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Mali VV
Department of Vegetable Science, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Kale VS
Professor, Department of Vegetable Science, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Nagre PK
Dean, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Sonkamble AM
Head, Department of Vegetable Science, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Jadhav PV
Biotechnology Center, Department of Agriculture Botany, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Hadole SS
Department of Soil Science and Agril. Chemistry, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Corresponding Author:
Mali VV
Department of Vegetable Science, Faculty of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Evaluation of cowpea genotypes for growth, yield and yield attributing characters

Mali VV, Kale VS, Nagre PK, Sonkamble AM, Jadhav PV and Hadole SS

Abstract
The present investigation on "Evaluation of cowpea genotypes for growth, yield and yield attributing characters" was carried out during the summer season in the year 2018. The study was undertaken on 30 genotypes of cowpea using a randomized block design with three replications. The genotypes found to be varied for growth, yield and yield attributing parameters. Among these 30 genotypes the highest plant height was recorded in Vu-5 (128.18 cm) whereas the lowest plant height was observed in the genotype Pusa Sukomal (46.13 cm). The genotype AKCP-SR-3 was found to be early that started flowering early (43.07 days) whereas AKCP-6 was a late genotype which started flowering late (62.33 days). Similarly, the lowest days for fifty per cent flowering were recorded in the genotype AKCP-SR-3 (46.00 days) while the genotype AKCP-6 recorded the highest days to 50% flowering (71.67 days). AKCP-8-2 (18.05 g) recorded the highest 100 seed weight. The highest pod length was recorded by AKCP-8-2-1-1 (29.39 cm) whereas the lowest pod length was observed in Konkan Sadabahar (12.69 cm). The genotype AKCP-8-2-1-1 recorded the highest number of pods per cluster (3.27), the highest number of pods per plant (33.29), the highest yield per plant (284.47g) and the highest yield per hectare (140.48q).

Keywords: Cowpea, genotypes, evaluation, growth, flowering, yield

Introduction
Cowpea [*Vigna unguiculata* (L.) Walp.] is one of the several species of the widely cultivated genus *Vigna*. Cowpea is a diploid species with a somatic chromosome number 2n=22. It is one of the most important pulse crops native to West Africa (Vavilov, 1951) [16]. Cowpea is called as a poor man's meat or vegetable meat due to its high amount of protein. The young leaves, pods, and peas contain vitamins and minerals, which are used for human consumption and animal feed. Cowpea can withstand a considerable degree of drought and high rainfall and can be grown in almost all kinds of soils provided there is proper drainage. Cowpea is mainly grown in tropical and subtropical regions in the world for vegetable and grain purpose and to a lesser extent as a fodder crop. It is a most versatile pulse crop because of its smothering nature, drought tolerant characters, soil restoring properties and multi-purpose uses. As a pulse crop, cowpea fits well into most of the cropping systems. It is cultivated for its seed (green or dried), pods and/or leaves, which are consumed in a fresh form as a green vegetable, while snacks and main meal dishes are prepared from the dried grain (Kumar and Shrikant 2017) [7]. Therefore, the evaluation of different cowpea genotypes performing better in rainfed, as well as irrigated conditions and its improvement for yield and yield attributing characters, is of crucial importance to get self-sufficiency in cowpea.

Material and Methods
The experiment was conducted at experimental field, Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS.) during summer 2018. The material for the study was comprised of 30 cowpea genotypes. The genotypes were raised in field experiment in randomized block design with three replications. Growth, yield and yield attributing parameters were studied and data were collected from the five randomly selected plants from each plot. The data collected on different parameters was subjected to statistical analysis as per method of analysis prescribed by Panse and Sukhatme (1995) [12].

Results and Discussion
Analysis of variance for the mean of characters showed highly significant differences among different genotypes. The genotype Vu-5 (128.18 cm) recorded the highest plant height which was statistically at par with Ajit-22 (121.21 cm). The lowest plant height was observed in the

genotype Pusa Sukomal (46.13 cm). Similar results were reported by Verma *et al.* (2019) [18].

The highest number of primary branches was recorded in the genotype Arka Garima (7.60) which was at par with Pusa Sukomal (7.50), Arka Suman (7.43), AKCP-8-2-1-1 (7.30) and AKCP-SR-3 (7.00). The genotype AKCP-2 recorded the lowest (5.43) number of primary branches per plant. These results are matching with the findings for a number of branches reported by Patil *et al.* (2015) [13].

The genotype AKCP-SR-3 was found to be early which started flowering early (43.07 days) as compared to the rest of the treatments and it was at par with the genotypes Pusa Sukomal (47.00), Konkan Sadabahar (47.67), Konkan Safed (48.00) and AKCP-8-5 (48.13). AKCP-6 was the late genotype that started flowering late (62.33 days). The forecited outcome is in accordance with the work did by Venkatesan *et al.* (2003) [17].

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 (46.00 days) which was at par with Pusa Sukomal (51.67) and Konkan Sadabahar (51.67). The genotype AKCP-6 recorded the highest days to 50% flowering (71.67 days). 50% flowering depends on the interaction of many complex processes such as both environmental and genetic factors. More or less comparable results were reported by Khanpara *et al.* (2016) [6].

The highest chlorophyll index was exhibited in genotype AKCP-13 (68.07 SPAD readings) which was statistically at par with AKCP-14 (63.30), Vu-5 (62.79) and AKCP-12 (59.54). The genotype AKCP-2 (43.33 SPAD readings) recorded the lowest chlorophyll index. These results are in conformity with the findings of Sunita (2016) [14].

With respect to the hundred seed weight, the genotype AKCP-8-2 (18.05 g) recorded the highest value which was at par with AKCP-SR-3 (17.25g), AKCP-13 (17.20g) and Kashi Kanchan (16.41g). Konkan Sadabahar (7.42g) recorded the lowest hundred seed weight. Similar range reported for 100 seed weight by Hegde and Mishra (2009) [4] and Doumbia (2012) [3].

The highest pod length was recorded by AKCP-8-2-1-1 (29.39 cm) which was at par with Pusa Sukomal (29.03 cm), AKCP-SR-3 (27.15cm) and AKCP-12(26.45 cm). The lowest pod length was observed in Konkan Sadabahar (12.69 cm). Similar findings were also reported by Makanur *et al.* (2013) [8].

Concerning the pod weight, AKCP-8-4 (9.40g) recorded the highest pod weight which was at par with Vu-5 (9.26g), Pusa Sukomal (9.20g), Kashi Kanchan (9.20g), AKCP-SR-3 (9.17g), AKCP-8-1 (9.13g), AKCP-15 (8.98g), AKCP-8-2 (8.93g), AKCP-8-2-1-1 (8.89g) and AKCP-12 (8.83g). the lowest pod weight was noticed in the genotype Konkan Sadabahar (3.36g). The observations for pod weight in the present studies are in line with the work of Jogdhandhe *et al.* (2017).

The genotype AKCP-8-2-1-1 (3.27) recorded the highest number of pods per cluster which was at par with Pusa Sukomal (3.13), AKCP-SR-3 (3.13), AKCP-12 (3.07) and AKCP-8-1P (2.97). The lowest number of pods per cluster was observed in the genotype Ajit-22 (1.86). These findings are in accordance with the work of Manju Devi and Jayamani (2018) [10].

The highest number of pods per plant was recorded in the genotype AKCP-8-2-1-1 (33.29) which was at par with AKCP-SR-3 (31.43). The lowest number of pods per plant was observed in the genotype Ajit-22 (9.47). Similar findings were reported by Yohanna (2014) [19].

The genotype AKCP-8-2-1-1 (284.47g) recorded the highest yield per plant which was at par with AKCP-SR-3 (277.85g) and Pusa Sukomal (262.71g). The lowest yield per plant was observed in the genotype Konkan Safed (35.53g). A similar range for yield per plant were reported by Khanpara *et al.* (2016) and Diwaker *et al.* (2017) [6, 2].

The highest yield per hectare was recorded in the genotype AKCP-8-2-1-1 (140.48q) which was at par with AKCP-SR-3 (137.21q) and Pusa Sukomal (129.73q). The lowest yield per plant was observed in the genotype Konkan Safed (17.54q). The low or high performance of the studied genotypes may not depend on genetic factor alone but also on environmental influences (Umaharan *et al.* 1997; Manggoel *et al.* 2012; Nwosu *et al.* 2013) [15, 9, 11]. The results are in conformity with Amin *et al.* (2014) and Sunita (2016) [1, 14].

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	64.68	5.43	53.33	65.33	43.33	12.43
AKCP- LR- 2	64.98	5.83	53.67	63.00	56.51	13.27
AKCP- SR- 3	47.01	7.00	43.07	46.00	48.17	17.25
AKCP- 6	64.67	5.57	62.33	71.67	53.04	11.23
AKCP- 8-1	68.10	6.10	55.33	63.33	58.01	14.22
PDKV Rutuja	76.40	5.93	53.00	60.67	53.41	11.16
AKCP- 8-1 P	74.77	6.30	53.33	59.33	53.03	13.82
AKCP- 8-2	71.20	6.21	60.67	64.67	57.27	18.05
AKCP- 8-2-1-1	97.73	7.30	60.33	65.33	58.71	13.64
AKCP- 8-4	69.50	6.77	56.33	64.33	53.59	13.25
AKCP- 8-5	82.57	6.63	48.13	58.55	50.22	13.42
AKCP- 9	67.81	5.73	61.00	65.67	55.05	12.53
AKCP- 10	68.55	6.80	59.33	68.00	56.75	13.77
AKCP-11	67.07	6.04	59.00	68.00	53.10	15.76
AKCP- 12	95.14	6.70	52.33	57.67	59.54	12.01
AKCP-13	62.63	5.47	50.33	53.00	68.07	17.20
AKCP-14	66.82	5.53	57.67	66.33	63.30	10.21
AKCP-15	86.73	6.43	52.33	55.33	52.99	11.23
AKCP-16	93.09	5.56	55.74	62.64	55.02	13.26
AKCP-16N	87.51	6.07	59.00	64.67	45.83	13.06

Ajit- 22	121.21	6.47	55.33	58.33	54.81	10.21
Arka Garima	108.13	7.60	52.33	57.67	43.85	13.18
Arka Suman	77.10	7.43	51.67	61.67	44.59	13.46
BOR- 14	75.20	6.40	52.67	57.33	48.63	15.63
Indira Hari-2	58.40	6.07	54.00	57.33	49.17	12.45
Kashi Kanchan	57.03	6.73	49.00	56.00	44.59	16.41
Konkan Sadabahar	52.90	5.90	47.67	51.67	50.45	7.42
Konkan Safed	63.07	5.73	48.00	53.00	56.49	7.74
Pusa Sukomal	46.13	7.50	47.00	51.67	56.71	12.38
Vu- 5	128.18	5.83	57.67	65.00	62.79	11.03
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE(m)±	3.53	0.23	2.02	2.12	3.03	0.76
CD at 5%	9.94	0.64	5.70	5.96	8.54	2.14

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	16.07	4.11	2.07	12.22	45.96	22.70
AKCP- LR- 2	21.07	7.66	2.27	14.07	102.75	50.74
AKCP- SR- 3	27.15	9.17	3.13	31.43	277.85	137.21
AKCP- 6	19.63	8.39	2.53	14.14	113.74	56.17
AKCP- 8-1	25.09	9.13	2.73	22.86	200.62	99.07
PDKV Rutuja	24.75	8.52	2.90	23.50	192.32	94.97
AKCP- 8-1 P	24.33	8.15	2.97	25.36	196.98	97.28
AKCP- 8-2	25.00	8.93	2.53	18.92	162.39	80.19
AKCP- 8-2-1-1	29.39	8.89	3.27	33.29	284.47	140.48
AKCP- 8-4	25.71	9.40	2.27	17.54	158.66	78.35
AKCP- 8-5	26.07	8.45	2.86	25.39	205.42	101.44
AKCP- 9	23.47	8.18	2.53	16.60	129.97	64.18
AKCP- 10	23.50	8.03	2.87	25.64	197.13	97.35
AKCP-11	23.20	7.89	2.67	23.07	180.15	88.96
AKCP- 12	26.45	8.83	3.07	28.74	243.54	120.27
AKCP-13	15.43	4.60	2.13	11.94	50.66	25.02
AKCP-14	21.16	6.49	2.37	15.23	93.38	46.11
AKCP-15	24.46	8.98	2.87	25.74	222.12	109.69
AKCP-16	19.39	8.13	2.47	15.89	123.83	61.15
AKCP-16N	19.60	8.08	2.60	16.71	129.08	63.74
Ajit- 22	16.87	5.10	1.86	9.47	44.95	22.20
Arka Garima	16.10	7.28	2.53	15.62	108.12	53.39
Arka Suman	16.07	4.90	2.73	18.12	82.38	40.68
BOR- 14	22.63	6.16	2.96	23.15	134.39	66.37
Indira Hari-2	25.87	6.78	2.90	20.09	129.09	63.75
Kashi Kanchan	23.80	9.20	2.67	15.66	138.71	68.50
Konkan Sadabahar	12.69	3.36	2.33	13.44	40.47	19.98
Konkan Safed	15.97	3.49	2.27	11.27	35.53	17.54
Pusa Sukomal	29.03	9.20	3.13	29.68	262.71	129.73
Vu- 5	24.03	9.26	2.37	14.00	123.90	61.19
'F' test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE(m)±	1.05	0.30	0.10	1.08	13.10	6.47
CD at 5%	2.97	0.84	0.29	3.04	36.92	18.23

Conclusion

It can be concluded that all the characters *viz.*, growth parameters, flowering behaviour, yield and yield attributing characters, pod parameters were varied significantly. Further, while studying the flowering behaviour, AKCP-SR-3 found to be the earliest. The genotype AKCP-8-2-1-1 recorded the highest yield per plant and hectare under Vidarbha agro-climatic conditions. This genotype 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 and AKCP-SR-3 were found to be promising.

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