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# Phenotypic and genotypic correlation coefficient Studies in *Gladiolus* (*Gladiolus grandiflorus* L.) for yield and quality parameters

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**Abstract**
The present investigation was carried out at Experimental Farm, Division of Vegetable Science & Floriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology. Chatha during 2018-19 to study the variability studies in *Gladiolus* (*Gladiolus grandiflorus* L.). The experiment was laid out in a Randomized Block Design with three replications. Twenty-five genotypes of *Gladiolus* were evaluated for 21 yield and flowering related traits to study their genetic parameters such as variability, heritability and coefficient of variation, Analysis of variance for all the traits showed significant differences among genotypes for all the flower and yield related traits. The magnitude of correlation coefficient at genotypic level was found higher than the corresponding correlation at phenotypic level. Number of florets per spike had a positive and highly significant correlation both at genotypic and phenotypic levels with spike length (0.923, 0.956), rachis length (0.769, 0.956), weight of corm per plant (0.383, 0.299), number of cormels per plant (0.327, 0.3100) and diameter of corms (0.326, 0.251) respectively.

**Keywords:** Genetic variability, heritability, genetic advance, *Gladiolus grandiflorus*

## Introduction
*Gladiolus* (*Gladiolus grandiflorus* L.) is a commercial ornamental bulbous crop which leads geophytes worldwide for cut flower trade and garden displays. It occupies an importance place in the garden for its magnificent inflorescence, wide range of colours, and different shapes and sizes of flowers. It ranks next to tulip, lily, freesia and hippeastrum among the geophytes in international florist trade and first in domestic bulbous flower trade (Flower council of Holland, 2008). Though India has suitable agro-climatic conditions for *Gladiolus* cultivation, it is being grown over an area of 11660 ha with a production of 106 crore spikes (agricoop.nic.in). It is commercially cultivated in Himachal Pradesh, Sikkim, Karnataka, Uttar Pradesh, West Bengal, Tamil Nadu, Punjab and Delhi. In the eastern states like Tripura, Assam, Manipur, Meghalaya and Nagaland, this flower has established itself as a commercial proposition. *Gladiolus* plant is a tender herbaceous perennial belonging to the family Iridaceae, growing from both seeds and corms. Corms are bulb-like, globose or ovoid having series of nodes wholly covered with tunic or husks and oriented strictly in vertical fashion within the soil. The corms produce a number of cormels or offsets which have very hard tunic. The leaves are sword shaped phyllode, clustering at the swollen stem base, prominently ribbed, radical and cauline. The modern hybrids have been derived from at least 12 species which are now called as *Gladiolus grandiflorus* (Wilfret, 1980) [8]. A huge amount of variability exists in this crop with respect to shape, growth habit, flowering behavior, yield of spikes and quality. Knowledge of correlation studies helps the plant breeder to ascertain the real components of yield and provide an effective basis of selection. 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 in isolating the elite selections in the crop. Thus, the magnitude of the variation and the estimates of the heritability, genetic advance were the important parameters on which the prospect of selection lies. So, present study was undertaken to study association among flower and yield contributing traits in *Gladiolus* genotypes.

## Materials and Methods

Experimental material consisting of twenty five genotypes planted in Randomized Complete Block Design (RBD) with three replications in a plot size of 1.20m x 1.20m at spacing of 20cm x 30cm on 22nd October, 2018 at the experimental farm of Division of Vegetable Science and Floriculture, Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, Chatha, Jammu during Rabi 2018-2019. Recommended package of practices and plant protection measures were followed for healthy crop growth during the season. Observations were recorded on twenty one parameters at appropriate stages of plant growth from five randomly selected plants in each plot from each replication.

## Results and Discussion

### Correlation Studies

Correlation coefficient analysis measures the mutual relationship between various plant characters and determines the component characters on which selection is based for genetic improvement for a particular character. The phenotypic and genotypic correlation coefficients were computed in all possible combinations for thirteen quantitative traits. The phenotypic correlation co-efficient were higher in magnitude over genotypic correlation co-efficient for most of the traits studied. This indicated that these differences might be due to environmental variations.

Plant height had positive and significant correlation with spike length, rachis length, and weight per corm, number of cormels per plant, diameter of corm and number of florets per spike. At both genotypic and phenotypic level indicating that with incensement of plant height these associated character could be improved. Gowda (1989) [5] and, Neeraj and Jha (2001) [7] also reported significant positive correlation between plant height with spike length. Similar results were obtained by Choudhary *et al.,* (2011) [3] in *Gladiolus*. Therefore, plant height is very important trait as it directly correlating with economic yield of *Gladiolus* crop. Breeder should give more emphasis for improving this character. Number of leaves exhibited negatively significant correlation with leaf area and weight per corm at both phenotypic and genotypic level. Whereas, leaf area exhibited positively significant correlation with weight per corm and diameter of corm but negatively significant with number of florets per spike at both genotypic and phenotypic level. Similar results were attained by Choudhary *et al.,* (2011) [3].

Days to spike emergence exhibited negative significant association with number of corms per plant, weight per corm, diameter of corm at both genotypic and phenotypic level. Spike length showed positive and significant association with rachis length, number of corms per plant, weight per corm, diameter of corm and number of florets per spike at both genotypic and phenotypic level. The results obtained are in full agreement with the findings of De and Misra (1994) [4] and Choudhary *et al.,* (2011) [3] suggesting the selection of the varieties on the basis of average to long spike length for improved number of florets per spikes. The rachis length was found positive and significantly correlated with stem diameter and number of florets per spike at both phenotypic and genotypic level. Stem diameter showed highly significant and positive correlation with number of florets per spike at both genotypic and phenotypic level. This is in agreement with the reports by More (1980), John *et al.,* (2002) [6] in *Gladiolus* and Mohanty *et al.,* (2003) in African marigold. Floret size was negatively non-significant association with all the traits under study except days taken to spike emergence and rachis length at both phenotypic and genotypic level.

Number of corms per plant exhibited positive significant association with weight per corm, diameter of corm and number of florets per spike at both genotypic and phenotypic level. These results are in agreement with the findings Anuradha and Gowda (2000) [1] in *Gladiolus*. Weight of corm per plant showed positive and significant correlation with diameter of corm, plant height, leaf area, and spike length, number of corms per plant at both phenotypic and genotypic level. Highly significant and positive correlation of diameter of corm was observed with plant height, leaf area, spike length, number of corms per plant and weight per corm at both genotypic and phenotypic level. Diameter of corm was positively and significantly correlated with weight per corm. Similar results were reported by John *et al.,* (2002) [6].

Information on correlations between the important growth, flower, quality and corm characters are of considerable help in the efficient selection programme. A higher correlation between two characters indicates that selection for the improvement of one-character leads to the simultaneous improvement in the other character depending upon the magnitude of association between them. The characters are considered to be independent when weak correlation exists, between them and selection for a character may not affect the other. It is evident by the present study that correlation exists between characters among themselves and in turn with yield. A narrow difference between the genotypic and phenotypic correlation coefficients indicates the lesser influence of environment on the expression of these traits and presence of strong inherent association among the traits (Archana, 2006) [2].

## Conclusion

The number of florets per spike had positive and highly significant association with spike length, rachis length, stem diameter and number of corms per plant while negatively significantly with leaf area at both genotypic and phenotypic level. Hence, selection based on these traits would ultimately improve the economic yield of the crop.

**Table 1:** Genotypic (G) correlation coefficients for 13 traits in *Gladiolus*

| | **Plant Height (cm)** | **No. of leaves** | **Leaf area ($cm^2$)** | **Days taken to spike emergence (days)** | **Spike length (cm)** | **Rachis length (cm)** | **Stem diameter (mm)** | **Floret size (cm)** | **Number of corms per plant** | **Number of cormels per plant** | **Weight of corm per plant (g)** | **Diameter of corm (cm)** | **Number of florets per spike** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Plant Height (cm) | - | -0.04 | 0.122 | 0.116 | 0.923** | 0.769** | 0.009 | -0.06 | 0.1058 | 0.327* | 0.383** | 0.326* | 0.3054 |
| No. of leaves | | - | -0.341* | 0.22 | -0.028 | 0.002 | -0.198 | -0.104 | 0.178 | -0.0974 | -0.262* | -0.0848 | 0.0481 |
| Leaf area($cm^2$) | | | - | -0.075 | 0.098 | -0.057 | -0.172 | -0.015 | -0.146 | 0.1569 | 0.309* | 0.312* | -0.427** |
| Days taken to spike emergence (days) | | | | - | 0.114 | 0.176 | 0.023 | 0.16 | -0.198 | -0.346* | -0.457** | -0.459** | -0.1218 |
| Spike length (cm) | | | | | - | 0.756** | -0.008 | -0.047 | 0.096 | 0.319* | 0.369* | 0.309* | 0.307* |
| Rachis length (cm) | | | | | | - | 0.485** | 0.071 | 0.001 | 0.0685 | 0.1233 | 0.2068 | 0.502** |
| Stem diameter (mm) | | | | | | | - | 0.117 | -0.053 | -0.0529 | -0.1046 | -0.0374 | 0.493** |
| Floret size (cm) | | | | | | | | - | -0.154 | -0.185 | -0.15 | -0.1215 | -0.085 |
| Number of corms per plant | | | | | | | | | - | 0.587** | 0.514** | 0.485** | 0.306* |
| Number of cormels per plant | | | | | | | | | | - | 0.921** | 0.842** | 0.107 |
| Weight of corm per plant (g) | | | | | | | | | | | - | 0.928** | 0.111 |
| Diameter of corm (cm) | | | | | | | | | | | | - | 0.219 |

***= Significant at 0.1%, **= Significant at 1%, *= Significant at 5%

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