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Correlation and path coefficient analysis in tuberose (*Polianthes tuberosa* L.)

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Abstract

A study carried out at Tamil Nadu, India on the association of metric traits and floral concrete contents of nine ecotypes of tuberose (*Polianthes tuberosa*) revealed that yield components like length of scape, length of spike, diameter of flower, number of scapes per plant and number of flowers per spike exhibited significant positive association with yield. These components were also positively intercorrelated among themselves. Path coefficient analysis indicated that length of scape, length of spike, number of scapes per plant, number of flowers per spike, vase life, longevity and floral concrete recovery had direct positive effect on flower yield, while diameter of flower had negative direct effect. Length of scape and length of spike were the strongest forces influencing yield.

Key words : correlation, path analysis, *Polianthes tuberosa,* tuberose.

Tuberose (*Polianthus tuberosa* L.) (Amaryllidaceae), an important commercial flower crop of India, is a good source of essential oil which is extensively used in the preparation of perfumes and cosmetics. In breeding programmes, the study of correlation coefficients between yield and its components and their relative contribution to yield is of great value indicating the association between the characters at phenotypic and genotypic levels, for selecting desirable characters. However, the information available on the association of different characters in tuberose is meagre. Reports pertaining to similar studies in gladiolus reveal that, flower yield per plant is positively correlated with floret lenth, floret width and number of florets (Pant & Lal 1992). The present study was carried out during 1994-95 at Annamalai University, Tamil Nadu, India to determine the corelation coefficients of yield and yield components and their interrelated variables in nine ecotypes of tuberose.

The experimental material consisted of nine ecotypes representing wide morphological variations, adapted to varied agroclimatic zones. The sources from which these ecotypes were obtained are

presented in Table 1 along with their distinguishing floral characters. The experiment was laid out in a Randomized Block Design replicated thrice. Each unit of the replicated plot was planted with 100 bulbs of uniform size of 1.5-2.0 cm diameter. They were planted along the sides of ridges laid 30 cm apart and the distance between plants maintained as 30 cm. In each replication, 25 plants were selected at random and tagged for recording observations. The crop was raised during August 1994 which flowered during October (first crop). Normal cultural operations were carried out to ensure a healthy stand. Observations were recorded on length of scape, length of spike, diameter of flower, number of scapes per plant, number of flowers per spike, yield of flowers, vase life, longevity and floral concrete recovery. Correlation coefficients of yield and yield components and inter correlations among the various components were calculated following the method of Panse &

Table 1. Salient features of selected ecotypes of tuberose

Ecotype	Source of collection	Distinguishing floral characters
Pt 1	Farmers field, Pachamalyaankottai, Dindigul, Anna District	Flowers small with single row of white fragrant petals
Pt 2	Farmers field, Perungudi, Madurai District	Flowers large with single row of white mildly fragrant petals
Pt 3	Farmers field, Ravanthavadi, Dharmapuri District	Flowers large with single row of creamy white fragrant petals
Pt 4	Farmers field, Lyngunam, Thiruvannamalai Sambuvarayar District	Flowers small with single row of dull white mildly fragrant petals
Pt 5	Farmers field, Sengi, Villupuram Ramasamy Padayachiar District	Flowers large with single row of white fragrant petals
Pt 6	Farmers field, Alakudi, Nagai Quaid-E-Milleth District	Flowers small with single row of dull white fragrant petals
Pt 7	Farmers field, Kaluperumpakkam, Pondicherry	Flowers large with single row of white fragrant petals
Pt 8	Indian Institute of Horticultual Research, Bangalore	Flowers medium sized with single row of pure white fragrant petals.
Pt 9	Indian Institute of Horticultural Research, Bangalore	Partialy opened flower buds larger than single types with double row of pinkish tinged, non fragrant petals (Picking of flowers is difficult in this ecotype)

Table 2. Phenotypic and genotypic correlation coefficients (r) between yield and its components in tuberose

Character		Flower yield	Scape length	Spike length	Flower diameter	No. of scapes/ plant	No. of flowers/ spike	Vase life	Longevity	Floral concrete recovery
Flower	P	1.0000	0.6922*	0.7139*	0.7409**	0.3497	0.5624	0.6393*	0.4187	0.6987*
yield	G	1.0000	0.9726**	0.9325	0.8600	0.7441**	0.8121**	0.9844**	0.9875**	0.8463**
Scape	P		1.0000	0.6637*	0.5350	0.0969	0.6201*	0.4375	0.2800	0.5257
length	G		1.0000	1.6624	0.9371**	1.0726**	1.4979	1.6866**	2.4999**	0.7797**
Spike	P			1.0000	0.5221	0.1241	0.5495	0.4226	0.4989	0.4734
length	G			1.0000	1.1134**	1.3567**	1.8944**	2.0801**	2.4313**	1.0523**
Flower	P				1.0000	0.5494	0.4949	0.5923	0.5220	0.7683
diameter	G				1.0000	0.8219**	0.9226**	1.0094**	1.3307**	0.8383**
No. of	P					1.0000	0.2758	0.3043	0.3626	0.1553
scapes/plant	G					1.0000	1.0722**	0.5613**	1.0368**	0.5184
No. of	P						1.0000	0.2967	0.5776	0.4367
flowers/spike	G						1.0000	1.7879**	1.8087**	0.6828*
Vase life	P							1.0000	0.4892	0.5914
	G							1.0000	2.0482**	1.0882**
Longevity	P								1.0000	0.4455
	G								1.0000	1.3083**
Floral	P									1.0000
concrete	G									1.0000
recovery										

* Significant at 5% level
** Significant at 1% level
P = Phenotype; G = Genotype

Sukhatme (1978) and path coefficient analysis was done as proposed by Dewey & Lu (1959).

The genotypic correlation coefficients were slightly higher than phenotypic correlation coefficients (Table 2) indicating a strong inherent association of the characters under study. This is in accordance with the findings of Pant & Lal (1992) in gladiolus. Except yield of flower and scape length, the genotpyic correlation coefficients exceeded unity for all other characters. This may be due to the higher error variance than the genotype variance leading to a small denominator in the formula or may be due to difference in the signs of the progeny and error mean products leading to a relatively larger genotypic mean products (numerator) as reported earlier by Pal *et al.* (1994) in *Solanum khasianum* Clark.

Flower yield exhibited positive association that was highly significant with flower diameter both at phenotpic and genotypic levels. The association was positive and significant with scape length, spike length, vase life and floral concrete recovery at phenotypic level. Number of scapes per plant, number of flowers per spike and longevity were significantly correlated at genotpyic levels only. Therefore it could be inferred that scape and spike length, flower diameter, number of scapes per plant and number of flowers per spike could be relied upon in selection for high yield. Vase life could be improved by selecting strains which show greater length of scape and spike, diameter of flower and number of flowers per spike as they are intercorrelated at genotpyic level.

The estimates on correlation coefficients only indicated the interrelationship of

Table 3. Path coefficient analysis of flower yield in tuberose

Character	Scape length	Spike length	Flower diameter	No. of scapes/ plant	No. of flowers/ spike	Vaselife	Longevity	Floral concrete recovery	Genotpyic correlation coefficient with yield
Scape length	0.1518	0.2745	-1.4208	0.0089	0.0740	0.2697	0.1772	0.5329	0.9726
Spike length	0.2524	0.1651	-1.6880	0.0112	0.0936	0.3411	0.1724	0.7193	0.9325
Flower diameter	0.1423	0.1839	-1.5161	0.0068	0.0456	0.3512	0.0943	0.5728	0.8600
No. of scapes/ plant	0.1629	0.2240	-1.2462	0.0083	0.0529	0.1953	0.0735	0.3543	0.7441
No. of flowers/spike	0.2274	0.3128	-1.3988	0.0089	0.0494	0.3873	0.1282	0.2655	0.8121
Vaselife	0.2561	0.3435	-1.5303	0.0046	0.0883	0.3479	0.1451	0.7439	0.9845
Longevity	0.2051	0.2270	-2.0175	0.0086	0.0894	0.5381	0.0709	0.4865	0.9875
Floral concrete recovery	0.1184	0.1738	-1.2709	0.0043	0.0337	0.3786	0.0928	0.6834	0.8463

Residual effect = 0.0349

Underlined values indicate direct effects and values above and below the underline indicate indirect effects

traits but did not furnish information on the cause and effect in order to perform selection. Hence, path analysis was carried out ot identify the ideal index for selection. Maximum positive direct effect was obtained through length of spike (0.1651) and length of scape (0.1518) (Table 2). The traits, number of scapes per plant, number of flowers per spike, vase life, longevity and floral concrete recovery also exhibited positive direct effect while diameter of flower showed negative direct effect. Therefore the characters, length of spike and length of scape should be given prime importance while attempting selection.

The four traits namely, floral concrete recovery, length of spike, vaselife and length of scape indirectly influenced the flower yield through diameter of flower, number of scpaes per plant and number of flowers per spike. Longevity of the crop also depends on floral concrete recovery. Hence, the ideal index of selection for yield in tuberose could be stated as length of the scape and length of the spike. The effect of the residual factors over yield was estimated as 0.0349. This indicates that there might be few other components other than those studied in this investigation which might have been responsible for influencing the yield.

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