

## GENETIC VARIABILITY AND ASSOCIATION STUDIES IN COWPEA [*VIGNA UNGUICULATA* (L.) WALP] FOR SEED YIELD AND RELATED TRAITS

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### SUMMARY

Fourteen genotypes of cowpea (*Vigna unguiculata* (L.) Walp) were evaluated for character association during *khari* 2017. The genotypes were analyzed for genetic variability, correlation and path coefficients. The genotypes were found significantly different for all the characters, which indicated scope for further genetic studies. High heritability along with high genetic advance was recorded in seed yield per plot, days to 50% flowering and plant height indicating predominance of additive effects in the inheritance of these characters. The phenotypic coefficient of variation (PCV) estimates was invariably higher than their corresponding genotypic coefficient of variation (GCV) values. This suggests the environmental influence. High GCV and PCV were observed for seed yield per plot, days to 50% flowering, days to maturity and plant height suggesting that selection based on these characters would facilitate successful isolation of desirable types. Number of seeds per pod had positive and significant correlation at genotypic level with seed yield per plot. The traits like number of seeds per pod, number branches per plant and days to maturity showed direct effect on seed yield per plot. Two genotypes *viz.* GC 3 and PTBCP 4 were found resistant against Cowpea Yellow Mosaic Virus (CYMV) disease.

**Key words :** Cowpea, Genetic advance, GCV, PCV, Heritability

Cowpea [*Vigna unguiculata* (L.) Walp.] is an annual, self pollinated legume belonging to family Leguminaceae with a diploid chromosome number of  $2n=2x=22$ . It is native to India but tropical and Central Africa is considered as secondary centre of origin. In India cowpea is cultivated for food, vegetables, and fodder purpose (Arya *et al.*, 2019). This crop has tremendous adaptability for various conditions and therefore it is cultivated from north Jammu & Kashmir to south Tamil Nadu. Cowpea has been referred to as “Poor man’s meat” because of its high protein content (20- 25%) (Sabale *et al.*, 2018). It is considered as one of the oldest legume used as protein source for humans and livestock. It is being used as pulse in form of dry seed, immature pod and green leaf and growing twig can be utilized as vegetable. It is an important source of green as well as dry fodder. Cowpea is cultivated for both grain and fodder in all tropical and sub-tropical regions among fodder legumes (Nguyen *et al.*, 2017). It is

drought hardy crop and responds well under irrigated conditions. In Haryana, cowpea is grown as intercrop with fodder sorghum, maize or pearl millet to improve the quality of fodder (Phogat *et al.*, 2017). The crops like cowpea can also become a valuable component in cereal based farming system as it restores soil fertility for succeeding crop. It fixes about 240kg/ha atmospheric nitrogen and leaves about 60 to 70 kg nitrogen for succeeding crop (Kumar, 2020). Therefore, being a pulse crop, it is useful to improve soil fertility (Nguyen *et al.*, 2016). There is need to develop varieties suitable for a specific region and use. Low and variable grain yield, seed quality and susceptibility to diseases & pests are the main constraints in cowpea production. Under such conditions genetic diversity is of great importance and plays a crucial role in focusing crop improvement. Genetic variability of yield and yield contributing characters and correlation between them is basic to plan out future improvement programme in any crop.



TABLE 2  
Genetic parameters of different characters in grain cowpea

| Characters              | Mean $\pm$ SE(m)   | C. D. (5%) | Range        | Coefficient of variation |        | Heritability (%) | Genetic advance as % of mean |
|-------------------------|--------------------|------------|--------------|--------------------------|--------|------------------|------------------------------|
|                         |                    |            |              | GCV                      | PCV    |                  |                              |
| Days to 50% flowering   | 43.67 $\pm$ 0.83   | 2.43       | 27.00-62.00  | 31.547                   | 31.720 | 98.92            | 64.635                       |
| Days to maturity        | 80.48 $\pm$ 0.89   | 2.61       | 59.33-118.33 | 28.575                   | 34.194 | 69.84            | 49.193                       |
| Plant height (cm)       | 110.74 $\pm$ 1.98  | 5.81       | 79.00-169.00 | 30.724                   | 30.880 | 98.98            | 62.970                       |
| No. of branches/ plant  | 6.93 $\pm$ 0.75    | 2.19       | 5.00-10.67   | 23.970                   | 30.417 | 62.10            | 38.913                       |
| No. of pods per plant   | 25.24 $\pm$ 1.61   | 4.70       | 17.33-39.00  | 21.555                   | 24.213 | 79.25            | 39.529                       |
| No. of seeds per pod    | 11.67 $\pm$ 1.02   | NA         | 9.33-13.67   | 6.833                    | 16.609 | 16.93            | 5.791                        |
| Seed yield per Plot (g) | 396.64 $\pm$ 12.57 | 36.75      | 63.33-95.67  | 70.424                   | 70.638 | 99.396           | 144.636                      |

TABLE 3  
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/ plant | No. of pods/ plant   | No. of seeds/ pod    | Seed yield (g)       |
|------------------------|-----------------------|----------------------|----------------------|------------------------|----------------------|----------------------|----------------------|
| Days to 50% Flowering  | 1.00                  | 0.851**              | 0.489**              | 0.492**                | -0.141 <sup>NS</sup> | -0.119 <sup>NS</sup> | -0.159 <sup>NS</sup> |
| Days to maturity       | 0.991**               | 1.00                 | 0.421**              | 0.496**                | -0.147 <sup>NS</sup> | -0.160 <sup>NS</sup> | -0.047 <sup>NS</sup> |
| Plant height (cm)      | 0.496**               | 0.505**              | 1.00                 | 0.337*                 | -0.280 <sup>NS</sup> | -0.035 <sup>NS</sup> | -0.453**             |
| No. of branches /plant | 0.619**               | 0.771**              | 0.416**              | 1.00                   | 0.013 <sup>NS</sup>  | -0.087 <sup>NS</sup> | 0.074 <sup>NS</sup>  |
| No. of pods per plant  | -0.171 <sup>NS</sup>  | -0.289 <sup>NS</sup> | -0.322*              | 0.002 <sup>NS</sup>    | 1.00                 | 0.340*               | 0.207 <sup>NS</sup>  |
| No. of seeds per pod   | -0.245 <sup>NS</sup>  | -0.103 <sup>NS</sup> | -0.116 <sup>NS</sup> | -0.438**               | 0.769**              | 1.00                 | 0.149 <sup>NS</sup>  |
| Seed yield (g)         | -0.162 <sup>NS</sup>  | -0.057 <sup>NS</sup> | -0.456**             | 0.090 <sup>NS</sup>    | 0.250 <sup>NS</sup>  | 0.414**              | 1.00                 |

TABLE 4  
Direct and indirect effect of component traits on yield in grain cowpea. Residual effect= 0.6901

| Characters                | Days to 50% flowering | Days to maturity | Plant height (cm) | No. of branches/ plant | No. of pods/ plant | No. of seeds/ pod |
|---------------------------|-----------------------|------------------|-------------------|------------------------|--------------------|-------------------|
| Days to 50% Flowering     | -0.252                | 0.253            | -0.259            | 0.119                  | -0.001             | -0.020            |
| Days to maturity          | -0.215                | 0.298            | -0.222            | 0.120                  | -0.001             | -0.027            |
| Plant height (cm)         | -0.123                | 0.125            | -0.529            | 0.082                  | -0.002             | -0.006            |
| No. of branches per plant | -0.124                | 0.148            | -0.178            | 0.243                  | 0.000              | -0.014            |
| No. of pods per plant     | 0.036                 | -0.044           | 0.148             | 0.003                  | 0.008              | 0.057             |
| No. of seeds per pod      | 0.030                 | -0.048           | 0.018             | -0.021                 | 0.003              | 0.167             |

*et al.*, 2018, Sharma *et al.*, 2017 for seed yield per plant and plant height. Number of seeds per pod had positive and significant correlation at genotypic level while, plant height has negative and significant correlation both at genotypic and phenotypic level with seed yield per plot. Traits like number of pods per plant and number of branches per plant had positive but non significant correlation with seed yield per plot both at genotypic and phenotypic level (Table 3). Similar results were found by Nguyen *et al.*, 2019 for number of seeds per pod, Om Vir and Singh, 2019, Sharma *et al.*, 2019, Walle *et al.*, 2018 for number of seeds per pod. The traits like number of seeds per pod, number

branches per plant and days to maturity showed direct positive effect while, plant height has high direct negative effect on seed yield per plot followed by days to 50% flowering (Table 4). The genotypes were also evaluated against the Cowpea Yellow Mosaic Virus (CYMV) disease. Two genotypes *viz.* GC 3 and PTBCP 4 were found resistant against CYMV (Table 5).

## CONCLUSION

At present, in India cowpea is consumed by people in the form of *daal* and vegetable. Cowpea

TABLE 5  
Evaluation of cowpea genotypes against cowpea yellow mosaic virus during Kharif 2017

| Name/ no of entry | Disease rating | Reaction             |
|-------------------|----------------|----------------------|
| RC 101            | 5.20           | Moderately Resistant |
| TPTC-29           | 5.00           | Moderately Resistant |
| GC 3              | 3.20           | Resistant            |
| Pant Lobia-3      | 5.80           | Susceptible          |
| Pant Lobia-4      | 6.40           | Susceptible          |
| CPD-249           | 7.20           | Susceptible          |
| PTBCP-4           | 4.40           | Resistant            |
| Phule PCP 1123    | 5.00           | Moderately Resistant |
| Phule PCP 1129    | 6.00           | Susceptible          |
| VCP 13-001        | 4.60           | Moderately Resistant |
| TC-172            | 5.00           | Moderately Resistant |
| GC 1506           | 5.80           | Moderately Resistant |
| CPD-221           | 5.60           | Moderately Resistant |
| GC-1501           | 6.40           | Susceptible          |
| VCP 12-005        | 6.00           | Susceptible          |

variety with white colored grain, high protein content, good taste & cooking quality and without anti-nutritional factors like tannins and trypsin inhibiting factors is preferred by consumers. Animals are fed with its green leaves but the use of cowpea seed in animal feed as protein source can be a new option. Keeping in view the above factors breeding objectives can be made.

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