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GENETIC ADVANCE AND PATH ANALYSIS IN THE F_2 GENERATION OF AN INTRASUBSPECIFIC CROSS IN GROUNDNUT

V. MANOHARAN, R. SETHUPATHI RAMALINGAM AND S. KALAIMANI

Regional Research Station, Vriddhachalam, Tamil Nadu 606001

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ABSTRACT

In the F_2 population of cross J1 x Chico, dry matter production and number of primary branches recorded the highest and lowest GCV, respectively. Pod yield was positively correlated with pod number, pod weight, plant height, number of primaries, dry matter production and harvest index (HI). The HI was negatively associated with plant height and dry matter production. Path analysis revealed that number and weight of pods and dry matter production had higher positive direct effects on pod yield.

Key words: Genetic advance, path analysis, F_2 generation, groundnut.

Improvement in groundnut yield depends on the nature and extent of genetic variability, heritability and genetic advance in the base population on which selection is exercised. Besides, the information on the nature of association between yield and its components helps in simultaneous selection for many characters associated with yield improvement. In the present study, such analysis has been carried out in the F_2 population of an intrasubspecific cross of groundnut.

The F_2 population of J1 x Chico (*Arachis hypogaea* L. ssp. *fastigiata* var. *vulgaris*) was raised in randomised block design with four replications along with the parents at the Regional Research Station, Vriddhachalam. A total of 100 plants for each parent and F_2 segregants was planted in each replication. Observations were recorded at maturity on 50 randomly selected plants in each replication on plant height, number of primary branches and matured pods, dry matter production, harvest index (HI), 10-pod weight, and pod yield. The coefficients of variability, heritability and genetic advance were estimated according to Mahmud and Kramer [1] and genetic advance was calculated as per Lush [2]. The simple correlation coefficients were subjected to path analysis [3]. The frequency of desirable segregants was worked out from the observed plants.

The coefficients of variability, heritability and genetic advance together with the percentage of desirable segregants are presented in Table 1. Dry matter production exhibited the highest (47.8) genotypic coefficient of variation (GCV), while number of primary branches showed the lowest GCV (13.4). Kushwaha and Tawar [4] also obtained lower GCV for primary branches. Plant height, dry matter production, pod weight and yield were highly heritable, showing that they are less influenced by the environment. Higher heritability coupled with higher genetic advance for dry matter production, plant height and pod yield indicated that these characters are controlled by additive gene action and phenotypic selection for these characters will be effective [5]. Higher heritability and GA for pod weight [6], plant height and pod yield [7] have already been reported. It was found that 10-15% of the F_2 segregants were in the desirable direction for pod number, pod weight and yield, indicating that high yielding lines can also be obtained in bunch x bunch crosses [8].

Table 1. Heritability, genetic advance and the frequency of desirable segregants in groundnut

Character	Range	Mean	PCV	GCV	Heritability (%)	GA	GA as % of mean	Frequency of desirable segregants (%)		
								(1)	(2)	(3)
Plant height (cm)	15.0–75.0	38.5	33.0	29.6	80.5	21.1	54.8	—	—	—
No. of primaries	4.0–10.0	5.3	28.3	13.4	22.9	0.7	13.2	—	—	—
Dry matter production (g)	6.0–83.0	26.5	56.3	47.8	72.1	22.1	83.5	—	—	—
Harvest index (%)	9.1–60.9	32.5	31.2	23.5	56.5	11.8	36.3	—	—	—
Pod number	6.0–49.0	23.0	38.4	25.2	42.9	7.8	33.9	10.5	3.5	—
10-pod weight (g)	1.8–8.4	5.2	24.4	19.8	65.6	1.7	33.0	12.5	3.0	—
Pod yield (g)	2.0–30.5	11.8	47.0	37.5	63.9	7.3	61.8	10.5	2.0	1.0

(1) $> \bar{x} + \sigma$ but $< \bar{x} + 2\sigma$; (2) $> \bar{x} + 2\sigma$ but $< \bar{x} + 3\sigma$; and (3) $> \bar{x} + 3\sigma$.
Note. The dashes indicate absence of analysis.

Pod yield was positively correlated with all the characters studied (Table 2). Positive association of pod yield with pod number [6], pod weight, plant height and number of primaries [9] have already been reported. Among the component characters, pod number and weight were positively correlated with plant height, number of primaries, dry matter production and HI. Plant height and number of primaries were also positively associated with dry matter production. The HI was negatively correlated with plant height and dry matter production. The results of path analysis (Table 3) revealed that pod number and weight and dry matter production had higher positive direct effect (0.650, 0.422 and 0.225, respectively) on the pod yield. Both dry matter production and HI has positive indirect

Table 2. Simple correlation coefficients in groundnut

Characters	No. of primaries	Dry matter production	HI	Pod No.	10-pod weight	Pod yield
Plant height	–0.05	0.47**	–0.17*	0.21**	0.31**	0.36**
No. of primaries		0.28**	–0.12	0.31**	0.04	0.28**
Dry matter production			–0.51**	0.55**	0.29**	0.64**
HI				0.23**	0.20**	0.26**
Pod No.					0.04	0.83**
10-pod weight						0.55**

*, ** Significant at P = 0.05 and 0.01, respectively.

effects, via pod number, on yield. Bhagat et al. [10] also found that pod number and weight had higher positive direct effects on yield. Therefore selection for dry matter production, number and weight of pods will be helpful in the improvement of yield in groundnut by virtue of their positive association and direct effects on yield.

Table 3. Direct (in bold) and indirect effects

Character	Plant height	No. of primaries	DMP	HI	Pod No.	10-pod wt.	Correlation with yield
Plant height	0.11	–0.001	0.105	–0.026	0.139	0.130	0.358**
No. of primaries	–0.001	0.021	0.063	–0.018	0.201	0.016	0.283**
DMP	0.005	0.006	0.225	–0.078	0.355	0.122	0.635**
HI	–0.002	–0.003	–0.116	0.151	0.147	0.083	0.261**
Pod No.	0.002	0.007	0.123	0.034	0.650	0.019	0.835**
10-pod wt.	0.003	0.001	0.065	0.030	0.029	0.422	0.550**

Residual effect = 0.181, **Significant at P = 0.01.

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