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Correlation studies in cowpea (*Vigna unguiculata* L.)

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Abstract
Twenty two genotypes including two checks of Cowpea [*Vigna unguiculata* (L.)] were studied for character association for yield and its components. The experiment was conducted at research farm, Department of Agril. Botany, VNMKV, Parbhani and it was laid out in Randomized Block Design with two replications. The observations was recorded on twelve characters *viz* , plant height, number of primary branches per plant, days to 50 per cent flowering, number of pods per plant, number of seeds per pod, mean pod weight (g), pod length (cm), pod width (cm), days to first pod harvest, 100 seed weight (g), pod yield per plant (g) and pod yield per hectare (qt). It was observed that the magnitude of association varied among the genotypes. The characters plant height, No. of primary branches per plant, No. of pods per plant, No. of seeds per pod, mean pod weight and 100 seed weight showed the positive and significant correlation with pod yield per plant.

Keywords: Correlation, cowpea, genotype, yield

Introduction
Cowpea (*Vigna unguiculata* (L.) Walp), is being cultivated in India from ancient times. Vavilov (1951) recognized India and Africa as the primary center of origin, while China is considered as secondary center of origin of cowpea. Now cowpea is well adapted crop, cultivated around the world primarily as a pulse, but also as a vegetable (both for the green peas and grain) and cover crop as well as for fodder. Cowpea is considered more tolerant to drought than even soybean and mungbean, due to its deep tap root.

Correlation shows nature and extent of such association between any two characters. For the study of genetic variability and correlation of characters, cowpea offers a good scope because of its extravert nature of pistil comparatively easier handling, wider adaptability and presence of maximum variability. While selecting a suitable plant type, association studies would provide reliable information on nature, extent and direction of selection, especially when there is a need to combine high yield potential with desirable agronomic traits and pod quality characters. A positive correlation between desirable characters is favorable to the plant breeder because it helps in simultaneous improvement of both the characters. A negative correlation will hinder the

simultaneous expression of both the characters with high values. The genetic improvement in dependent trait can be achieved by applying strong selection to a character which is genetically correlated with the dependent character is called correlated response. Sometimes a character has low heritability. Under such situation another character having high heritability and high correlation with the former trait is choose to make selection more effective.

Material and Methods
The present investigation was undertaken to study correlation and character associated studies in twenty two genotypes of Cowpea [*Vigna unguiculata* (L.)] including two checks in Randomized Block Design with two replications. The experiment was conducted at research farm, Department of Agril. Botany, VNMKV, Parbhani. All the recommended cultural practices and packages were applied for growing healthy and good crop, in each entry, five plants are randomly selected from each replication and following observations were recorded for plant height, number of primary branches per plant, days to 50 per cent flowering, number of pods per plant, number of seeds per pod, mean pod weight (g), pod length (cm), pod width (cm), days to first pod harvest, 100 seed weight (g), pod yield per plant (g) and pod yield per hectare (qt). Genotypic and phenotypic correlation co-efficient were computed as suggested by Johnson *et al.* (1955) [5].

Results and Discussion
Correlation analysis provides information on the nature and magnitude of the association of different component characters with pod yield. Pod yield being a complex character, it is very

difficult to improve by selecting the genotypes for yield *per se*. Therefore, identifying the characters which are closely related and which have contributed to yield becomes highly essential. In this context, correlation is an important tool to measure the direction and strength of relationship of different component characters on seed yield. Correlation analysis provides information about yield components and thus helps in the selection of superior genotypes from diverse genetic population. Similar information is provided by Manggoel *et al.* (2012), Sapara *et al.* (2014) [10] and Patel *et al.* (2016) [6]. In the present studies, the characters plant height (cm), number of primary branches per plant, number of pods per plant, number of seeds per pod, mean pod weight (g), pod width (cm), 100 seed weight (g), showed positive and significant correlation with pod yield per plant. These results are supported by Manggoel *et al.* (2012), Thorat *et al.* (2013) [15], Sapara *et al.* (2014) [10] and Patel *et al.* (2016) [6].

Pod yield per hectare recorded positive significant correlation with number of pods per plant (0.685r_g, 0.653rp) and mean pod weight (0.935r_g, 0.601rp) at both levels of significance. It also showed positive significant correlation with number of primary branches per plant (0.575r_g, 0.562r_p) at 5% level of significance only. These results are supported by Patel *et al.* (2016) [6]. The magnitude of genotypic correlation was higher than phenotypic correlation for all the traits that indicated inherent association between various characters. The findings were in agreement to Pathak and Jamwal (2002) [9] and Venkatesan *et al.* (2003) [11]. In the present findings significant positive phenotypic correlation pod yield per plant was observed with number of pods per plant, pod weight indicating that these characters are the primary yield determinant in cowpea. The earlier findings of Pathak and Jamwal (2002) [9], Kutty *et al.* (2007) and Lal *et al.* (2007) [13] for number of pods per plant, Venkatesan *et al.*,(2003) [11] for number of pods per plant, Singh *et al.* (2004), Anbumalarmathi *et al.* (2005) and Sharma *et al.* (2007) [14] for number of pods per plant.

While selecting a suitable plant type, association studies would provide reliable information on nature, extent and direction of selection, especially when there is a need to combine high yield potential with desirable agronomic traits and pod quality characters. Pod yield recorded positive significant correlation with number of pods per plant, and mean pod weight. Whereas pod yield per hectare recorded positive significant correlation with number of pods per plant and mean pod weight at both levels of significance. It also showed positive significant correlation with number of primary branches per plant at 5% level of significance only. The magnitude of genotypic correlation was higher than phenotypic correlation for all the traits that indicated inherent association between various characters. In the present findings significant positive phenotypic correlation pod yield per plant was observed with number of pods per plant and pod weight indicating that these characters are the primary yield determinant in cowpea.

Table 1: Analysis of variance for 12 characters of cowpea

S. No	Character	Mean sum of squares		
		Replications (d.f=1)	Treatment (d.f=21)	Error (d.f=21)
1	Plant height (cm)	0.519	310.37**	3.05
2	No. of primary branches per plant	0.038	6.581**	0.176
3	Days to 50% flowering	1.454	21.80**	1.787
4	Number of pods per plant	0.568	19.44**	1.32
5	Number of seeds per pod	0.340	16.14**	0.883
6	Mean pod weight (g)	35.227	56.44**	23.43
7	Pod length (cm)	0.512	33.54**	0.605
8	Pod width (cm)	0.0012	0.0092**	0.0014
9	Days to first pod harvest	2.272	41.13**	2.748
10	100 seed weight (g)	0.342	9.602**	0.245
11	Pod yield per plant (g)	3.455	2056.68**	2.618
12	Pod yield per hectare (kg)	2.835	632.90**	1.135

**Significant at 1% level *Significant at 5% level

Table 2: Estimation of genotypic and phenotypic correlation coefficients for different characters of Cowpea

Character		Plant Height (cm)	Number of primary branches per plant	Days to 50% flowering	Number of pods per plant	Number of seeds per pod	Mean pod weight (g)	Pod length (cm)	Pod width (cm)	Days to first pod harvest	100 seed weight (g)	Pod yield/ plant (g)	Pod yield (qt/ha)
Plant height	G	**1.00**	0.4901**	0.5750**	0.3518*	-0.1057	0.3987	-0.3458*	-0.3902*	0.5894**	-0.0228	0.3864**	0.3864**
	P	**1.00**	0.4824**	0.5046**	0.3467*	-0.0803	0.2620	-0.3235*	-0.3055*	0.5311**	-0.0105	0.3863**	0.3850**
Number of primary branches per plant	G		1.00	0.1058	0.4543**	-0.0498	0.6151*	-0.4430**	-0.1916	0.2617	-0.0926	0.5757**	0.5755**
	P		1.00	0.0723	0.4273**	-0.0374	0.3382*	-0.4137**	-0.1066	0.2184	-0.0759	0.5632**	0.5629**
Days to 50 per cent flowering	G			1.00	0.0903	-0.1379	-0.3280	0.0854	-0.2270	0.7279**	0.2118	-0.1198	-0.1194
	P			1.00	-0.0212	-0.1863	-0.1851	0.0308	-0.2722	0.6986**	0.1529	-0.1238	-0.1261
Number of pods per plant	G				1.00	-0.2684	0.3193	-0.4130*	-0.0223	0.0972	0.0170	0.6866**	0.6852**
	P				1.00	-0.1893	0.2071	-0.3386*	0.0843	0.0358	0.0532	0.6525**	0.6535**
Number of seeds per pod	G					1.00	0.09676	0.4858**	-0.2450	-0.3295*	0.3194	0.0754	0.0786
	P					1.00	0.0677	0.4884**	-0.1709	-0.3104*	0.2899	0.0814	0.0766
Mean pod weight (g)	G						1.00	-0.2444	0.1706	-0.2604	-0.1878	0.9344**	0.9352**
	P						1.00	-0.1576	0.1164	-0.1481	-0.1036	0.6017**	0.6014**
Pod length (cm)	G							1.00	0.0416	-0.0517	0.4284**	-0.2418	-0.2415
	P							1.00	0.0723	-0.0789	0.4288**	-0.2300	-0.2309
Pod width (cm)	G								1.00	-0.1026	-0.3764	0.0870	0.0798
	P								1.00	-0.2131	-0.2435	0.0853	0.0920
Days to first pod harvest	G									1.00	-0.0048	-0.0536	-0.0501
	P									1.00	-0.0684	-0.0559	-0.0598

100 seed weight (g)	G										1.00	0.0731	0.0700
	P										1.00	0.0751	0.0766
Pod yiel per plant (g)	G											1.00	1.0006
	P											1.00	0.9994
Pod yield (qt/ha)	G												1.00
	P												1.00

G = Genotypic correlation coefficient P = Phenotypic correlation coefficient *,** Indicates significant at 5% and 1% level of significant

Conclusion

The magnitude of genotypic correlation was higher than phenotypic correlation for all the traits that indicated inherent association between various characters. In the present findings significant positive phenotypic correlation pod yield per plant was observed with number of pods per plant and pod weight indicating that these characters are the primary yield determinant in cowpea.

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