



## Character Association and Path Analysis for Seed Yield in Sunflower (*Helianthus Annuus L.*)

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### ABSTRACT

Character association and path coefficient studies were carried out on 64 genotypes of sunflower, during the season *Rabi*-2009 and the genetic material comprised of EC-601609 to EC-601702 and two checks *viz.*, DRSF-108, 113. Seed yield was positively correlated with number of filled seeds/head, total number of seeds/head, head diameter and seed filling per cent. The results of the study revealed that selection based on number of filled seeds/head, total number of seeds/head, head diameter and seed filling per cent would increase seed yield. Path analysis indicated that total number of filled seeds/head had the highest positive direct effect followed by 100-seed weight on seed yield.

**Key words :** Path analysis, Sunflower, Yield.

The cultivated sunflower, *Helianthus annuus L.* has emerged as one of the major edible vegetable oilseeds crop in the world. To initiate any breeding programme, information on association of yield with its component yield and among themselves and the extent by which these are influenced by the environment, are essential. The various yield components often exhibit considerable degree of association, which maybe due to linkage, pleiotrophy or physiological association. Path co-efficient analysis measures the direct influence of a variable upon yield and permits the partitioning of the correlation coefficient into components of direct and indirect effects. The present study was, therefore conducted to investigate the nature of correlations by path analysis for seed yield.

### MATERIAL AND METHODS

The material for the present study comprised of 62 germplasm accessions of sunflower (EC-601609 to EC-601702) and two checks *viz.*, DRSF-108, DRSF-113. The experiment was conducted at Directorate of Oilseeds Research, Hyderabad during *Rabi* 2009. Each accession was sown in two rows 4 m length with spacing of 60 cm between rows and 30 cm between plants. The experiment a laid out in Simple Lattice Design with two replications. In each accession, five plants were randomly selected and used for collection of data on yield and yield related characters. The correlations were computed based on Fisher and Yates, (1967). The path co-efficient analysis at genotypic level was computed following Dewey and Lu, (1959).

### RESULTS AND DISCUSSION

The correlation coefficients among all the twelve traits are presented in Table 1. Seed yield was significantly associated with number of filled seeds/head, total seeds/ head, head diameter, seed filling per cent, 100-seed weight and plant height, while unfilled seeds/head and oil content had no correlation. This indicated that seed yield can be improved by making selection on the basis of number filled of seeds/head, total number of seeds/head, head diameter, seed filling per cent and 100-seed weight. Number filled seeds/head exhibited significant positive association with total number of seeds/head, head diameter, seed filling percent and plant height.

Total seeds/head exhibited significant positive association with filled seeds/head, head diameter, seed filling per cent and plant height. Head diameter exhibited significant positive association with filled seeds/head, total number of seeds/head, seed filling percent and plant height. Seed filling per cent exhibited significant positive association with filled seeds/head, head diameter, total number of seeds/head and plant height. 100-seed weight exhibited significant positive association with head diameter, filled seeds/head, seed filling per cent and stem diameter. Plant height exhibited significant positive association with head diameter, stem diameter, seed filling per cent, filled seeds/head and total seeds/head. Unfilled seeds/head exhibited significantly positive association with total number of seeds/head, while negative association with seed filling per cent, plant height and 100-seed weight.



Table 2. Estimation of path co-efficient between seed yield and yield component characters in 64 sunflower genotypes

Character	Days to 50% flowering	Days to maturity	Plant height (cm)	Stem diameter (cm)	Head diameter (cm)	No. of filled seeds/head	No. of unfilled seeds/head	Total no of seeds/head	Seed filling per cent	100-seed weight (g)	Oil content (%)	Hull content (%)	Seed yield/plant
Days to 50% flowering	0.040	0.010	0.010	0.012	-0.001	-0.000	-0.000	-0.0005	0.000	0.002	-0.004	-0.002	0.047*
Days to maturity	-0.006	-0.024	-0.007	-0.004	-0.002	-0.003	-0.001	-0.0039	-0.004	0.002	0.001	0.001	0.055
Plant height (cm)	-0.007	-0.010	-0.031	-0.020	-0.020	-0.017	0.005	-0.0160	-0.017	-0.007	-0.000	-0.007	0.531*
Stem diameter (cm)	0.005	0.003	0.011	0.017	0.009	0.007	-0.002	0.0065	0.007	0.005	-0.002	0.002	0.440*
Head diameter (cm)	0.000	-0.001	-0.012	-0.010	-0.019	-0.016	0.003	-0.0159	-0.014	-0.007	0.000	-0.005	0.843**
Filled seeds/head	-0.035	0.422	1.640	1.209	2.553	2.914	-0.245	2.8434	2.375	0.961	-0.127	0.591	0.910**
Unfilled Seeds/head	-0.001	0.029	-0.071	-0.051	-0.062	-0.032	0.380	0.0518	-0.222	-0.058	0.027	0.017	-0.145
Total no. of seeds/ head	0.027	-0.325	-1.054	-0.779	-1.704	-1.996	-0.278	-2.0461	-1.394	-0.596	0.044	-0.428	0.870**
Seed filling (%)	-0.001	-0.014	-0.051	-0.037	-0.068	-0.073	0.052	-0.0612	-0.089	-0.026	0.004	-0.010	0.755**
100-seed weight (g)	0.028	-0.032	0.100	0.117	0.163	0.130	-0.060	0.1153	0.118	0.395	0.013	0.079	0.660**
Oil content (%)	-0.003	-0.001	0.000	-0.004	-0.001	-0.001	0.002	-0.0006	-0.001	0.001	0.027	0.000	-0.015
Hull content (%)	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.000	-0.0012	-0.000	-0.001	-0.000	-0.0059	0.231

\*5% level of significance

\*\* 1 % level of significance

Similar results were reported by other workers viz., Chikkadevaiah *et al.* (2002), Madhavilatha *et al.* (2004), Sridhar *et al.* (2005).

A path coefficient analysis that partitions the correlation coefficient into direct and indirect effects was worked out and has been presented in Table 2. Among the twelve characters the maximum direct effect on seed yield /plant was that of number of filled seeds/head, followed by 100-seed weight, days to 50 per cent flowering, oil content per cent and stem diameter. While days to maturity, plant height, head diameter, total number of seeds/head, seed filling per cent, hull content recorded negative direct effects on seed yield/plant.

Days to 50 per cent flowering recorded indirect positive effect through stem diameter, days to maturity, plant height and 100-seed weight while it exhibited indirect negative effect through oil content, hull content and head diameter. Days to maturity exhibited indirect positive effect through 100-seed weight, oil content and hull content while it exhibited indirect negative effect through plant height, days to 50 per cent flowering , stem diameter , seed filling per cent, filled seeds/head, total number of seeds/head, head diameter and unfilled seeds/head. Plant height recorded indirect positive effect through unfilled seeds/head while it exhibited indirect negative effect through stem diameter, head diameter, seed filling per cent, filled seeds/head, total number of seeds/head, days to maturity, days to 50 per cent flowering, 100-seed weight and hull content. Stem diameter exhibited indirect positive effect through plant height, head diameter, filled seeds/head, seed filling per cent, total number of seeds/head, days to 50 per cent flowering, 100-seed weight, days to maturity and hull content while it exhibited indirect negative effect through oil content and unfilled seeds/head. Head diameter recorded indirect positive effect through unfilled seeds/head while it exhibited indirect negative effect through filled seeds/head, total number of seeds/head, seed filling per cent, plant height, stem diameter, 100-seed weight, hull content and days to maturity.

Filled seeds/head exhibited indirect positive effect through total number of seeds/head, head diameter, seed filling per cent, plant height, stem diameter, 100-seed weight, hull content and days to maturity while it exhibited indirect negative association through unfilled seeds/head, oil content and days to 50 per cent flowering. Total number of seeds/head exhibited indirect positive effect through oil content, days to 50 per cent flowering while it exhibited indirect negative association filled seeds/head, head diameter, seed filling per cent, plant height, stem diameter, 100-seed weight, hull content, days to maturity and unfilled seeds/head. Unfilled seeds/head exhibited indirect positive effect through total number of seeds/head, days to

maturity, oil content and hull content while it exhibited indirect negative association seed filling per cent, plant height, head diameter, 100-seed weight, stem diameter, filled seeds/head, and days to 50 per cent flowering.

Seed filling per cent exhibited indirect positive effect through unfilled seeds/head, oil content while it exhibited indirect negative association filled seeds/head, head diameter, total number of seeds/head, plant height, stem diameter, 100-seed weight, days to maturity, hull content and days to 50 per cent flowering. 100-seed weight exhibited indirect positive effect through head diameter, filled seeds/head, seed filling per cent, stem diameter, total number of seeds/head, plant height, hull content, days to 50 per cent flowering and oil content, while it exhibited indirect negative association unfilled seeds/head and days to maturity. Oil content exhibited indirect positive effect through unfilled seeds/head, 100-seed weight while it exhibited indirect negative association stem diameter, days to 50 per cent flowering, head diameter, seed filling per cent, days to maturity and filled seeds/head. Similar results were reported by Ayub Khan (2001), Vidhyavathi *et al.* (2005).

In conclusion, selection for higher yield in sunflower should be based on number of filled seeds/head, total number of seeds/head, head diameter, seed filling per cent, 100-seed weight and seed yield/plant.

#### LITRETURE CITED

- Ayub Khan 2001** Yield performance, heritability and inter relationship in some quantitative traits in sunflower. *Helia*, 84: 35-40.
- Chikkadevaiah, Sujatha H L and Nandini 2002** Correlation and path analysis in sunflower. *Helia*, 25 (37): 109-117.
- Dewey J R and Lu K H 1959** Correlation and Path coefficient analysis of components of crested wheat grass seed production. *Agronomy Journal*, 51: 515-518.
- Fisher R A and Yates F 1967** Statistical tables for biological, agricultural and medical research, longmen group limited, London.
- Madhavi Latha K, Reddy A V V and Reddy G L 2004** Studies on genetic nature of yield and its components in sunflower (*Helianthus annuus* L.). *Journal of Oilseeds Research*, 21 (2): 252-256.
- Sridhar V, Dangi K S, Reddy A V V and Kumar S S 2005** Character association and path analysis in sunflower (*Helianthus annuus* L.). *Crop Research*, Hisar 30 (1): 63-67.
- Vidhyavathi R, Mahalakshmi P, Manivannan N and Muralidharan V 2005** Correlation and path analysis in sunflower (*Helianthus annuus* L.). *Agricultural Science Digest*, 25(1): 6-10.

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