

Variability and Correlation studies in cowpea (*Vigna unguiculata*)

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Abstract

Genotypic coefficient of variation, heritability and genetic advance were assessed in 30 genotypes of cowpea. (*Vigna unguiculata* (L.) Walp). Genotype differed significantly for all characters studied. Almost all characters showed high heritability values. High heritability coupled with high genetic advance was observed for plant height, number of pods per plant and number of branches per plant and high GCV observed for leaf area index followed by days to 50% flowering indicating thereby the preponderance of additive gene effects for this characters.

Interrelationships between seed yield per plot, number of pods per plant, and their component traits were studied. Days to maturity had highly significant positive correlation with days to 50% flowering both genotypically and phenotypically. Protein content is significant

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but negatively associated with days to maturity. Number of clusters per plant showed strong positive significant correlation with protein content. Pod length exhibited significant positive correlation with protein content. Number of seeds per pod exhibited positive significant correlation with protein content and strongly correlated with pod length. Seed yield per plot exhibited strong positive significant correlation with clusters per plant, number of pods per plant. It also shows moderately positive significant correlation with protein content. Components of seed yield viz. number of pods per cluster and number of clusters per plant appears to provide reliable criteria for effective selection in cowpea.

Introduction

Cowpea [*Vigna unguiculata* (L.) Walp] is an important leguminous vegetable crop mainly grown both in *kharif* and spring summer season crop in most parts of India. Cowpea is diploid with chromosome number of $2n = 22$. Cowpea belongs to family Leguminaceae, Sub family Fabaceae, is a genus having 170 species.. Cowpea contains three cultivated species viz., *V. unguiculata*, *V. cylindrica*, *V. sequipedalis*. It is early, multiseasonal and

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multipurpose crop. Cowpea seeds are good source of protein (24.8%), fat (1.9%), CHO (63.6%), vitamin A (0.00074), Thiamine (9) (0.00014) Riboflavin (mg) (0.00042), Niacin (mg) (0.00281).

The present study was taken up to understand the variability, heritability estimates, expected genetic advance and correlation studies. For selection of the important traits of the seed yield in cowpea.. Genotypic coefficient of variation (GCV) was highest leaf area index (45.17%) followed by days to 50% flowering (40.04%), plant height (34.71%),

Yield is a complex entity and is associated with a number of component character. These Characters are themselves interrelated. Such a interdependence of the contributory factors often affect their direct relationship with yield thereby making correlation coefficient unreliable as selection indices .It is however, desirable to know the degree to which different component characters are correlated among themselves as well as with the both at genotypic and phenotypic levels. The present investigation was, therefore undertaken to determine correlation coefficients both at genotypic and phenotypic levels in cowpea.

MATERIALS AND METHODS

Thirty cowpea indigenous type genotypes were grown in RBD with three replications in 2010. With 1.80 cm long and 2.40cm broad of each genotype was sown keeping 45cm spacing between rows. Observations were recorded on five random plants for days to 50% flowering, days to maturity, plant height,

leaf area index, chlorophyll content 45 and 65 DAS number of branches per plant, no. of clusters per plant, no. of pods per plant, protein content, no of seeds per pod, pod length, seed yield per plot and 100 seed weight.

The data were subjected to statistical analysis and the various genetic parameters such as PCV, GCV, heritability and genetic advance were worked out by making use of appropriate formula (Singh and Chaudhary, 1977 and Johnson *et al.*, 1955). The plot means were used for statistical analysis (Panse and Sukhatme, 1967). The phenotypic and genotypic correlations were calculated according to formulae suggested by fisher (1954); Al-Jibouri *et al.* (1958) and Singh and Choudhari (1977) which were compared with table r values at n-2 d.f.

RESULT AND DISCUSSION

The performance of 30 genotypes for 14 characters with the estimate of phenotypic and genotypic correlation coefficient among 14 characters is presented in Table 2.

High GCV observed for leaf area index (45.17%) followed by days to 50% flowering (40.04%), plant height (34.71%), number of branches per plant (27.99%), number of pods per plant (24.84%), number of clusters per plant (24.73%) and for days to maturity (18.01%).

Heritability was higher for plant height (99.95%), days to 50% flowering (99.73%) followed by days to maturity (99.34%), number of branches per plant (98.78%), number of pods per plant (97.70%), 100 seed

weight (96.71%), number of clusters per plant (96.69%) which shows the selection for these characters will be beneficial. High heritability coupled with high genetic advance was observed for plant height (99.95% and 91.62%), number of pods per plant (97.70% and 64.82%) and number of branches per plant (98.78% and 73.45%)

The genotypic correlation coefficients were worked out for all the characters and presented in table 6. In general genotypic correlation coefficients were higher in magnitude over the respective phenotypic correlation coefficients except for the association in few pairs of characters.

Days to maturity had highly significant positive correlation with days to 50% flowering both at phenotypic and genotypic level. Plant height showed significant positive correlation with days to 50% flowering and days to maturity both at phenotypic and genotypic level. Number of branches per plant exhibited strong positive correlation with days to 50% flowering and days to maturity and plant height at genotypic as well as phenotypic level.

Chlorophyll content Index (65 DAS) was found to have positive-significant correlation with Chlorophyll content Index (45 DAS) both at phenotypic and genotypic level. Protein content is significant but negatively associated with days to maturity. Number of clusters per plant showed strong positive significant correlation with protein content while it had moderately negatively significant correlation with number of branches per plant. Also it is highly significant but negatively correlated

with Days to 50 % flowering, days to maturity and plant height. Number of pods per clusters showed strong positive significant correlation with number of cluster per plant and protein content while it had moderately negative but significant correlation with number of branches per plant. It had significant negative association with days to 50 % flowering, days to maturity and plant height both at phenotypic and genotypic level. Pod length exhibited significant positive correlation with protein content both at phenotypic and genotypic level. Number of seeds per pod exhibited positive significant correlation with protein content and strongly correlated with pod length Seed yield per plot exhibited strong positive significant correlation with clusters per plant, number of pods per plant. It shows moderately significant correlation with number of pods per plant phenotypically. It also shows moderately positive significant correlation with protein content and moderately negative significant correlation with days to 50% flowering, days to maturity and number of branches per plant both at phenotypic and genotypic level.

Days to maturity exhibited strong positive correlation with days to 50 per cent flowering. Tyagi *et al.* (2001) observed similar trends of results for days to maturity and plant height at both phenotypic and genotypic levels. Number of clusters per plant is negatively significantly correlated with the days to 50% flowering, days to maturity, plant height and Number of branches per plant. Analogous results are reported by Venkatesan *et al.* (2003) for plant height and number of branches per plant.

Sr. No	Characters	GM	RANGE	GCV %	PCV %	H ^b %	GAM1%
1.	Days to 50% flowering	70.64	33.33-100.33	40.04	40.09	99.73	105.56
2.	Days to maturity	114.56	64.66-137.66	18.01	18.07	99.34	47.40
3.	Plant height (cm)	85.07	47.40-137.60	34.71	34.72	99.95	91.62
4.	Number of branches per plant	14.95	10.66-22.53	27.99	28.16	98.78	73.45
5.	Leaf area Index	1.26	0.57-3.66	45.17	47.80	89.29	112.69
6.	Chlorophyll content Index (45 DAS)	32.86	26.14-37.46	10.32	11.15	85.54	25.19
7.	Chlorophyll content Index (65 DAS)	32.53	24.62-39.93	10.12	12.12	69.74	22.31
8.	Protein content (%)	19.62	17.38-23.63	8.54	8.74	95.36	22.02
9.	Number of clusters per plant	4.96	3.26-7.20	24.73	25.15	96.69	64.20
10.	Number of pods per plant	9.92	6.60-14.40	24.84	25.13	97.70	64.82
11.	Pod length (cm)	11.76	10.26-15.46	10.17	10.76	89.38	25.39
12.	Number of seeds per pod	10.53	8.80-13.80	10.86	11.28	92.63	27.60
13.	100 seed weight (g)	9.87	8.33-15.16	17.05	17.34	96.71	44.27
14.	Seed yield per plant (g)	11.26	9.46-14.66	10.08	11.25	80.44	23.88
15.	Seed yield per plot (g)	433.86	335-576.66	11.76	12.84	83.90	28.45

Table 1: Estimate of genetic variability for fifteen characters in cowpea

CONCLUSION

The experimental studies revealed substantial amount of genetic variability among the genotypes under study. In general, phenotypic coefficients of variation were higher in magnitude than genotypic coefficient of variation. The characters LAI and days to 50% flowering showed comparatively higher

estimates of genotypic and phenotypic coefficients of variation indicating high level of variability and ample scope for effective improvement. The higher estimates of heritability coupled with high genetic advance as percentage of mean indicated additive gene action for the above characters. The characters Seed yield per plot exhibited strong positive

significant correlation with clusters per plant ($r=0.496^{**}$), number of pods per plant ($r=0.483^{**}$). Also shows moderately positive

significant correlation with protein content (0.384*).

Sr. No	Character	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches/plant	LAI	CCI 45 DAS	CCI 65 DAS	Protein content (%)	No of clusters /plant	No of pods/cluster	Pod length (cm)	No. of seeds /pod	100Seed Weight (g)	Seed yield/ plant (g)
1	Days 50% to flowering	G 1 0.886** P 0.882**		0.687** 0.685**	0.534** 0.530**	-0.026 -0.024	-0.163 -0.153	0.301 0.249	-0.340 -0.331	-0.589** -0.576**	-0.587** -0.579**	0.000 0.000	-0.070 -0.068	-0.047 -0.046	-0.404* -0.369*
2	Days to maturity	G 1		0.570** 0.568**	0.506** 0.501**	0.019 0.025	-0.156 -0.145	0.236 0.197	-0.403* -0.394*	-0.641** -0.632**	-0.642** -0.635**	-0.171 -0.164	-0.253 -0.240	0.004 0.002	-0.436* -0.402*
3	Plant height (Cm)	G P		1	0.810** 0.805**	-0.031 -0.028	-0.212 -0.194	0.246 0.210	-0.352 -0.344	-0.477** 0.469**	-0.497** -0.474**	0.015 0.015	0.011 0.011	-0.086 -0.085	-0.325 -0.295
4	No. of branches/ plant	G P			1	0.142 0.133	-0.112 -0.113	0.319 0.260	-0.311 -0.297	-0.446* -0.435**	-0.445* -0.437*	-0.169 -0.155	-0.161 -0.157	-0.201 -0.197	-0.440* -0.400*
5	LAI	G P			1		-0.309 -0.253	-0.267 -0.200	0.121 0.114	-0.225 -0.227	-0.234 -0.232	-0.025 -0.023	-0.006 0.000	0.353 0.316	0.103 0.069
6	CCI 45 DAS	G P					1	0.667** 0.668**	-0.044 -0.053	0.279 0.247	0.273 0.245	0.028 0.037	0.039 0.042	-0.109 -0.095	0.027 0.020
7	CCI 65 DAS	G P						1	-0.252 -0.206	-0.102 -0.094	-0.108 -0.099	-0.029 0.000	0.009 0.025	-0.117 -0.106	-0.090 -0.072
8	Protein content (%)	G P							1	0.589** 0.562**	0.592** 0.568**	0.430* 0.372*	0.436* 0.406*	0.319 0.300	0.384* 0.354
9	No. of clusters/ plant	G P							1	0.998** 0.996**	0.998** 0.996**	0.038 0.050	0.042 0.040	-0.092 -0.087	0.456** 0.447*
10	No. of pods /plant	G P								1	0.039 0.043	0.039 0.043	0.046 0.039	-0.097 -0.094	0.483** 0.440*
11	Pod length (Cm)	G P										1	0.990** 0.934**	0.028 0.020	0.163 0.131
12	No. of seeds /pod	G P											1	0.051 0.042	0.158 0.148
13	100 seed weight (g)	G P												1	0.124 0.108
14	Seed yield/ plot (g)	G P													1

Table 2: Estimates of genotypic and phenotypic correlation coefficient in cowpea.

Note - 1=0.361- at 5% level, 0.461-1 % level. *, **, *** Significant at 5 and 1 per cent, respectively

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