

Original Research Article

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Genetic Parameters in Seed Yield Components of Cowpea (*Vigna unguiculata* (L.) Walp.)

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ABSTRACT

Keywords

Cowpea, Genetic parameters, Heritability, Genetic advance

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The phenotypic coefficient of variation was found to be higher than the genotypic coefficient of variation for all the traits studied. The highest magnitude of GCV was observed for pod weight followed by number of pod clusters plant⁻¹, seed yield plant⁻¹, 100 seed weight, pod length, number of pods cluster⁻¹ and number of pods plant⁻¹. All the characters considered except number of primary branches plant⁻¹, number of pods plant⁻¹ and seed yield plant⁻¹ recorded high estimates of heritability. High heritability coupled with high genetic advance was observed for days to 50 per cent flowering, length of main stem, number of pod clusters plant⁻¹, number of pods cluster⁻¹, pod weight, pod length, pod girth, number of seeds pod⁻¹, and 100 seed weight.

Introduction

Cowpea [*Vigna unguiculata* (L.) Walp] also known black-eyed pea, southern pea etc is a pulse crop rich in proteins, vitamins and minerals and is mainly grown for grain, vegetable and fodder purposes. Low productivity is one of the major constrain in pulse production. Considerable research regarding selection criteria for yield is very essential to increase the productivity of pulses to meet the increasing demands of growing population. Greater the genetic variability, greater the chances for the selection of better genotypes. The genetic parameters like

genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) gives an idea about magnitude of variability present in a genetic population. The estimates of genetic parameters like heritability and genetic advance help the plant breeder in selection of elite genotypes from diverse genetic populations. Therefore plant breeding efforts should aim at the manipulation of available genetic diversity in the desired direction through suitable selection criteria. Keeping these aspects in view, the present investigation was undertaken to study genetic variability, heritability, and genetic advance in cowpea genotypes.

Materials and Methods

The experimental crop was raised during the period of April 2016 to July 2016 in a farmer field Kayamkulam in randomized block design with three replication. The experimental field was divided into three blocks of thirty plots each and the treatment was allotted to each block at random. The plot size was 3m². Spacing was 30cm between rows and 10cm between plants in a row. The genotypes were evaluated for following traits *viz.*, days to 50 percent flowering, number of primary branches plant⁻¹, length of main stem (cm), number of pod clusters plant⁻¹, number of pods cluster⁻¹, number of pods plant⁻¹, pod weight (g), pod length (cm), pod girth (mm), number of seeds pod⁻¹, 100 seed weight (g), seed yield plant⁻¹ (g) and crop duration (days).

The data studied on various parameters were subjected to statistical analysis as per methods suggested by Panse and Sukhatme (1967) for analysis of variance, Burton (1952) for variability, Lush (1940) for heritability (Broad Sense) and Johnson *et al.*, (1955) for genetic advance in per cent of mean.

Results and Discussion

Genetic parameters

The various genetic parameters like GCV, PCV, heritability and genetic advance were calculated for different characters for all the thirty genotypes and recorded in the table 1. PCV was greater than GCV for all the characters studied.

Genotypic coefficient of variation (GCV)

Genotypic coefficient of variation (GCV) ranged from 10.33 (crop duration) to 47.73 (pod weight). Highest GCV was observed for pod weight (47.73) followed by number of pod clusters plant⁻¹ (24.99), seed yield plant⁻¹

(24.43), 100 seed weight (24.07), pod length (23.66), number of pods cluster⁻¹ (20.86) and number of pods plant⁻¹ (20.66). Number of primary branches plant⁻¹ (19.46), pod girth (18.75), length of main stem (16.22), days to 50 per cent flowering (15.28), number of seeds pod⁻¹ (12.37) and crop duration (11.67) exhibited moderate level of GCV. None of the characters exhibited low magnitude of GCV.

Phenotypic coefficient of variation

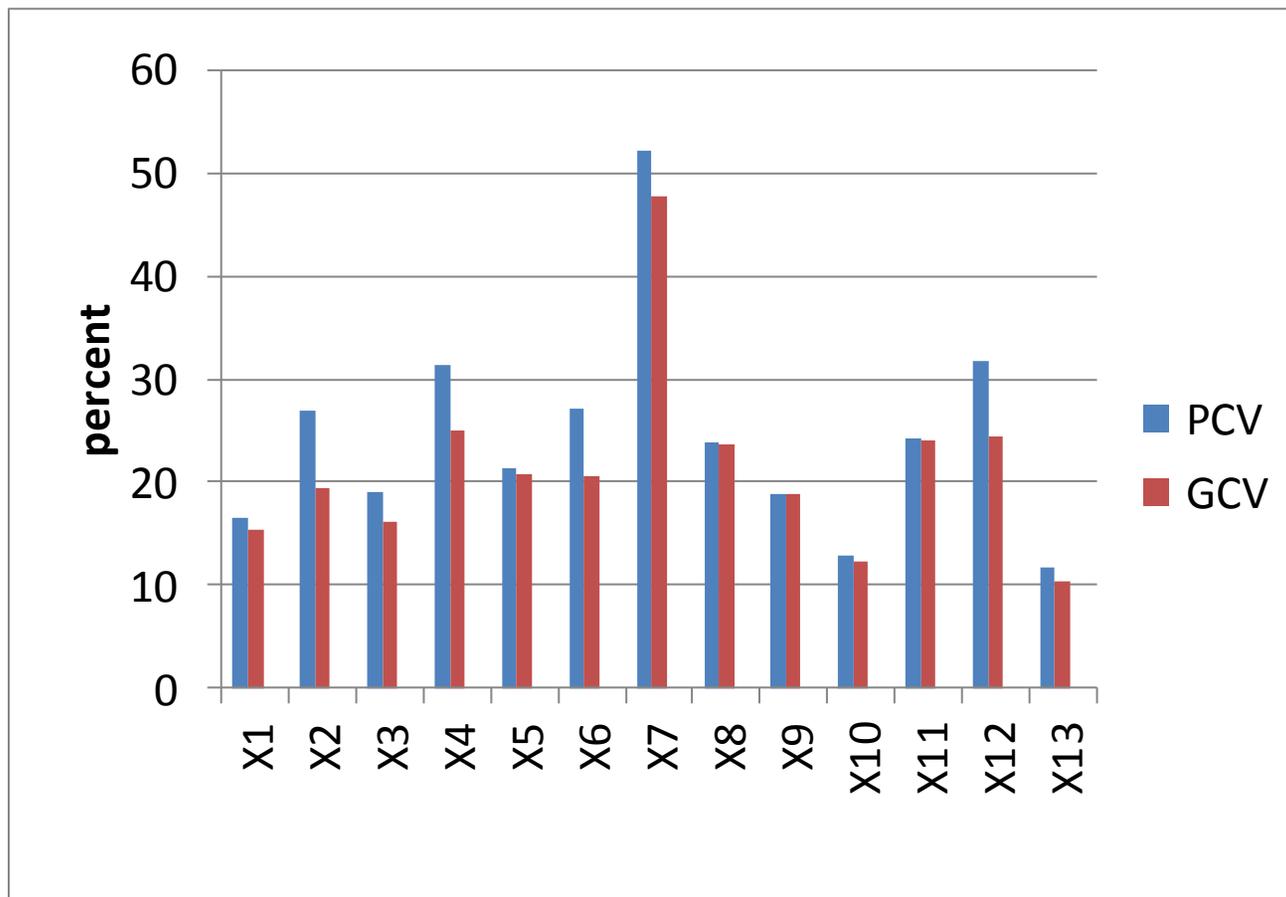
The phenotypic coefficient of variation (PCV) ranged from 11.67 (crop duration) to 52.12 (pod weight). Highest PCV was for pod weight (52.12) followed by seed yield plant⁻¹ (31.72), number of pod clusters plant⁻¹ (31.36), number of pods plant⁻¹ (27.21), number of primary branches plant⁻¹ (26.92), 100 seed weight (24.13), pod length (23.81) and number of pods cluster⁻¹ (21.32). Length of main stem (18.94), pod girth (18.85), days to 50 per cent flowering (16.44) and number of seeds pod⁻¹ (12.84) and crop duration (11.67) exhibited moderate level PCV. None of the characters exhibited low PCV values.

These findings of GCV and PCV values are in close harmony with the result of Manggoel *et al.*, (2012) for 100-seed weight, grain yield, number of pods plant⁻¹ and Thorat *et al.*, (2013) for number of pods plant⁻¹, and number of clusters plant⁻¹; Vavilapalli *et al.*, (2013) for pod weight and pod length; Ajayi *et al.*, (2014) for number of pods plant⁻¹, pod length, pod weight (g), number of seeds pod⁻¹, and 100-seed weight; Selvakumar *et al.*, (2015) for yield plant⁻¹, pod length, number of clusters plant⁻¹, number of pods clusters⁻¹ and 100 grain weight; Khandait *et al.*, (2016) for number of pods plant⁻¹, number of pods cluster⁻¹, pod weight and pod length; Rajput (2016) number of pod plant⁻¹, number of pods cluster⁻¹, pod weight and pod length.; and Srinivas *et al.*, (2017) for number of pods plant⁻¹ and number of seeds pod⁻¹.

Table.1 Genetic parameters

Characters	Coefficient of variation		Heritability	Genetic advance (as % of mean)
	GCV	PCV		
Days to 50% flowering	15.28	16.44	86.45	29.28
No. of primary branches per plant	19.46	26.92	52.26	28.98
Length of main stem (cm)	16.22	18.94	73.34	28.62
No. of pod clusters per plant	24.99	31.36	63.5	41.02
No. of pods per cluster	20.86	21.32	95.73	42.04
No. of pods per plant	20.66	27.21	57.67	32.33
Pod weight (g)	47.73	52.12	83.86	90.05
Pod length (cm)	23.66	23.81	98.74	48.44
Pod girth (mm)	18.75	18.85	98.94	38.43
Number of seeds per pod	12.37	12.84	92.83	24.55
100 seed weight (g)	24.07	24.13	99.41	49.43
Seed yield per plant (g)	24.43	31.72	59.30	38.75
Crop duration (days)	10.33	11.67	78.31	18.83

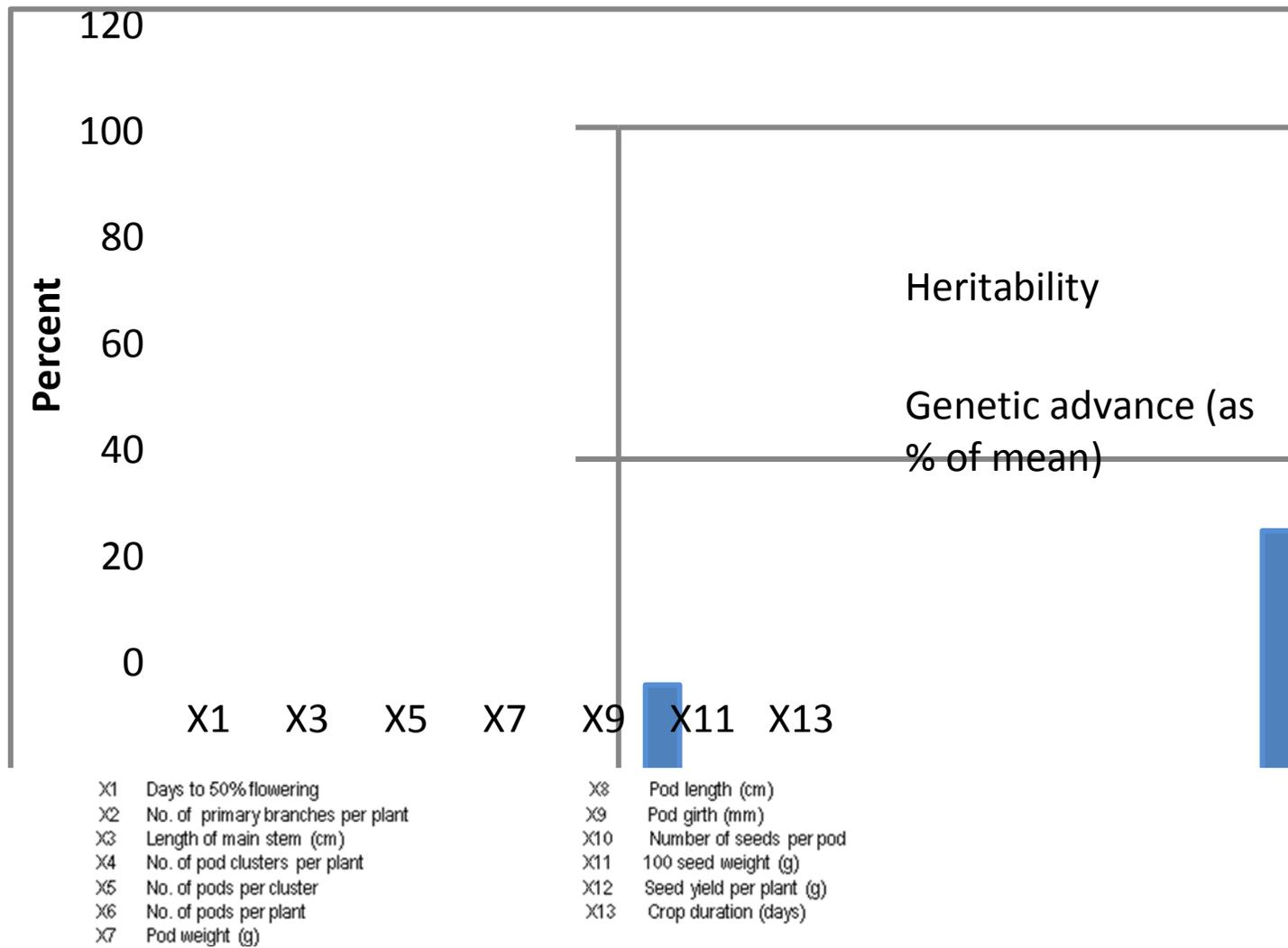
Phenotypic and genotypic coefficients of variation for thirteen characters in Cowpea



- X1 Days to 50% flowering
- X2 No. of primary branches per plant
- X3 Length of main stem (cm)
- X4 No. of pod clusters per plant
- X5 No. of pods per cluster
- X6 No. of pods per plant
- X7 Pod weight (g)

- X8 Pod length (cm)
- X9 Pod girth (mm)
- X10 Number of seeds per pod
- X11 100 seed weight (g)
- X12 Seed yield per plant (g)
- X13 Crop duration (days)

Heritability and Genetic advance for thirteen characters in cowpea



For the characters exhibiting negligible difference between estimates of GCV and PCV, selection will be effective since the environmental influence is low for these characters.

Heritability and Genetic advance

Heritability (in broad sense) values for the studied traits ranged from 52.26 % to 99.41 %. The highest heritability was obtained for 100 seed weight (99.41 %) followed by pod girth (98.94 %), pod length (98.74 %), number of pods cluster⁻¹ (95.73 %), number of seeds pod⁻¹ (92.83 %), days to 50 per cent flowering (86.45 %), pod weight (83.86 %), crop duration (78.31 %), length of main stem (73.34 %) and number of pod clusters plant⁻¹ (63.50 %); while moderate heritability was observed for seed yield plant⁻¹ (59.30 %), number of pods plant⁻¹ (57.67 %) and number of primary branches plant⁻¹ (52.26 %).

Similar findings were recorded Adewale *et al.*, (2010) for seeds pod⁻¹, 100 seed weight and pod length; Manggoel *et al.*, (2012) for 100 seed weight, days to 50 per cent flowering, number of seeds pod⁻¹ and pod length; Ajayi *et al.*, (2014) for number of pods plant⁻¹, pod length, pod weight (g), number of seeds pod⁻¹, and 100-seed weight; Khandait *et al.*, (2016) for pod length and pod weight.

All the characters exhibited high genetic advance (as % of mean) except crop duration (18.83 %) which exhibited moderate genetic advance.

The highest estimate was obtained for pod weight (90.05 %) followed by 100 seed weight (49.43 %), pod length (48.44 %), number of pods cluster⁻¹ (42.04 %), number of pod clusters plant⁻¹ (41.02), seed yield plant⁻¹ (38.75 %), pod girth (38.43 %), number of pods plant⁻¹ (32.33 %), days to 50 per cent flowering (29.28 %), number of

primary branches plant⁻¹ (28.98 %), length of main stem (28.62 %) and number of seeds pod⁻¹ (24.55 %).

Corroborative findings were reported by Suganthi and Murugan (2008) for seed yield plant⁻¹, number of pods plant⁻¹ and number of clusters plant⁻¹; Manggoel *et al.*, (2012) and Khandait *et al.*, (2016) for number of pods plant⁻¹, pod length, number of pods cluster⁻¹, and pod weight.

High heritability coupled with high genetic advance was observed for days to 50 per cent flowering, length of main stem, number of pod clusters plant⁻¹, number of pods cluster⁻¹, pod weight, pod length, pod girth, number of seeds pod⁻¹, and 100 seed weight. It supports findings of Vavilapalli *et al.*, (2013) for pod length, pod girth and pod weight. Kharde *et al.*, (2014) pod length, average pod weight and number of seeds pod⁻¹; Selvakumar *et al.*, (2015) for number of pods clusters⁻¹ and 100 grain weight, Srinivas *et al.*, (2017) for number of pods plant⁻¹ and number of seeds pod⁻¹.

Heritability estimates along with genetic advance are normally more helpful in predicting the gain under selection than heritability estimates alone (Singh and Chaudhary, 1985).

The pod weight exhibited the highest GCV (47.73%) and PCV (52.12%). Heritability was high for all the characters except number of primary branches plant⁻¹, number of pods plant⁻¹ and seed yield plant⁻¹ which possessed moderate heritability.

GA (% mean) was high for all the characters except crop duration. High GCV, PCV, Heritability and Genetic advance was found on the characters number of pod clusters⁻¹, number of pods cluster⁻¹, number of pods plant⁻¹, pod weight, pod length and 100 seed weight. Therefore plant breeding efforts

should aim at the manipulation of available genetic diversity in the desired direction through these selection criteria.

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