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Performance of Cowpea (*Vigna unguiculata* (L.) Walp.) Genotypes in Vidarbha Region of Maharashtra

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ABSTRACT: Cowpea has been recognized as one of the most important leguminous crops. The agro-climatic conditions of Vidarbha region of Maharashtra have a better future prospect for its commercial cultivation. The evaluation of genotypes has a key role for the successful cultivation as the growth and yield characters are greatly influenced by different climatic conditions. Hence the present investigation was carried out during the summer season in the year 2019. The study was undertaken on 30 genotypes of cowpea using a randomized block design with three replications. Results showed that the genotypes varied in all growth, yield and yield attributing parameters. Among these 30 genotypes the highest plant height was recorded in Vu-5 (126.56 cm) whereas the lowest plant height was observed in the genotype Pusa Sukomal (45.97 cm). The genotype AKCP-SR-3 was found to be early that started flowering early (42.18 days) whereas AKCP-6 was a late genotype which started flowering late (60.27 days). Similarly, the lowest days for fifty per cent flowering were recorded in the genotype AKCP-SR-3 (45.31 days) while the genotype AKCP-6 recorded the highest days to 50% flowering (70.65 days). AKCP-8-2 (17.91 g) recorded the highest 100 seed weight. The highest pod length was recorded by AKCP-8-2-1-1 (29.37 cm) whereas the lowest pod length was observed in Konkan Sadabahar (12.53 cm). The genotype AKCP-8-2-1-1 recorded the highest number of pods per cluster (3.31), the highest number of pods per plant (35.43), the highest yield per plant (297.56g) and the highest yield per hectare (146.94q).

Keywords: Cowpea, Genotypes, Evaluation, Flowering, Growth, Yield.

INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp.) is one of the most important food legumes grown in the arid and semi-arid regions of the world. It is also known as lobia, black-eye pea and southern pea. Cowpea serves as an important protein rich food and also as soil fertility enrichment by fixing atmospheric nitrogen. As a leguminous crop it fits well in different cropping systems. Annual global production of cowpea is over 7 million tonnes from an area of 14.5 million hectares (Singh, 2014). In India vegetable cowpea is grown over an area of 23,012 ha with production of 1,33,587 tons of green pod and productivity of 5800 kg/ha (Leelavathi *et al.,* 2021). It is drought tolerant crop and it thrives very well under moisture stress conditions. It is also a shade tolerant crop and, therefore, compatible as an intercrop with a number of cereals and root crops, as well as with cotton, sugarcane and several plantation crops. On account of diverse uses of cowpea, the varietal requirements are also diverse from region to region (Singh *et al.,* 2020). Collection and evaluation of cowpea landraces allow their conservation and identification of the most promising ones to be used by farmers and breeding programs (Freitas *et al.,* 2019). In India the average yield is very low it may be due to under rainfed and low input conditions (Asati *et al.,* 2018). Another reason for low average yield of cowpea at farmer's field is the continuous cultivation of traditional low potential cultivars (Leelavathi *et al.,* 2021). Different genotypes are grown in various localities and they have well adapted to different regions. Such variability is an immense potential to find out promising genotypes having long pods, more

number of pods per plant, early and synchronous flowering, high yield with disease and pest resistant. Due to high protein content, resistance to drought, adaptability of different soil types and its ability to improve soil fertility, this crop getting more economic important all over the world. The deep rooted system and its short duration life cycle are some of the factors that make cowpea very adaptable to hostile environments. It is therefore very important to develop cowpea varieties that are high yielding, early in flowering and maturity and insect pest resistant. The present study was thus undertaken to find out yield potential of several promising cowpea genotypes for higher yield and early maturity.

MATERIAL AND METHODS

The present investigation was conducted at experimental field, Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS.) during summer 2019. Akola comes under sub-tropical zone and is situated at a latitude of 22.42°N and longitude of 77.02°E. The altitude of the place is 307.42 m from mean sea level. The mean annual precipitation on the basis of last fifteen years is 800 mm. The land used for experiment layout was uniform. The soil was medium black with uniform texture.

The study was undertaken on thirty genotypes of cowpea using randomized block design with three replications. All the genotypes were randomized separately in each replication keeping 3.6 × 3.6 m plot size and 45 × 45 cm spacing. Sowing of the seeds was done on 15 February 2019. Immediately after sowing of seeds, light irrigation was provided to facilitate the seed germination and later on the irrigation was given as per the requirement of the crop. For keeping the crop weed free, manual weeding was carried out regularly in the experimental plots.

The biometrical observations on flowering, plant growth, pod characters and yield attributes were recorded from each plot. Chlorophyll index was measured by using the SPAD meter. For recording the observations five plants were randomly selected and marked initially. The data collected on different parameters was subjected to statistical analysis as per method of analysis prescribed by Panse and Sukhatme (1995).

RESULTS AND DISCUSSION

Analysis of variance for the mean of characters showed highly significant differences among different genotypes. The genotype Vu-5 (126.56 cm) recorded the highest plant height which was statistically at par with Ajit-22 (123.47 cm). The lowest plant height was observed in the genotype Pusa Sukomal (45.97 cm). Similar results were reported by Singh *et al.,* (2020). Wide variation in plant height was due to genetic characters of the genotypes and also might be influenced by agronomical and environmental conditions.

The highest number of primary branches was recorded in the genotype Arka Garima (7.52) which was at par with Pusa Sukomal (7.34), Arka Suman (7.49), AKCP-8-2-1-1 (7.22) and AKCP-SR-3 (7.07). The genotype AKCP-2 recorded the lowest (4.98) number of primary branches per plant. These results are matching with the findings for a number of branches reported by Verma *et al.,* (2019). The number of primary branches determines ultimately, the pod bearing ability of the plant which will intern contributes to the yield, hence identification and selection of genotypes with more branching ability is necessary.

The genotype AKCP-SR-3 was found to be early which started flowering early (42.18 days) as compared to the rest of the treatments and it was at par with the genotypes Pusa Sukomal (48.98), Konkan Sadabahar (45.32), Konkan Safed (49.13) and AKCP-15 (48.98). AKCP-6 was the late genotype that started flowering late (60.27 days). Flowering, is dependent on the interaction of many complex processes which are influenced by both genetic and environmental factors (Uarrota, 2010). The forecited outcome is in accordance with the work did by Jogdhande *et al.,* (2017).

Days to 50% flowering was varied statistically among the genotypes studied during the investigation. The lowest days for 50% flowering were recorded in the genotype AKCP-SR-3 (45.31 days) which was at par with Konkan Sadabahar (49.74). The genotype AKCP-6 recorded the highest days to 50% flowering (70.65 days). Benee, (1988) stated that the earlier a variety sets flowers, the earlier it matured. Indications are that the genotypes used in the present study would be very useful in dry environments because of their ability to escape drought. More or less comparable results were reported by Sunita, (2016).

The highest chlorophyll index was exhibited in genotype AKCP-13 (67.56 SPAD readings) which was statistically at par with AKCP-14 (64.38), Vu-5 (61.16) and AKCP-12 (62.35). The genotype AKCP-2 (42.78 SPAD readings) recorded the lowest chlorophyll index. The measurement of chlorophyll content can evaluate the process of photosynthesis in tolerant plants. The plants that absorb more water leads to high level of chlorophyll content. These results are in conformity with the findings of Sunita, (2016).

With respect to the hundred seed weight, the genotype AKCP-8-2 (17.91 g) recorded the highest value which was at par with AKCP-SR-3 (17.09g), AKCP-13 (17.32g) and Kashi Kanchan (16.18g). Konkan Sadabahar (7.32g) recorded the lowest hundred seed weight. 100 seed weight decides the weight of individual seed which might be contributing to the seed germination and vigour of the plant which ultimately decides the further growth and development. Similar range reported for 100 seed weight by Gondwe *et al.,* (2019).

Table 1 (a). Estimation of mean of characters.

Genotypes	Plant height (cm)	Number of primary branches	Days to initiation of flowering	Days to 50 % flowering	Chlorophyll index (SPAD readings)	100 seed weight (g)
AKCP- 2	65.42	4.98	55.17	65.22	42.78	12.23
AKCP- LR- 2	66.38	5.75	56.49	64.37	57.17	13.51
AKCP- SR- 3	46.52	7.07	42.18	45.31	49.88	17.09
AKCP- 6	67.74	5.31	60.27	70.65	54.88	11.56
AKCP- 8-1	59.78	6.19	57.86	63.77	56.78	13.98
PDKV Rutuja	75.31	5.83	54.25	62.14	52.79	11.21
AKCP- 8-1 P	69.38	6.42	55.09	58.86	51.86	13.71
AKCP- 8-2	74.21	6.13	58.74	62.18	58.03	17.91
AKCP- 8-2-1-1	93.29	7.22	58.14	66.98	59.04	13.66
AKCP- 8-4	73.29	6.42	57.24	65.45	50.32	13.24
AKCP- 8-5	87.35	6.67	52.78	60.51	51.34	13.27
AKCP- 9	63.28	5.58	59.09	68.45	53.90	12.76
AKCP- 10	70.98	6.57	57.36	69.34	55.98	13.43
AKCP-11	65.43	6.17	56.27	63.37	54.08	15.96
AKCP- 12	93.27	6.53	51.54	56.24	62.35	11.83
AKCP-13	58.74	5.63	53.27	56.74	67.56	17.32
AKCP-14	72.38	5.24	58.34	65.35	64.38	10.38
AKCP-15	90.86	6.58	48.98	60.57	53.44	11.36
AKCP-16	89.15	5.76	53.27	60.26	55.93	13.11
AKCP-16N	89.46	6.14	59.32	63.78	48.74	13.38
Ajit- 22	123.47	6.39	58.00	54.68	53.89	10.42
Arka Garima	103.46	7.52	53.47	63.28	45.67	13.54
Arka Suman	83.29	7.49	50.91	58.63	45.67	13.19
BOR- 14	79.54	6.54	53.09	58.25	46.79	15.28
Indira Hari-2	61.28	6.17	54.78	53.98	51.11	12.53
Kashi Kanchan	59.52	6.81	48.77	58.53	44.47	16.18
Konkan Sadabahar	49.85	5.78	45.32	49.74	53.89	7.32
Konkan Safed	66.53	5.47	49.13	56.32	57.79	7.39
Pusa Sukomal	45.97	7.34	48.98	57.38	56.37	12.23
Vu- 5	126.56	6.05	59.87	63.29	61.16	11.37
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE(m)±	4.63	0.22	2.86	2.82	3.06	0.77
CD at 5%	13.04	0.61	8.07	7.96	8.63	2.18

The highest pod length was recorded by AKCP-8-2-1-1 (29.37 cm) which was at par with Pusa Sukomal (28.69 cm), AKCP-SR-3 (27.65cm) and AKCP-12(27.08 cm), Indira Hari-2 (26.17 cm) and AKCP-8-5 (25.87 cm). The lowest pod length was observed in Konkan Sadabahar (12.53 cm). Cobbinah *et al.,* (2011) opined that the genotypes with longer pods were easily visible (especially with the erect types) and firmly held during harvesting. Similar findings were also reported by Bozokalfa *et al.,* (2017).

Concerning the pod weight, AKCP-8-4 (9.32g) recorded the highest pod weight which was at par with Vu-5 (9.28g), Pusa Sukomal (9.16g), Kashi Kanchan (9.13g), AKCP-SR-3 (9.12g), AKCP-8-1 (9.04g), AKCP-15 (8.69g), AKCP-8-2 (9.02g), AKCP-8-2-1-1 (8.97g) and AKCP-12 (8.75g). The lowest pod weight was noticed in the genotype Konkan Sadabahar (3.29g). The observations for pod weight in the present study are in line with the work of Jogdhande *et al.,* (2017).

The genotype AKCP-8-2-1-1 (3.31) recorded the highest number of pods per cluster which was at par with Pusa Sukomal (3.31), AKCP-SR-3 (3.19), AKCP-12 (3.03) and AKCP-8-1P (3.03). The lowest number of pods per cluster was observed in the genotype Ajit-22 (1.95). These findings are in accordance with the work of Khanpara *et al.,* (2016).

The highest number of pods per plant was recorded in the genotype AKCP-8-2-1-1 (35.43) which was at par with AKCP-SR-3 (29.89). The lowest number of pods per plant was observed in the genotype Ajit-22 (11.28). The number of pods per plant is dependent on the number of flowers produced per plant and per cent pod set which in turn are dependent on the genetic makeup as well as the crop management practices and season in which it is grown. Similar findings were reported by Verma *et al.,* (2019).

The genotype AKCP-8-2-1-1 (297.56g) recorded the highest yield per plant which was at par with AKCP-SR-3 (283.28g) and Pusa Sukomal (243.29g). The lowest yield per plant was observed in the genotype Konkan Safed (38.76g). Local genotypes showed the highest yield per plant than other check varieties it may be due to the suitable growth and environmental conditions. A similar range for yield per plant was reported by Diwaker *et al.,* (2017).

The highest yield per hectare was recorded in the genotype AKCP-8-2-1-1 (146.94q) which was at par with AKCP-SR-3 (139.89q) and Pusa Sukomal (120.14q). The lowest yield per plant was observed in the genotype Konkan Safed (19.14q). Yield per hectare is an important quantitative character having the highest significance considering the commercial cultivation of the crops. The results are in conformity with Patel *et al.,* (2018).

Table 1(b): Estimation of mean of characters.

Genotypes	Pod length (cm)	Pod weight (g)	Number of pods per cluster	Number of pods per plant	Yield per plant (g)	Yield per hectare (q)
AKCP- 2	16.34	4.06	2.13	15.87	44.87	22.16
AKCP- LR- 2	21.97	7.53	2.31	18.58	121.67	60.08
AKCP- SR- 3	27.65	9.12	3.19	29.89	283.28	139.89
AKCP- 6	19.97	8.48	2.60	18.57	119.67	59.10
AKCP- 8-1	25.18	9.04	2.83	27.89	214.98	106.16
PDKV Rutuja	24.07	8.93	3.02	26.35	203.43	100.46
AKCP- 8-1 P	23.69	8.01	3.03	24.54	187.47	92.58
AKCP- 8-2	25.12	9.02	2.50	21.98	148.63	73.40
AKCP- 8-2-1-1	29.37	8.97	3.31	35.43	297.56	146.94
AKCP- 8-4	25.53	9.32	2.45	20.87	178.53	88.16
AKCP- 8-5	25.87	8.53	3.00	21.86	198.78	98.16
AKCP- 9	24.71	8.23	2.38	13.74	122.68	60.58
AKCP- 10	24.31	7.95	2.62	22.85	168.31	83.12
AKCP-11	22.79	8.03	2.82	21.78	203.17	100.33
AKCP- 12	27.08	8.75	3.03	33.54	253.78	125.32
AKCP-13	16.21	4.73	2.22	14.26	56.37	27.84
AKCP-14	20.82	6.34	2.42	13.20	103.28	51.00
AKCP-15	24.87	8.69	2.90	27.32	213.21	105.29
AKCP-16	20.78	8.22	2.41	17.68	137.62	67.96
AKCP-16N	20.13	8.21	2.67	15.58	121.95	60.22
Ajit- 22	16.98	4.97	1.95	11.28	40.56	20.03
Arka Garima	15.79	7.11	2.63	18.78	112.32	55.47
Arka Suman	17.23	4.62	2.83	24.76	76.36	37.71
BOR- 14	22.96	6.34	3.01	19.67	126.89	62.66
Indira Hari-2	26.17	6.83	2.96	24.54	125.63	62.04
Kashi Kanchan	24.11	9.13	2.47	19.57	147.79	72.98
Konkan Sadabahar	12.53	3.29	2.50	16.74	49.89	24.64
Konkan Safed	16.37	3.34	2.49	13.29	38.76	19.14
Pusa Sukomal	28.69	9.16	3.03	27.67	243.29	120.14
Vu- 5	24.09	9.28	2.16	13.68	132.78	65.57
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE(m)±	1.26	0.35	0.15	0.89	14.56	7.19
CD at 5%	3.55	0.99	0.42	2.51	41.05	20.27

CONCLUSION

From the present investigation it can be concluded that all the characters *viz*., growth parameters, flowering behavior, yield and yield attributing characters, pod parameters were varied significantly. Considering flowering behavior, AKCP-SR-3 found to be the earliest. The genotype AKCP-8-2-1-1 recorded the highest yield per plant and hectare. AKCP-8-2-1-1 also recorded the highest pod length. Thus, on the basis of growth characters, flowering behaviour, yield and yield attributing characters and pod parameters AKCP-8-2-1-1 was found to be promising.

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Conflict of Interest. None.

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