

Research Article**Character association and path analysis in sunflower (*Helianthus annuus* L.)**

H.C.Sowmya, Y.G.Shadakshari, K.J. Pranesh, Arpita Srivastava and B. Nandini

Abstract

The present study was undertaken during *Summer* 2009 at ZARS, GKVK, Bangalore. The material used in this study was provided by All India Co-ordinated Research Project on Sunflower, Bengaluru. The base material comprised of thirty eight sterility maintainer lines ('B' lines) and thirty eight fertility restorer lines ('R' lines). The studies on correlation and path coefficient analysis in sunflower (*Helianthus annuus* L.) showed that days to 50% flowering, days to maturity, plant height, head diameter, seed filling per cent, 100 seed weight, total dry matter per plant and oil content characters were positively and significantly correlated with seed yield per plant. Among these characters head diameter recorded maximum direct effect on seed yield per plant whereas all other characters recorded low direct effect. Seed filling per cent and plant height recorded maximum indirect effect on seed yield per plant through head diameter. The results of the study revealed that the character head diameter could be given emphasis for isolation of desirable genotypes, with high genetic potential for seed yield.

Keywords : sunflower, correlation, path analysis, direct and indirect effects

Introduction

Yield, a complex character, is influenced by several other characters known as yield contributing characters. These yield components are related among themselves and with yield either favorably or unfavorably. In general, in most of crops, the associations among yield components are reported to be undesirable thereby hindering the rapid progress that could be made. The path coefficient analysis, which is a standardized partial regression analysis, permits further separation of correlation coefficients to measure direct and indirect effects. In the present study, an attempt was made to investigate the correlation and path coefficient analysis in sunflower genotypes.

Material and methods

Seventy six genotypes comprising 38 B and 38 R lines were evaluated in a randomized block design with two replications during summer season of 2009 at ZARS, GKVK, Bangalore. Each genotype was grown in single row of 3m length. A spacing of 60cm

between rows and 30cm between plants within a row was adopted. Two or three seeds were dibbled in each hill to facilitate better emergence and to provide uniform stand of plants. Thinning was attended at 10-12 days after sowing to retain one healthy seedling per hill and all the recommended agronomic practices for the crop in the region under protective irrigation were followed during the crop growth period, to raise a good healthy crop.

The characters studied were days to 50% flowering, days to maturity, plant height, head diameter, seed filling per cent, 100 seed weight, total dry matter per plant, oil content and seed yield per plant. Phenotypic (r_p), genotypic (r_g) correlation coefficients were calculated using the formulae suggested by Al-Jibouri *et al.* (1958). Standard path coefficients or standardized path regression coefficients were obtained by solving the set of 'p' simultaneous equations through the use of 'Dolittle technique' as described by Goulden (1959).

Results and discussion

Character association studies indicated that days to 50% flowering, days to maturity, plant height, head diameter, seed filling percentage, 100 seed weight,

total dry matter per plant, oil content had significant and positive correlation with seed yield per plant. Among these head diameter (0.980), seed filling per cent (0.882), plant height (0.667) and total dry matter per plant (0.554) had relatively greater correlations with seed yield compared to all other characters (Table 1).

This is in accordance with the reports of Lakshmanaiah (1980), Tecklewold *et al.* (2000) and Dagustu (2002). The path analysis revealed that the character head diameter had the maximum direct effect on seed yield per plant whereas all other characters showed low positive direct effect on seed yield. Thus, the character head diameter which showed high positive correlation and high direct effect with seed yield per plant had a higher influence on seed yield. seed filling percentage and plant height recorded maximum indirect effect through head diameter (Table 2). Genetic correlations between different characters on the plant due to linkage, pleiotropy or developmentally induced functional relationships. So, selection of these characters for seed yield will be rewarding in future. On the other hand, a maximum direct effect of head diameter on

seed yield was observed. Hence, it may be concluded that this trait contributed maximum to higher seed yield compared to other characters, thus simultaneous selection for this character is expected to improve seed yield in sunflower.

References

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**Table 1. Estimates of correlation coefficients between seed yield and yield contributing traits in B and R lines of sunflower (*Helianthus annuus* L.)**

Character	Days to maturity	Plant height (cm)	Head diameter (cm)	Seed filling per cent	100 Seed weight (g)	Hull content (%)	Volume weight (g/100cc)	Total dry matter per plant (g)	Oil content (%)	Seed yield per plant (g)
Days to 50% flowering	0.982**	0.473**	0.389**	0.363**	0.151	0.098	0.077	0.314**	0.257*	0.374**
Days to maturity		0.456**	0.373**	0.360**	0.16	0.12	0.082	0.350**	0.264*	0.358**
Plant height (cm)			0.656**	0.579**	0.307**	-0.089	0.028	0.672**	0.320**	0.667**
Head diameter (cm)				0.899**	0.375**	-0.025	0.074	0.537**	0.241*	0.980**
Seed filling per cent					0.299*	-0.059	0.027	0.535**	0.149*	0.882**
100 Seed weight (g)						0.053	0.193	0.325**	-0.039	0.385**
Hull content (%)							0.232*	-0.08	-0.226*	-0.039
Volume weight (g/100cc)								-0.009	0.132	0.099
Total dry matter per plant (g)									0.281*	0.554**
Oil content (%)										0.261*

** Significance at 0.01 probability level *Significance at 0.05 probability level

Table 2. Path coefficient analysis for seed yield per plant in B and R lines of Sunflower (*Helianthus annuus* L.)

Character	Days to 50% flowering	Days to maturity	Plant height (cm)	Head diameter (cm)	Seed filling per cent	100 seed weight (g)	Total dry matter/plant (g)	Oil content (%)	Correlation coefficient with seed yield (r)
Days to 50% flowering	0.058	-0.082	0.014	0.358	0.008	0.003	0.007	0.007	0.374**
Days to maturity	0.057	-0.084	0.014	0.344	0.008	0.004	0.008	0.007	0.358**
Plant height (cm)	0.028	-0.038	0.03	0.604	0.013	0.007	0.015	0.009	0.667**
Head diameter (cm)	0.023	-0.031	0.02	0.921	0.02	0.008	0.012	0.006	0.980**
Seed filling per cent	0.021	-0.03	0.018	0.828	0.023	0.007	0.012	0.004	0.882**
100 seed weight (g)	0.009	-0.013	0.009	0.345	0.007	0.022	0.007	-0.001	0.385**
Total dry matter/plant(g)	0.018	-0.029	0.02	0.495	0.012	0.007	0.023	0.008	-0.039
Oil content (%)	0.015	-0.022	0.01	0.222	0.003	-0.001	0.006	0.027	0.099

Residual effect= 0.0378 Bold: Direct effect, Normal: Indirect effect

** Significance at 0.01 probability level *Significance at 0.05 probability level