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CORRELATION AND PATH ANALYSIS IN GREENGRAM [*VIGNA RADIATA* (L.) WILCZEK] FOR DROUGHT STRESS

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Abstract

The estimates of correlation revealed that seed yield per plant had positive and significant association with 100 seed weight, number of branches per plant, pod length, number of pods per cluster and plant height. Path coefficient analysis indicated that number of branches per plant, number of seeds per pod, days to first flowering, pod length, number of clusters per plant and number of pods per cluster had maximum direct contribution on seed yield under drought stress in greengram.

Key words : Green gram, correlation coefficient, drought stress.

Introduction

Vigna a pantropical genus comprises of about 150 species, most of which are found in Asia and Africa. Only seven species of vigna are cultivated as pulse crops, of which two are African and five Asiatic origins. The vigna species in general; show a wide distribution in the tropics and subtropics (Anishetty and Moss, 1998). They are adapted to a range of agro climatic conditions and trait growth on marginal lands without supplementing any fertilizers particularly an added advantage for subsistence agriculture.

India is the largest producer of pulses in the world with 25 per cent share in global production, of which 39 per cent from chickpea, 21 per cent from pigeon pea, 11 per cent from mung bean, 10 per cent from long bean, 7 per cent from lentil and 5 per cent from field bean. The latest estimates indicates that the present production of pulses is about 23.63 million hectares with an average productivity of 625 kg/ha. The projected pulse requirement for the year 2025 is 29.44 million tones, which necessitates annual growth rate of 4.02 per cent in production.

Food productivity is at a cross load due to determinate effects of various biotic and abiotic stresses. Therefore minimizing these losses is a major area of concern to ensure food security under changing climate. Drought being the most important environmental stress, severely impairs plant growth and development, limits plant production and the performance of crop plants more than any other environmental factor (Shao, 2009). Plant experiences drought stress either when the water supply to roots becomes difficult (or) when the transpiration rate becomes very high. Available water resources for successful crop have been decreasing in recent years. Furthermore, in view of various climatic change models, scientists suggested that in many regions of the world, crop losses due to increasing water shortage will further aggravate its impacts.

Green gram [*Vigna radiata* (L) Wilczek] is one of the most important food legumes in the tropic and sub tropic regions, where drought is a major production constraint due to low and erratic rainfall (Singh *et al*., 1997). Green gram suffers considerable damage due to frequent drought. Moreover, green gram cultivars tend to be very sensitive to drought that occurs during the early stages of the reproductive phase and maturation phase (Thiaw *et al*., 1993). The water extraction capacity in green gram is low during the vegetative period.

Therefore, genetic enhancement of green gram for tolerance by incorporating drought tolerance lines represents the best most cost–effective method for ensuring sustainable and improved yield under variable and changing climates.

Yield is a complex character associated with various contributing characters, which are interrelated among

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Table 1 : Genotypic correlation among 10 characters in mung bean for drought stress.

Character	Plant height	Number of branches per plant	Number of flower per cluster	Number of cluster per plant	Number of pods per cluster	Pod length	Number seeds per pod	100 seed weight	Seed yield per plant
Days of first flowering	-0.001	-0.217	0.180	-0.477**	-0.247*	0.345*	0.006	0.151	-0.252*
Plant height		0.235	0.150	-0.185	0.300*	0.260*	0.148	-0.073	0.286**
Number of braches per plant			0.098	0.074	0.381*	-0..36	0.050	-0.199	0.402**
Number of flowers per cluster				0.078	0.158	0.437**	0.288*	0.198	-0.070
Number of cluster per plant					0.210	-0.244	-0.168	0.040	-0.028
Number of pods per cluster						0.125	0.058	-0.175	0.368**
Pod length							-0.101	0.418**	0.369**
Number of seeds per pod								0.054	0.176
100 seed weight									0.458**

*Significant at 5% level, **Significant at 1% level.

Table 2 : Direct and Indirect effect among the characters towards seed yield in mung bean for drought stress.

Characters	Plant height	Number of branches per plant	Number of flower per cluster	Number of cluster per plant	Number of pods per cluster	Pod length	Number seeds per pod	100 seed weight	Seed yield per plant	Plant height
Days of first flowering	**0.108**	-0.328	-0.025	-0.008	-0.023	-0.011	0.035	0.004	-0.004	-252*
Plant height	0.252	**-0.066**	0.028	-0.008	-0.009	0.014	0.026	0.029	0.002	0.286*
Number of braches per plant	-0.035	-0.016	**0.225**	-0.003	-0.129	0.032	-0.005	0.069	0.006	0.402**
Number of flowers per cluster	0.028	-0.049	0.017	**-0.030**	-0.004	0.008	0.048	0.065	-0.005	0.070
Number of cluster per plant	-0.076	0.014	0.039	-0.002	**0.047**	0.010	-0.026	-0.035	-0.001	-0.028
Number of pods per cluster	0.040	-0.021	0.056	-0.005	0.0224	**0.046**	0.013	0.014	0.005	0.368**
Pod length	-0.93	-0.019	-0.009	-0.012	-0.399	0.06	**0.103**	-0.032	-0.014	-0.369**
Number of seeds per pod	0.004	-0.009	0.006	-0.007	-0.008	-0.003	-0.024	**0.213**	-0.001	0.176
100 seed weight	0.044	0.040	-0.023	-0.005	0.333	-0.08	-0.043	0.148	**-0.028**	0.458**

Residual = 0.1057. Bold diagonal values indicate direct effects. *Significant at 5% level, **Significant at 1% level.

themselves. For developing suitable selection strategy the knowledge of genetic variability present in the available germplasm for yield and its associated characters is important. To accumulate optimum contribution of yield contributing characters, it is essential to know the association of various character along with path coefficients. Therefore, the present study was undertaken to examine the nature and magnitude of genetic variability and association among characters in green gram under drought situation.

Materials and Methods

The present investigation was carried out at the Plant Breeding Farm, Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Annamalai Nagar (Tamil Nadu), India. Seeds of 25 genotypes were raised adopting randomized block design replicated thrice. The crop was raised in pots. Uniform population of two plants in each plant was maintained. The recommended agronomic and plant protection practices were followed. The water stress was induced by withholding irrigation at 25 DAYS [according to the method given by Biradar *et al*. (2007)]. Thereafter no irrigation was given up to harvest. The details of the materials are presented in table 1 and the observations were recorded for days to first flowering, plant height, number of branches per plant, number of flowers per cluster, number of cluster per plant, number of pods per cluster, pod length, number of seeds per pod, 100 seed weight, seed yield per plant.

Results and Discussion

Genotypic correlations among ten characters are represented in table 1. It represents that seed yield per plant possessed highly significant positive correlation with 100 seed weight, number of branches per plant, pod length, number of pods per cluster and plant height. It showed negative association with days to first flowering, because under drought stress delayed flowering was noticed, when compared to the normal condition between the genotypes. Inter correlation among the characters exhibited that days to first flowering possessed highly significant positive association with pod length and highly negative association with number of clusters per plant and number of pods per cluster. This is because when the plant experiences drought stress the cluster production per plant will be reduced and in turn the number of pods produced will be also reduce due to dropping of flowers when compared to normal plant. Similarly, number flowers per cluster exhibited highly significant positive association with pod length and number of seeds per pod. Number of branches per plant exhibited positive significant association with the number of pods per cluster and pod length exhibited positive significant association with 100 seed weight.

Path coefficient analysis revealed that the trait number of branches per plant had high positive direct effect on seed yield followed by number of seeds per pod, days to first flowering, pod length, number of clusters per plant and number of pods per cluster (table 2). The residual effect is low, indicating appropriateness of the characters chosen. Days to first flowering exhibited negative direct effect towards seed yield per plant. Number of branches per plant, number pods per cluster, 100 seed weight exhibited positive indirect effects towards seed yield through number clusters per plant and number of seeds per pod. Hence, number branches per plant, number of seeds per pod, days to first flowering, pod length number of clusters per plant and number of pods per cluster are the most important yield contributing components as they recorded high direct and indirect effects in increasing the seed yield in mung bean under drought stress.

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