Studies on Genetic Variability in Gerbera (*Gerbera jamesonii*)

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ABSTRACT

An at empt was made to study the extent of genetic variability present in gerbera grown under protected conditions in mid-hills of West Bengal. The values for GVC, in general, were in closer proximity to that of PCV for almost all the characters indicating that these can be utilized in breeding programme. The magnitude of heritability estimates were observed to be high in most of the characters except flower diameter and girth of stalk indicating substantial improvement can be made by using standard selection criteria. High genetic advance coupled with high heritability and comparable genotypic coefficient of variation were observed for number of leaves/plant, disc diameter, weight of harvested stalk and vase life indicating the preponderance of additive gene effects in controlling these characters.

Keywords: Genetic advance, genetic variability, gerbera, heritability

Knowledge about the genetic parameters like genotypic coefficient of variation, heritability and genetic advance is the pre-requisite in the genetic improvement of any crop. Quantification of available genetic variability for the characters of economic importance is very useful in crop breeding.

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Selection is an easy method for varietal improvement in Gerbera as it is vegetatively propagated. However, selection is effective only when the observed variability in the population is heritable in nature. Genetic variance, heritability and other genetic parameters are reported to be subject to fluctuations with changing environments (Lal *et. al.*, 1985). The magnitude of the variation and estimates of heritability and genetic advance are the important parameters on which the success of selection lies. In the present study, an attempt has been made to assess the extent of genetic variability present in gerbera grown under protected conditions in mid-hills of West Bengal.

MATERIALS AND METHODS

Nine cultivars of gerbera (viz. Sangria, Vital, Sunway, Flaurance, Red Explosion, Foske, Kalimpong Red,

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Kalimpong Pink and Kalimpong Yellow) were evaluated in a randomized block design with three replications under protected conditions at Regional Research Station (Hill Zone) of Uttar Banga Krishi Viswavidyalaya located at Kalimpong, West Bengal during 2011-2012. The recommended package of practices was adopted for raising the crop. Observations were recorded on various growth and floral characters from ten randomly selected plants for each replication and subjected to variance analysis as described by Gomez and Gomez (1984). The genotypic coefficient of variation (GVC) and phenotypic coefficient of variation (PVC) were estimated according to the formula given by Burton (1952). The method suggested by Hanson *et al*. (1956) was used for estimating the heritability of different characters. The expected genetic advances were estimated by the formulae suggested by Johnson *et al*. (1955).

RESULTS AND DISCUSSION

The analysis of variance revealed highly significant variations for all the characters under study. The mean, range, PCV, GCV, heritability and expected genetic advance for 19 characters in gerbera have been presented in Table I. The variability in each character has been substantiated by the estimates of GCV and PCV. The values of GCV, in general, were closer in proximity to that of PCV

Table 1. Estimates of genetic parameters for various vegetative and floral characters of Gerbera (*Gerbera Jamesonii*)

Characters	Mean ± SE (m)	Range	PCV*	GCV**	Heritability (broad sense)	Genetic advance (as percent of mean)
Plant height (cm)	39.54±0.53	33.88-47.38	10.81	10.55	0.95	21.21
Number of leaves/ plant	28.21±0.83	14.75-50.22	39.60	38.61	0.99	79.47
Leaf length (cm)	32.41±0.69	25.98-38.87	13.97	13.46	0.92	26.72
Leaf breadth (cm)	15.64±0.56	10.01-20.17	23.04	22.17	0.92	43.92
Number of side shoots/ plant	5.03±0.27	3.51-7.75	26.86	25.15	0.87	48.31
Circumference of plant(cm)	195.58±2.12	168.29-209.90	7.25	7.00	0.93	13.92
Plant spread (N-S)	66.23±1.93	53.29-80.47	13.49	12.51	0.86	23.88
Plant spread (E-W)	73.85±1.36	58.34-87.21	14.00	13.63	0.95	27.32
Days to visibility	126.89±1.04	109.72-141.12	8.80	8.65	0.97	17.57
Days to opening of flower bud	135.63±0.90	118.43-149.39	8.46	8.38	0.98	17.10
Days to full bloom	141.98±0.91	125.36-155.80	7.92	7.84	0.98	15.98
Flower diameter (cm)	10.76±0.37	8.94-12.26	11.89	10.27	0.74	15.21
Disc diameter (cm)	4.07±0.30	2.37-6.12	32.03	29.27	0.83	55.03
Length of stalk (cm)	52.91±1.90	35.63-62.43	17.33	16.18	0.87	31.11
Girth of stalk(cm)	2.41±0.13	1.60-3.22	21.92	19.68	0.81	36.09
Flowers/clump/year	28.41±0.75	20.04-39.61	22.57	22.10	0.95	44.56
Weight of harvested stalk (g)	20.65±0.37	9.08-26.98	32.34	32.19	0.99	66.00
Vase life (days)	10.93±0.21	6.82-15.67	25.79	25.59	0.98	52.33
Self life on plant (days)	17.54±0.31	13.17-23.15	19.49	19.25	0.97	39.16

PCV* - Phenotypic Coefficient of Variation
GCV**- Genotypic Coefficient of Variation

for almost all the characters indicating that these can be utilized as parents in breeding progtamme as was earlier observed by Mahanta *et al*. (1988). The high estimates of GCV and PCV were recorded for disc diameter, weight of harvested stalk, number of side shoots/plant, number of leaves / plant and vase life indicating the presence of maximum variability. Senapati *et al*. (2013) also reported higher cultivation of GCV and PCV for number of leaves/ plant. On the other hand, characters like circumference of plant, days to flower bud opening, days to full bloom and days to visibility of flower buds gave low estimates of both GCV and PCV. However, with the help of GCV alone it is not possible to determine the amount of variations that is heritable; the heritable portion of variation can be identified with the help of heritability estimates and genetic gain (Johnson *et al., 1955*)

High heritability estimates generally enable the breeder to select plants on the basis of phenotypic expression. In the present study, the magnitude of heritability estimates were observed to be very high in most of the characters except diameter (0.74) and girth of stalk (0.81) indicating that substantial improvement can be made by using standard selection criteria. Less weightage should be given to those characters with low heritability while fixing selection criteria.

Burton (1952) suggested that the extent of advance from selection can be obtained from the study of GCV along with heritability estimates, as heritability estimates are often subject to genotype -environment interactions. In the present study, high genetic advance associated with high heritability and comparable GCV was observed for number of leaves/ plant, disc diameter, weight of harvested stalk and vase life. This association would suggest that additive genes are probably more important in the inheritance of these characters (Panse, 1957) and hence, direct selection for these characters would be highly effective. Kumari *et al*. (2011) also reported high estimates of heritability and genetic advance for number of leaves/ plant. Circumference of plant, days to visibility, days to full bloom and days to opening of flower buds had low estimates of genetic advance but high heritability indicating greater contribution of non additive gene effect in controlling these characters as was also observed by Chobe *et al*. (2010) for days to 1st flowering, vase life and number of flowers/ plant/year. The high heritability is being exhibited due to favourable influence of environment rather than genotype.

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