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Variability, Correlation and Path Analysis studies in Clusterbean Genotypes during summer season under Haryana conditions

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ABSTRACT

Twenty elite genotypes of clusterbean (guar) were evaluated in the present study for nine traits in RBD during summer 2016 at CCSHAU Hisar. High PCV and GCV estimates were found for the characters; seed yield per plant, number of branches per plant and plant height. High heritability coupled with genetic advance as per cent of mean was observed for traits like number of branches per plant and seed yield per plant, indicating additive effect in these traits. High positive and significant correlation of seed yield per plant observed with number of pods per plant followed by seed weight, number of branches per plant, number of seeds per pod and pod length. Path coefficient study revealed that very high direct positive effect on seed yield per plant was observed by 100 seed weight, number of pods per plant and pod length. Moderate direct positive effect on seed yield per plant was observed by number of seeds per pod. The number of branches per plant showed positive indirect effect on seed yield per plant via 100 seed weight and number of pods per plant.

Key words: *Summer Guar, Variability, Heritability, Character Association.*

INTRODUCTION

Clusterbean {*Cyamopsis tetragonoloba* (L.)} one of most important drought hardy crop, popularly known as guar. Guar is well adapted to arid and semi arid regions due to presence of long, deep and well developed lateral roots[4]. Guar is suitable for the areas with light to medium textured soils, no water logging, rainfall range of 250 – 450 mm with 3-4 spells, Temperature range of 25°C to 40°C. [5].

Haryana has achieved the highest productivity of guar among all the states of India. Guar has been grown in the *kharif* season in the state. Apart from this, the crop can be grown during summer season after the harvesting of *raya* in the arid regions of the state. *Raya* is generally harvested till the end of February. After that, fields are generally remains fallow till *kharif* season in which the sowing is mainly dependent on the onset of monsoon. Therefore, in such areas during this period guar can be taken as summer crop if there is one pre sowing and one life saving irrigation is available.

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To convert this idea into an economic advantage for the farming community of such areas varieties with earliness, better adaptability, resistance to drought, photo and thermo insensitivity with efficient root system and nodulation will be required. Earliness to be the key characters for such varieties as the crop has to mature and to be harvested before the onset of monsoon.

The basic understanding of the magnitude of genetic variability and its genetic components is a prerequisite for the planning of breeding programme. Generally, genotypic coefficient of variability (GCV) and phenotypic coefficient of variability (PCV) are measured to study the variability. The knowledge of nature and magnitude of genetic variability, heritability and genetic advance over mean for seed yield and component character are useful for an effective selection programme. Correlation between different quantitative characters of a given crop plant provides information on their association with each other, whereas, path coefficient analysis helps in estimating direct and indirect contribution of various components towards yield. Therefore, the present investigation was conducted to understand of these genetic parameters, which form an integral part of a programme for making improvements in different seed yield and its component traits. Such studies have been conducted previously in guar in the *kharif* season but present study was conducted during summer season to understand the above mentioned characters in different photoperiod and temperature conditions.

MATERIAL AND METHODS

The material for the present study comprised of 20 clusterbean genotypes. The present experiment was conducted in Forage Section Research Area, Department of Genetics and Plant Breeding, CCSHAU, Hisar during summer 2016 in randomized block design with three replications. After applying pre-sowing irrigation, the experiment was sown on February 25, 2016 with all recommended package of practices to raise a healthy crop. Each genotype was sown by hand plough with plot size of 1.8 X 4 m^2 with six rows per plot at the spacing of 30 cm. Observations were recorded on five randomly selected competitive plants of each genotype from each replication for yield and its component traits *viz.* days to 50% flowering, days to maturity, plant height (cm), number of branches per plant, number of pods per plant, number of seeds per pod, 100-seed weight (g) and seed yield per plant (g). The genetic parameters like phenotypic and genotypic coefficient of variability (PCV and GCV), heritability (h^2) and genetic advance as per cent of mean of traits were estimated. The association among traits was estimated in terms of phenotypic (r_p) and genotypic (r_g) correlation coefficient estimates of component traits with yield were partitioned into direct and indirect effects by path coefficient analysis[1].

RESULTS AND DISCUSSION

In present study, higher genetic variability for seed yield number of branches per plant and plant height. (Table 1). Dwivedi[2], Pathak *et al*.[8], Saini *et al.*[11], Shabarishrai *et al*.[12] and Om Vir and Singh[7] studied the clusterbean genotypes and reported higher genetic variability for yield and its attributing traits. The magnitude of PCV was higher than the GCV for all the characters indicating the influence of environment on these traits (Table 2). The high GCV and PCV were shown by the traits like number of branches per plant and seed yield per plant medium for plant height, number of pods per plant and 100 seed weight and low for days to 50% flowering, days to maturity, number of seeds per pod and pod length. Seed yield per plant and number of branches per plant showed very high; 100 seed weight and plant height showed high; days to maturity, number of pods per plant, pod length and number of seeds per pod showed moderate and days to 50% flowering showed low heritability. High genetic advance as per cent of mean shown by number of branches per plant, seed yield per plant and plant height; moderate for number of pods per plant and 100 seed weight and low for days to 50% flowering, days to maturity, number of seeds per pod and pod length. High genetic advance as per cent of mean coupled with high heritability was observed for number of branches per plant and seed yield per plant, indicating additive effect in these traits and direct selection would be effective for these

traits. Similar additive gene effects of traits were found by Saini *et al*.[11] and Kumar[5].

The intense correlation coefficient at phenotypic and genotypic levels among different traits were studied (Table 3). High positive and significant correlation of seed yield per plant was observed for number of pods per plant (0.936) followed by 100 seed weight (0.906), number of branches per plant (0.437), number of seeds per pod (0.313) and pod length (0.266). Saini et. al., (2010) and Raghuprakash et al. (2009) also reported positive and significant associations of number of seeds per pod, number of pods per plant and number of branches per plant with seed yield per plant. Plant height (-0.513) and days to maturity (-0.315) showed negative and significant association with seed yield per plant.

The genotypic correlations of component traits with yield were partitioned into direct and indirect effect by path coefficient analysis. The 100 seed weight (0.498), number of pods per plant (0.376) and pod length (0.255) showed very high, while number of seeds per pod (0.058) showed moderate direct positive effect on seed yield per plant. Direct and negative effect was recorded days to 50% flowering (-0.1292) followed by plant height (-0.124), number of branches per plant (-0.052) and days to maturity (-0.019). Similar results for number of pods per plant, number of seeds per pod and number of branches per plant were found by Ibrahim *et al*[3].

The number of pods per plant and 100 seed weight showed positive indirect effect on seed yield per plant via 100 seed weight (0.459) and number of pods per plant (0.346) respectively. The number of branches per plant showed positive indirect effect on seed yield per plant via 100 seed weight (0.200) and number of pods per plant (0.179).

Table 1: Analysis of variance for different traits for 20 genotypes in Guar

Sr. No.	Characters	Mean sum of Squares			CV (%)
		Replication	Genotypes	Error	
		2	19	38	
1	Plant height (cm)	64.800	632.361	38.695	7.879
2	Days to 50% flowering	0.817	4.255	3.571	5.621
3	Days to maturity	5.717	47.681	7.646	2.585
4	No. of branches per plant	0.417	34.887	0.645	18.746
5	No. of pods per plant	9.450	78.010	15.204	12.398
6	No. of seeds per plant	0.317	0.943	0.369	6.69
7	Pod length (cm)	0.067	0.718	0.137	6.746
8	100-seed weight (g)	0.041	0.157	0.006	3.843
9	Seed yield per Plant (g)	0.007	1.424	0.019	6.638

** Significant at 1% level

Table 2: Mean, range, phenotypic and genotypic coefficient of variation, heritability, and genetic advance for various traits in Guar

Characters	Mean ±SE(m)	Range	Coefficient of variation		Heritability (%)	Genetic Advance as % of mean
			GCV	PCV		
Plant height (cm)	78.95±5.07	33-111	17.81	19.48	83.64	33.57
Days to 50% flowering	33.61±1.54	30-38	1.42	5.79	6.00	0.71
Days to maturity	106.96±2.25	100-114	3.41	4.23	63.57	5.60
No. of branches per plant	4.28±0.65	1.00-10	78.87	81.07	94.65	158.08
No. of pods per plant	31.45±3.18	22-48	14.54	19.11	57.93	22.81
No. of seeds per pod	9.08±0.49	7.00-11	4.81	8.24	34.12	5.79
Pod length (cm)	5.48±0.30	4.00-7.00	8.03	10.49	58.62	12.66
100-seed weight (g)	2.04±0.06	1.66-2.00	10.94	11.59	89.02	21.26
Seed yield per plant (g)	2.26±0.11	3.31-1.31	30.23	30.83	96.11	61.04

Table 3: Phenotypic (Above diagonal) and Genotypic (Below diagonal) Correlations among yield component traits in Guar

	PH	**DFF**	**DM**	**BPP**	**PP**	**SPP**	**PL**	**100 SW**	**SY/Plant**
PH	1.000	0.192^{NS}	0.648**	-0.372**	-0.354**	0.035^{NS}	0.252^{NS}	-0.344**	-0.460**
DFF	**1.156****	1.000	0.186^{NS}	-0.152^{NS}	-0.074^{NS}	0.107^{NS}	0.181^{NS}	0.099^{NS}	-0.010^{NS}
DM	**0.864****	**0.663****	1.000	-0.334**	-0.261*	-0.099^{NS}	0.188^{NS}	-0.122^{NS}	-0.240^{NS}
BPP	**-0.419****	**-0.374****	**-0.409****	1.000	0.379**	-0.105^{NS}	0.043^{NS}	0.348**	0.417**
PP	**-0.497****	**-0.254**^{NS}	**-0.230**^{NS}	**0.477****	1.000	0.417**	0.057^{NS}	0.638**	0.749**
SPP	**0.113**^{NS}	**1.044****	**-0.105**^{NS}	**-0.206**^{NS}	**0.109**^{NS}	1.000	0.299*	0.234^{NS}	0.219^{NS}
PL	**0.461****	**0.617****	**0.374****	**0.050**^{NS}	**0.181**^{NS}	**0.337****	1.000	0.115^{NS}	0.234^{NS}
100 SW	**-0.364****	**0.275***	**-0.253**^{NS}	**0.402****	**0.921****	**0.527****	**0.139**^{NS}	1.000	0.826**
SY/Plant	**-0.513****	**-0.006**^{NS}	**-0.315***	**0.437****	**0.963****	**0.313***	**0.266***	**0.906****	1.000

PH= Plant height, DFF= Days to 50% flowering, DM=Days to maturity, BPP= No. of Branches per plant, PP= No. of pods per plant, SPP= No. of seeds per plant, PL= Pod length, 100 SW= 100 seed weight, SY/Plant= Seed yield per plant

Table 4: Direct and Indirect effects of component traits on yield in Guar

	PH	**DFF**	**DM**	**BPP**	**PP**	**SPP**	**PL**	**100 SW**	
PH	**-0.12481**	-0.14949	-0.01673	0.02200	-0.18720	0.00663	0.11777	-0.18145	**-0.513**
DFF	-0.14434	**-0.12926**	-0.01285	0.01963	-0.09565	0.06137	0.15773	0.13692	**-0.006**
DM	-0.10783	-0.08576	**-0.01936**	0.02146	-0.08669	-0.00618	0.09558	-0.12625	**-0.315**
BPP	0.05234	0.04835	0.00792	**-0.05247**	0.17957	-0.01213	0.01265	0.20041	**0.437**
PP	0.06207	0.03285	0.00446	-0.02503	**0.37641**	0.00643	0.04628	0.45925	**0.963**
SPP	-0.01408	-0.13492	0.00204	0.01083	0.04117	**0.05879**	0.08613	0.26275	**0.313**
PL	-0.05753	-0.07981	-0.00724	-0.00260	0.06818	0.01982	**0.25547**	0.06935	**0.266**
100 SW	0.04540	-0.03548	0.00490	-0.02108	0.34657	0.03097	0.03552	**0.49880**	**0.906**

PH= Plant height, DFF= Days to 50% flowering, DM=Days to maturity, BPP= No. of Branches per plant, PP= No. of pods per plant, SPP= No. of seeds per plant, PL= Pod length, 100 SW= 100 seed weight, SY/Plant= Seed yield per plant

CONCLUSIONS

It could be concluded from this study that number of pods per plant and 100 seed weight are most important yield components, as pointed out by correlation study and path analysis. These components were positively associated with each other and with yield, suggesting that simultaneous improvement in these characters will lead to increase in yield.

REFERENCES

1. Dewey, D.R. and Lu, K.H., A correlation and path coefficient analysis of crested wheat grass seed production. *Agronomy journal*. **51:** 515-518 (1959).
2. Dwivedi, N. K., Evaluation of vegetable guar [*Cyamopsis tetragonoloba* (L.) Taub.] germplasm. *J. Arid Legumes*, **6(1):** 17-19 (2009).
3. Ibrahim, E.A., Abdalla, A.W. H., Rahman, M. E. A., Naim, A.M. E., Path Coefficient and Selection Indices in Sixteen Guar (Cyamopsis Tetragonoloba L.) Genotypes Under Rain-fed. *International Journal of Agriculture and Forestry*, **2(1):** 79-83 (2012).
4. Jitender, S.K. Pahuja, N., Verma and Bhusal, N., Genetic variability and heritability for seed yield and water use efficiency related characters in Clusterbean {*Cyamopsis tetragonoloba* (L.) Taub.}. *Forage Res.*, **39:** 170-174 (2014).

5. Kumar, D., *Guar& Its By–Products Status, Potential, Prospects, Challenges and R&D Road Map*.CAZRI-Jodhpur. P. 4. (2014).
6. Kumar, V. and Ram, R.B. Genetic variability, Correlation and Path analysis for Yield and Yield attributing Traits in Cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.] Genotypes. *Int. J. Pure App. Biosci*. **3(1):** 143-149 (2015).
7. Vir, O. and Singh, A. K., Variability and correlation analysis in the germplasm of cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.] In hyper hot arid climate of Western India. *Legume Research*, **38(1):** 37-42 (2015).
8. Pathak Rakesh, Singh, Manjit and Henry, A., Genetic divergence in Cluster bean (*Cyamopsis tetragonoloba*) for seed yield and gum content under rainfed conditions. *Indian Journal of Agricultural Sciences*, **79 (7):** 559–61 (2009).
9. Panse, V.G., and Sukhatme, P.V., *Statistical methods of Agricultural Workers*, 2nd Edn. ICAR Publicatons, New Delhi, India (1967) .
10. Raghuprakash K.R., Parthsarthi L., Reddyshekhar M., Studies on selection indices in Guar {*Cyamopsis tetragonoloba* (L.) Taub.}*The Asian and Australian Journal of Plant Sciences and Biotechnology*, **3(1):** 26-30 (2009).
11. Saini, D. D., Singh, N. P., Chaudhary, S. P. S., Chaudhary, O. P and Khedar, O. P., Genetic variability and association of component characters for seed yield in clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.]. J. Arid Legumes, **7(1):** 47-51 (2010).
12. Shabarishrai, P., Dharmatti, P.R., Shashidhar, T.R., Patil, R. V. and Patil, B.R., Genetic variability studies in clusterbean [*Cyamopsis tetragonoloba* (L.) Taub]. *Karnataka J. Agric. Sci.*, **25(1):** 108-11(2012).