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Evaluation of Vegetable Cowpea Genotypes for Fodder Yield

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Abstract

The success of most crop improvement programs largely depends upon the genetic variability and the heritability of desirable traits. The magnitude and type of genetic variability help the breeder to determine the selection criteria and breeding schemes to be used for improvement purposes. In the present study, 14 promising vegetable purpose cowpea genotypes were evaluated during *kharif* and summer season of 2006-07 for fodder yield, green pod yield and other component traits. Results showed that there was considerable variation among cultivars for all the traits. Genotypic and phenotypic coefficients of variation were high for green pod yield and green forage yield. High heritability coupled with high genetic advance as per cent of mean was noticed for characters plant height, number of branches, number of pods per plant, green pod yield and green forage yield. We concluded that there was sufficient genetic variance to warrant selection for improvement in these cowpea genotypes and that considerable progress in forage cowpea breeding could be achieved by exploiting these traits.

Key words : Variability, Heritability, Genetic advance, Selection.

Cowpea (*Vigna unguiculata* L. Walp.), an annual legume is chiefly used as a grain crop, for animal fodder, or as a vegetable. Cowpea can be used at all stages of growth as a vegetable crop and in many areas of the world, it is the only available high quality legume hay for livestock feed as the nutritive value of cowpea grain, leaves and haulms is high. The crude protein content is 5 and 23% in the fresh and dry leaves, respectively (1). Digestibility and yield of certain cultivars have shown to be comparable to alfalfa. The addition of even a small amount of cowpea improves the nutritional balance of the diet and enhances protein quality. Cowpea may be used as green or dry fodder. It is also used as a green manure crop, a nitrogen fixing crop, or for erosion control. Observations on vegetable cowpea genotypes maintained at the Department of Genetics and plant Breeding, College of Agriculture, GKVK, Bangalore, revealed their high fodder value and hence the present study was undertaken to assess variability existing for fodder traits in 12 such lines. The efficiency of selection largely depends on the extent of genetic variability present in the population and the heritability of the character. Selection is generally more effective for characters with high heritability and genetic advance (2).

Methods

Twelve promising vegetable purpose cowpea genotypes were evaluated with two fodder cowpea national checks UPC-5286 and Bundel Lobia-1, under randomized complete block design with three replications during *kharif* and summer season of 2006-07 at ZARS. V. C. Farm, Mandya, Karnataka,India. Each entry was sown in six rows measuring 4 m with spacing of 30 cm between rows. The data on plant height (cm), number of branches per plant, leaf : stem ratio, number of pods per plant,pod length (cm), green fodder yield (q/ha) and green pod yield (q/ha) were recorded from 10 randomly selected plants in each replications. Analysis of variance was carried out following the method suggested by Panse and Sukhatme 93). PCV and GCV were calculated by using the formulae suggested by Burton and Devane (4). Heritability in broad sense was calculted following the metod advocated by Hanson et al. (5) and expressed in percentage. Genetic advance was estimated by the method given by Johnson et al. (2).

Results and Discussion

Analysis of variance for the seven characters

Table 1. Analysis of variance for seven quantitative traits in vegetable cowpea.

Source	Plant height (cm)	No. of branches	No. of pods per plant	Pod length (cm)	Leaf : Stem ratio	Green pod yield (q/ha)	Green forage yield (q/ha)
Replications	3.494	0.182	0.146	0.168	0.0001	0.295	32.508
Genotypes	112.973**	0.836**	2.887**	6.043**	0.009**	13.86**	1083.835**
Error	2.358	0.098	0.363	2.248	0.002	0.413	21.788

revealed the presence of significant genotypic differences indicating the presence of sufficient variability in the experimental material (Table 1). These results are in conformity with the earlier reports (6—11) for yield and related characters. The genotypes AV-6, PV-3, KBC-2 and AV-5 recorded significantly higher fodder yield of 9.54, 9.47, 9.31 and 9.25 tonnes per ha, respectively, compared to the best check UPC-5286 (Table 2). These genotypes also recorded higher leaf : stem ratio and number of branches per plant. The entries KM-6 and KBC-2 recorded maximum plant height. The genotypes Arka Garima yielded highest green pod yield of 10.63 q/ha followed by AV-5 (10.43 q/ha). The genotype Arka Garima also recorded more number of pods per plant. The genotype PKB-3 recorded maximum pod length (18.7 cm). The knowledge on genetic parameters like phenotypic, genotypic coefficient of variation, heritability and genetic advance for economically important characters is essential for formulating an effective selection strategy. In our study, genotypic and phenotypic coefficients of variation were high for green pod yield and green forage yield. High PCV and GCV for green fodder yield were also reported earlier (10, 12). High PCV and moderate GCV were observed for number pods per plant. Moderate PCV and GCV values were reported for the characters plant height and number of branches per plant. For pod length, moderate PCV and low GCV were observed whereas for leaf : stem ratio PCV and GCV were low.

The magnitude of inheritance of quantitative traits is provided by the heritability estimate but provides no indication of the amount of genetic progress that would result from selecting the best individuals. A suitable selection procedure could be followed only when the high heritability estimate in broad sense coupled with high genetic advance as the genetic advance measures and predicts the genetic gain un-

Table 2. Mean performance of vegetable cowpea genotypes.

	Entry	Green fodder yield (q/ha)	Plant height (cm)	No. of branches	Leaf : Stem ratio	No. of pods	Pod length (cm)	yield (q/ha)
1	AV-6	95.34	31.42	4.70	0.88	5.43	14.07	8.86
2	PV-3	94.72	29.06	4.85	0.89	5.00	16.07	5.36
3	KBC-2	93.09	43.39	4.65	0.90	4.80	14.17	4.59
4	AV-5	92.55	34.89	4.37	0.82	6.13	15.50	10.43
5	PV-1	67.22	29.13	4.98	0.73	5.17	14.83	7.01
6	Arka Garima	65.50	33.03	3.70	0.72	6.67	16.47	10.63
7	PKB-3	61.57	31.62	4.33	0.91	5.67	18.70	5.65
8	PKB-6	58.10	34.47	3.95	0.81	5.00	16.80	5.05
9	PKB-4	54.04	25.50	3.52	0.79	4.80	16.43	6.18
10	AV-1	51.79	32.97	3.42	0.74	5.00	17.63	5.98
11	KM-6	51.22	45.92	4.80	0.82	5.80	16.47	4.64
12	PKB-5	36.11	26.46	3.87	0.88	5.07	17.70	6.18
13	UPC-5286	86.85	45.67	4.05	0.83	5.00	15.33	6.55
14	Bundel Lobia-1	66.83	36.33	4.60	0.78	4.73	14.98	6.38
	Mean	66.77	33.15	4.09	0.80	4.98	16.24	6.97
	CD (5%)	7.90	2.60	0.53	0.07	1.02	2.54	0.75
	CV (%)	6.99	4.63	7.63	5.21	12.11	9.23	11.20

Table 3. Estimation of range, mean and other genetic parameters for seven quantitative traits in vegetable cowpea.

Characters	Mean	Range	GCV (%)	PCV (%)	Heritability (%)	Genetic advance over mean
Plant height (cm)	33.16	25.50–45.92	18.31	18.88	93.98	36.57
No. of branches	4.09	3.42—4.98	12.20	14.40	72.12	21.27
No. of pods per plant	19.90	11.20—26.668	18.40	22.03	69.81	31.67
Pod length (cm)	16.24	14.17–18.70	6.91	11.54	35.90	8.56
Leaf : Stem ratio	0.80	0.723—0937	5.59	7.91	50.00	8.14
Green pod yield (q/ha)	6.96	4.59–10.63	68.27	69.20	97.34	78.67
Green Forage yield (q/ha)	66.77	3.61—9.54	28.18	29.03	94.45	56.42

der selection. In the present investigation, high heritability with high genetic advance estimates were observed for the traits viz. plant height, number of branches, number of pods per plant, green yield and green forage yield denoting the predominance of additive genetic variance in the genetic control of these traits (Table 3). Whereas for pod length and leaf : stem ratio high heritability coupled with low genetic advance was noticed indicating the predominance of non-additive genetic variance. In accordance with these results Sheela Mary and Gopalan (10) reported high heritability and high genetic advance for plant height, number of branches, and green fodder yield and Prasanthi (12) for plant height, pods per plant and fodder yield. The number of plant height, number of branches per plant, number of pods per plant, green pod fodder yield per plant will offer a greater scope for their improvement through selection as these attributes exhibited greater to moderate genetic advance coupled with higher heritability and genetic advance estimates. Also in keeping view of the above results, the vegetable cowpea genotypes AV-6, PV-3, KBC-2 and AV-5 can be promoted for fodder purposes.

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