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Path coefficient analysis studies in gladiolus

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Abstract : Path coefficient analysis was worked out for spike length and number of florets per spike in twelve genotypes of gladiolus (*Gladiolus x hybridus* Hort.). Plant height and rachis length exhibited direct effect on spike length; while spike length, rachis length and plant height had direct influence on number of florets per spike. Improving plant height and rachis length can bring about improvement in spike length. Similarly, improvement in spike length, rachis length and plant height directly increased number of florets per spike.

Key words : Gladiolus, Number of florets per spike, Path coefficient, Spike length

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Gladiolus (*Gladiolus x hybridus* Hort.) is an important bulbous cut flower for beauty and perfection. It is a popularly known as 'Queen of the bulbous flowers' because of attractive spikes, having florets of different colours and longer keeping quality. It is very popular for interior decoration and flower arrangements due to its impressive and vibrant coloured spikes which are in great demand in both domestic and international markets. Development of high yielding varieties with better quality blooms has been main objective of most of the breeding programmes. Heritable traits of yield and flower quality are complex characters and are known to be collectively influenced by various polygenically inherited traits which are highly vulnerable to environmental effects. Hence, for an effective and efficient selection of genotypes in gladiolus for yield and quality parameters, the knowledge of direction and magnitude of association between yield and its components and quality components and within components themselves become necessary. The path coefficient analysis method splits the correlation coefficients into direct and indirect effects which help in assessing the relative influence of each important character on the ultimate yield and flower quality. With this background information, a study on path coefficient analysis was undertaken in gladiolus.

RESEARCH METHODS

A field trial on twelve genotypes of gladiolus was conducted at the Research Farm of Department of Floriculture and Landscaping, College of Horticulture and Forestry, Jhalarapatan, Jhalawar (Rajasthan) during 2008-09. The experiment was laid out in randomized block design (RBD) with three replications. Healthy and uniform size corms of 3-5 cm diameter were planted at 6-8 cm depth in plots of 1.55 m x 1.10 m size at spacing of 40 cm between rows and 25 cm between plants. The data on plant height, number of leaves, days to slipping, rachis length, leaf area, spike length, size of floret, corm diameter, corm weight, cormels weight per plant, number of florets per spike, spike diameter, number of florets remaining open at one time, size index of corm and number of shoots per plant were recorded on five randomly selected plants. Path coefficient analysis was carried out using phenotypic correlation coefficient for spike length and number of florets per spike as dependent variables as suggested by Wright (1921) and illustrated by Dewey and Lu (1959).

RESEARCH FINDINGS AND DISCUSSION

The data on direct and indirect effects of different quantitative characters on spike length and number of florets per spike are presented in the Table 1 and 2, respectively. Path coefficient analysis for spike length showed significant effects of other characters studied (Table 1). Similar results were obtained by Anuradha *et al*. (2002) where positive correlation was encountered for spike length with rachis length, number of florets per spike and weight of corm in gladiolus.

The correlation coefficients were further partitioned to study direct and indirect effects. The spike length as a dependent variable showed that plant height had the highest direct effect followed by rachis length, leaf area and floret diameter. Lal *et al*. (1985) also reported that spike length was positively correlated with plant height. Similar results were obtained by Rao (1982) in China aster where plant height had direct effect on stalk length. Number of leaves, days to sleeping, corm weight and diameter and number of florets per spike showed negative direct effect toward spike length. Similar findings were reported by Balaram and Janakiram (2009) in gladiolus.

Positive and significant phenotypic correlation of spike length with plant height and rachis length were mainly due to their respective high direct effects. Direct effects of cormels weight per plant, diameter and weight of corms and number of florets per spike were recorded to be negative and low, but their phenotypic correlations were positive and significant indicating high indirect effects through other characters namely plant height. The residual effect indicated that 34.75 per cent variation in spike length was due to unknown factors and 65.25 per cent variation was contributed by the characters studied.

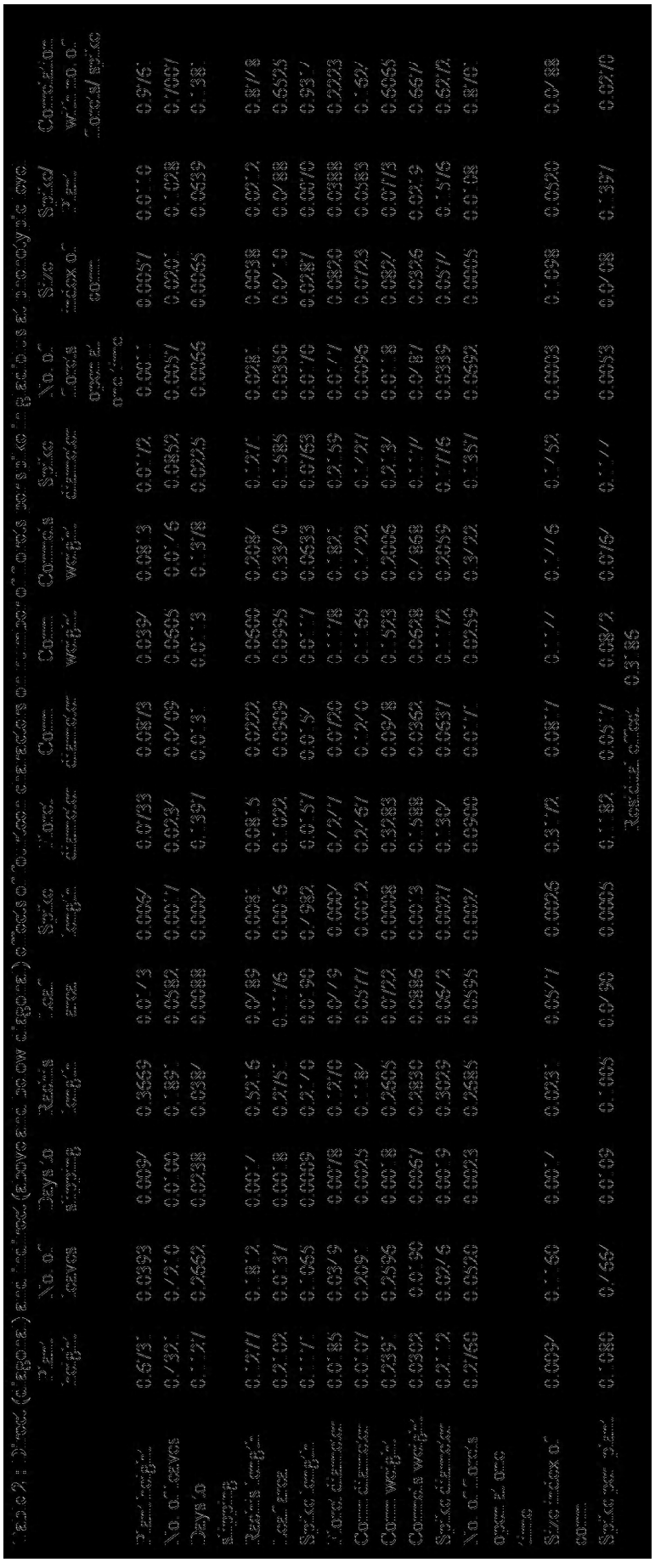
Among indirect effects, plant height through rachis length was relatively high as compared to low indirect effects of leaf area and days to sleeping. But its indirect effects through number of leaves, floret diameter, diameter and weight of corm, number of florets per spike and cormels weight per plant were negative and negligible. The indirect contribution of rachis length through plant height and floret diameter was positive and relatively high. Further, it shows positive but low indirect effect with number of leaves, days to sleeping and leaf area.

The floret diameter showed positive indirect effect through rachis length and leaf area followed by days to sleeping and plant height. With rest of the characters it recorded low indirect effects. Number of florets per spike exhibited positive indirect effect via plant height, rachis length and leaf area followed by floret diameter on spike length.

The number of leaves, days to slipping, number of florets per spike, corm weight and diameter exhibited

Table 1: Direct (diagonal) and indirect (above and below diagonal) effects of characters on spike length in gladiolus at phenotypic eve

	Plant height	No. of leaves	Days to sleeping	Rachis length	Leaf area	Floret diameter	Corm diameter	Corm weight	No. of florets per spike	Correlation with spike length
Plant height	0.1921	0.0515	0.0022	0.1230	0.0287	0.0318	0.0121	0.0520	0.0525	0.9203
No. of leaves	0.3101	0.0231	0.0568	0.3115	0.1153	0.0009	0.0671	0.0126	0.0161	0.7803
Days to sleeping	0.2023	0.0098	0.1397	0.0632	0.0175	0.0051	0.0205	0.0135	0.1008	0.2408
Rachis length	0.4321	0.0161	0.0292	0.3245	0.0969	0.0033	0.0318	0.0121	0.1525	0.9765
Leaf area	0.3531	0.0116	0.0119	0.1021	0.2329	0.0046	0.0953	0.1123	0.2111	0.6588
Floret diameter	0.2235	0.0073	0.0523	0.2097	0.0801	0.0172	0.1278	0.1111	0.1332	0.7170
Corm diameter	0.1370	0.0071	0.0369	0.1350	0.1113	0.0100	0.1972	0.1399	0.1970	0.6521
Corm weight	0.1371	0.0093	0.0118	0.2292	0.1730	0.0133	0.1785	0.1829	0.1768	0.8925
Cormels weight	0.2131	0.0087	0.0150	0.2652	0.1598	0.0065	0.0551	0.0153	0.3552	0.2090
No. of floret/spike	0.1729	0.0110	0.0075	0.3123	0.1316	0.0038	0.0212	0.0535	0.2197	0.7803
Residual effect	0.3475									



negative indirect effect on spike length through leaf area. Weight of corm exhibited high indirect positive effect on spike length through plant height and rachis length and low positive indirect effect via days to slipping, leaf area and floret diameter. However, it showed negative indirect effect with corm diameter, number of florets and leaves. Similar results were obtained by Anuradha *et al*. (2002).

The number of florets per spike was directly positively influenced by the characters plant height, rachis length, spike length, cormels weight, floret diameter, leaf area, number of leaves and number of spikes per plant. Thus, selection for plant height, spike length and rachis length may improve number of florets per spike. The observed results are in accordance with the findings by Anuradha (1990) for rachis length, Misra and Saini (1990) for number of florets open at a time, plant height and weight of daughter corm. This also indicates that their significantly positive correlations at phenotypic level were due to their high direct effects.

Though, diameter and weight of corm and size index of corms exhibited negative direct effects, their phenotypic correlations were positive and significant indicating that, they had high indirect effects through other traits *viz.,* plant height, spike diameter and number of florets open with respect to spike length and floret diameter (De and Misra, 1994). Residual effect of 32 per cent indicates that the studied characters contributed 68 per cent of variation on number of florets per spike.

Improvement in gladiolus thus may be enhanced through the direct selection of genotypes (to be used in breeding programmes) for the above mentioned characters exhibiting high positive direct and indirect effects with positive correlation. From the foregoing discussion we can infer that by improving plant height and rachis length we can bring about improvement in spike length. Similarly, improvement in spike length, rachis length and plant height directly increase number of florets per spike.

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