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Ansh Singh
Department of Horticulture,
Sam Higginbottom University of
Agriculture Technology and
Sciences, Prayagraj, Uttar
Pradesh, India

Deepanshu
Department of Horticulture,
Sam Higginbottom University of
Agriculture Technology and
Sciences, Prayagraj, Uttar
Pradesh, India

Vijay Bahadur
Department of Horticulture,
Sam Higginbottom University of
Agriculture Technology and
Sciences, Prayagraj, Uttar
Pradesh, India

Corresponding Author:
Ansh Singh
Department of Horticulture,
Sam Higginbottom University of
Agriculture Technology and
Sciences, Prayagraj, Uttar
Pradesh, India

Genetic variability, heritability, correlation studies and path coefficient in cowpea [*Vigna unguiculata* (L.) Walp.]

Ansh Singh, Deepanshu and Vijay Bahadur

Abstract

The current experiment entitled, "Genetic Variability, Heritability, Correlation Studies and Path Coefficient in Cowpea [*Vigna unguiculata* (L.) Walp.]", was conducted for experimentation focus at field of Department of Horticulture, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, during Kharif season 2020-2021. The experiment was carried out with 36 genotypes secured from SHUATS, Prayagraj in Randomized Block Design (RBD) with three replications. The moderate magnitude of genotypic coefficient of variance GCV was recorded for TSS (⁰Brix), pod yield (q/ha), pod yield plot-1 (kg), pod yield (gm) plant-1, number of seeds plant-1 and number of pods plant-1. The most elevated magnitude of the phenotypic coefficient of variance PCV was recorded for TSS (⁰Brix). Genotypic correlation coefficient analysis revealed that pod yield (t/ha) showed a positive significant association with plant height (cm) (0.301**) at genotypic level, number of pods per plant (0.743** & 0.578**), number of seeds per plant (0.558** & 0.474**), pod weight (g) (0.718** & 0.519**), pod yield per plant (0.932** & 0.846**), pod yield per plot (0.914** & 0.850**) and TSS (⁰Brix) in Pod (0.234* & 0.194*) at both genotypic and phenotypic level. The most elevated direct beneficial outcome on Pod yield (q/ha) was displayed by plant height (cm) (0.0277) at genotypic level, days to first picking (0.0292 & 0.0482), number of pods per plant (0.0417 & 0.0748), no. of nodes per plant (0.0022 & 0.0382), length of the pods (cm) (0.0313 & 0.0058), number of seed per plant (0.144 & 0.0374), 100 seed weight (gm) (0.0302 & 0.0579), pod weight (gm) (0.1699 & 0.1312), pod yield per plant (gm) (0.3952 & 0.3452) and pod yield per plot (kg) (0.4029 & 0.3844) at both genotypic and phenotypic and number of branches per plant (0.0563), number of seeds per plant (0.0705) and TSS (⁰Brix) (0.0065).

Keywords: Cowpea, yield attributes, genetic parameter, correlation and path coefficient

Introduction

The importance of vegetable crops in India can be decided from the way that the majority of the Indian population is vegetarian. India delivers the largest assortment of vegetables. Cowpea [*Vigna unguiculata* (L.) Walp.] is an annual, autogamous leguminous vegetable crops of India that belongs to the family Fabaceae (Mackie and Smith, 1935)^[12] with a chromosome number of $2n=2x=22$ (Darlington and Wylie, 1955)^[4]. It is local to India (Vavilov, 1949)^[19] yet tropical and central Africa is also considered as an optional focus of origin where wild races are found (Ng and Marechal, 1985)^[13]. Generally, grain-type cowpea varieties produce short pods with more number of seeds and mature early though vegetable sort varieties produce long pods with a smaller number of seeds and mature late and the pods stay delicate and delicate for a longer period. Under such conditions, genetic diversity is of incredible importance and plays a crucial role in centering crop improvement Sabale *et al.*, (2018)^[18].

Materials and Methods

This section contains the details of the materials utilized and the strategies embraced in the current review entitled "Genetic Variability, Heritability, Correlation Studies and Path Coefficient in Cowpea [*Vigna unguiculata* (L.) Walp.]" Under Prayagraj agro-climatic conditions, was done on genetic variability, heritability, correlation, way coefficient analysis in cowpea during 2020-2021 at the Horticulture Research Field, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences. The analysis was laid out in randomized block design with three replications on 08-09- 2020. The planting was done on raised bed method with a spacing of 60 cm and 60 cm, plant to plant and row to row, respectively, each plot with 9 plants. Experimental materials comprised of 36 genotypes.

All are genotypes and are collected from SHUATS, Prayagraj. For the analysis of this experiment observations recorded *viz.*, plant height (cm), number of branches plant⁻¹, days to first flowering, days to first picking, no. of nodes per plant on main stem, number of pods plant⁻¹, length of the pod (cm), number of seeds pod⁻¹, number of seeds plant⁻¹, 100 seed weight, pod weight (g), pod yield (gm) plant⁻¹, pod yield plot⁻¹ (kg), pod yield (q/ha), TSS (⁰Brix). Analysis of difference was finished parceling the total fluctuation into total variety because of the medicines and replications according to system Panse and Sukhatme (1978)^[16]. PCV and GCV were classified as suggested by Robinson *et al.*, (1949)^[17]. It was calculated by the formula given by Lush (1949)^[11] and Burton and Devane (1953)^[3]. The range of genetic advance as per cent of mean is classified as suggested by Johnson *et al.*, (1955)^[8, 9]. The correlation coefficients among all possible character combinations at phenotypic (rp) and genotypic (rg) level were estimated employing formula by Johnson *et al.*, (1955)^[8, 9]. The coefficient analysis was completed with different components as casual factors (Independent Variables) and yield as the immediate effect (Dependent Variables) and the relationship was acquired by solution of simultaneous conditions, which express the fundamental relationship among correlation and way coefficient analysis Dewey and Lu (1959)^[5].

Table 1: List of genotypes were used in the present investigation

Sl. No.	Genotype Symbol	Genotypes	Source
1	G ₁	IC-370499	NBPGR, ICAR, New Delhi, India
2	G ₂	IC-253277	NBPGR, ICAR, New Delhi, India
3	G ₃	IC-259106	NBPGR, ICAR, New Delhi, India
4	G ₄	IC-333208	NBPGR, ICAR, New Delhi, India
5	G ₅	IC-259104	NBPGR, ICAR, New Delhi, India
6	G ₆	IC-259085	NBPGR, ICAR, New Delhi, India
7	G ₇	IC-259083	NBPGR, ICAR, New Delhi, India
8	G ₈	IC-259071	NBPGR, ICAR, New Delhi, India
9	G ₉	IC-259063	NBPGR, ICAR, New Delhi, India
10	G ₁₀	IC-257446	NBPGR, ICAR, New Delhi, India
11	G ₁₁	IC-257407	NBPGR, ICAR, New Delhi, India
12	G ₁₂	IC-253281	NBPGR, ICAR, New Delhi, India
13	G ₁₃	IC-253276	NBPGR, ICAR, New Delhi, India
14	G ₁₄	IC-253273	NBPGR, ICAR, New Delhi, India
15	G ₁₅	IC-243501	NBPGR, ICAR, New Delhi, India
16	G ₁₆	IC-219594	NBPGR, ICAR, New Delhi, India
17	G ₁₇	IC-219574	NBPGR, ICAR, New Delhi, India
18	G ₁₈	IC-214833	NBPGR, ICAR, New Delhi, India
19	G ₁₉	IC-214757	NBPGR, ICAR, New Delhi, India
20	G ₂₀	IC-202918	NBPGR, ICAR, New Delhi, India
21	G ₂₁	IC-202926	NBPGR, ICAR, New Delhi, India
22	G ₂₂	IC-214751	NBPGR, ICAR, New Delhi, India
23	G ₂₃	IC-202718	NBPGR, ICAR, New Delhi, India
24	G ₂₄	IC-202709	NBPGR, ICAR, New Delhi, India
25	G ₂₅	IC-202707	NBPGR, ICAR, New Delhi, India
26	G ₂₆	IC-202705	NBPGR, ICAR, New Delhi, India
27	G ₂₇	IC-201095	NBPGR, ICAR, New Delhi, India
28	G ₂₈	IC-199701	NBPGR, ICAR, New Delhi, India
29	G ₂₉	IC-58905	NBPGR, ICAR, New Delhi, India
30	G ₃₀	IC-52094	NBPGR, ICAR, New Delhi, India
31	G ₃₁	IC-39911	NBPGR, ICAR, New Delhi, India
32	G ₃₂	IC-39853	NBPGR, ICAR, New Delhi, India
33	G ₃₃	IC-20561	NBPGR, ICAR, New Delhi, India
34	G ₃₄	IC-20514	NBPGR, ICAR, New Delhi, India
35	G ₃₅	IC-202821	NBPGR, ICAR, New Delhi, India
36	G ₃₆	IC-202803	NBPGR, ICAR, New Delhi, India

Results and Discussion

The mean sum of squares due to genotypes showed significant differences for all characters at 1% level and 5% level of significance, indicating the presence of the substantial amount of genetic variability among the cowpea genotypes. Moderate magnitude of genotypic coefficient of variance GCV was recorded for TSS (⁰Brix) (19.79), pod yield (q/ha) (14.43), pod yield plot-1 (kg) (14.46), pod yield (gm) plant-1 (14.43), number of seeds plant-1 (13.75) and number of pods plant-1 (10.75). The most elevated magnitude of the phenotypic coefficient of variance PCV was recorded for TSS (⁰Brix) (22.90). In the current investigation, the heritability estimate was found to be high (>60) for almost all the characters *viz.*, TSS (⁰Brix) (74.2), pod yield (q/ha) (84.9), pod yield plot-1 (kg) (85.0), pod yield (gm) plant-1 (84.9), pod weight (g) (76.1), 100 seed weight (96.9), number of seeds plant-1 (65.3), length of the pod (cm) (99.8), no. of nodes per plant on the main stem (81.9), number of pods plant-1 (81.00) and number of branches plant-1 (70.3). The most noteworthy genetic advance was recorded for characters like number of seeds plant-1(63.50) and pod yield (gm) plant-1 (45.42). Genetic advance as per penny of mean was most noteworthy for TSS (⁰Brix) (35.12), pod yield (q/ha) (27.39), pod yield plot-1 (kg) (27.48), pod yield (gm) plant-1 (27.39), number of seeds plant-1 (22.89) and length of the pod (cm) (28.26). The phenotypic coefficient of variation was higher than genotypic coefficient of variation for all the traits studied; this implies the combination of environmental and genetic factors. Similar results have been reported by other researchers in vegetable crops, roselle and cowpea respectively (Vijayan, 2005; Ibrahim and Hussein 2006, Adewale *et al.*, 2010, Adeigbe *et al.*, 2011, Kaushik *et al.*, 2007; Adewale *et al.*, 2010)^[21, 7, 2, 1, 10].

Genotypic correlation coefficient analysis revealed that pod yield (q ha⁻¹) showed a positive significant association with plant height (cm) (0.301**), number of pods per plant (0.743**), number of seeds per plant (0.558**), pod weight (g) (0.718**), pod yield per plant (0.932**), pod yield per plot (0.914**) and TSS in Pod (0.234*). Phenotypic correlation coefficient analysis revealed that pod yield (q ha⁻¹) showed a positive significant association with a number of pods per plant (0.578**), number of seeds per plant (0.474**), pod yield per plant (0.846**), pod weight (g) (0.519**), pod yield per plot (0.850**), TSS(⁰Brix) (0.194*). The genotypic path coefficient among the different Pod yield (q/ha) traits in cowpea was worked out to assess the association among themselves. Similar results were found by (Nguyen *et al.*, 2019, Om Vir and Singh, 2019, Walle *et al.*, 2018, Venkatesan *et al.*, 2003 and Diriba Shanko *et al.*, 2014)^[14, 15, 22, 20, 6]. A perusal of Table revealed that the most elevated direct constructive outcome on Pod yield (q/ha) was displayed by plant height (cm) (0.0277), days to first picking (0.0292), number of pods per plant (0.0417), no. of nodes per plant (0.0022), length of the pods (cm) (0.0313), number of seed per plant (0.144), 100 seed weight (gm) (0.0302), pod weight (gm) (0.1699), pod yield per plant (gm) (0.3952) and pod yield per plot (kg) (0.4029). The phenotypic path coefficient among the different pod yield (q ha⁻¹) traits in cowpea was worked out to assess the association among themselves. A perusal of Table revealed that the most noteworthy direct beneficial outcome on pod yield (q ha⁻¹) was shown by a number of branches per plant (0.0563), days to first picking (0.0482), number of pods per plant (0.0748), no. of nodes per plant on main (0.0382), length of the pods (cm) (0.0058), number of seed per pod (0.0374), number of seed per plant (0.0705), 100 seed weight (gm) (0.0579), pod weight (gm) (0.1312), pod yield per plant (gm) (0.3452), pod yield per plot (kg) (0.3844), and TSS (⁰Brix) (0.0065).

Table 2: Analysis of variance (mean squares) for fifteen characters in cowpea

S. No.	Source of Variations	Replication (df= 2)	Treatments (due to 35)	Error = 70
1.	Plant height (cm)	88.81	231.260**	5257.72
2.	Number of branches plant ⁻¹	0.0086	2.27**	0.28
3.	Days to first flowering	12.91	22.59**	8.47
4.	Days to first picking	19.45	43.30**	21.10
5.	Number of pods plant ⁻¹	0.74	14.25**	1.03
6.	No. of nodes per plant on main stem	0.025	0.23**	0.016
7.	Length of the pod (cm)	0.048	63.20**	0.042
8.	Number of seeds pod ⁻¹	0.296	3.55**	1.004
9.	Number of seeds plant ⁻¹	273.92	5137.84**	772.92
10.	100 Seed weight	0.190	4.793**	0.050
11.	Pod weight (g)	0.334	2.22**	0.21
12.	Pod yield (gm) plant ⁻¹	331.152	1819.50**	101.739
13.	Pod yield plot ⁻¹ (kg)	0.0285	0.1481**	0.0082
14.	Pod yield (q/ ha)	25.55	140.38**	7.849
15.	TSS (⁰ Brix)	0.0286	0.476**	0.0495

Table 3: Estimation of range, grand mean, phenotypic, genotypic, environmental, coefficients of variation, heritability in broad (h²bs) sense and genetic advance in per cent of mean GA for fifteen characters in cowpea genotypes.

	Genetic parameters	Range		Mean	GV σ^2g	PV σ^2g	CV		Heritability h ² (Broad Sense)	Genetic Advancement 5%	Gen. Adv as % of Mean 5%
		Maximum	Minimum				GCV	PCV			
1.	Plant height (cm)	117.44	89.04	106.79	52.05	127.161	6.80	10.64	40.9	9.50	8.97
2.	Number of branches plant ⁻¹	9.82	6.36	8.67	0.66	0.947	9.38	11.19	70.3	1.40	16.20
3.	Days to first flowering	49.69	41.23	44.78	4.709	13.18	4.82	8.07	35.7	2.67	5.94
4.	Days to first picking	59.57	51.43	55.48	7.399	28.50	4.94	9.70	26.00	2.85	5.18
5.	Number of pods plant ⁻¹	23.51	13.53	19.48	4.405	5.44	10.75	11.95	81.00	3.89	19.94
6.	No. of nodes per plant on main Stem	3.62	2.05	3.21	0.074	0.090	8.46	9.35	81.9	0.50	15.78
7.	Length of the pod (cm)	39.56	20.44	33.42	21.05	21.09	13.73	13.74	99.8	9.44	28.26
8.	Number of seeds pod ⁻¹	16.62	10.96	14.19	0.849	1.854	6.50	9.60	45.8	1.28	9.06
9.	Number of seeds plant ⁻¹	390.80	147.90	277.36	1454.973	2227.86	13.75	17.01	65.3	63.50	22.89
10.	100 Seed weight	15.33	10.29	13.32	1.581	1.632	9.44	9.59	96.9	2.55	19.14
11.	Pod weight (g)	9.77	6.45	8.46	0.672	0.883	9.63	11.04	76.1	1.47	17.31
12.	Pod yield (gm) plant ⁻¹	217.59	87.21	164.97	572.58	674.328	14.43	15.66	84.9	45.42	27.39
13.	Pod yield plot ⁻¹ (kg)	2.96	1.22	2.31	0.047	0.055	14.46	16.68	85.0	0.41	27.48
14.	Pod yield (q/ ha)	78.37	32.30	61.10	44.17	52.029	14.43	15.66	84.9	12.61	27.39
15.	TSS (⁰ Brix)	2.56	1.02	1.89	0.142	0.192	19.79	22.90	74.2	0.66	35.12

Table 4: Estimation of genotypic correlation coefficient between 15 characters in cowpea genotypes.

	Plant height (cm)	Number of branches per plant	Days to first flowering	Days to first picking	Number of pods per plant	No. of nodes per plant on main	Length of the pod (cm)	Number of seeds per pod	Number of seeds per plant	100 Seed weight	Pod weight (g)	Pod yield per plant	Pod yield per plot	TSS in Pod	Pod yield (q/ha)
Plant height (cm)	1.0000	-0.196*	0.270**	-0.1550	0.303**	0.309**	0.250**	0.1100	0.1860	0.0640	0.0340	0.294**	0.284**	0.0380	0.301**
Number of branches per plant		1.0000	0.1070	0.1010	-0.0970	0.484**	0.0560	0.1110	-0.0150	0.405**	-0.0390	-0.0910	-0.0940	0.309**	-0.1030
Days to first flowering			1.0000	0.0740	-0.206*	-0.0880	-0.1340	0.1270	0.0190	-0.251**	-0.198*	-0.293**	-0.300**	-0.330**	-0.291**
Days to first picking				1.0000	-0.439**	0.1560	-0.231*	-0.0900	-0.445**	0.190*	0.1670	-0.204*	-0.207*	0.1290	-0.193**
Number of pods per plant					1.0000	-0.0450	0.385**	0.1070	0.885**	-0.426**	-0.0360	0.740**	0.737**	-0.0050	0.743**
No. of nodes per plant on main						1.0000	0.273**	0.317**	-0.0920	0.543**	0.270**	0.1790	0.1870	0.351**	0.1800
Length of the pod (cm)							1.0000	0.237*	0.288**	-0.0420	-0.355**	0.0400	0.0380	0.1660	0.0390
Number of seeds per pod								1.0000	0.521**	0.1300	-0.0800	0.0290	0.0400	-0.321**	0.0370
Number of seeds per plant									1.0000	-0.383**	-0.1250	0.553**	0.555**	-0.193*	0.558**
100 Seed weight										1.0000	0.1060	-0.202*	-0.204*	0.1080	-0.195*
Pod weight (g)											1.0000	0.712**	0.713**	0.353**	0.718**
Pod yield per plant												1.0000	0.911**	0.235*	0.932**
Pod yield per plot													1.0000	0.234*	0.914**
TSS (⁰ Brix)in Pod														1.0000	0.234*
Pod yield (q/ha)															1.0000

Table 5: Estimation of phenotypic correlation coefficient between 15 characters in cowpea genotypes.

	Plant height (cm)	Number of branches per plant	Days to first flowering	Days to first picking	Number of pods per plant	No. of nodes per plant on main	Length of the pod (cm)	Number of seeds per pod	Number of seeds per plant	100 Seed weight	Pod weight (g)	Pod yield per plant	Pod yield per plot	TSS in Pod	Pod yield (q/ha)
Plant height (cm)	1.0000	-0.1260	0.0950	-0.1460	0.223*	0.214*	0.1690	0.0660	0.1100	0.0820	0.0600	0.200*	0.227*	0.0450	0.1780
Number of branches per plant		1.0000	0.0770	0.1190	-0.1140	0.289**	0.0290	0.0960	0.0120	0.251**	-0.0490	-0.0550	-0.0470	0.235*	-0.0120
Days to first flowering			1.0000	-0.0350	-0.1640	-0.0760	-0.0780	0.0890	0.0280	-0.1830	-0.0870	-0.1630	-0.1440	-0.217*	-0.1680
Days to first picking				1.0000	-0.289**	0.0720	-0.1470	-0.0880	-0.264**	0.1630	0.0820	-0.1280	-0.1210	0.0660	-0.1630
Number of pods per plant					1.0000	-0.0090	0.300**	0.1000	0.736**	-0.284**	-0.0260	0.589**	0.591**	-0.0130	0.578**
No. of nodes per plant on main						1.0000	0.1870	0.1820	-0.0480	0.311**	0.1750	0.1430	0.1170	0.291**	0.1380
Length of the pod (cm)							1.0000	0.1720	0.237*	-0.0160	-0.282**	0.0310	0.0420	0.1480	0.0360
Number of seeds per pod								1.0000	0.372**	0.0500	-0.0590	0.0330	-0.0060	-0.222*	0.0060
Number of seeds per plant									1.0000	-0.292**	-0.1190	0.491**	0.474**	-0.1580	0.474**
100 Seed weight										1.0000	0.0570	-0.1440	-0.1370	0.0940	-0.1720
Pod weight (g)											1.0000	0.540**	0.544**	0.275**	0.519**
Pod yield per plant												1.0000	0.860**	0.191*	0.846**
Pod yield per plot													1.0000	0.201*	0.850**
TSS (⁰ Brix)														1.0000	0.194*
Pod yield (q/ha)															1.0000

Table 6: Direct and indirect effects of 15 characters on yield at genotypic level in cowpea genotypes

	Plant height (cm)	Number of branches per plant	Days to first flowering	Days to first picking	Number of pods per plant	No. of nodes per plant on main	Length of the pod (cm)	Number of seeds per pod	Number of seeds per plant	100 Seed weight (g)	Pod weight (g)	Pod yield per plant (gm)	Pod yield per plot (kg)	TSS (^o Brix)	Podyield (q/ha)
Plant height (cm)	0.0277	-0.0054	0.0075	-0.0043	0.0084	0.0085	0.0069	0.003	0.0052	0.0018	0.0009	0.0082	0.0079	0.0011	0.301**
Number of branches per Plant	0.0025	-0.0127	-0.0014	-0.0013	0.0012	-0.0061	-0.0007	-0.0014	0.0002	-0.0051	0.0005	0.0012	0.0012	-0.0039	-0.1030
Days to first flowering	-0.0026	-0.001	-0.0095	-0.0007	0.002	0.0008	0.0013	-0.0012	-0.0002	0.0024	0.0019	0.0028	0.0029	0.0031	-0.291**
Days to first picking	-0.0045	0.0029	0.0022	0.0292	-0.0128	0.0045	-0.0067	-0.0026	-0.013	0.0055	0.0049	-0.006	-0.0061	0.0038	-0.193*
Number of pods per plant	0.0126	-0.004	-0.0086	-0.0183	0.0417	-0.0019	0.016	0.0045	0.0369	-0.0178	-0.0015	0.0308	0.0307	-0.0002	0.743**
No. of nodes per plant on main	0.0007	0.0011	-0.0002	0.0003	-0.0001	0.0022	0.0006	0.0007	-0.0002	0.0012	0.0006	0.0004	0.0004	0.0008	0.1800
Length of the pod (cm)	0.0078	0.0017	-0.0042	-0.0072	0.012	0.0085	0.0313	0.0074	0.009	-0.0013	-0.0111	0.0013	0.0012	0.0052	0.0390
Number of seeds per pod	-0.008	-0.008	-0.0093	0.0065	-0.0078	-0.0231	-0.0173	-0.0727	-0.0378	-0.0095	0.0058	-0.0021	-0.0029	0.0233	0.0370
Number of seeds per plant	0.0268	-0.0022	0.0028	-0.0641	0.1275	-0.0133	0.0415	0.075	0.144	-0.0551	-0.018	0.0797	0.0799	-0.0278	0.558**
100 Seed weight (gm)	0.0019	0.0122	-0.0076	0.0057	-0.0128	0.0164	-0.0013	0.0039	-0.0115	0.0302	0.0032	-0.0061	-0.0060	0.0032	-0.195*
Pod weight (gm)	0.0058	-0.0067	-0.0337	0.0284	-0.0061	0.0458	-0.0603	-0.0135	-0.0213	0.0181	0.1699	0.121	0.1211	0.0599	0.718**
Pod yield per plant (gm)	0.1163	-0.0361	-0.1158	-0.0808	0.2924	0.0708	0.0159	0.0114	0.2187	-0.0799	0.2815	0.3952	0.4086	0.0927	0.932**
Pod yield per plot (kg)	0.1145	-0.0378	-0.121	-0.0836	0.297	0.0752	0.0152	0.0161	0.2236	-0.082	0.2873	0.4165	0.4029	0.0942	0.914**
Pod yield (q/ha)	0.301**	-0.1030	-0.291**	-0.193*	0.743**	0.1800	0.0390	0.0370	0.558**	-0.195*	0.718*	0.932**	0.914*	0.234*	1.0000
Partial R2	0.0083	0.0013	0.0028	-0.0056	0.031	0.0004	0.0012	-0.0027	0.0803	-0.0059	0.122	0.4102	0.4177	-0.0052	

Table 7: Direct and indirect effects of 15 characters on yield at phenotypic level in cowpea genotypes

	Plant height (cm)	Number of branches per plant	Days to first flowering	Days to first picking	Number of pods per plant	No. of nodes per plant on main	Length of the pod (cm)	Number of seeds per pod	Number of seeds per plant	100 Seed weight t	Pod weight t (g)	Pod yield per plant	Pod yield per plot	TSS in Pod	Podyield (q/ha)
Plant height (cm)	-0.0059	0.0007	-0.0006	0.0009	0.0013	0.0013	-0.001	0.0004	0.0006	0.0005	0.0003	0.0012	-0.0013	0.0003	0.1780
Number of branches per plant	-0.0071	0.0563	0.0044	0.0067	-0.0064	0.0163	0.0016	0.0054	0.0007	0.0142	-0.0028	-0.0031	-0.0026	0.0132	-0.0120
Days to first flowering	-0.0043	-0.0035	-0.0456	0.0016	0.0075	0.0034	0.0036	-0.0043	-0.0013	0.0083	0.0049	0.0074	0.0066	0.0099	-0.1680
Days to first picking	0.007	-0.0057	0.0017	-0.0482	0.0139	-0.0035	0.0071	0.0042	0.0127	-0.0078	-0.0039	0.0062	0.0058	-0.0032	-0.1630
Number of pods per plant	0.0167	-0.0085	-0.0123	-0.0216	0.0748	-0.0007	0.0224	0.0075	0.0551	-0.0213	-0.0019	0.0442	0.0442	-0.001	0.578*
No. of nodes per plant on main	0.0082	0.011	-0.0029	0.0027	-0.0003	0.0382	0.0072	0.007	-0.0018	0.0119	0.0067	0.0055	0.0045	0.0111	0.1380
Length of the pod (cm)	-0.001	-0.0002	0.0005	0.0009	-0.0017	-0.0011	-0.0058	-0.001	-0.0014	0.0001	0.0016	-0.0002	-0.0002	-0.0009	0.0360
Number of seeds per pod	-0.0025	-0.0036	-0.0033	0.0033	-0.0038	-0.0068	-0.0064	-0.0374	-0.0139	-0.0019	0.0022	-0.0012	0.0002	0.0083	0.0060
Number of seeds per plant	0.0077	0.0009	0.002	-0.0186	0.0519	-0.0034	0.0167	0.0262	0.0705	-0.0206	-0.0084	0.0346	0.0334	-0.0111	0.474**
100 Seed weight	-0.0047	-0.0145	0.0106	-0.0094	0.0164	-0.018	0.0009	-0.0029	0.0169	-0.0579	-0.0033	0.0083	0.0079	-0.0054	-0.1720
Pod weight (g)	0.0078	-0.0064	-0.0114	0.0107	-0.0034	0.023	-0.037	-0.0078	-0.0156	0.0075	0.1312	0.0708	0.0714	0.0361	0.519*
Pod yield per plant	0.0692	-0.0188	-0.0563	-0.0441	0.2031	0.0492	0.0107	0.0114	0.1694	-0.0496	0.1863	0.3452	0.2968	0.0657	0.846*
Pod yield per plot	0.0872	-0.0179	-0.0555	-0.0466	0.2272	0.0448	0.0161	-0.0023	0.1824	-0.0525	0.2092	0.3305	0.3844	0.0771	0.850*
TSS ⁰ Brix in Pod	-0.0003	-0.0015	0.0014	-0.0004	0.0001	-0.0019	-0.001	0.0014	0.001	-0.0006	-0.0018	-0.0012	-0.0013	-0.0065	0.194*
Pod yield (q/ha)	0.1780	-0.0120	-0.1680	-0.1630	0.578**	0.1380	0.0360	0.0060	0.474**	-0.1720	0.519**	0.846**	0.850**	0.194*	1.0000
Partial R ²	-0.001	-0.0007	0.0076	0.0078	0.0433	0.0053	-0.0002	-0.0002	0.0334	0.0099	0.0681	0.292	0.3268	-0.0013	

Conclusion

On the basis of performance of 36 genotypes of cowpea [*Vigna unguiculata* (L.) Walp.] IC-202821 was found superior in terms of yield per plant. Larger amount of variability exhibited in the genotypes for selection. The trait like TSS (⁰Brix), pod yield (q/ha), pod yield per plot (kg), pod yield (gm) per plant, pod weight (g), 100 seed weight, number of seeds per plant, length of the pod (cm), no. of nodes per plant on the main stem, number of pods per plant and number of branches per plant was found high heritability coupled with high genetic advance providing good scope for further improvement in advance generation. Plant height (cm) at genotypic level, number of pods per plot and TSS(⁰Brix) of pods showed positive correlation at both genotypic and phenotypic level proved their genetic worth for selection and improvement of cowpea.

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