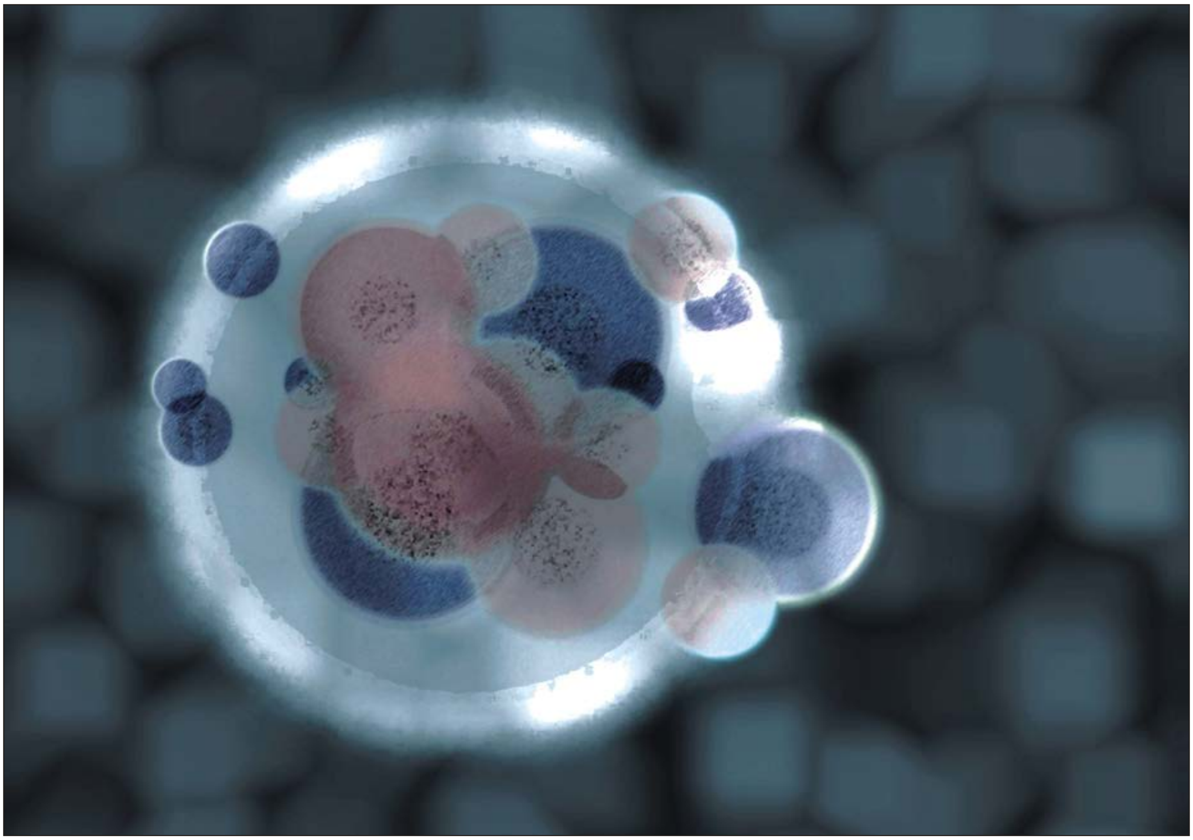

Journal of Biological Sciences

ISSN 1727-3048

OnLine Journal of Biological Sciences 1 (1): 24-26, 2001

Relationship in Various Yield Traits of Exotic Groundnut Genotypes under Moisture Stress Condition in Swat, Pakistan

[1]Khan, [2]Asghari Bano and [1]Nasrullah Jan Malik
[1]Agriculture Research Station Mingora, Swat, Pakistan
[2]Department of Biological Sciences, Quaid-e-Azam University, Islamabad.

Abstract: Genotype Pl.275688 produced significantly the highest pod yield (3153-kg ha^{-1}) followed by variety Cina (2610-kg ha^{-1}). 10 genotypes yield ranged from 2056-2861 kg ha^{-1}, 52 genotypes 1056-917 kg ha^{-1} and 7 genotypes yield less than 900-kg ha^{-1}. Pod yield had higher correlation with shelling percentage, 100-kernel weight and kernel pod^{-1}. Path coefficient analysis revealed that 100-kernel weight had the highest direct influence on dry pod yield followed by shelling percentage and pod $plant^{-1}$. SMK percentage exhibited negative direct effect on yield closely followed by maturity, plant height and kernel pod^{-1}. Hence, selection for 100-kernel weight, shelling percentage and pods $plant^{-1}$ would be effective in improving the pod yield in groundnut.

Key words: Groundnut, genotypes, correlation, path analysis, yield, Pakistan

Introduction

Groundnut is a cash crop of barani area's farmers in Pakistan. North West Frontier Province (NWFP) being the 11% contributor to production, in Pakistan has 57% rainfed area. Groundnut can be a lucrative crop in rainfed area if high yielding, pest resistant and adopted variety(ies) are developed. The national average yield is 1119-kg ha^{-1} against 5000-kg ha^{-1} under experiment. So there is clearly room for yield improvement. Pod yield is multiplicative end product of numerous genetically controlled traits, which singly or jointly influence it. Sangha (1973) reported that 100-kernel weight exhibited maximum phenotypic as well as genotypic coefficient of variation followed by number of pods and pod yield. Hoque *et al*. (1993) revealed that pod yield had significant positive association with pods $plant^{-1}$, sound mature kernel percent (SMK%), shelling percentage and 100 kernel weight, while days to maturity had negative correlation with yield. The direct and indirect effect obtained from path analysis revealed that pod yield was positively associated with pods $plant^{-1}$, 100-kernel weight and shelling percentage, while days to maturity and SMK had negative association with pod yield. Badwal and Harbans (1973) observed that among yield components the SMK manifested highly negative correlation with 100-kernel weight and highly positive correlation with shelling percentage. SMK, 100-kernel weight and shelling in semi spreading and erect type showed significant positive correlation with pod yield. Manoharan *et al.* (1990) reported that pod yield was positively correlated with pod $plant^{-1}$, pod weight and dry matter production. Khan *et al*. (2000) revealed that 100-kernel weight showed the highest but non significant correlation with pod yield. Path coefficient analysis indicated that 100 kernel weight had the highest direct effect on pod yield followed by pods $plant^{-1}$, seeds pod^{-1} and SMK %, while 100 kernel weight affected pod yield negatively via indirect influence of pods $plant^{-1}$, seeds pod^{-1}, SMK % and shelling %. Bhagat *et al.* (1986) found that the number of pods and weight had higher positive direct effect on pod yield. Sahu and Roy (1989) reported that only number of mature pods $plant^{-1}$ was positively and significantly correlated with pod yield. Path analysis showed that 100 pod weight had high positive direct effect on pod yield. Katiyar and Singh (1990) revealed that pods $plant^{-1}$ was positively and significantly correlated with yield while path coefficient analysis further revealed that pods $plant^{-1}$, seeds pod^{-1}, and seed weight were the important yield attributes for effective selection. Path analysis further depict the highest positive direct effect of 1000 seed weight on seed yield, while highest negative direct effect was noted for 50% flowering (-0.3199).

The present study was conducted to evaluate the available groundnut germplasm for yield and its parameters and to measure the extent of direct and indirect causes of association among traits through path coefficient analysis, to furnish the information for selection of suitable criteria for predicting the pod yield in groundnut.

Materials and Methods

The experiment, consisting of 70 groundnut genotypes (inland and exotic) namely ICGS-03, ICGS-50, ICGS-56, ICGS-09, ICGS-44, ICGS-37, ICGS-16, ICGS-07, ICGS-08, ICGS-36, ICGS-44, ICGS-30, ICGS-45, ICGS-171, ICGS-147, ICGS-108, ICGS-234, ICG-57, ICGS-2741, ICGS-3899, ICGS-4770, ICGS-4790, ICGS-29, ICGS-86554, ICGS-86556, PG-445, PG-496, PG-951, PG-492, PG-952, PG-543, PG-759, PG-479, PG-507, PG-168, PG-949, PG-542, PG-481, PG-702, PG-799, PG-681, PG-567, PK-90043, PK-20052, Commet-73, Parachinar, BARD-699, BARD-189, Banki, B-51, V.Bunch G-67, NMVC, Len 73-30, No.335, PI 145044, PI 183290, PI 275688, PI 275693, PI 565452, PI 196614, PI 403834, PI 139920, PI 153344, PI 259606, PI 145044, PI 230328, ICGS-86555, PK-90120, Cina and Swat Phalli-96 were planted at Agriculture Research Station Mingora, Swat (72°73'E and 34°36'N and altitude 1150 m a.s.l.) on May 21, 1998. It was laid out in RCB design with two replications. The plot size was 5×1.8 m, with inter and intra row space of 45 and 15 cm, respectively. A fertilizer dose of 25 nitrogen and 60 P_2O_5 were applied at sowing time. Gypsum at 500 kg ha^{-1} were applied on the standing crop at flowering in order to enhance more pod set as calcium help in pod formation. The rainfall during crop growth and development were 519.9 mm (Fig. 1). The data were statistically analyzed using MSTATC software package. Simple correlation was calculated by using the "CORRELATION" sub-program of the same package. Path co-efficient analysis was performed to delineate the nature and extent of direct and indirect causes of association among characters in groundnut

Table 1: Correlation coefficients among eight qualitative and quantitative attributes of 70 groundnut genotypes at Agri. Research Station Mingora, Swat

	Plant height (cm)	Pods plant^{-1}	Kernel pod^{-1}	Shellin g %	100 kernel wt:	SMK%	Dry pod yield kg ha^{-1}
Maturity (days)	-0.060	-0.016	0.198	-0.186	-0.093	-0.843**	-0.116
Plant height (cm)	---	0.040	-0.130	0.014	-0.277*	0.067	-0.067
Pods plant^{-1}		---	-0.323**	0.142	-0.012	0.036	0.323**
Kernel pod^{-1}			---	-0.025	-0.128	-0.192	-0.140
Shelling %				---	0.175	0.120	0.447**
100 kernel weight					---	0.204	0.436**
SMK%						---	0.058

An asterisks indicate significance at $p<0.05$ (*) and $p<0.01$ (**)

Table 2: Path coefficient analysis depicting direct (bold) and indirect effects for eight attributes of 70 groundnut genotypes at Agri. Research Station Mingora, Swat

	Maturity (Days)	Plant height (cm)	Pods plant^{-1}	Kernel pod^{-1}	Shelling %	100 kernel wt:	SMK %	T. C.
Maturity (Days)	**-0.25**	0.0042	-0.0046	-0.00059	-0.0656	-0.036	0.236	-0.116
Plant height (cm)	0.00149	**-0.07**	0.0114	0.00039	0.0049	-0.108	0.0187	-0.17
Pods plant^{-1}	0.00399	-0.003	**0.28**	0.00097	0.050	-0.0047	-0.01	0.323
kernel pod^{-1}	-0.0493	0.0091	-0.083	**-0.003**	-0.0088	-0.0499	0.054	-0.14
Shelling %	0.046	-0.0011	0.041	0.00008	**0.353**	0.0683	-0.0336	0.474
100 kernel weight	0.0232	0.0207	-0.0034	0.000038	0.0618	**0.39**	-0.057	0.436
SMK%	0.2099	-0.0050	0.010	0.00057	0.042	0.0795	**-0.28**	0.058

R = 0.743 TC = Total Correlation with yield

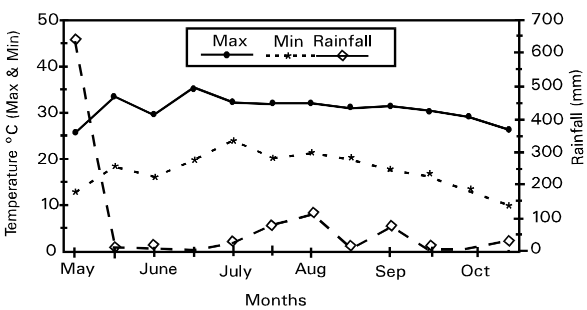

Fig. 1: Fortnightly temperature (Maximum & minimum) and rainfall data during the crop growth period at agriculture research station, Mingora, Swat

genotypes as devised by Dewey and Lu (1959).

Results and Discussion

Among 70 genotypes, PI 275688 obtained significantly the highest pod yield of 3153-kg ha^{-1} followed by variety Cina with 2610 kg ha^{-1}. 10 genotypes yield ranged from 2056-2861 kg ha^{-1}, 52 genotypes yield 1056-917 kg ha^{-1} and 7 genotypes yield less than 900-kg ha^{-1} (Data not shown).

Correlation of characters studied, revealed that pod yield had higher association with shelling percentage and 100 kernel weight and kernel pod^{-1}. Sound mature kernel also had positive but nonsignificant correlation with pod yield. The rest of the characters showed negative correlation with pod yield (Table 1). Similar results have also been obtained in a previous study on groundnut genotypes by Khan *et al.*, 2000. However, significant negative correlation were observed between maturity and Sound mature kernel percentage and pods plant^{-1} and kernel pod^{-1}. Maturity was negatively correlated with all traits except kernel pod^{-1}. Kernel pod^{-1} showed positive correlation with SMK percentage, while shelling percentage also positively correlated with the 100-kernel weight and sound mature kernel percentage.

As pod yield is influenced by numerous factors selection based on simple correlation without taking into consideration the interaction between the component attributes can be misleading. Therefore, the genotypic correlation were split into direct and indirect influence and depicted in Table 2. The correlation coefficient between maturity period and pod yield was negative. However, this was mainly due to indirect effects via shelling percentage, 100-kernel weight, pods plant^{-1} and little effects of kernel pod^{-1}. The high negative direct effect of maturity showed that early maturing varieties would be developed. Similar results was also reported by Hoque *et al.* (1993). The direct effect of plant height on pod yield was negative, which is due to indirect influence of 100-kernel weight. Sahu and Roy (1989) also noticed the similar results.

The direct effect of pods plant^{-1} on pod yield was high and their indirect effects via shelling percentage, maturity period and kernel pod^{-1} were the chief cause of positive genotypic correlation between pods plant^{-1} and pod yield. The results are in conformity with findings of Khan *et al.* (2000).

The direct effect of kernel pod^{-1} was low in magnitude and mainly due to indirect effect of pods plant^{-1}, 100 kernel weight and maturity period such findings were also observed by other workers (Bhagat *et al.* 1986; Manoharan *et al.*, 1990.

The direct effect of shelling percentage (0.353) on pod yield was positive and high in magnitude. This positive effect is mainly due to the indirect influence of maturity period (0.046), pods plant^{-1} and 100 kernel weight. Khan *et al*. (2000) also obtained such results.

The high and positive direct effect of 100-kernel weight on pod yield was attributed to the indirect influences of shelling percentage (0.0618), maturity period, plant height and kernel pod^{-1}. Khan *et al*. (2000) reported similar findings.

The height negative direct effect of SMK % (-0.28) on pod yield was due to indirect effect of plant height (-0.0050). The result are in agreement with findings of Badwal and Harbans (1973) and Hoque *et al*. (1993).

100-kernel weight, shelling percentage and pods plant^{-1} had direct effects which were close to the total correlation affirming that these parameter had genuine association with pod yield.

Thus it can be inferred from this study that 100 kernel weight, shelling percentage, and pods plant^{-1} would prove quite useful while selecting groundnut genotype for improved pod yield but compromise should also be made with other traits because of their indirect effect on yield.

References

Badwal, S.S. and S. Harbans, 1973. Effect of growth habit on correlations and path coefficients in groundnut. Indian J. Genet. Plant Breed., 33: 101-111.

Bhagat, N.R., T. Ahmad, H.B. Lalwant and G. Nagaraj, 1986. Variation, character association and path analysis in improved groundnut varieties. Indian J. Agric. Sci., 56: 300-302.

Dewey, D.R. and K.H. Lu, 1959. A correlation and path-coefficient analysis of components of crested wheatgrass seed production. Agron. J., 51: 515-518.

Hoque, M.S., F.U. Mia, D. Nessa and M. Azimddin, 1993. Correlation and path analysis in groundnut. Bangladesh J. Agric. Res., 18: 131-136.

Katiyar, R.P. and A.K. Singh, 1990. Path coefficient studies for yield and yield components in faba bean (*Vicia faba* L.). FABIS Newslett., 26: 3-5.

Khan, A., M. Rahim, M.I. Khan and M. Tahir, 2000. Genetic variability and criterion for the selection of high yielding peanut genotypes. Pak. J. Agric. Res., 16: 9-12.

Manoharan, V., R. Ramalingam and S. Kalaimani, 1990. Genetic advance and path analysis in the F_2 generation of an intrasubspecific cross in groundnut. Indian J. Genet. Plant Breed., 50: 244-247.

Sahu, S. and D. Roy, 1989. Character association and path analysis in two species of groundnut. Crop Improv., 16: 53-56.

Sangha, A.S., 1973. Genetic variability and correlation studies on spreading groundnut varieties (*Arachis hypogaea* L.). Madras Agric. J., 60: 1446-1452.