Original Research Article

Performance of Cowpea (*Vigna unguiculata* L. Walp.) Varieties in Prayagraj Agro Climatic Condition for Growth, Yield, and Quality

~~**Performance of different varieties of cowpea (*Vigna unguiculata* L. Walp.) for growth, yield and quality in Prayagraj Agro climatic conditions.**~~

ABSTRACT

The present investigation was carried out at the Horticultural Research Farm (CRF), Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, during the *Kharif* season of 2022 ~~with a view~~ to identify the best variety of cowpea that performed in the Prayagraj region. The varieties comprised of Kashi Kanchan, Kashi Gauri, Kashi Queen, C.P. 6, K-K- 25, Kaveri, GOMACHI, Basant, Pusa Komal, Pusa Gaurav, Nirali, Gomati, Gayatri and Talvar. Based on results obtained during the present investigation, it is concluded that varieties C P-6 ~~was~~ were found to be best in ~~the~~ terms of growth and yield and Nirali in terms of quality among different varieties of Cowpea.

Keywords: *Varieties, T.S.S., Cowpea.*

INTRODUCTION

~~Botanically speaking~~ *Vigna unguiculata* (L.) Walp., commonly called Cowpea~~;~~ , is an annual herbaceous legume from the genus *Vigna*. Its tolerance ~~for~~ to sandy soil and low rainfall have made it an ~~important~~ essential crop in ~~the~~ semiarid regions across Africa and Asia. It requires ~~very~~ few inputs, as the plant's root nodules can fix atmospheric nitrogen, making it a valuable crop for resource-poor farmers and well-suited to intercropping with other crops. The whole plant is used as forage for animals, with its use as cattle feed likely responsible for its name. Its many varieties differ substantially in the shape of the fruit. ~~It 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). 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 purposes and, to a lesser extent as a fodder crop. It is a most versatile pulse crop because of its smothering nature, drought tolerant characteristics, 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). Four subspecies of cowpeas are recognised, of which three are cultivated. A high level of morphological diversity is found within the species with large variations in the size, shape, and structure of the plant. Cowpeas can be erect, semierect (trailing), or climbing. The crop is mainly grown for its seeds, which are high in protein, although the leaves and immature seed pods can also be consumed. Cowpea plays a ~~major~~ significant role in human nutrition, fruit contain high nutritive value constituting a high amount of Carbohydrate 60.03 g, protein 23.52 g, dietary fibre 10.6 g, magnesium 184 mg,

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sodium 16 mg, Vitamin C 1.5 mg, 424 mg of Phosphorous, Iron 8.27 mg, Calcium 110 mg, Potassium 1152 mg, Vitamin A 3 µg, Folate (B9) 633 µg and many other nutrients out of 100 g of edible portion. (Choudhary, 2013). Cowpea ~~crop~~ is widely grown in South and Southeast Asian countries such as India, Bangladesh, Pakistan, China, and the Philippines. In India, ~~area under Cowpea production accounts to 1.5 million hectares with production of 2.25 million metric tonnes in year~~the area under Cowpea production accounts for 1.5 million hectares with a production of 2.25 million metric tonnes in 2021-22. Maharashtra ranks first in area and production of Cowpea in year 2021-22 followed by Andhra Pradesh, and Karnataka. In Uttar Pradesh area under production is 0.23 thousand hectares while production is estimated to be 8.13 million tonnes for year 2021-22. (Source: NHB, Ministry of Agriculture & Farmers Welfare, Government of India, 2021-22.). Evaluati~~on of~~ng varieties will let the farm community choose better varieties and maximize the profit. The findings of the research will help the farmers of Prayagraj region to enhance their farming practices and maximize the yield with better Varieties. The success of any breeding programme depends upon selection of a proper plant. The efficiency of selection depends on the magnitude and nature of genetic variation in a specific population for effective breeding program. Yield is polygenic ~~in nature~~ and influenced by environmental factors, which complicate the selection process thus, the knowledge of correlation of the traits is necessary for effective selection process.

MATERIAL AND METHODS

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The present investigation was done to understand the plant growth, fruit yield and quality of fruit of different varieties of Cowpea. The details of the materials used~~,~~ and the methods adopted in the investigation, which was carried out at Horticultural Research Farm (CRF), Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj during the *Kharif* season of 2022 are presented. In the present investigation the design used for analysis of variables ~~were~~ was Randomized Block Design (RBD) comprising ~~3~~ three replications comprising ~~nine varieties~~ including fourteen varieties enlisted below in table 1. Observations were recorded at different stages of growth periods. The data were statistically analysed by the method suggested by Fisher and Yates, 1963**.**

Table 1 Details of different varieties of Cow pea under evaluation.in……..

Sl No.	Varie~~ties details~~	Sl No.	Varie~~ties details~~
1.	Kashi Kanchan	**8.**	Basant
2.	Kashi Gauri	**9.**	Pusa Komal
3.	Kashi Queen	**10.**	Pusa Gaurav
4.	C.P. 6	**11.**	Nirali
5.	K-K -25	**12.**	Gomti
6.	Kaveri	**13.**	Gayatri
7.	GOMACHI	**14.**	Talvar

Table 2 Performance of different varieties on growth and yield parameters studied for Cowpea.

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~~Varieties~~ Variety~~details~~	Plant height (cm) [60 DAS]	No of primary branches per plant [60 DAS]	Days to first flowering	Days to first pod setting	Days to first pod picking	Number pods per plant	Pod weight (g)	Pod length (cm)	Pod Diameter (mm)	Pod yield per plant (g/plant)	Number of nodules/plants	TSS [°Brix]
Kashi Kanchan	187.83	33.24	31.71	38.12	49.17	74.67	14.83	26.51	2.48	1.10	7.33	4.26
Kashi Gauri	180.68	30.90	32.11	38.52	49.57	77.65	12.50	28.37	2.54	0.97	6.33	4.07
Kashi Queen	162.09	31.44	32.31	38.72	49.77	45.99	12.13	34.80	2.98	0.56	3.33	3.38
C.P. 6	166.77	29.73	33.12	39.53	50.58	108.12	17.43	29.17	2.32	1.88	13.00	2.66
K-K -25	175.91	32.53	33.58	39.99	51.04	74.07	13.53	29.87	2.75	1.00	9.33	4.09
Kaveri	154.90	34.32	32.31	38.72	49.77	57.34	12.10	24.87	2.99	0.68	2.00	3.26
GOMACHI	177.13	27.88	32.51	38.92	49.97	54.95	11.47	30.07	2.57	0.63	3.33	3.36
Basant	191.32	29.62	31.71	38.12	49.17	51.37	12.70	32.33	2.57	0.65	7.00	3.66
Pusa Komal	188.62	28.01	31.61	38.02	49.07	43.90	8.77	24.33	2.39	0.38	2.00	3.46
Pusa Gaurav	171.48	26.84	32.31	38.72	49.77	59.14	9.03	25.13	2.71	0.53	6.67	4.34
Nirali	173.15	28.11	32.59	39.00	50.05	67.50	10.07	26.00	2.74	0.68	2.67	4.86
Gomati	172.61	29.08	31.31	37.72	48.77	54.36	11.87	23.87	2.51	0.64	3.67	3.86
Gayatri	176.93	28.27	32.11	38.52	49.57	78.85	14.27	23.93	3.06	1.12	3.00	4.15
Talvar	171.64	32.04	31.91	38.32	49.37	95.57	16.67	30.00	3.08	1.60	3.33	4.60
'F' test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
C.D. (5%)	**3.16**	**2.30**	**0.98**	**0.98**	**0.99**	**16.96**	**1.45**	**1.24**	**0.20**	**0.21**	**4.12**	**1.42**
S.E. (m) ±	**1.09**	**0.79**	**0.34**	**0.34**	**0.36**	**5.80**	**0.50**	**0.43**	**0.07**	**0.07**	**1.42**	**0.49**
C.V.	**1.07**	**4.54**	**1.80**	**1.50**	**1.17**	**14.92**	**6.84**	**2.66**	**4.48**	**14.59**	**47.13**	**21.96**

RESULTS AND DISCUSSION

Growth Parameters

Plant height (cm) ~~[60 DAS],~~ and Number of primary branches per plant [60 DAS]

The plant height significantly varied among different varieties sown. The mean Plant height at 60 DAS was observed to be 175.08 cm. The maximum Plant height (191.32 cm) at 60 DAS was observed with Basant followed by Pusa Komal with 188.62 cm. Minimum Plant height (154.90 cm) was observed in Kaveri. The number of primary branches per plant significantly varied among different varieties sown. The mean Number of primary branches per plant at 60 DAS was observed to be 30.14 branches. The C.V. for Number of primary branches per plant was observed to be 4.54, while S.E.(m) was 0.79. The maximum Number of primary branches per plant (34.32 branches) at 60 DAS was observed with Kaveri followed by Kashi Kanchan with 33.24 branches. Minimum Number of primary branches per plant (26.84) was observed in Pusa Gaurav. Plant height and number of primary branches per plant development depends on the availability of proper nutrients and water to plants. The proper availability of water boosted the vegetative growth along with the proper availability of nutrients from the soil. Sunlight triggered the formation of photosynthates that also showed an increase in vine length. Similar findings were reported by Abayomi *et al.,* (2008); Pawar *et al.,* (2016); Singh *et al.,* (2016) Dangi *et al.,* (2020); Mali *et al.,* (2021); and Triveni *et al.,* (2022) in Cowpea.

Earliness parameter

Days to first flowering, days first pod setting and days to first pod picking

The Kaveri variety showed the minimum days to 50% flowering at 35.33 days, followed closely by K-K-25 at 37.59 days, while Pusa Komal required the highest number of days to reach 50% flowering at 39.46 days. Early maturity and high yields are desirable traits in today's market, and among the varieties tested, the Gomati variety exhibited the shortest days to the first pod setting at 37.72 days, followed closely by Pusa Komal at 38.02 days. K-K-25 took the longest time to reach the first pod setting at 39.99 days. Proper nutrition and sunlight exposure contributed to photosynthetic processes and supported early reproductive phases of the plant. Gomati variety exhibited the minimum days to the first pod picking at 48.77 days, and Pusa Komal took 49.07 days. K-K-25 recorded the maximum days to the first pod picking at 51.04 days. These observations align with previous studies on cowpea by Abayomi et al., (2008), Pawar et al., (2016), Singh et al., (2016), Dangi et al., (2020), Mali et al., (2021) and Triveni et al., (2022).~~Among the different varieties, the minimum days to 50% flowering was seen in Kaveri with 35.33 days, followed by K-K-25 with 37.59 days whereas maximum days to 50% flowering 39.46 days was recorded in Pusa Komal. Earliness is one of the necessities of today's market scenario along with high yields. Among varieties sown, minimum days to first pod setting was seen in Gomati with 37.72 days, followed by Pusa Komal with 38.02 days whereas maximum days to first pod setting 39.99 days was recorded in K-K-25. The availability proper nutrients and sunshine boosted the photosynthates that in turn boosted early reproductive phase of plant. Among varieties sown, minimum days to first pod picking was seen in Gomati with 48.77 days, followed by Pusa Komal with 49.07 days whereas maximum days to first pod picking 51.04 days~~

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~~was recorded in K K 25. The present findings were in conformity with Abayomi *et al*., (2008); Pawar *et al*., (2016); Singh *et al*., (2016) Dangi *et al*., (2020); Mali *et al*., (2021); and Triveni *et al*., (2022) in Cowpea.~~

Yield Parameter

Number of pods per plant, fruit weight (g) and fruit diameter (cm)

C.P. 6 exhibited the highest number of pods per plant, recording 108.12, followed by Talvar with 95.57, while Pusa Komal had the lowest number of pods per plant at 43.90. The maximum pod weight was 17.43 grams for C.P. 6, followed by Talvar at 16.67 grams and the lowest pod weight (8.77 grams) was recorded in Pusa Komal. Kashi Queen had the longest pod length at 34.80 cm, followed by Basant at 32.33 cm; whereas Gomati had the shortest pod length at 23.87 cm. The maximum pod diameter (3.08 mm) was observed in Talvar, followed by Gayatri (3.06 mm); C. P. 6 had the lowest pod diameter (2.32 mm). C. P. 6 recorded the highest pod yield per plant at 1.88 grams, followed by Talvar at 1.60 grams, while Pusa Komal had the lowest pod yield per plant at 0.38 grams. C.P. 6 had the highest number of root nodules per plant (13.00), followed by Kashi Kanchan with 7.33, whereas Pusa Komal had the lowest number of root nodules per plant (2.00). To ensure uniform pod dimensions for marketing purposes and to increase pod yield, the number of pods per plant is dependent on the number of female flowers, as well as nutrient availability during the growth and development stages. The pod weight contributes directly to the yield per plant, which is determined by the amount of photosynthates produced and stored in the pods. The availability of nutrients and ample sunlight increases the photosynthates produced, resulting in a higher number of leaves per plant. Proper nutrition is also important in increasing productivity and improving the quality of the pod. The increased plant vigor and assimilating area correlates with increased size and weight of the pod. These findings are consistent with prior research by Agyeman et al. (2014), Reddy et al. (2016), Singh et al. (2016), Ramya et al. (2020), Triveni et al. (2020), Kumar and Topno (2022), and Triveni et al. (2022) on cowpea.

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~~The maximum number of pods per plants 108.12 were recorded in C.P. 6 followed by Talvar i.e., 95.57 and the lowest pods per plant 43.90 were observed in Pusa Komal. The maximum pod weight 17.43 g were recorded in C.P. 6 followed by Talvar i.e., 16.67 g and the lowest pod weight (8.77 g) were observed in Pusa Komal. The maximum pod length (34.80 cm) was recorded in Kashi Queen followed by Basant i.e., 32.33 cm and the lowest pod length (23.87 cm) was observed in Gomati. The maximum pod diameter (3.08 mm) was recorded in Talvar followed by Gayatri i.e., 3.06 mm and the lowest pod diameter (2.32 mm) were observed in C. P. 6. The maximum pod yield per plant 1.88 g/plant were recorded in C. P. 6 followed by Talvar i.e., 1.60 g/plant and the lowest pod yield per plant (0.38 g/plant) was observed in Pusa Komal. The maximum number of root nodules per plant (13.00) was observed in C. P. 6 followed by Kashi Kanchan with 7.33. The minimum number of root nodules per plant (2.00) was noticed in Pusa Komal. Uniform pod dimension is essentiality for marketing of pod~~

~~and yield of pods too. Number of pods per plant depends on number of female flowers along with lower node number of female flower due to adequate availability of major and minor nutrients during its growth and development. Pod weight directly contribute to yield per plants. Weight of pod directly depends on higher photosynthates produced that is stored in pods too. The more photosynthates production is directly correlated to higher leaves number per plant and availability of nutrients and sunshine. Nutrition play an important role in improving productivity and quality of pod. Increased vigour of plants, assimilating area, size of pod, thereby resulting into higher weight of pod. These results are in close conformity with the findings of Agyeman *et al.*, (2014); Reddy *et al.*, (2016); Singh *et al.*, (2016) Ramya *et al.*, (2020); Triveni *et al.*, (2020); Kumar and Topno (2022) and Triveni *et al.*, (2022) in Cowpea.~~

Quality parameter

TSS [°Brix]

The maximum T.S.S. (4.86 ^{0}Brix) was observed in Nirali followed by Talvar with 4.60 ^{0}Brix and minimum T.S.S. (2.66 ^{0}Brix) was noticed in variety C. P. 6. These results are in close conformity with the findings of Agyeman *et al.*, (2014); Reddy *et al.*, (2016); Singh *et al.*, (2016) Ramya *et al.*, (2020); Triveni *et al.*, (2020); Kumar and Topno (2022) and Triveni *et al.*, (2022) in Cowpea.

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Summary and Conclusion

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Based on the findings of the investigation carried out at the Horticultural Research Farm of SHUATS, Prayagraj, during the Kharif season of 2022, it can be concluded that C.P. 6 is the best variety of cowpea in terms of growth and yield, and Nirali is the best in terms of quality. Out of the various varieties tested, these two varieties produced outstanding results. The study identifies the importance of selecting the right variety for optimal growth and yield, as well as the significance of quality in determining the acceptance of a product in the market. The outcomes of this research will be useful for farmers and researchers alike, and can serve as a reference for future work on cowpea cultivation in the Prayagraj region.~~From the above experimental finding it may be concluded that the treatment C P-6 was found to be best in the terms of growth and yield. Nirali in terms of quality among different germplasm of Cowpea.~~

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