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CORRELATION AND PATH ANALYSIS OF YIELD COMPONENTS IN SUNFLOWER

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ABSTRACT

In Sunflower 100 seed weight diameter of head and plant height possessed high genotypic correlation with seed yield. While 100 seed weight had the maximum direct effect on seed yield, plant height and days to maturity contribute substantially through other related characters.

Sunflower (*Helianthus annuus* L.) is gaining popularity as an edible oilseed crop in India. During the past fifteen years many varieties from East European Countries, particularly from Soviet Union, have been introduced and tested for their adapatability in many plant breeding institutes of this Country. The investigations so far conducted at Cotton and Millet Experiment Station, Kovilpatti, South India and elsewhere indicated that the crop suffered poor seed set and fluctuating yield levels. The information on the association of different yield components, their influence and contribution to yield will largely benefit the breeders to evolve high yielding and stable varieties.

MATERIALS AND METHODS:

Forty inbreds of sunflower with diverse geographical orgin were chosen and raised at the Cotton and Millet Experiment Station, Kovilpatti. Seed yield and its nine components, viz. plant height, number of leaves, stem thickness, days to first flowering, days to 50 per cent flowering, days to maturity, diameter of head, setting percentage and weight of 100 seeds were studied and data were recorded on five randomly selected plants for each inbred in each of the three replications. The genotypic, phenotypic and environmental correlation coefficients were worked out (Johnson *et a* 1955). Path coefficient analysis as applied by Dewey and Lu (1959) was used to partition the genotypic correlation coefficients into direct and indirect effects.

RESULTS AND DISCUSSION:

The genotypic correlation coefficients (rg) were slightly higher than the phenotypic correlation coefficients (rp) (Table 1). The environmental effect (re) for all the characters was mostly nonsignificant and uniform. The genotypic correlation coefficent of seed yield was positive and highly significent for six out of nine characters studied. Among them, the mangitude of genotypic correlation was high for 100 seed weight, diameter of head and plant height followed by number of leaves and days to maturity. The remaining four characters were interrelated among themselves. Seed yield is a complex character and is dependent upon its components. Though the seed yield has high heritability it may not be prudent to depend upon this character alone in a breeding programme as it is highly influenced by environment. But the yield contributing component characters are less influenced by environment. So to improve the seed yield of sunflower it is advisable to go in for selection of the stable character viz. 100 seed weight, plant height,

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Table 1. Phenotypic (r_p) and environmental (r_e) correlation coefficients between different pairs of characters in sulflower

		No. of leaves	Stem thickness	Days to first flowering	Days to 50% flowering	Days to maturity	Diameter of head	Setting percentage	100 seed weight	Seed yield
'lant height	r_g	0.556**	0.148	0.459**	0.543**	0.547**	0.799**	0.082	0.408**	0.626**
	r_p	0.399**	0.113	0.227	0.245	0.493**	0.689**	0.054	0.328*	0.565**
	r_e	0.192	0.021	0.020	-0.146	-0.145	0.338	-0.079	0.134	0.084
umber of leaves	r_g		0.052	0.551**	0.488	0.615**	0.405**	0.283	0.097	0.536**
	r_p		-0.037	0.133	0.050	0.390*	0.333*	0.148	0.140	0.345**
	r_e		-0.139	-0.088	-0.215	-0.079	0.259	-0.045	0.192	0.030
Stem thickness	r_g			0.327*	0.492**	0.288	0.160	-0.121	0.218	0.085
	r_p			-0.028	0.069	0.212	0.173	-0.134	0.152	0.103
	r_e			-0.296	-0.280	-0.053	0.197	-0.166	0.050	0.188
Days to first flowering	r_g				0.710**	0.571**	0.272	0.120	-0.082	0.276
	r_p				0.713*	0.291	-0.013	0.039	-0.130	0.083
	r_e				0.715**	0.037	-0.269	-0.033	-0.181	-0.169
Days to Maturity	r_g					0.704**	0.337*	0.019	0.213	0.408**
	r_p					0.378*	0.064	-0.026	-0.028	0.137
	r_e					-0.016	-0.199	-0.085	-0.231	-0.265
Diameter of head	r_g						0.444**	0.154	0.096	0.619**
	r_p						0.346*	0.118	0.072	0.480**
	r_e						-0.116	-0.114	-0.011	0.069
Setting percentage	r_g							0.111	0.594**	0.685**
	r_p							0.047	0.518**	0.568**
	r_e							-0.118	0.383	0.175
100 seed weight	r_g								-0.039	0.138
	r_p								-0.066	0.120
	r_e								-0.125	0.045
										0.686**
										0.537**
										0.162

Residual effect = 0.474

Table 2. Direct and indirect effects of yield components on seed yield in sunflower

	Plant height	Number of leaves	Stem thickness	Days to first flowering	Days to 50% flowering	Days to maturity	Diameter of head	Setting percentage	100 seed weight	Total correlation with Y (Yield)
Plant height	0.042	0.121	-0.023	0.057	-0.069	0.184	0.048	0.0007	0.266	0.626
Number of leaves	0.024	0.217	-0.008	0.068	-0.062	0.207	0.024	0.003	0.063	0.536
Stem thickness	0.006	0.011	-0.157	0.040	-0.062	0.097	0.009	-0.001	0.142	0.085
Days to first flowering	0.019	0.012	-0.052	0.123	-0.090	0.192	0.016	0.001	-0.054	0.276
Days to 50%Maturity	0.023	0.106	-0.077	0.088	-0.127	0.237	0.020	0.0002	0.139	0.408
Days to Maturity	-0.023	0.134	-0.045	0.070	-0.089	0.336	0.027	0.001	0.063	0.519
Diameter of head	0.034	0.088	-0.025	0.034	-0.043	0.149	0.060	0.0009	0.387	0.684
Setting percentage	0.003	0.061	0.019	0.015	-0.002	0.052	0.007	0.0089	0.027	0.138
00 seed weight	0.017	0.021	-0.034	-0.010	-0.027	0.032	0.036	-0.0003	0.652	0.686

days to maturity and diameter of head which are highly correlated to yield. Singh *et al.* (1977) Varshney and Singh (1977) and Ayyasamy *et al.* (1977)reported that seed yield was positively correlated with head diameter. Plant height exhibited positive and highly significant correlation with seed yield, number of leaves, days to 50 per cent flowering, diameter of head and 100 seed weight in the present study. Similar findings were reported by Varshney and Singh (1977) and Chandra and Anand (1977). Percentage of seed set had no effect on other characters. Selection for plant height, seed weight, head diameter and days to maturity will be more effective for enhancing seed yield.

It has been well established that path coefficeients are better indices than mere phenotypic correlations (wright, 1921). In the path coefficient analysis carried out in the present study, the direct contribution of 100 seed weight to yield was maximum(Table 2). Comparatively, plant height and days to maturity appaer to contribute more to yield through other related characters rather than themselves directly. Shabana (1974) also reported that the most important traits influencing seed yield were 1000 seed weight, seed number and plant height. According to Velkov (1976), the diameter of head had the main effect on yield, but 1000 seed weight also had an important effect *viz.* head diameter.

The residual effect (0.474) in the present path analysis was slightly more, indicating the noninclusion of some more useful component characters. However, the maximum direct effect by 100 seed weight (0.652) is high enough to indicate the reliability of this trait as an important criterian for selection.

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