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Short Communication

# Genetic variability studies in Gerbera

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**Five genotypes of gerbera were evaluated to determine genetic variability, heritability, genetic advance and genetic gain for eleven contributing characters. Significant variations were recorded for the various characters studied. Phenotypic and genotypic coefficients of variation were highest for number of flowers per plant and leaf area index, indicating presence of sufficient genetic variability for selection in these traits. High heritability and high genetic advance for number of leaves per plant and number of flowers per plant indicated the presence of additive gene effects in these traits and their amicability for direct selection. The non additive gene effects were evident in number of suckers per plant, flower dry weight and flower stalk diameter thus warranting use of heterosis breeding for these characters. The selection on the basis of number of flowers per plant will be more effective for further breeding programme.**

**Key words:** Gerbera, genetic advance, genetic gain, heritability, variability

Gerbera (*Gerbera jamesonii* Bolus ex. Hooker F) belongs to family Asteraceae, is suitable both for export and domestic market, because of its potential to withstand in long transportation. It is a diploid species with somatic chromosome number 2n= 50. The modern gerbera arose from *G. jamesonii* hybridized with *G. viridifolia* and possibly other species. It is commonly known as Transvaal Daisy, Barberton Daisy or African Daisy are a small group of temperate and tropical Asiatic and African perennial herbs. They produce very attractive flower heads. The attractive cut-flowers of gerbera are widely used in bouquets and flower arrangements. It is highly suitable for growing in beds, borders, pots and rock gardens. Its cut blooms remain fresh at least for a week and are in great demand for presentation and interior decoration.

The consumer preferences changes with time. Hence, crop improvement is the need of the time to sustain the availability of desirable cultivars. Improvement through selection depends upon the variability existing in the available genotypes, which may be either due to different genetic constitution of cultivars or variations in the growing environments. Gerbera is a vegetatively propagated crop through suckers on commercial scale and selection is an easy method for varietal improvement in it. 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). Genetic variability in a group of germplasm is a pre-requisite for a successful breeding programme. Since, most of the characters influencing yield are polygenic, it is essential for plant breeders to estimate the type of variation available in the germplasm. The type of breeding programme for developing suitable varieties depends largely on the availability of genetic variability in a given species. Heritability estimates give a measure of transmission of characters from one generation to the other, as consistency in the performance of the selection depends on the heritable portion of the variability. Thus, enabling the plant breeder for isolating elite selections in the crop. Hence, the magnitude of the variation and the estimates of the heritability and genetic advance are the important parameters on which the success of selection lies. With this background in view, the present study was undertaken to assess and estimate the magnitude and nature of variation among five genotypes of gerbera with respect to various vegetative, flower and yield attributes which could be utilized in crop improvement programme.

**Materials and Methods**

The present investigation was conducted at the Horticulture Research Farm, Anand Agricultural University, Anand, Gujarat during the year 2008- 09. Healthy tissue culture plants of five genotypes of gerbera v*iz.,* Dhoni, Zingaro, Roselin, Dune and Balance were planted in raised beds of 45 cm height, 75 cm base and 60 cm top at a spacing of 30.0 cm × 37.5 cm in two rows in completely randomized design with eight replications. The recommended package of practices was followed for raising the crop. Five randomly selected plants of each genotype in each replication were used for recording observations. The data were recorded on various parameters of vegetative growth, flowering, yield and quality as per genotypes. Yield characters were recorded up to six months which started after one month of transplanting. The genotypic and phenotypic coefficients of variation were estimated according to the methods of Panse and Sukhatme (1967). Parameters of variability were calculated as per the formula given by Buton and De Vane (1953). Heritability, genetic advance and expected genetic gain were calculated by the formula suggested by Jhonson *et al.* (1955). The mean and standard errors were worked out as per standard methods and coefficients of variations were computed.

**Results and Discussion**

The analysis of variance reveled that mean square of treatments were significant for most of the characters indicating varietal differences for all the characters studied. The estimates of phenotypic coefficient of variance (PCV) were found higher than genotypic coefficient of variance (GCV) for all the eleven characters studied indicating that the apparent variation was not only due to genotypes but was also due to the influence of environmental in the expression of genotypes. The results were in agreement with the results of Chobe *et al*., (2010). But there was close correspondence between GCV and PCV for certain characters like number of suckers per plant, flower dry weight, number of flower per plant, shelf life, flower diameter and flower stalk diameter, indicating little influence of environment on these characters. In the study, phenotypic and genotypic coefficients of variation were higher for number of flowers per plant and leaf area index indicating high variation in these characters, predicting greater scope for improvement of these two characters. The rest of characters viz., flower dry weight, number of suckers per plant flower fresh weight and number of leaver per plant, had

moderate variability thus amenable for improvement.

The estimates of heritability in broad sense give a measure of transmission of characters from one generation to another, thus giving an idea of heritable portion of variability and enabling the plant breeder in isolating the elite selection in the crop. Heritability and genetic advance increase the efficiency of the selection in a breeding programme by assessing the influence of environmental factors and additive gene action. The estimates of heritability in broad sense specifying the heritable portion of total variation, helps in identification of the appropriate characters for selection. High estimates of heritability in broad sense were obtained for all the characters except plant height, leaf area index and flower stalk length, reflecting the importance of these traits in selection programme. The magnitude of heritable variability is the most important aspect of genetic constitution of the genotype which has close bearing on the response to selection (Panse, 1957). Similar findings were reported by Kannan and Rammdas (1990) in gerbera.

**Table 1: Analysis of genetic parameters for certain quantitative characters in gerbera**

| Character | Range | Mean | PCV ( % ) | GCV (% ) | ECV (%) | Heritability ($h_2$) % | GA | GG (%) |
|---|---|---|---|---|---|---|---|---|
| Plant height (cm) | 29.82 – 41.05 | 35.93 | 15.87 | 13.43 | 8.45 | 71.7 | 8.42 | 23.44 |
| No. of leaves/plant | 14.81 – 25.91 | 20.52 | 24.26 | 22.76 | 8.34 | 88.0 | 9.03 | 43.98 |
| Flower diameter (cm) | 9.53 – 11.41 | 10.40 | 8.03 | 7.21 | 3.53 | 80.6 | 1.39 | 13.33 |
| Flower stalk length (cm) | 53.00 – 62.95 | 58.26 | 7.03 | 6.16 | 3.39 | 76.8 | 6.48 | 11.12 |
| Flower stalk diameter (cm) | 0.40 – 0.51 | 0.43 | 10.57 | 9.78 | 3.40 | 84.8 | 0.08 | 18.46 |
| Flower fresh weight(g) | 8.11 – 14.37 | 11.63 | 22.04 | 20.99 | 6.70 | 90.7 | 4.79 | 41.18 |
| Flower dry weight (g) | 1.40 – 2.51 | 1.85 | 27.90 | 27.32 | 5.64 | 95.9 | 1.02 | 55.12 |
| No. of suckers/plant | 2.54 – 4.88 | 3.52 | 25.94 | 25.75 | 3.12 | 98.6 | 1.86 | 52.69 |
| No. of flowers/plant | 3.77 – 10.59 | 6.80 | 41.78 | 40.96 | 4.23 | 98.9 | 5.71 | 83.89 |
| leaf area index | 1.77 – 5.24 | 3.30 | 44.79 | 38.44 | 22.99 | 73.6 | 2.24 | 67.90 |
| Shelf life (days) | 6.03 – 10.11 | 8.26 | 18.39 | 17.67 | 5.09 | 92.3 | 2.89 | 34.96 |

GCV and heritability (broad sense) are not sufficient to determine the amount of variation which is heritable (Burton, 1952). Heritable variation can be determined with greater accuracy when heritability along with genetic advance is studied. Heritability along with genetic gain is more useful criterion in predicting the resultant effects of selecting the best individual (Johnson *et al.,* 1955). High heritability with high genetic advance tells that the character is governed by additive gene action, for that simple selection is advocated. In the present study number of flower per plant showed the high heritability along with maximum genetic gain, followed by number of suckers per plant and flower dry weight. Thus, selection on the basis of number of flowers per plant, number of suckers per plant and flower dry weight would be more effective for further breeding programs, as also reported by Nair and Shiva (2003) and Kolte (2008). Chobe *et al.* (2010) reported high heritability along with genetic advance as percent of mean for number of ray florets, leaf area, number of days to first flowering, vase life and number of flowers per plant. High heritability along with high genetic gain indicated in these characters was due to considerable additive gene effects (Panse and Sukhatme, 1967). Flower

diameter, flower stalk diameter and flower stalk length showed moderate to high heritability but low genetic gain, indicating that high heritability may likely be due to non-additive gene action and for this selection with adequate progeny testing is practiced (Panse, 1957). Chobe *at al.* (2010) reported high heritability along with lower genetic advance for number of days required for first flowering, vase life and number of flowers per plant per year, exhibiting non-additive gene effects. Selection of individual plants based on number of flowers produced per plant which showed high heritability along with high genetic gain might therefore be effective for crop improvement.

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