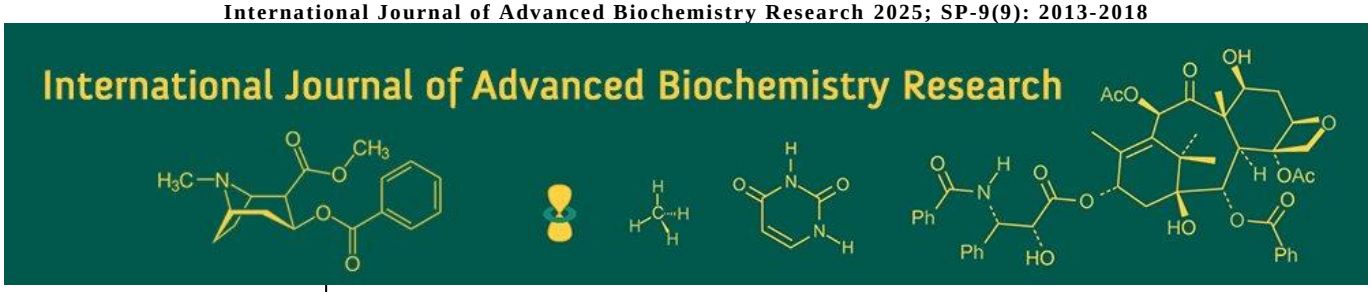

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(9): 2013-2018
www.biochemjournal.com
Received: 20-06-2025
Accepted: 27-07-2025

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Studies on morphological evaluation and genetic variability in Cowpea (*Vigna unguiculata* L. (Walp.) genotypes

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DOI: https://www.doi.org/10.33545/26174693.2025.v9.i9Sz.5797

Abstract
The current investigation was carried out on morphological evaluation of cowpea (*Vigna unguiculata* L. (Walp.) genotypes. Fifty genotypes were evaluated in a randomized block design with two replications at Central Experiment Station, Wakavali during *Rabi* 2022–23. ANOVA revealed highly significant differences among the 50 cowpea genotypes for all the traits studied, indicating the presence of sufficient genetic variability in the germplasm. Phenotypic coefficient of variation exceeded genotypic variation for all traits except the number of branches per plant. High estimates of heritability coupled with high genetic advance were observed for the traits *viz*., days to first flower initiation, days to 50% flowering, days to maturity, plant height, pod length, biological yield per plant and harvest index which indicates that additive gene action is involved and that selection will be effective in improving these traits. On the other hand, the characters number of primary branches per plant, number of seeds per pod, test weight, number of pods per plant, and grain yield per plant exhibited non-additive gene action, making selection ineffective.

Keywords: Cowpea, morphology, heritability, genetic advance, gene action

1. Introduction
Cowpea (*Vigna unguiculata* L. (Walp.) is an important legume of the Fabaceae family, widely grown around the world. It is especially prevalent in Africa and Asia, where it plays a key role as a major protein source in vegetarian diets (Duraipandian *et al*., 2022) [11]. In addition, it shows better resilience than cereals under moisture stress and low fertility. Despite being a major producer, India faces low cowpea productivity due to the use of traditional, low-yielding varieties. Therefore, there is great scope for improving its production by developing high-yielding cultivars with desirable agronomic traits in cowpea. Progress in crop improvement largely depends on the extent of genetic variability present in a particular crop, as it provides the genes of interest for selection. The greater the genetic variability, the higher the chances of improvement in the desired direction. Considering the above points, studying the morphological evaluation of cowpea genotypes will help in selecting suitable parents for breeding programs and conserving valuable genetic resources.

2. Materials and Methods
The present investigation was carried out with 50 cowpea genotypes at Central Experiment Station, Wakavali, Dapoli (Ratnagiri) during *Rabi* 2022-23 for the estimation of genetic variability. The experiment was conducted in Randomized Block Design with two replications. Each genotype was planted at a spacing of 45 × 30 cm, with three rows of five plants each.

Table 1: List of cowpea genotypes with their sources

Genotype code	Genotypes	Source	Genotype code	Genotypes	Source
G1	EC723983	NBPGR, New Delhi	G26	EC240682	NBPGR, New Delhi
G2	EC723690	NBPGR, New Delhi	G27	EC240664	NBPGR, New Delhi
G3	IC471955	NBPGR, New Delhi	G28	IC471387	NBPGR, New Delhi
G4	EC724418	NBPGR, New Delhi	G29	IC560919	NBPGR, New Delhi
G5	EC723990	NBPGR, New Delhi	G30	IC257413	NBPGR, New Delhi
G6	EC724347	NBPGR, New Delhi	G31	EC240675	NBPGR, New Delhi
G7	EC725177	NBPGR, New Delhi	G32	EC240628	NBPGR, New Delhi
G8	EC170072	NBPGR, New Delhi	G33	EC149303-A	NBPGR, New Delhi
G9	IC586952	NBPGR, New Delhi	G34	EC240679	NBPGR, New Delhi
G10	EC149474	NBPGR, New Delhi	G35	EC243991	NBPGR, New Delhi
G11	IC398083	NBPGR, New Delhi	G36	EC149288	NBPGR, New Delhi
G12	EC724488	NBPGR, New Delhi	G37	EC724826	NBPGR, New Delhi
G13	EC724900	NBPGR, New Delhi	G38	EC240668	NBPGR, New Delhi
G14	EC725135	NBPGR, New Delhi	G39	EC240652	NBPGR, New Delhi
G15	EC724901	NBPGR, New Delhi	G40	EC240670	NBPGR, New Delhi
G16	EC240831	NBPGR, New Delhi	G41	BA 01	Department of Agricultural Botany, COA, Dapoli
G17	EC240850	NBPGR, New Delhi	G42	EC-1071 55	Department of Agricultural Botany, COA, Dapoli
G18	IC 296560	NBPGR, New Delhi	G43	CP 17	Department of Agricultural Botany, COA, Dapoli
G19	IC259071	NBPGR, New Delhi	G44	ACD109	Department of Agricultural Botany, COA, Dapoli
G20	EC724746	NBPGR, New Delhi	G45	DWD10	Department of Agricultural Botany, COA, Dapoli
G21	EC724376	NBPGR, New Delhi	G46	Saswad local type	Collection from farmer (Saswad, Dist. Pune)
G22	EC724299	NBPGR, New Delhi	G47	Gowalkot local type	Collection from farmer (Gowalkot, Tal. Chiplun)
G23	EC723822	NBPGR, New Delhi	G48	Konkan Sadabahar	Department of Agricultural Botany, COA, Dapoli
G24	EC724374	NBPGR, New Delhi	G49	PCB971102	Department of Agricultural Botany, COA, Dapoli
G25	IC471954	NBPGR, New Delhi	G50	CP13	Department of Agricultural Botany, COA, Dapoli

In each replication, randomly five plants in each genotype were marked for observations. The observations were recorded on 12 quantitative traits. The data recorded were statistically analyzed as suggested by Panse and Sukhatme (1985) [24] for analysis of variance, genotypic and phenotypic coefficients of variation by Burton and De Vane (1953) [4], heritability in the broad sense by Lush (1949) [20] and genetic advance by the formula suggested by Johnson *et al*. (1955) [14]. Heritability in the broad sense was categorized by the method suggested by Robinson (1966) [26] and Stansfield (1969) [31] as follows: Low: 5–10%, Moderate: 10–30%, High: 30–60%, and Very High: >60%.

3. Results and Discussion

The results of mean performance, range, general mean, standard error, coefficient of variance and critical difference from the statistical analysis of fifty cowpea genotypes for twelve quantitative characters are given in Table 2.

Table 2: Mean performance for quantitative traits in 50 cowpea genotypes

Sr. no.	Genotype	Days to first flower initiation	Days to 50% flowering	Days to maturity	Plant Height (cm)	No. of primary branches per plant	No. of pods per plant	Pod Length (cm)	No. of seeds per pod	Test weight (g)	Grain yield per plant (g)	Biological yield per plant (g)	Harvest Index (%)
1	G1	60.50	64.50	111.00	53.10	3.80	10.50	15.20	13.05	17.45	18.50	52.9	34.97
2	G2	58.50	63.50	105.00	60.10	3.75	13.90	13.40	13.40	11.15	18.70	52.9	35.35
3	G3	61.50	69.50	119.50	242.25	3.35	14.80	32.50	13.80	16.40	19.40	83.7	23.18
4	G4	71.50	78.00	116.00	143.70	3.60	12.90	16.15	13.45	19.95	30.70	84.1	36.50
5	G5	62.00	67.00	118.00	59.45	4.00	16.05	15.90	10.15	19.90	27.40	76.4	35.86
6	G6	63.50	68.00	111.50	52.90	3.90	13.20	14.35	13.45	11.35	17.50	56.9	30.76
7	G7	60.50	66.00	107.50	103.05	3.20	12.00	15.45	13.55	15.60	18.40	58.7	31.35
8	G8	52.00	55.50	98.00	37.10	4.55	19.10	17.55	14.80	15.70	27.30	61.3	44.54
9	G9	71.00	78.50	122.00	254.70	3.70	13.10	31.45	13.30	16.05	17.00	80.4	21.14
10	G10	57.00	63.50	106.50	53.00	3.80	11.30	13.90	11.50	8.30	10.00	44.8	22.32
11	G11	69.50	78.50	120.50	56.55	3.95	9.90	13.05	11.35	14.25	12.80	67.5	18.96
12	G12	51.50	56.00	101.00	53.90	3.70	14.70	11.55	10.25	8.75	12.60	47.6	26.47
13	G13	54.00	60.00	100.00	30.00	4.40	13.20	14.70	13.40	9.40	13.60	42.2	32.23
14	G14	59.00	64.00	111.00	56.10	3.80	12.70	12.30	10.20	13.90	14.10	57.9	24.35
15	G15	58.50	63.00	112.50	35.25	3.60	20.00	14.35	13.15	9.90	18.30	47.4	38.61
16	G16	48.50	54.00	97.00	36.00	2.80	21.90	12.15	10.90	10.95	20.00	50.7	39.45
17	G17	60.00	69.00	109.00	44.20	2.90	11.90	11.95	9.25	20.55	18.00	56.6	31.80
18	G18	54.00	60.00	101.00	42.60	3.70	15.80	13.60	8.60	14.75	21.70	54.1	40.11
19	G19	52.00	55.50	104.00	35.40	3.90	20.60	11.70	11.35	9.31	18.90	51.9	36.42
20	G20	61.00	66.50	107.50	34.30	3.60	13.60	13.80	10.90	9.75	13.60	45.75	29.73
21	G21	46.50	50.00	87.00	29.75	3.50	16.20	7.75	8.20	5.80	8.70	29.7	29.29
22	G22	61.50	69.00	105.00	188.30	3.50	13.40	18.40	9.10	12.20	17.30	50.1	34.53
23	G23	73.00	81.50	130.50	57.80	3.50	15.80	14.85	12.10	9.25	17.00	67.5	25.19
24	G24	69.00	75.00	121.50	39.20	4.80	11.30	16.60	13.25	19.45	18.30	63.6	28.77

25	G25	99.00	111.50	141.50	273.0	3.10	13.10	34.55	9.25	17.30	19.40	83.8	23.15
26	G26	54.00	59.50	110.00	43.55	3.30	15.00	11.80	13.10	11.90	17.50	50.5	34.65
27	G27	59.50	65.00	101.00	41.90	4.20	19.70	12.90	11.85	7.25	12.20	46.6	26.18
28	G28	70.50	77.50	114.50	47.20	3.80	12.30	13.65	11.60	13.20	14.90	67.5	22.07
29	G29	65.50	75.50	124.00	283.95	3.10	17.10	33.35	14.20	18.00	21.70	83.7	25.93
30	G30	62.50	73.50	117.00	52.00	3.90	10.10	10.10	10.50	8.45	7.70	55.5	13.87
31	G31	52.00	56.50	102.50	39.80	4.30	17.80	15.65	13.00	10.25	21.60	57.9	37.31
32	G32	60.50	64.00	113.00	86.60	5.00	13.90	15.20	12.80	13.90	18.00	65.3	27.57
33	G33	52.00	57.00	82.00	51.10	3.90	18.50	14.75	14.30	8.25	18.70	49	38.16
34	G34	67.50	74.00	119.00	139.50	4.30	17.60	15.25	14.30	11.70	21.90	70.1	31.24
35	G35	71.50	78.00	117.00	131.60	4.10	17.30	16.05	13.95	11.90	21.40	77	27.79
36	G36	59.00	63.00	102.00	43.40	3.30	13.20	15.30	11.80	12.00	14.70	43.9	33.49
37	G37	51.50	57.00	99.00	39.80	4.50	21.20	11.55	14.75	4.25	13.00	39.2	33.16
38	G38	57.50	63.00	103.50	30.20	2.20	13.90	15.60	12.35	16.45	18.60	47.5	39.16
39	G39	56.50	61.50	102.50	47.90	4.20	19.40	17.25	15.10	10.15	22.50	57.8	38.93
40	G40	59.50	64.00	109.50	55.60	3.80	16.60	15.15	12.75	14.75	24.80	67.7	36.63
41	G41	52.00	56.50	101.50	49.30	3.20	18.70	12.90	11.25	9.90	20.80	53.3	39.02
42	G42	68.50	77.50	107.00	116.80	4.10	13.40	15.10	13.75	11.75	17.00	52.2	32.57
43	G43	57.50	64.50	103.50	36.40	3.80	16.30	21.80	9.25	12.85	19.10	55.5	34.41
44	G44	52.00	57.00	100.00	36.30	3.80	30.80	10.10	10.40	5.55	18.70	49.2	38.01
45	G45	53.00	58.50	102.50	47.00	4.30	17.50	15.05	12.45	10.15	21.10	53.9	39.15
46	G46	52.00	58.50	100.00	35.90	3.10	25.80	9.95	10.50	6.95	18.90	49.3	38.34
47	G47	52.50	59.00	101.00	60.20	3.10	14.00	13.65	9.25	20.35	19.00	61.2	31.05
48	G48	44.00	48.50	89.00	39.30	3.50	19.80	11.50	10.30	9.80	18.60	51.6	36.05
49	G49	54.00	58.50	102.00	41.90	4.70	17.50	15.75	13.70	10.50	18.70	57	32.81
50	G50	52.00	57.00	96.50	44.90	4.00	22.70	11.95	12.85	8.15	19.70	49.3	39.96
	Grand Mean	59.44	65.44	107.67	74.28	3.76	16.02	15.57	12.04	12.31	18.20	57.60	32.05
	Maximum	99.00	111.50	141.50	283.95	5.00	30.80	34.55	15.10	20.55	30.70	84.1	44.54
	Minimum	44.00	48.50	82.00	29.75	2.20	9.90	7.75	8.20	4.25	7.70	29.7	13.87
	SE	1.05	0.79	1.20	2.93	0.21	0.73	0.48	0.52	0.33	0.77	1.06	1.17
	CD 5%	3.00	2.26	3.41	8.33	0.60	2.06	1.38	1.47	0.94	2.18	3.01	3.33
	CV	2.51	1.72	1.58	5.58	7.93	6.40	4.40	6.10	3.78	5.97	3.28	4.06

The analysis of variance showed that the mean sum of squares of all the genotypes were significant for all 12 quantitative characters considered under the study (Table 3).

Table 3: Analysis of variance for quantitative traits in 50 genotypes of Cowpea (*Vigna unguiculata* L. Walp) studied at CES, Wakavali during *Rabi*,2022

Sr. no	Characters	Central Experimental Station, Wakavali		
		Replication	Treatment	Error
	DF	1	49	49
1	Days to first flower initiation	0.04	165.14*	2.22
2	Days to 50% flowering	0.16	221.52*	1.26
3	Days to Maturity	0.49	232.71*	2.88
4	Plant Height (cm)	14.0	8338*	17.00
5	No. of primary branches per plant	0.01	0.58*	0.09
6	Pod Length (cm)	1.12	64.56*	0.20
7	No. of seeds per pod	0.86	6.77*	0.27
8	Test Weight (g)	0.81	34.02*	0.22
9	No. of pods per plant	0.76	33.88*	1.05
10	Grain yield per plant (g)	1.74	38.90*	1.18
11	Biological yield per plant(g)	4.80	309.51*	2.24
12	Harvest Index	1.23	166.54*	2.75

Days to first flower initiation: Days to initiation of flowering recorded a grand mean of 59.44 days and the values ranged from 44.00 days (G48) to 99.00 days (G25). The genotype G48 (44.00 days) was found earliest in flowering followed by G 21 (46.50 days), G16 (48.5 days), G12 and G 37 (51.5 days), G-8, G19, G31, G33, G41, G44, G46, G50 (52 days) whereas G25 (99.0 days) found late in flowering initiation followed by G23 (73.0 days), G35 and G4 (71.5 days). The above results align with the findings of Lazaridi *et al.* (2023) [18] and Bondade and Deshapande (2021) [3]. They reported a wide variation in flower initiation, ranging from 55.23 to 85.15 days and 43.50 to 57.00 days after sowing, respectively. In the present study, the genotypes G25, G9, G29, and G3 showed strongly indeterminate growth habit and a significantly later initiation of the first flowers (99, 71, 65.5, and 61.5 days, respectively) compared to the grand mean (59.44 days) and the control, G48 (Konkan Sadabahar) (44 days). The main genes responsible for the plant transition to flowering are TFL1 and FLOWERING LOCUS (FT) from the PEBP family which determine the flowering of the plants (Kobayashi *et al.*, 1999) [16]. During vegetative stage the level of TFL1 expression is low and it increases upon transition to flowering (Krylova, 2020) [17].

Days to 50% flowering: The variation for days to 50% flowering ranged from 48.50 days (G48) to 111.50 days (G25) with the grand mean of 65.44 days. The genotypes G25 (111.5 days) was found very late in days to 50% flowering followed by G23 (81.5 days), G 11 (78.5 days), G9 (78.5 days), G35 and G 4 (78.0 days). These findings are in accordance with the work of Chandrakar *et al* (2016) [5], Devi *et al*. (2018) [9], Jadhav *et al.,* (2023) [13]. 50% flowering depends on the interaction of many complex processes such as both environmental and genetic factors (Jadhav *et al.*,2023) [13]. The earliest in this instance were the G48 (Konkan Sadabahar) and G21, which can be utilized as parents or in the breeding program to achieve even greater progress.

Days to maturity: The character days to maturity recorded grand mean of 107.67 days. The variation ranged from 82.0 days (G33) to 141.5 days (G25). The genotype G33 (82.0 days) recorded minimum number of days to reach maturity followed by G 21 (87.0 days), G48 (Konkan Sadabahar) (89.0 days), G50 (96.5 days), G16 (97.0 days), G8 (98.0 days). The genotypes G25 (141.5 days) recorded maximum days to maturity followed by G23 (130.5 days), G 29 (124.0 days), G9 (122.0 days), G24 (121.5), G11 (120.5 days) and G 3 (119.5). The studies by Lazaridi *et al.* (2023) [18] and Lonare *et al.* (2024) [19] were also in line with the present investigation. Early maturing varieties are considered climate smart cultivars since they have the ability to escape terminal drought as well as pest and disease damage that normally occurs later in the cropping season (Mortimore *et al.*,1997; Song *et al.*,2013) [22, 30].

Plant height: The average plant height was 74.28 cm, with a range of 29.75 cm (G 21) to 283.95 cm (G 29). Among all genotypes, G29 was the tallest, followed by G25 (273.00 cm), G9 (254.70 cm), and G3 (242.25 cm). In comparison to other genotypes, the G21 genotype (29.75 cm) was found shorter than the others followed by the G13 genotype (30.00 cm) and the G38 genotype (30.20 cm). A similar range for plant height were reported by Chandrakar *et al. (*2016) [5], Mali *et al.,* (2021) [21]. Reduction in plant height may be ascribed to a diminution of mitotic activity of meristematic tissues, cell length, cell number, and phytohormones (Cheng *et al.*, 2019) [8].

Number of Primary Branches per plant: The average number of primary branches per plant was 3.76, with a range of 2.20 (G38) to 5.00 (G32). In contrast, G32 (5.00) recorded the highest number of primary branches per plant, followed by G24 (4.80), G49 (4.70), G8 (4.55), and G37 (4.50). These results were matching with the findings for a number of primary branches reported by Odeseye *et al.*, (2022) [23] and Chaudhary *et al. (*2020) [6]. The decreased number of branches per plant might be due to cellular divisions at a low rate, reduced photosynthetic activities, and synthesis of growth regulators (Raina and Khan,2023) [25].

Pod length (cm): The variation for pod length ranged between (G 21) 7.75 cm to 34.55 cm (G 25) with 15.57 cm general mean. The G25 was longest among all genotypes followed by G29 (33.35 cm), G3 (32.50 cm), G9 (31.45) and G43 (21.80 cm) whereas the genotypes G21 (7.75 cm) and G46 (9.95 cm) exhibited shortest pod length as compared to other genotypes. Simillar type of findings were recorded by Selvi *et al.* (2022) [28] and Lonare *et al.* (2024) [19] in cowpea for this character.

Number of seeds per pod: The average number of seeds per pod was 12.04, ranging from 8.20 (G21) to 15.10 (G39). The genotype G21 (8.20) exhibited minimum number of seeds per pod followed by G18 (8.60), G22 (9.10) and G17 (9.25) while the genotype G39 (15.1) reported maximum number of seeds per pod followed by G8 (14.80), G37 (14.75), G34 (14.30). The results were in accordance with the findings of Verma *et al.* (2019) [33], Selvi *et al. (*2022) [28] and Lonare *et al.* (2024) [19]. The relationship between the number of seeds per plant and yield in cowpea is generally positive and strong.

Test weight (g): Test weight had a general mean of 12.31 g with values varying between 4.25 g (G37) to 20.55 g (G17). The genotype G 37 (4.25 g) reported lowest test weight followed by G 44 (5.55 g), G 21 (5.80 g) and G 46 (6.95 g) while the genotype G17 (20.55 g) recorded highest test weight followed by G47 (20.35 g), G4 (19.95 g), G 5 (19.90 g) and G 24 (19.45 g). This result is in agreement with Selvi *et al.* (2022) [28] and Lonare *et al.* (2024) [19]. The productivity of cowpea can be improved through emphasis on pod and seed characteristics which are direct contributors to the economic yield either as seed yield in case of grain cowpea or pod yield for yard-long bean (Romanus *et al.*,2008; Ullah *et al.,* 2011) [27, 32].

Number of pods per plant: The range of number of pods per plant extended from 9.90 (G11) to 30.80 (G44) and average was 16.02. Among fifty genotypes G11 (9.90) recorded less number of pods per plant followed by G30 (10.10), G1 (10.50) G10 and G24 (11.30), whereas G44 (30.80) shown maximum number of pods followed by G46 (25.80), G50 (22.70) and G16 (21.9). These results are in conformity with the findings of Odeseye *et al,* (2022) [23] and Mali *et al,* (2021) [21].

Grain yield per plant (g): The general mean for grain yield per plant was 18.20 g with a range from 7.70 g (G30) to 30.70 g (G4). The highest grain yield per plant was recorded by genotype G4 (30.70 g) followed by G5 (27.40 g), G 8 (27.30 g), G40 (24.80 g) while the lowest grain yield per plant was exhibited by genotype G30 (7.70 g) followed by G21 (8.70 g), G10 (10.00 g) and G27 (12.20 g). Similar type of results were recorded by Selvi *et al.* (2022) [28] and Lonare *et al.* (2024) [19]. Yield-related traits are often correlated and selection for one may lead to negative or positive response in the other traits (Ajibade and Morakinyo,2000) [1].

Biological yield per plant (g): The range of biological yield per plant extended from 29.7 g (G21) to 84.1 g (G4) and average was 57.60 g. The genotype G21 (29.7 g) was lowest in biological yield per plant followed by G37 (39.2 g) and G13 (42.2 g) while the genotype G4 (84.1 g) was highest in biological yield per plant followed by G25 (83.8 g), G29, G3 (83.7 g) and G9 (80.4 g). Allocation of biomass or photosynthates toward desired harvestable product could play a vital role in obtaining a good yield and determines how plant biomass is converted to seed yield (Chen *et al.*, 2021) [7].

Harvest index (%): The observed harvest index ranged from 13.87% (G30) to 44.54 (G8) with a grand mean of 32.05%. The genotype G8 (44.54%) exhibited highest harvest index followed by G18 (40.11%), G50 (39.96%), G16 (39.45%) and G38 (39.16%), while the genotype G30 (13.87%) showed lowest harvest index followed by G11 (18.96%), G9 (21.14%) and G28 (22.07%). Similar type of results were recorded by Selvi *et al. (*2022) [28] and Lonare *et al.* (2024) [19]. The ratio of seed yield to total dry weight defines the harvest index and signifies its capacity to allocate photosynthetic assimilates into grains (Donald and Hamblin, 1976; Sinclair, 1998) [10, 29].

Genetic parameters of variation for grain yield and its component characters studied are presented in Table 4.

Table 4: Estimates of genetic parameters for quantitative traits in 50 genotypes of Cowpea (*Vigna unguiculata* L. Walp) during *Rabi*, 202

Sr. No.	Quantitative traits	Central Experiment Station, Wakavali				
		PCV	GCV	H^2b	GA	Ga (Gennetic action)
1	Days to first flower initiation	15.39	15.18	97.34	18.34	A
2	Days to 50% flowering	16.13	16.04	98.87	21.50	A
3	Days to Maturity	10.08	9.96	97.56	21.81	A
4	Plant Height (cm)	88.05	87.87	99.60	134.19	A
5	No. of primary branches per plant	0.09	0.33	73.49	0.88	NA
6	Pod Length (cm)	36.56	36.45	99.38	11.65	A
7	No. of seeds per pod	15.56	14.96	92.45	3.57	NA
8	Test Weight (g)	33.60	33.39	98.73	8.41	NA
9	No. of pods per plant	26.09	25.29	93.97	8.09	NA
10	Grain yield per plant (g)	24.60	23.86	94.11	8.68	NA
11	Biological yield per plant(g)	27.38	27.18	98.56	25.35	A
12	Harvest Index (%)	22.25	21.89	96.75	18.34	A

PCV: Phenotypic coefficients of variation, GCV: Genotypic coefficients of variation, H^2b: Heritability, GA: Genetic advance, Ga: Genetic action, A: Additive, Na: Non-additive

The phenotypic coefficient of variation was higher compared to genotypic coefficient of variation except number of primary branches per plant. In the present investigation, the highest estimates of genotypic and phenotypic coefficients of variation were observed for plant height, pod length, test weight, number of pods per plant, grain yield per plant, biological yield per plant and harvest index. In contrast, the lowest estimates were recorded for the number of primary branches per plant High estimates of GCV and PCV in cowpea had been observed for seed yield per plant and harvest index by Lonare *et al.* (2024) [19] and Havaraddi and Deshpande (2018) [12]. While, Bhagavati *et al.* (2018) [2] and Khan *et al.* (2015) [15] recorded high estimates of GCV and PCV for the number of pod per plant. Lonare *et al.* 2024 [19] registered high GCV and PCV for the trait harvest index and number of pods per plant. Most of the traits included in this investigation were considerably highly heritable as they have shown to be associated with very high (> 60%) broad sense heritability. The high magnitude of heritability observed in cowpea had also been reported by Lonare *et al.* 2024 [19] for days to flowering, number of branch per plant, number of pods per plant, number of seeds per pod, harvest index and seed yield per plant. The quantitative traits days to first flower, days to 50% flowering, days to maturity, plant height, pod length, biological yield per plant and harvest index shown the high heritability with high genetic advance indicating additive gene action and selection is effective while the characters number of primary branches per plant, number of seeds per pod, test weight, number of pods per plant and grain yield per plant exhibited non- additive gene action and selection is ineffective.

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