Journal of Biotechnology
and Crop Science
6(8): 69-72, 2017

Correlation between yield and yield attributing traits in soybean (*Glycine max* (L.) Merrill)

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Received: 17 March 2017; Revised Accepted: 15 May 2017

ABSTRACT

Ninety genotypes of soybean including five checks were evaluated to know the correlation between yield and yield attributing traits in soybean during *kharif* 2014. Grain yield was found to be positively and highly significantly associated with number of pods per plant, seeds per pod, 100 seed weight, both at genotypic and phenotypic levels. Protein % showed positive and significant association with number of pods per plant while oil content showed negative and significant association with plant height at both genotypic and phenotypic level.

Key Words: *Genotypic correlation coefficient, Phenotypic correlation coefficient, Soybean*

INTRODUCTION

Cultivated soybean [*Glycine max* (L.)Merr.], one of the major crops, is used for animal feed and human foods. Unlike most of the vegetable proteins, soybean protein supplies all the essential amino acids, having cardio friendly oil which fulfills 30 percent of world vegetable oil requirement and also has many therapeutic components, namely, lactose-free fatty acids, antioxidants and folic acid, vitamin B complex, and isoflavones (Mathur, 2004). Due to the versatile nature of this crop, its contribution to industrial, agricultural, and medicinal sectors is significantly increasing. Genetic diversity is an essential requirement for progress in plant breeding (Nooghab *et al*., 2014). Breeders usually use genetic diversity for selecting desirable traits in order to improve grain yield. A breeder can have chance of success in the modification plans in case there is diversity and opportunity for adopting desirable materials. Regarding this point different studies have been done by incorporating correlation between traits in order to investigate the relationship between morphological traits and also type and extent of its impact on grain yield (Nooghab *et al*., 2014). Correlation between traits is of high importance, because such correlations can help the breeder in indirect selection of important traits through less important traits, which are easier to select.

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MATERIALS AND METHODS

The experimental materials consists of ninety genotypes of soybean including five checks which were selected from the germplasm stock of Soybean Research Scheme, BAU, Kanke representing different agro-ecological niches of India. These genotypes of soybean were evaluated in randomized block design with two replications at experimental area of Plant Breeding and Genetics department, Birsa Agricultural University, Kanke, Ranchi during *kharif*, 2014. Each genotype was accommodated in a single row of 3 m length with a spacing of 45 cm between rows and 15 cm between plants within the row. Observations on sixteen quantitative characters

Table 1 Estimates of genotypic and phenotypic correlation coefficients between different character pairs in ninety genotypes of soybean.

		50% Flow	Days to Matu	Plant ht. In cm	No. of bran/pl	No of pods/pl	Pod length	Seeds/ pod	100 SW	Oil%	CP%	Root Length	RFW	RDW	Root Vol	No. of Lat roots	Yield
50%	G		0.360**	0.087	-0.057	0.107	-0.166	-0.008	-0.100	-0.182	** 0.237	0.140	0.155	0.110	-0.030	0.142	0.121
Flow	P		0.349**	0.085	-0.056	0.090	-0.135	0.010	-0.098	-0.182	0.201	0.137	0.151	0.109	-0.027	0.121	0.108
Days to	G			0.186	-0.046	-0.020	-0.052	0.024	0.115	-0.037	0.084	*0.209	*0.220	0.154	0.197	*0.218	0.072
Matu	P			0.018	-0.039	-0.030	-0.049	0.020	0.110	-0.035	0.082	0.204	0.215	0.150	0.193	0.189	0.079
Plant ht.										*-							
In cm	G				0.251*	**0.337	*-0.240	-0.067	*-0.213	0.223	*0.227	**0.919	**0.899	**0.889	**0.713	**0.550	0.139
	P				0.239*	**0.320	*-0.214	-0.063	*-0.211	*-	0.194	**0.917	**0.892	**0.858	**0.707	**0.509	0.133
										0.218							
No. of	G					*0.247	0.094	-0.083	*-0.212	-0.055	0.028	**0.312	0.266	*0.221	0.106	0.067	0.089
bran/pl	P					*0.219	0.069	-0.069	-0.203	-0.063	0.029	**0.296	*0.252	*0.228	0.100	0.061	0.096
No of	G						*-0.213	-0.083	**-0.310	*-	**0.297	**0.375	**0.376	**0.355	*0.211	0.264**	**0.567
pods	P						-0.193	-0.088	**0.295	0.206	*0.235	**0.357	**0.350	**0.322	0.193	0.211*	**0.514
/pl										-0.187							
Pod	G							0.190	0.175	0.089	-0.198	*-0.253	*-0.261	*-0.215	*-0.221	0.045	-0.055
Length	P							0.188	0.157	0.075	-0.146	*-0.231	*-0.235	-0.194	-0.203	0.016	-0.048
Seeds/p	G								*0.249	0.156	-0.044	-0.075	-0.026	-0.090	0.003	-0.051	**0.563
od	P								*0.240	0.157	-0.045	-0.072	-0.017	-0.068	0.008	-0.043	**0.503
100 SW	G									0.103	-0.167	*-0.209	-0.187	-0.178	0.007	-0.123	**0.375
	P									0.105	-0.138	**-0.207	-0.182	-0.164	0.010	-0.113	**0.351
Oil%	G										**-0.886	**-0.271	**-0.292	*-0.231	-0.188	**-0.283	-0.100
	P										-0.751	*-0.265	**-0.285	-0.222	-0.184	*-0.266	-0.089
CP%.	G											*0.237	0.228	0.189	0.1283	0.152	0.097
	P											0.204	0.204	0.164	0.114	0.118	0.100
Root	G												**0.983	**0.972	**0.792	**0.644	0.133
length	P												**0.975	**0.936	**0.783	**0.599	0.124
RFW	G													**0.9818	**0.781	**0.661	0.153
	P													**0.942	**0.782	**0.608	0.144
RDW	G														**0.764	**0.674	0.121
	P														**0.735	**0.606	0.115
Root	G															**0.461	0.096
Vol	P															**0.423	0.092
No. of	G																0.107
Lat root	P																0.062
Yield	G																
	P																

*Significant at p=0.05 **Significant at p=0.01

(Table 1) were recorded on five randomly selected plants from each genotype and average value was used for statistical analysis. The data were analyzed statistically by analysis of variance as per randomized block design method given by Ostle (1966). Genotypic and phenotypic correlation coefficients for different characters were calculated in all possible combinations following the formula given by Miller *et al.* (1958).

RESULT AND DISCUSSION

Correlation studies provide information on the nature and extent of association between any two pairs of quantitative characters. The estimates of different genetic parameters are important for better understanding of the nature and magnitude of genetic variability present in the available breeding materials and the association of different yield attributing characters for successful plant breeding programme. Genotypic correlation coefficient provides a measure of genotypic association between the characters and also provides an indication about the characters which may be used for selection and further improvement of the trait. So understanding the relationship between yield and its components is important for making the best use of this relationship in selection. Therefore, identifying the characters which are closely related and which provide considerable contribution towards yield becomes essential. In this context, correlation which measures the degree and direction of relationship of different component characters towards yield is very important to study. Genotypic and phenotypic correlation coefficient (Table-1) indicated similar trends but genotypic correlation coefficient were higher in magnitude for most of the characters than their corresponding phenotypic correlation coefficients. Grain yield was found to be positively and highly significantly associated with attributing characters, viz. number of pods per plant, seeds per pod, 100 seed weight, both at genotypic and phenotypic levels indicating the importance of these traits for yield improvement in soybean. These correlation results between yield and number of pods

per plant, seeds per pod, 100 seed weight are also supported by Chand (1999), Amanullah and Hatam (2001), Chamundeswari and Aher (2003), Iqbal *et al.* (2003), Basavaraja *et al.* (2005) and Malik *et al.* (2007). Iqbal *et al.* (2010) also reported positive and significant association between 100 seed weight and seed yield per plant.

In the present correlation study number of lateral roots had positive and highly significant correlation with a plant height, root length, root fresh weight, root dry weight, whereas it had negative and significant correlation with oil content at both genotypic and phenotypic levels. Root volume showed positive and highly significant correlation with plant height, root length, root fresh weight and root dry weight both at genotypic and phenotypic level. Root dry weight showed positive and highly significant correlation with plant height, number of pods per plant, root length and root fresh weight, whereas it has positive and significant correlation with number of branches per plant both at genotypic and phenotypic level. Root fresh weight showed positive and highly significant correlation with plant height, number of pods per plant, root length at both genotypic and phenotypic level. Although it was negatively and significantly correlated with pod length and oil content. Root length was positive and significantly correlated with plant height and number of branches per plant, number of pods per plant while it was negative and significantly correlated with pod length, 100 seed weight at both genotypic and phenotypic level. Protein % showed positive and significant association with number of pods per plant at both genotypic and phenotypic level. Oil content showed negative and significant association with plant height at both genotypic and phenotypic level. Hundred seed weight showed positive and significant association with seeds per pod, but with number of pods per plant it showed negative and highly significant association, whereas with plant height it showed negative and significant correlation at both level. Seeds per pod were positively correlated with days to maturity and pod length at both genotypic and phenotypic level with low magnitude. The genotypic and phenotypic correlation of pod length was negative and significant with plant height.

In correlation study, positive and highly significant genotypic and phenotypic correlation was observed between number of pods per plant and plant height.Although positive and significant correlation was observed for the pods per plant and number of branches per plant. Number of branches per plant was positive and significantly correlated with plant height at both genotypic and phenotypic level. Plant height showed positive correlation with 50 % flowering and days to maturity at both genotypic and phenotypic level. The positive and significant association between plant heights with days to maturity was also reported by Ngon *et al.* (2006). The genotypic and phenotypic correlation of days to maturity with days to 50% flowering was positive with low magnitude.

Thus, for enhancing yield in soybean number of pods per plant, seeds per pd, 100 seed weight, number of branches per plant and plant height could be considered as selection criteria.

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