

CORRELATION AND PATH ANALYSIS IN SUNFLOWER (*HELIANTHUS ANNUUS L.*)

R. Vidhyavathi, P. Mahalakshmi, N. Manivannan and V. Murulidharan

Department of Oilseeds,
Tamil Nadu Agricultural University, Coimbatore - 641 003, India

ABSTRACT

Twenty nine sunflower genotypes were evaluated to study the association between characters through correlation and path analysis. The correlation study revealed that seed yield/plant had significant positive correlation with head diameter followed by plant height. The path analysis indicated that the characters plant height and head diameter had high and medium positive direct effect on seed yield respectively. Hence plant height and head diameter can be taken as selection indices for sunflower crop improvement programme. Non association of seed characters and oil content (seed and kernel) indicated the possibility of selection for non-oilseed or confectionery types.

Yield is a complex character and influenced by several other yield component characters. The knowledge of association of several characters with yield and among themselves will be very essential for planning a successful breeding programme. The actual contribution of each character can be provided by partitioning of correlation coefficients into its direct and indirect effects. The present study was undertaken to assess the association between yield and yield components and also path analysis of seed yield per plant in sunflower (*Helianthus annuus L.*).

Twenty nine genotypes of sunflower were evaluated in randomized block design with two replications during *kharif* 2001 at the Department of Oilseeds, Tamil Nadu Agricultural University, Coimbatore. The spacing of 60 x 30 cm was adopted. Normal cultural practices were followed through out the crop growth. Biometrical observations were taken on live randomly selected plants in each genotype for the following 12 characters viz., days to first flowering, days to 50 % flowering, plant height (cm), head diameter (cm), volume weight(g), 100-seed weight (g), hull content (%), seed length (mm), seed breadth (mm), kernel oil content (%), seed oil content (%) and seed yield per plant (g). The kernel and seed oil content (%) were estimated using oxford 4000

NMR oil analyzer. Correlation among yield and yield components were worked out as per the standard method. The direct and indirect effects of 11 component characters on seed yield/plant were estimated by path coefficient analysis (Dewey and Lu, 1957).

Genotypic correlation coefficients were presented in Table 1. Seed yield/plant had significant positive correlation with head diameter (0.3296) and plant height (0.2882). This indicated that the seed yield was highly influenced by head diameter followed by plant height. Similar results were obtained by Mogali and Virupakshappa (1994) and Narayana and Patel (1998). But Nirmala *et al.* (1999) observed significant positive correlation between head diameter and seed yield/plant and positive non significant correlation between plant height and yield/plant. Significant positive correlation of seed yield/plant with 100-seed weight was observed by Pathak and Dixit (1990), Chidambaram and Sundaresan (1990) and Nirmala *et al.* (1999). Marinkovic (1992) observed significant positive correlation of seed yield/plant with head diameter. 1000-seed weight, volume weight and seed oil content (%). The positive significant correlation of seed yield/plant with head diameter and kernel oil content was observed by Rao (1987). All other characters had non significant

Table 1. Correlation co-efficient for yield and yield components

Characters	Days to first flowering	Days to 50% flowering	Plant height (cm)	Head diameter (cm)	Volume weight (g)	100-seed weight (g)	Hull content (%)	Seed length (mm)	Seed breadth (mm)	Kernel oil content (%)	Seed oil content (%)
Days to 50 % flowering	0.9215**	1									
Plant height (cm)	0.3472**	0.4493	1								
Head diameter (cm)	0.0424	0.1031	0.4717**	1							
Volume weight (g)	0.3540**	0.3247*	0.2142	-0.0267	1						
100-seed weight (g)	0.0688	0.0300	0.3471**	0.1504	0.1171	1					
Hull content (%)	-0.2316	-0.2862*	-0.2734*	-0.2145	-0.2235	0.1336	1				
Seed length (mm)	0.2273	0.2240	0.3318**	0.0080	-0.0688	0.4709**	0.1339	1			
Seed breadth (mm)	0.1042	0.1374	0.3182*	0.0678	0.0279	0.5861**	-0.0368	0.4848**	1		
Kernel oil content (%)	0.0620	0.0995	0.2460	0.2978*	0.1240	0.4602**	-0.3613**	0.2485	0.4560**	1	
Seed oil content (%)	0.3100**	0.3304**	0.0968	-0.0017	0.4631**	-0.0058	-0.3899**	-0.0799	0.0009	0.2663* 1	
Seed yield/plant	-0.0742	-0.0287	0.2882	0.3296**	0.0187	0.0991	-0.0436	-0.0504	-0.0398	0.0474	0.0854

* Significant at 5 % level;

** Significant at 1% level.

correlation with seed yield/plant. Lal *et al.* (1997) reported the non significant correlation of seed yield/plant with days to 50 % flowering and 100-seed weight. Non significant correlation between seed yield/plant and oil content was recorded by Chidambaram and Sundaresan (1990).

The information of the inter-association among the yield components shown the nature and extent of relationship with each other. In the present study, days to first flowering had significant positive correlation with days to 50 per cent flowering (0.9215), plant height (0.3472), volume weight (0.3540) and seed oil content (0.3100). Nirmala *et al.* (1999) also observed the significant positive correlation of days to first flowering with each of days to 50 per cent flowering, plant height and 100-seed weight.

Days to 50 per cent flowering had significant positive correlation with plain height (0.4493), seed oil content (0.3304) and volume weight (0.3247) and significant negative association with hull content (%) (-0.2862). The significant positive correlation of days to 50 per cent flowering with days to first flowering, plant height, head diameter, 100-seed weight and hull content was observed by Nirmala *et al.* (1999).

Plant height had significant positive correlation with head diameter (0.4717), 100-seed weight (0.3471), seed length (0.3318) and seed breadth (0.3182) and significant negative correlation with hull content per cent (-0.2734). Significant positive and negative correlation of plant height with hull content and seed oil content per cent respectively was observed by Nirmala *et al.* (1999). Lal *et al.* (1997) reported the positive significant association between plant height and days to 50 per cent flowering. Head diameter had significant positive correlation with kernel oil content (0.2978). Positive significant association between head diameter and seed

oil content was reported by Marinkovic (1992). Volume weight had significant positive correlation with seed oil content (0.4631).

Hundred seed weight had significant positive correlation with seed length (0.4709), seed breadth (0.5861) and kernel oil content (0.4602). Hull content (%) had significant negative correlation with kernel oil content (-0.3613) and seed oil content (-0.3899). Non significant negative correlation between hull content and seed oil content was observed by Nirmala *et al.* (1999). Seed length and seed breadth had significant positive correlations with seed breadth (0.4848) and kernel oil content (0.4560) respectively. Kernel oil content had significant positive correlation with seed oil content (0.2663).

The correlation analysis revealed that days to 50 per cent flowering, plant height, volume weight and seed oil content are important selection indices for seed yield/plant. It may also be noted that the seed characters namely 100-seed weight, seed length and seed breadth and other characters namely seed oil content and kernel oil content had no significant association with seed yield. Nirmala *et al.*, 1999 observed the non significant association of seed oil content with seed yield/plant.

The genotypic correlation were partitioned into direct and indirect effects (Table 2). In the present study the estimated residual effects 0.4930 has indicated the inadequacy of the characters selected for study. So more characters namely harvest index and other physiological characters should be included.

The present analysis revealed that plant height (0.3098) and head diameter (0.2203) recorded high and medium levels of direct effect on seed yield/plant. The high direct effects of plant height and head diameter on yield/plant was also observed by Mogali and Virupakshappa (1994) and Nirmala *et al.* (1999). Badwal *et al.* (1993) observed high

Table 2. Path coefficient analysis showing the direct and indirect effects of the yield components in sunflower

Characters	Days to first flowering	Days to 50% flowering	Plant height (cm)	Head diameter (cm)	Volume weight (g)	100-seed weight (g)	Hull content (%)	Seed length (mm)	Seed breadth (mm)	Kernel oil content (%)	Seed oil content (%)	Correlation coefficient with seed yield/plant
Days to first flowering	<u>-0.1562</u>	-0.0270	0.1075	0.0093	-0.0181	0.0078	-0.0154	-0.0201	0.0124	-0.0046	0.0549	-0.0742
Days to 50 % flowering	-0.1439	<u>-0.0293</u>	0.1392	0.0227	-0.0166	0.0034	-0.0191	-0.0198	0.0164	-0.0074	0.0585	-0.0287
Plant height (cm)	-0.0542	-0.0131	<u>0.3028</u>	0.1039	-0.0109	0.0396	-0.0182	-0.0294	0.0379	-0.0184	0.0171	0.2882*
Head diameter (cm)	-0.0066	-0.0030	0.1461	<u>0.2203</u>	0.0014	0.0172	-0.0143	-0.0007	0.0081	-0.0222	-0.0003	0.3296**
Volume weight (g)	-0.0553	-0.0095	0.0664	-0.0059	<u>-0.0510</u>	0.0134	-0.0149	0.0061	0.0033	-0.0093	0.0820	0.0187
100-seed weight (g)	-0.0107	-0.0009	0.1075	0.0331	0.0060	<u>0.1141</u>	0.0089	-0.0417	0.0699	-0.0344	-0.0010	0.0991
Hull content (%)	0.0362	0.0084	-0.0847	-0.0472	0.0114	0.0152	<u>0.0667</u>	-0.0119	0.0044	0.0270	-0.0691	-0.0436
Seed length (mm)	-0.0355	-0.0066	0.1028	0.0018	0.0035	0.0537	0.0089	<u>-0.0886</u>	0.0578	-0.0186	-0.0142	-0.0504
Seed breadth (mm)	-0.0163	-0.0040	0.0986	0.0149	-0.0014	0.0669	-0.0025	0.0429	<u>0.1192</u>	-0.0341	0.0002	-0.0398
Kernel oil content (%)	-0.0097	-0.0029	0.0762	0.0656	-0.0063	0.0525	-0.0241	-0.0220	0.0543	<u>-0.0747</u>	0.0472	0.0474
Seed oil content (%)	-0.0484	-0.0097	0.0300	-0.0004	-0.0236	-0.0007	-0.0260	0.0071	0.0001	-0.0199	<u>0.1771</u>	0.0854

Underlined figures denote the direct effects;

Residual effect = 0.4930.

positive direct effects of oil content, 100-seed weight and head diameter on oil yield. Through plant height all the characters except hull content had positive indirect effects on seed yield/plant. Hull content (%) exerted negative direct effect on seed yield/plant through plant height.

From the forgoing discussion, it may be concluded that head diameter and plant height can be used as selection indices in

sunflower crop improvement programmes. Moreover the seed characters; seed length, seed breadth and 100-seed weight and oil content (both seed and kernel) had no association with seed yield. Hence simultaneous improvement through selection for non-oilseed or confectionery types with bold seededness, seed yield is possible in sunflower breeding programme.

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