Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.8437

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **6 (6):** 1403-1407 (2018)

International Journal of Pure & Applied Bioscience

Research Article

OPEN ACCESS

Correlation and Path Analysis for Yield and Yield Attributes in Spanish Bunch Groundnut (*Arachis hypogaea* L.)

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Received: 5.11.2018 | Revised: 18.12.2018 | Accepted: 23.12.2018

ABSTRACT

The estimate of genotypic correlation coefficients in general higher than their corresponding phenotypic correlations indicating strong inherent association among the traits. The association of initial plant stand per plot with kernel yield per plot and biological yield per plot was found to be significant and positive. Days to maturity with final plant stand per plot had significant and positive association. Biological yield per plot established significant positive association with initial plant stand per plot and kernel yield per plot and negative association with shelling percent. Shelling percent possessed significant and positive association with hundred kernel weight, sound mature kernel percent and kennel yield per plot. Pod yield per plot had significant positive association with initial plant stand per plot, kernel yield per plot and biological yield per plot. The maximum positive direct positive effect on pod yield per plant was contributed by days to maturity followed by kernel yield per plot and biological yield per plot. On contrary, the highest negative direct effect to pod yield per plant was contributed by final plant stand per plot. Hence, a direct selection for this trait would be effective.

Keywords: *Pod, Groundnut, Correlation, Breeding*

INTRODUCTION

Pod yield in groundnut (*Arachis hypogaea* L.) is a complex and depends upon the interplay of number of components attributes. A clear picture of contribution of each component in the final expression of character would emerge through the study of correlation and path analysis. In order to achieve the goal of increased production by increasing the yield potential of crop, knowledge of direction and magnitude of association between various traits is essential for plant breeders. Understanding the relationships between yield and yield components is of paramount importance for making the best use of these relationships in selection. Correlation is a biometrical approach which brings out the intensity of the association between two pairs of characters and provides information on those components that could serve as criteria for selection of candidates in a breeding program.

Cite this article: Venkateswarlu, O., Naik, B.S.K., & Naik, K. S. S., Venkataramana, M., & Prasanna Rajesh, A. (2018). Correlation and Path Analysis for Yield and Yield Attributes in Spanish Bunch Groundnut (*Arachis hypogaea* L.), *Int. J. Pure App. Biosci.* **6(6):** 1403-1407 (2018). doi: http://dx.doi.org/10.18782/2320-7051.8437

Traits that are positively correlated with yield are considered effective because selection for such traits would result in the simultaneous improvement in yield (Mahalakshmi et al., 2005). The correlation coefficient may be confounded with indirect effect due to common association inherent in trait interrelationships. Path coefficient analysis measures the direct influence of one variable upon another and facilitates the separation of correlation coefficients into components of direct and indirect effects (Dewey & Lu, 1959). Therefore, information derived from the correlation coefficients can be augmented by partitioning correlations into direct and indirect effects by path coefficient analysis. Accordingly, the present investigation was aimed to study the association of pod yield and its component traits in the forty eight Spanish bunch genotypes in groundnut.

MATERIALS AND METHODS

The experimental material comprised of forty eight Spanish bunch groundnut genotypes. The experiment was laid out in randomized block design with four replications at Agricultural Research Station, Kadiri during *Kharif* 2018. Each entry was accommodated in eight rows of 5.0 m length with a spacing of 30 × 10 cm. The experiment was conducted in a red sandy loam soil with a neutral pH, low in organic carbon. Recommended agronomic and plant protection measures were adopted for the conduct of experiment The data were recorded for nine characters like Initial plant stand per plot, Final plant stand per plot, days to maturity, shelling percentage, 100 kernel weight (g), kernel yield per plot (g), biological yield per plot (g), pod yield per plot (g) and Sound Mature kernel percent. Genotypic and phenotypic correlation coefficients were calculated among the genotypes using the formulae suggested by Al-Jibouri et al. (1958). Path coefficient analysis was carried out by using phenotypic and genotypic correlation coefficients as per the method suggested by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Correlation coefficient analysis: The association studiesprovide reliable information on nature and extent of relationship between different characters. The information on the association between traits of the economic worth is of great value to the plant breeders as it will help in assessing the scope of simultaneous improvement of two or more characters. Hence, understanding of the inter-relationships of characters with yield and among themselves will be of great value in any crop improvement programme. Yield is a highly complex character and polygenic nature which is influenced by the environment. Hence, the study of inter-association is essential to understand the relationship of simple traits with complex yield contributing traits. These relationships may be positive or negative.In the present study, genotypic correlations were higher than phenotypic correlations for all the characters. These indicate that the strong inherent association between the characters governed largely by genetic causes and reduced by environmental forces. The environment and genotype x environment interaction played a major role in determining these associations between the characters.

The correlation coefficients worked-out for yield and its components in 48 genotypes evaluated during *kharif*, 2018 are furnished in Table 1. Pod yield per plot had significant positive association with initial plant stand per plot, kernel yield per plot and biological yield per plot, while its association with other characters *viz.*,final plant stand per plot and hundredkernel weight was found to be positive but non-significant (Table 1). These characters can be considered as criteria for selection for higher yield, as these were mutually and directly associated with pod yield. Similar results were obtained by Mahesh et al. (2018).

The association of initial plant stand per plot with kernel yield per plot (g) and biological yield per plot was found to be significant and positive and negative significant association with final plant stand

per plot, days to maturity, shelling percentage, and Sound Mature kernel percent. The association of final plant stand per plot with days to maturity was highly significant and positive, whereas it is correlation with kernel yield per plot and biological yield per plot is weak and positive and with shelling percent, hundred kernel weight and sound mature kernel percent is negative non- significant. The relationship of days to maturity with final plant stand per plot was significant and positive, while its association with initial plant stand per plot is negative and significant. On contrary negative non-significant correlation of this character with shelling percent, kernel yield per plot, hundred kernel weight and sound mature kernel percent and non - significant positive association with biological yield per plot. These results were confirmed with the findings of Korat et al. 2010.

Shelling percent possessed significant and positive association with hundred kernel weight, sound mature kernel percent and kennel yield per plot and significant negative association with biological yield per plot. Similar results were reported by John et al. (2019), Tirumala Rao (2016). Kernel yield per plot established a significant and positive relationship with shelling percent, pod yield per plot, biological yield per plot and non-significant and positive association of it with hundred kernel weight indicating the positive linear relationship of these characters with kernel yield. The results indicate that with the improvement in these characters improvement in pod yield can be achieved. It also expressed non-significant negative relation with sound mature kernel percent. Similar results were reported in groundnut by Ravi Kumar and ReddiSekhar (2012), Jonah et al. 2010. Biological yield per plot established significant positive association with initial plant stand per plot and kernel yield per plot and negative association with shelling percent and non-significant positive association days to maturity and final plant stand per plot.

The relationship of sound mature kernel per cent with shelling per cent and hundred kernel weight was significant and positive, while its association with initial plant stand per plot and biological yield per plot negative and significant. Its relationship with kernel yield per plot, days to maturity and final plant stand per plot was found to be non-significant and negative. The hundred kernel weight exhibited significant and positive association with shelling percent and. Its relationship with initial plant stand per plot, final plant stand per plot, days to maturity, biological yield per plot non-significant and negative. On contrary positive non-significant correlation of this character with kernel yield per plot was recorded. These results were confirmed with the findings of John et al. (2019) and Tirumala Rao (2016). From the foregoing discussion, it is evident that pod yield per plant was closely associated with initial plant stand per plot and kernel yield per plot. The significant association of yield attributes among themselves revealed that kernel yield per plot, days to maturity, shelling percent, biological yield per plot, and hundred kernel yield per plot positive significant association indicate that selection for these traits might be rewarding in improvement of pod yield in groundnut.

Path coefficient analysis: Pod yield is a complex dependentcharacter and is contributed by several components. Correlation studies simply measures the association of yield and yield attributes and does not give the actual dependence of yield on the correlated characters. Path coefficient analysis is an effective method to determine the direct and indirect causes of associations and also permits to examine the specific forces acting to produce to a given correlation. Hence, an attempt was made to study the direct and indirect effects of characters on pod yield through path coefficient analysis in forty eightSpanish bunch groundnutgenotypes (Table 2). The genotypic path coefficients worked-out for yield and its components in 48 genotypes evaluated during *kharif* 2018 are furnished in Table 2.

The maximum positive direct positive effect on pod yield per plot was contributed by days to maturity followed by kernel yield per plot and biological yield per plot. Similar results were reported earlier by Jonah et al.

2010 and On contrary, the highest negative direct effect to pod yield per plot was contributed by final plant stand per plot Mathews et al. (2000) reported maximum positive direct effect of kernel yield on pod yield in groundnut. The high direct effect of kernel yieldwas appeared to be the main factor for its strong positive correlation with pod yield. Hence, a direct selection for this trait would be effective. These findings are in agreement with the results of Mahesh et al. (2018), Ravi Kumar and ReddiSekhar 2012, John et al. 2019 and Vaithiyalingan et al. (2010).

Initial plant stand showed positive indirect effect through final plant stand per plot, kernel yield per plot and initial plant stand per plot, while throughdays to maturity showed negative indirect effect. Final plant stand per plot had a positive indirect effect through biological yield per plot, hundred kernel weightand sound mature kernel percent. On contrary, its highest negative indirect effect was through initial plant stand per plot, kernel yield per plot and shelling percent. Days to maturity had negative indirect effect through final plant stand per plot and positive indirect effect through biological yield per plot, hundred kennel weight and sound mature kernel percent. The character, shelling percent hada positive indirect effect through final plant stand per plot and kernel yield per plot and negative indirect effect through sound mature kernel percent and days to maturity. Kernel yield per plot showed positive indirect effect through final plant stand per plot, initial plant stand per plot, biological yield per plot while through days to maturity had shown indirect negative effect. Similar findings were also reported by Vaithiyalingan et al. (2010). Sound mature kernel per cent exhibited positive indirect effect through, final plant stand per plot an negative indirect effect through days to maturity, initial plant stand per plot, kernel yield per plot and hundred kernel weight. Biological yield per plot exerted positive indirect effect through days to maturity, kernel yield per plot, hundred kernel weight and sound mature kernel percent and negative indirect effect through final plant stand per plot. Hundred kernel weight positive indirect effect through final plant stand per plot and negative days to maturity and sound mature kernel percent.

These results were confirmed with the findings of Giri et al. (2009). From the above discussion on path coefficient analysis it can be concluded that, days to maturity, kernel yield per plot, initial plant stand per plot had maximum positive direct effect on pod yield per plot indicating that these traits are the important yield contributing characters.

Table 1: Phenotypic (P) and genotypic (G) correlation coefficients among yield and yield traits in groundnut

Character		Initial plant stand/plot	Final plant stand/plot	Days to maturity	Shelling per cent	Kernel yield/ plot	Biological yield/plot	100 kernel weight	SMK %	Pod yield/ plot
Initial plant stand/ plot	**P**	**1.000**								0.463**
	G	**1.000**								**0.479****
Final plant stand/ plot	**P**	-0.125	**1.000**							0.024
	G	**-0.148***	**1.000**							**0.015**
Days to maturity	**P**	-0.560**	0.877**	**1.000**						-0.555
	G	**-0.166***	**1.01****	**1.000**						**-0.050**
Shelling percent	**P**	- 0.257**	-0.065	-0.065	**1.000**					-0.012
	G	**- 0.287****	**0.102**	**-0.088**	**1.000**					**-0.033**
Kernel yield/ plot	**P**	0.394**	0.028	-0.049	0.213**	**1.000**				0.885**
	G	**0.447****	**0.040**	**-0.052**	**0.184**	**1.000**				**0.958****
Biological yield/ plot	**P**	0.448**	0.078	0.069	-0.338**	0.246**	**1.000**			0.320**
	G	**0.456****	**0.097**	**0.077**	**-0.387****	**0.273****	**1.000**			**0.329**
100kernel weight	**P**	**-0.054**	-0.048	-0.025	0.361**	0.048	-0.108	**1.000**		0.009
	G	**-0.058**	**-0.068**	**-0.043**	**0.397****	**0.044**	**-0.116**	**1.000**		**0.000**
SMK percent	**P**	**-0.160***	-0.090	-0.060	0.477**	-0.014	-0.212**	0.502**	**1.000**	-0.0141
	G	**-0.173***	**-0.099**	**-0.060**	**0.702****	**-0.050**	**-0.317****	**0.648****	**1.000**	**-0.204****
Pod yield /plot	**P**	0.463**	0.024	-0.555	-0.012	0.885**	0.320**	0.009	-0.0141	**1.000**
	G	**0.479****	**0.015**	**-0.050**	**-0.033**	**0.958****	**0.329**	**0.000**	**-0.204****	**1.000**

* Significant at 5% level ** Significant at 1% level

Table 2: Path coefficients for yield and yield traits in groundnut

Character		Initial plant stand/ plot	Final plant stand/ plot	Days to maturity	Shelling per cent	Kernel yield/ plot	Biological yield/ plot	100 kernel weight	SMK percent	Pod yield/ plot
Initial plant stand/plot										
	G	0.1896	1.0942	-1.3135	-0.0041	0.4334	0.0177	0.0044	0.0561	0.479**
Final plant stand/plot										
	G	-0.0262	-7.9106	7.9525	-0.0015	-0.0355	0.0038	0.0076	0.0300	0.015
Days to maturity										
	G	-0.0314	-7.9287	7.9343	-0.0013	-0.0502	0.0030	0.0044	0.0193	-0.050
Shelling percent										
	G	-0.0544	0.8034	-0.6970	0.0144	0.1783	-0.0150	-0.0377	-0.2275	-0.033
Kernel yield/plot										
	G	0.0847	0.2892	-0.4108	0.0026	0.9704	0.0106	-0.0054	0.0162	0.958**
Biological yield/plot										
	G	0.0865	-0.7813	0.6127	-0.0056	0.2646	0.0389	0.1050	0.1027	0.329
100kernel weight										
	G	-0.0088	0.6376	-0.3711	0.0057	0.0552	-0.0043	-0.0943	-0.2109	0.000
SMK percent										
	G	-0.0328	0.7331	-0.4739	0.0101	-0.0485	-0.0123	-0.0614	-0.3239	-0.204**

Genotypic residual effect =0.6798

* Significant at 5% level ** Significant at 1% level Diagonal values (Bold): Direct effects

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