Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.8035

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2020) *8*(2), 169-172

Research Article

Indian Journal of Pure & Applied Biosciences

Variability, Correlation and Path Analysis Studies in Grain Cowpea [*Vigna unguiculata* (L.) Walp]

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Received: 9.03.2020 | Revised: 13.04.2020 | Accepted: 15.04.2020

ABSTRACT

Cowpea [Vigna unguiculata (L.) Walp] is highly drought tolerant and important crop for arid and semi arid areas. Twenty two genotypes of grain cowpea were evaluated for various morphological traits to study the main yield contributory traits during kharif 2018 under rainfed conditions. The high estimates of GCV and PCV were observed for seed yield per plot, number of pods per plant and plant height. High heritability accompanied with high genetic advance as per cent of mean revealed that the additive gene effect controls the inheritance of seed yield per plot, plant height and number of pods per plant. Highly significant and positive correlation were observed between seed yield per plot and plant height followed by days to 50% flowering, days to maturity and number of pods per plant indicated the importance of these characters for seed yield per plot. Highly significant and negative correlation was observed between seed yield per plot and 100 seed weight. The Path coefficient analysis showed that the plant height had the highest positive and direct contribution towards seed yield per plot followed by days to maturity and number of pods per plant indicating that selection for these characters would bring about improvement in seed yield of cowpea under rainfed condition.

Keywords: *Variability, Correlation, Path Analysis, Rainfed and Semi Arid Conditions and Grain Cowpea*

INTRODUCTION

Cowpea [*Vigna unguiculata* (L.) Walp.], which is native to India is a multipurpose, highly drought tolerant annual legumes. This diploid (2n=2x=22) legume belongs to family Leguminaceae. In India its dry seeds are used as pulse, green pods and young twigs are used for culinary purpose. It also provides good quality green as well as dry fodder for cattles (Nguyen et al., 2019). This legume perform well in the arid & semi arid areas as well as in the areas with assured irrigation. The cowpea varieties with high yielding, drought tolerant, photo-insensitive, white seeded, containing high protein content & digestibility, low anti-nutritional factors like tannins & trypsin inhibiting factors and resistant against cowpea yellow mosaic virus (CYMV) are desirable.

Cite this article: Panchta, R., Preeti, & Arya, S. (2020). Variability, Correlation and Path Analysis Studies in Grain Cowpea [*Vigna unguiculata* (L.) Walp], *Ind. J. Pure App. Biosci. 8*(2), 169-172. doi: http://dx.doi.org/10.18782/2582-2845.8035

Prior knowledge of correlation between seed yield and its contributing characters is essential for yield improvement through selection programmes. Path coefficient analysis is an effective tool to partition the correlation coefficients into direct and indirect effects of the component characters of yield. Considering these fact, the present study was undertaken to assess the nature and magnitude of genetic variability and association of seed yield with its component characters in grain cowpea under arid semi arid conditions of Hisar.

MATERIALS AND METHODS

A breeding trial containing twenty two genotypes of grain cowpea was conducted during *kharif* 2018, at CCSHAU, Hisar. The experimental material was sown in a randomized block design (RBD) with three replications. Four rows of each genotype of 4 m length were grown with row-to-row distance of 45 cm and plant to plant distance of 10 cm. All the recommended cultural practices to raise a good crop were followed throughout the season. Observations from five randomly selected plants of each genotype in each replication were recorded on eight quantitative 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 plot (g). Analysis of variance was performed using method described by Panse and Sukhatme (1967). Phenotypic coefficient of variance and genotypic coefficient of variability were calculated by the method explained by Singh and Chaudhary (1985). Heritability in broad sense and genetic advance were calculated by method given by Burton and Devane (1953). Correlation coefficient and path analysis was worked out as per the method suggested by Dewey and Lu (1959).

RESULTS AND DISCUSSION

The genotypes were found significantly different for all the characters, which indicated scope for further genetic studies. The environmental influence over all the characters under study was revealed by invariably higher phenotypic coefficient of variation (PCV) estimates than their corresponding genotypic coefficient of variation (GCV) values. The high estimates of GCV and PCV were observed for seed yield per plot, number of pods per plant and plant height. This suggests the fact that selection based on these characters would facilitate successful isolation of desirable types. Similar results were found by Om Vir and Singh (2019) for all traits by Sharma et al. (2017) for plant height and by Sharma et al. (2019) and Sabale et al. (2018) for seed yield per plot. High heritability accompanied with high genetic advance as per cent of mean revealed that the additive gene effect controls the inheritance of seed yield per plot, plant height and number of pods per plant. (Table 1). Similar results were found by Sharma et al. (2019), Om Vir and Singh (2019), Sabale et al. (2018), Sharma et al. (2017) for seed yield per plot and plant height. Highly significant and positive correlation were observed both at genotypic and phenotypic level between seed yield per plot and plant height followed by days to 50% flowering, days to maturity and number of pods per plant indicated the importance of these characters for seed yield per plot. (Table 2). Similar results were found by Nguyen et al. (2019), Sharma et al. (2019), Santos et al. (2014) for number of pods per plant and by Kwon-Ndung & Kwala (2017), for plant height as well. The Path coefficient analysis showed that the plant height had the highest positive and direct contribution towards seed yield per plot followed by days to maturity and number of pods per plant while, 100 seed weight has high direct negative effect on seed yield per plot followed by days to 50% flowering (Table 3). Similar result were found by Nguyen et al. (2019) for number of pods per plant, by Walle et al. (2018) for plant height, days to maturity & 100 seed weight and by Kwon-Ndung & Kwala, (2017), for number of pods per plant and plant height. The selection for characters high positive and direct contribution towards would bring about improvement in seed yield of cowpea under rainfed condition.

Table1: Genetic parameters of different characters in Grain Cowpea

Characters	Mean ±SE(m)	CD (5%)	Range	Coefficient of variation		Heritability (%)	Genetic Advance as % of mean
				GCV	PCV		
Days to 50% flowering	40.11± 5.25	15.03	31.33-53.33	16.367	16.680	96.29	33.08
Days to maturity	74.43±8.69	24.88	64.33-94.33	11.425	11.702	95.33	22.98
Plant height (cm)	77.48±5.43	15.56	54.00-102.67	21.396	22.132	93.47	42.61
No. of branches per plant	9.65± 6.18	17.68	6.33-13.00	17.295	20.551	70.82	29.98
No. of pods per plant	15.01 ± 6.19	17.71	8.67-27.33	34.414	36.393	80.02	65.99
No. of seeds per pod	10.15± 7.14	20.45	6.67-12.67	15.091	17.363	75.55	27.02
100 seed weight (g)	11.05± 3.82	10.92	9.44-14.73	12.160	12.340	97.11	24.69
Seed yield per plot (g)	312.57± 5.67	16.24	133.33-473.33	38.768	39.883	94.49	77.63

Table 2: Phenotypic and genotypic correlations among yield component traits in grain cowpea. Above diagonal indicates phenotypic, below diagonal and bold are genotypic correlation coefficients

Characters	Days to 50% Flowering	Days to maturity	Plant height (cm)	No. of branches per plant	No. of pods per plant	No. of seeds per pod	100 seed weight (g)	Seed yield per plot (g)
Days to 50% Flowering	1	0.908*	0.794**	0.418**	0.281*	0.123^{NS}	-0.050^{NS}	0.277*
Days to maturity	**0.940****	1	0.696**	0.364**	0.266*	0.074^{NS}	0.023^{NS}	0.270**
Plant height (cm)	**0.835****	**0.740****	1	0.443**	0.272*	0.206^{NS}	-0.108^{NS}	0.406**
No. of branches per plant	**0.502****	**0.459****	**0.509****	1	0.246*	-0.163^{NS}	0.219^{NS}	-0.011**
No. of pods per plant	**0.296***	**0.304***	**0.307***	**0.361****	1	-0.147^{NS}	-0.016^{NS}	0.252*
No. of seeds per pod	**0.139^{NS}**	**0.068^{NS}**	**0.275***	**-0.253***	**-0.176^{NS}**	1	-0.437**	0.210^{NS}
100 seed weight (g)	**-0.061^{NS}**	**0.026^{NS}**	**-0.112^{NS}**	**0.255***	**-0.023^{NS}**	**-0.491****	1	-0.452**
Seed yield per plot (g)	**0.292***	**0.286***	**0.411****	**-0.002^{NS}**	**0.274***	**0.272***	**-0.473****	1

Table 3: Direct and indirect effect of component traits on yield in grain cowpea. Residual effect= 0.60922

Characters	Days to 50% Flowering	Days to maturity	Plant Height (cm)	No. of branches per plant	No. of pods per plant	100 seed weight (g)	No. of seeds per pod
Days to 50% Flowering	**-0.383**	0.273	0.377	-0.054	0.048	-0.005	0.021
Days to maturity	-0.348	**0.301**	0.331	-0.047	0.045	-0.003	-0.009
Plant height (cm)	-0.304	0.209	**0.475**	-0.057	0.046	-0.008	0.045
No. of branches per plant	-0.160	0.110	0.211	**-0.129**	0.042	0.006	-0.090
No. of pods per plant	-0.108	0.080	0.129	-0.032	**0.170**	0.006	0.007
100 seed weight (g)	-0.047	0.022	0.098	0.021	-0.025	**-0.039**	0.180
No. of seeds per pod	0.019	0.007	-0.051	-0.028	-0.003	0.017	**-0.413**

CONCLUSION

Selection for the characters *viz.* plant height, no. of pods per plant, days to maturity and days to 50 % flowering which shows high positive and direct contribution towards seed yield per plot would result into development of high yielding grain cowpea varieties.

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