

Genotypic and Phenotypic Path Analysis for Yield and Yield Components in Groundnut (*Arachis hypogea*)

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Groundnut is known to be “king of oilseed crop” also referred as peanut or monkey-nut (*Arachis hypogea*) belongs to the family leguminosae. A field experiment was conducted during *kharif* 2010 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad. 268 Recombinant inbred lines (RILs) were developed from the cross TAG 24 x GPBD 4. Path analysis was helped to study the extent and nature of direct and indirect effects of yield contributing characters and developmental traits on pod yield. The characters which had positive direct effect with high magnitude were oil content and test weight. The characters which had positive direct effect with lower magnitude were seed phosphorous content and shelling percentage at phenotypic level. Path coefficient analysis indicated that test weight had direct effect and indirect effect on pod yield.

Keywords: Groundnut, seed phosphorous content, yield.

Groundnut also referred as peanut or monkey-nut (*Arachis hypogea*) is the most important oilseed crop of tropical subtropical and temperate regions of the world. India ranks second in the world in groundnut production. It is a valuable cash crop cultivated by millions of small farmers, because of its economic and nutritional value. It is an annual legume crop, grown mainly for quality edible oil (40- 50%) and easily digestible protein (25%) in the seeds. Pod growth and development occupy an important position in determining the final quality and economic yield in groundnut crop. It is known as “king of oilseed crop” is believed to be native of Brazil (South America) and belongs to the family leguminosae and sub-family papilionaceae and it is self-pollinated.

The role of seed phosphorus is that a plant seed contains a store of the nutrients necessary to keep its embryo alive and to provide the embryo with essential nutrient elements when it germinates and starts to grow. Seed phosphorus directly effects plant shoot and root growth only during the early stages of growth of the embryo and the seedling (Mike Bolland *et al.*, 2006).

Variability studies are the basic studies to assess the genotypes for their variation in quantitative and qualitative characters. The extent of the genetic and non-genetic components of variation formulates proper breeding programme to reach the goal. More variability in characters indicates the scope for selection of genotypes for further genetic studies (Khote *et al.*, 2009). Recently, it has been indicated that there is a variation in seed P content in groundnut genotypes (Gupta *et al.*, 2010).

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Pod yield is the ultimate economic product in groundnut, which is determined mainly by pod weight and the number of pods per unit area. Most of the yield component shows a direct influence on pod yield (Natarajarathnam, 1979).

MATERIALS AND METHODS

A field experiment was conducted during *kharif* 2010 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to assess the Genotypic and phenotypic path analysis for yield and yield components in Groundnut.

Recombinant inbred lines (RILs) were developed from the cross TAG 24 x GPBD 4. These comprises of 268 RILs which segregated for agronomic trait, foliar disease reaction, nutritional and oil quality traits (Gowda *et al.* 2002). A set of 268 RILs were evaluated for quantitative traits in a randomized complete block design (RCBD) with two replications with 30X10cm spacing under field condition. Three plants from each line were taken for recording the physiological, biochemical and yield parameters. Phosphorus content in plant sample was determined by digestion of the plant sample and with the vanadomolybdate yellow colour (Jackson, 1973) method.

Path analysis was helped to study the extent and nature of direct and indirect effects of yield contributing characters and developmental traits on pod yield.

Directs effects of various characters on pod yield

Four characters out of six had positive and directs effects on pod yield at phenotypic level. The characters which had positive direct effect with high magnitude were oil content and test weight. The characters which had positive direct effect with lower magnitude were seed phosphorous content and shelling percentage at phenotypic level. The characters which had negative direct effects with pod yield were SPAD at 60 days after sowing and with SPAD at 90 days after sowing.

Whereas at genotypic level, out of six parameters only four characters had positive directs effects on pod yield. The characters which had positive direct effect with high magnitude were oil content and test weight. The characters which had positive direct effect with lower magnitude were

seed phosphorous content and shelling percentage at phenotypic level.

Indirect effects of various characters on pod yield

SPAD at 60 days after sowing had negative indirect influence on grain yield at phenotypic level and genotypic level through SPAD at 90 days after sowing, seed phosphorous content, shelling percentage and 100 seed weight. It had positive influence on pod yield through the characters oil content.

SPAD at 90 days after sowing had positive and indirect influence on pod yield through seed phosphorous content and test weight. Its influence on pod yield was observed to be in negative direction through SPAD at 60 days after sowing, oil content, and shelling percentage both the level.

This character had positive indirect influence on pod yield through test weight, SPAD at 60 days after sowing and shelling percentage. While the character SPAD at 90 days after sowing and oil content had negative indirect influence but on pod yield at phenotypic and genotypic level.

Oil content had negative indirect influence on grain yield at phenotypic and genotypic level through SPAD at 60 days after sowing, seed phosphorous content and test weight. It had positive and indirect influence on pod yield through SPAD at 90 days after sowing, shelling percentage.

Shelling percentage had positive indirect influence on pod yield through SPAD at 60 days after sowing, SPAD at 90 days after sowing, seed phosphorous content, oil content and 100 seed weight both at phenotypic and genotypic level.

Test weight had positive indirect influence on pod yield through seed phosphorous content and shelling percentage. It influences pod yield negatively through SPAD at 90 days after sowing and oil content both at phenotypic and genotypic level.

DISCUSSION

Path coefficient analysis is a statistical device developed by Wright (1921). The analysis takes into an account the cause and effect relation between the variable and is unique in partitioning the association into direct and indirect effect through other independent variables. Path

Table 1. Genotypic and phenotypic path analysis for yield and yield components in 268 RILs in groundnut

Parameters		SPAD 60 DAS	SPAD 90 DAS	Seed P content (%)	Oil content (%)	Shelling percentage (%)	Test weight (g)
SPAD 60 DAS	P	-0.2165	-0.0261	-0.0044	0.0073	-0.0281	-0.002
	G	-0.5156	-0.0922	-0.0233	0.0124	-0.0816	-0.0015
SPAD 90 DAS	P	-0.0121	-0.1006	0.0028	-0.0083	-0.0014	0.0019
	G	-0.0153	-0.0854	0.0027	-0.0094	-0.0027	0.0059
Seed P content (%)	P	0.0002	-0.0001	0.0022	-0.0001	0.0001	0.0002
	G	0.0004	-0.0003	0.0088	-0.0002	0.0002	0.0009
Oil content (%)	P	-0.0071	0.0174	-0.0026	0.2115**	0.0079	-0.0047
	G	-0.0076	0.0349	-0.0061	0.3167**	0.0248	-0.045
Shelling percentage (%)	P	0.0045	0.0005	0.0003	0.0013	0.0348	0.0119
	G	0.0079	0.0016	0.0005	0.0039	0.0501	0.0297
Test weight (g)	P	0.0014	-0.003	0.0106	-0.0034	0.0529	0.1548*
	G	0.0009	-0.0215	0.0305	-0.0439	0.1829**	0.3085**
Pod yield (g/plant)	P	-0.2297**	-0.1118	0.0089	0.2083**	0.066	0.1621**
	G	-0.5293**	-0.1629**	0.013	0.2796**	0.1736**	0.2985**

G= Genotypic, P= Phenotypic

coefficient analysis also measures the relative importance of casual factors involved. In the present study, Path coefficient analysis was done at phenotypic and genotypic level and results are discussed below.

Four characters out of six had positive and direct effects on pod yield at phenotypic level. The characters which had positive direct effect with high magnitude were oil content and test weight. The characters which had positive direct effect with lower magnitude were seed phosphorous content and shelling percentage at phenotypic level. At genotypic level, out of six parameters only four characters had positive direct effects on pod yield. The characters which had positive direct effect with high magnitude were oil content and test weight. The characters which had positive direct effect with lower magnitude were seed phosphorous content and shelling percentage at phenotypic level. Path coefficient analysis indicated that test weight had direct effect and indirect effect on pod yield. These results are in accordance with Ayub Khan *et al.* (2000), Deshmukh *et al.* (1986) and Bhagat *et al.* (1986). Indirect effect via seed phosphorous content and shelling percentage.

Shelling percentage had direct positive and indirect positive effect on pod yield via many characters like seed phosphorous content, shelling percentage and test weight. The results are in agreement with the findings Ayub Khan *et al.* (2000) and Abraham (1990).

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