	0.46
CD *(P=0.05)*	4.39	0.83	2.58	0.92

cvs. Goldy, Rosabella, Tiffany and Piton produced lower number of suckers per plant. Similar variations in sucker production among cultivars of cut-gerbera was also reported earlier by Rajiv Kumar and Yadav (2005), and Sarkar and Ghimiray (2004). Least number of days taken to flowering was recorded in cv. Oranila (109.67 days), followed by cv. Dalma (113.67 days). The least number of days taken to flowering was recorded in cv. Ruby Red (145.0 days).

On perusal of data presented in Table 3, it is seen that floral characters differed significantly among cultivars. Stalk length is one of the most important characters considered in grading cut-flowers. Cultivars White Tibet and Rosalin produced the longest stalk, while cultivars Dalma and Florida produced the shortest. Similar variations have been earlier observed by Kandpal *et al* (2003) in cut-gerbera. Diameter of the flower was highest in cv. Rosalin (11.7cm) and White Tibet (11.45cm), while cv. Mini had the lowest flower diameter (5.47cm). This is perhaps due to the inherent character of the individual variety. These findings are in accordance with results of Luna and Mahumita (2009) who reported large difference in flower-diameter of different gerbera cultivars grown under greenhouse conditions. Number of cut-flowers per plant varied from 24 to 48 flowers per plant per year. Cultivar Rosalin produced the highest number of cut-flowers (48), followed by White Tibet (40). Minimum number of cut-flowers were produced by Dalma (23). Longest vase-life of cut-flower in water was recorded in cv. Rosalin (11.33 days).

Analysis of Variance revealed that mean square of treatments was significant for most of the characters, indicating varietal differences in all the characters studied (Table 4). Estimates for phenotypic coefficient of variance (PCV) were found to be higher than genotypic coefficient of variance (GCV) for all the seven characters studied indicating, that, the apparent variation was not only due to the genotype but also due to influence of the environment in expression of the genotype. These results are in agreement with Chobe *et al* (2010). A close correspondence was seen between GCV and PCV for number of leaves, number of suckers per plant, flower diameter and number of flowers, indicating little influence of environment on these characters. Estimates for heritability in the broad sense gives a measure of transmission of characters from one generation to another, thus, giving an idea of the heritable portion of variability, and enabling the plant breeder isolate elite selections in the crop.

In the present study, number of flowers per plant had high heritability values along with genetic advance of mean, followed by number of suckers per plant and number of leaves. Thus, selection on the basis of number of flowers per plant, number of suckers per plant and number of leaves would be more effective in further breeding programmes. Chobe *et al* (2010) reported high heritability along with genetic advance as per cent of mean for number of days to first flowering, stalk length and number of flowers per plant. Anoop Kumari *et al* (2011) reported high heritability, along with lower genetic advance, for number of suckers and flower diameter, thereby exhibiting non-additive gene effects.

Table 4. Analysis of genetic parameters for quantitative traits in gerbera

Character	Range	Mean	PCV (%)	GCV (%)	ECV (%)	Heritability (h2) %	GA(%) of Mean
Plant height (cm)	22.09 - 28.37	25.49	7.84	5.91	5.15	56.90	9.19
Number of leaves	16.21 - 41.54	29.22	25.13	24.05	7.29	91.58	47.41
Days to flowering	109.67 - 145	127.75	8.18	6.35	5.16	60.25	10.15
Number of suckers	3.55 - 7.60	4.95	22.74	22.13	5.25	94.66	44.35
Stalk length (cm)	35.77 - 62.62	46.27	15.10	13.93	5.84	85.06	26.46
Flower diameter (cm)	5.47 - 11.75	8.58	18.14	17.12	6.00	89.07	33.29
Number of flowers / plant /year	24.00 - 48.00	29.67	23.29	22.67	5.35	94.71	45.44

Table 5. Genotypic and phenotypic co-efficient of correlation for yield attributing parameters in gerbera

Character		Number of leaves	Days to flowering	Number of suckers	Stalk length (cm)	Flower diameter (cm)	No. of flowers / plant /year
Number of leaves	Genotype	1	0.181	0.386	0.041	0.048	0.241
	Phenotype	1	0.165	0.372	0.042	0.038	0.238
Days to flowering	Genotype		1	-0.016	-0.293	0.115	-0.276
	Phenotype		1	0.129	0.003	0.262	-0.114
Number of suckers	Genotype			1	-0.151	-0.08	0.188
	Phenotype			1	-0.059	-0.009	0.211
Stalk length (cm)	Genotype				1	0.238	0.200
	Phenotype				1	0.333	0.201
Flower diameter (cm)	Genotype					1	-0.292
	Phenotype					1	-0.254
No. of flowers / plant / year	Genotype						1
	Phenotype						1

Table 6. Path co-efficient analysis for cut gerbera

Character	Number of leaves	Days to flowering	Number of suckers	Stalk length (cm)	Flower diameter (cm)	No. of flowers / plant /year
Number of leaves	0.24881	0.02556	0.02463	0.01306	-0.02052	0.24881
Days to flowering	0.04515	-0.14084	-0.00105	-0.09251	-0.04929	-0.14084
Number of suckers	0.09602	0.00231	0.06383	-0.04765	0.03445	0.06383
Stalk length (cm)	0.0103	0.04131	-0.00964	0.31537	-0.10227	0.31537
Flower diameter (cm)	-0.01191	-0.01619	-0.00513	0.07521	-0.42884	-0.42884

In the present study, it was observed that genotypic correlation coefficient was higher than phenotypic correlation coefficient for most of the characters under study (Table 5). Similar trend was observed also by Magar *et al* (2010) in cut-gerbera for most of the characters. These findings indicate that though there is a strong, inherent association between various characters, phenotypic expression is reduced under the influence of environment. In some cases, phenotypic and genotypic correlations were very close, indicating less influence of environment. In the present study, genotypic correlation between number of flowers per plant per year was positively correlated with plant height (0.145), number of leaves (0.241), number of suckers (0.188) and stalk length (0.200) and were positively correlated, while, the days to first flowering and flower diameter showed a negative correlation with yield. This is in line with results of Magar *et al* (2010).

Path coefficient analysis revealed that plant height, number of leaves, number of suckers and stalk length had a positive effect on yield (Table 6), while this was negative for days to first flowering and flower diameter. Direct effect was the highest for plant height, followed by stalk length and number of leaves. Number of leaves had the highest indirect effect on number of flowers/plant/year through days to first flowering. Considering correlation and path coefficients, plant height, number of leaves per plant and number of suckers per plant emerged as the important components of cut-flower yield in gerbera. This is in agreement with results of Hasanuzzaman (2006). It may be concluded from the present investigation that of the 36 cultivars evaluated under polyhouse condition, cultivars Rosalin, White Tibet, Junkfru and Golden Gate were the best, with superior qualities for cut-flower production under Shevaroy condition of Eastern Ghats.

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