

Original Research Article

Evaluation of Performance of Cowpea (*Vigna unguiculata* L.) Genotypes for Growth, Yield & Quality Under Prayagraj Agro-climatic Condition

Abstract

The experiment on Evaluation of performance of cowpea genotypes (*Vigna unguiculata* L.) for growth, yield & quality under Prayagraj agro-climatic condition was conducted at Department of Horticulture, Naini Agricultural Institute, SHUATS, Prayagraj during 2022 in order to standardize the best genotype of Cowpea. Among the all genotype VNRCP-27 (G₁) found to be the earliest. The Cowpea genotypes Sheetal (G₁₀) had noticed more yield 556gram per plant and 17.91 tonnes per hac. under Prayagraj agro climatic conditions. The above genotype also recorded desirable values for pod parameters like length of pod 86.53 cm, weight of pod 23.07 gram, which parameters deciding a better market acceptability. Thus, on the basis of growth characters, flowering behavior, yield characters, pod parameters cowpea genotype Kashi Gouri (G₁₅) and cowpea genotypes Sheetal (G₁₀) were found to be promising. While cowpea genotype VNRCP-27 (G₁) found to be the highest T.S.S 5.90 among all genotypes. The highest profit and maximum benefit cost ratio 2.53 was observed in cowpea genotypes Sheetal (G₁₀).

Comment [A1]: space

Comment [A2]: Don't bolt

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). 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

Comment [A3]: space

Comment [A4]: not found in the list of reference

Comment [A5]: reference????

leaves, which are consumed in a fresh form as a green vegetable, while snacks and main meal dishes are prepared from the dried grain.

Comment [A6]: Reference????

Cowpea is a warm- season, self-pollinated annual herb with a wide range of growth habit and response to photoperiod. It is grown throughout India for its long green pods as vegetable, seeds as pulse and foliage as vegetable and fodder. When grown for dry seeds, it is also known as black-eye pea, kaffir pea, china pea and southern bean. The cultivars grown for their immature green pods which are used as vegetable are variously known as yardlong bean, asparagus bean and snake bean.

Comment [A7]: Reference????????????????

Cowpea is a native to Central Africa and belongs to the family Leguminaceae with subfamily Papilionaceae. The common names are “Black-eye-pea” “Southern pea” “China pea” “Marble pea”. Cowpea is an annual herbaceous plant with large tap root system and alternate trifoliolate leaves with ovate leaflets. It can either be short and bushy or act like a vine by climbing supports or trailing along the ground. Generally colors of cowpea flowers are purple, pink, yellow, white and blue. A pod can contain 6-13 seeds that are usually kidney shaped although the seed become more spherical and more restricted within the pod. It is eaten in the form of grain, green pods and leaves. Like other legumes, cowpea grains is cooked to make it edible, usually by boiling but the most important way to eat them is in curries. The roots are eaten in Sudan and Ethiopia. Peduncles and stems are used as fibers in Nigeria. Cowpea is known as „vegetable meat“ or „Poor man“’s meat“ due to high amount of protein in the green leaves with better biological value on dry weight basis. The grain contains 24.8 per cent protein, 1.9 per cent fat, 63.6 per cent carbohydrates, 6.3 per cent fiber, 0.00074 per cent thiamine, 0.00042 per cent Riboflavin, 0.00281 per cent Niacin.

Comment [A8]: space

Comment [A9]: colours

Comment [A10]: Reference ???????

Among different vegetables, leguminous crops play an important role as it is the only source of vegetable protein which is required for human health. They also provide minerals, vitamins and fibers. It constitutes about 10-12% of the Indian diet. According to WHO recommendation, the intake of leguminous should be 80g/day/capita. Similarly, leguminous vegetables are fewer probes to climatic changes and helps in maintaining soil health and thus, are important contributors of profitable cropping system is popularly followed by vegetables wherever irrigation is available after withdrawal of rain.

Comment [A11]: Reference ?????????

When dried, tender pods and green shelled seeds are consumed as a vegetable and a pulse. It can also be used as a green manure, fodder, cover, or catch crop. Considering the nutritive value, 100g of green pods of cowpea contain energy (34.00 kcal), protein (4.20mg), calcium (10.00mg), iron (4.70mg), vitamin A (2.40mg), vitamin C (35.00mg) and is also a good source of Lysine. Loamy soil is considered the best for the cultivation of cowpea with a pH value of 6-7 for optimum growth. Varieties with shorter maturity dates are available for gardeners with a less lengthy summary. Apart from this, cowpea forms excellent forage and it gives a heavy vegetative growth and covers the ground so well that it checks the soil erosion.

Comment [A12]: Reference ?????

Materials and Methods

The materials used and methods adopted in the present experiment **Evaluation of performance of cowpea (*Vigna unguiculata* L.) genotypes for growth, yield & quality under Prayagraj agro-climatic condition.** The experiment was conducted during the *Kharif* season of 2022 at the Departmental field of Horticulture, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences Prayagraj. The experiment was laid out in Randomized Block Design RBD with 17 different cowpea genotypes was used in the experiment which was performed using various sources. Observations will be recorded like growth parameters; days of germination of first seedling, plant habit, plant height (cm) 20-40-60 DAS, number of nodes per plant on main stem, reproductive parameters; days taken to first flowering, number of clusters per plant, days of first and 50% flowering, yield i.e. pod length, pod weight and quality parameter like T.S.S were recorded in main field level as well as in laboratory.

Comment [A13]: No bolt

Result and Discussion

1. Growth Parameter

1.1 Days of 1st germination in various cowpea genotypes.

The maximum day of germination (5.80 days) was observed in cowpea genotypes Kashi Kanchan and followed with cowpea genotypes Kashi Gouri (5.00 days). The minimum days of

germination (3.80 days) was observed in cowpea genotypes with followed in cowpea genotypes VNRCP-27.

Comment [A14]: Table no.1
Insert table after this paragraph

1.2 Plant Growth Habit in various cowpea genotypes.

Plant growth habit were recorded according to bushy or pole type growth nature. VNRcp-27, Jaripa, C.G.01, C.G.02, C.G.03, C.G.04, C.G.05, Super ujjwal., Ujala, Sheetal, Ujjawal, Danmantri are the pole type and all other like Kashi nindi, Kashika-6, Kashi kohinor, Kashi gouri, Kashi Kanchan is genotypes.

Comment [A15]: space

1.3 Plant height in various cowpea genotypes.

At 60 DAS maximum plant height was observed in Cowpea genotype Sheetal(304.40), followed by in was cowpea genotypes VNRCP-27 (284.07cm). The minimum was (68.73) in Cowpea genotype Kashi Kanchan.

Comment [A16]: (Table no.1)

1.4 Number of nodes / plant on main stem in various cowpea genotypes

At 60 DAS maximum Number of nodes per plant on main stem was observed in Cowpea genotype Kashi Gouri(22.33) and with followed in cowpea genotypes Kashi Nindi (22). The minimum was (13.27) in Cowpea genotype Ujala.

Comment [A17]: (Table no.1)

1.5 No. of root nodules per plant in various cowpea genotypes.

The number of Root nodules per plant of cowpea maximum number of Root nodules per plant was recorded in Cowpea genotype Kashi kanchan (48.67), followed by Cowpea genotype Sheetal (44.00), Cowpea genotype VNRCP-27 (11.00) and minimum was (56.67) in Cowpea genotype G5.

Comment [A18]: (Table no.1)

Comment [A19]: They are emerge into one paragraph and table 1 is discussed and the table is insert after presenting the result

2. Reproductive Parameters

2.1 Days of 50 % of flowering in various cowpea genotypes

The minimum number of Days of first 50% flowering was recorded in Kashi Gouri (36.87 days), followed by Sheetal with and (37.67days) and whereas maximum was (63.47) recorded in C.G.03. The genotypes of Kashi Gouri given minimum days to 50% flowering observed due to favourable Prayagraj Agro-climatic condition.

Comment [A20]: Space ????????????

Comment [A21]: favorable

Comment [A22]: Table No. 2

2.2 Number of cluster /plant in various cowpea genotypes

Maximum Number of cluster /plant was recorded in Kashi Gouri (5.40), followed by Sheetal (4.87) and minimum was (2.53) recorded in C.G.03. Thus more accumulation of photosynthates and their translocation from source to sink in reproductive crop growth phase which resulted in improvement of all yield attribute.

2.3 Number of Pod/cluster in various cowpea genotypes

Maximum Number of Pod /cluster was recorded in Kashi Gouri (11.47), followed by sheetal with (10.13) and minimum was (3.73) recorded in C.G.03

Comment [A23]: They are emerge into one paragraph and table 2 is discussed and the table is insert after presenting the result

3. Yield Parameter

3.1 Pod length (cm) in various cowpea genotypes.

The pod per length (cm) of cowpea the maximum pod length (cm) recorded in Sheetal (86.53cm), followed by C.G.05 with (39.53) and minimum was (18.33) recorded in C.G.01.

3.2 Single pod weight (g) in various cowpea genotypes

The maximum 10 pod weight per plant (g) recorded in Sheetal (196.17), follows by C.G.05 with (150.g) and minimum was (65.75g) recorded in Kashi Kanchan.

3.3 Number of Seeds/pod in various cowpea genotypes

The maximum number of seeds/pods was recorded in Sheetal (18.53), followed by C.G.05 with (17.33) and minimum was (10.93) recorded in C.G.01.

3.4 Pod yield (Q/ha) in various cowpea genotypes

The Pod Yield (t/ha) in plant of cowpea maximum was recorded in Sheetal (17.91), followed by Kashi Gouri with (16.8) and minimum was (5.98) recorded in C.G.O3.

Comment [A24]: They are emerge into one paragraph and table 3 is discussed and the table is insert after presenting the result

4. Quality characters

4.1 T.S.S

The maximum T.S.S. of cowpea was recorded in VNRC-27 is better favourable climatic condition and adaptability of genotype under prayagraj Agro-climatic condition.

Table 1 : Evaluation of different genotypes of cowpea (*Vigna unguiculata* L.) on pre harvest observations.

Notation	Genotype	Days of 1 st germination	Plant height (cm)	Number of Nodules /plant	No. of Root nodules per plant
G ₁	VNRCP-27	3.8	284.07	19.6	11
G ₂	Jaripa	5.2	268.33	19.93	21.67
G ₃	C.G.01	5.33	211.67	16.93	19.67
G ₄	C.G. 02	4.33	274.53	14.33	12.33
G ₅	C.G. 03	4.47	283.87	20.27	3
G ₆	C.G. 04	4.93	223.53	19.27	20
G ₇	C.G. 05	4.2	274.07	17.27	18.67
G ₈	Super Ujjwal	4.33	265.13	21.73	14.33
G ₉	Ujala	5.53	268.33	13.27	29.67
G ₁₀	Sheetal	4.33	304.4	18.6	44
G ₁₁	Ujjawal	4.2	277.73	17.33	13.67
G ₁₂	Kashi Nindi	5.47	112	22	17.33
G ₁₃	Kashika-6	4.87	137.07	16.27	20
G ₁₄	Kashi Kohinor	5.57	111.8	16.47	34.33
G ₁₅	Kashi Gouri	5	92.27	22.33	39.67
G ₁₆	Kashi kanchan	5.8	68.73	14.47	48.67
G ₁₇	Danmantri	4.27	270.4	18.87	19
F- test		S	S	S	S
SE(m)		0.378	3.392	0.417	2.16
C. D. (P = 0.05)		0.78	7	0.86	4.45
C.V.		3.85	34.56	4.25	21.99

Table 2: Evaluation of different genotypes of cowpea (*Vigna unguiculata* L.) on reproductive parameter.

Notation	Genotype	Days of first flowering	50 % of flowering days	Number of cluster /plant	Number of Pod /cluster	Days to first picking
G ₁	VNRCP-27	34	38.73	3.27	8.27	44.87
G ₂	Jaripa	37	40.67	4.07	7.47	45.2
G ₃	C.G.01	48.33	58.93	2.53	4.67	71
G ₄	C.G. 02	56.33	62.07	3.2	5.07	69.93
G ₅	C.G. 03	56.67	63.47	2.53	3.73	48.13
G ₆	C.G. 04	53	58.93	2.6	4	67.13
G ₇	C.G. 05	46	55.47	2.73	4.67	61.73
G ₈	Super Ujjwal	38	59.73	4.13	6.53	46.8
G ₉	Ujala	34	38.27	4.73	9.73	68.6
G ₁₀	Sheetal	33.67	37.67	4.87	10.13	44.93
G ₁₁	Ujjawal	35	40.27	3.93	7.87	48.47
G ₁₂	Kashi Nindi	35	39.13	4.6	9.47	45.2
G ₁₃	Kashika-6	37	40.53	3.8	7.6	48.13
G ₁₄	Kashi Kohinor	35.67	40.07	3.8	7.33	47.93
G ₁₅	Kashi Gouri	33	36.87	5.4	11.47	44.6
G ₁₆	Kashi kanchan	37	40.6	4.87	9.87	48.53
G ₁₇	Danmantri	43.33	43	4.33	8.67	47.67
F- test		S	S	S	S	S
SE(m)		2.22	4.79	0.21	0.58	0.56
C. D. (P = 0.05)		4.59	9.9	0.44	1.2	1.17
C.V.		22.64	48.85	2.18	5.94	5.75

Table 3: Evaluation of different genotypes of cowpea (*Vigna unguiculata* L.) on Yield Parameter.

Notation	Genotype	Pod length (cm)	Single pod weight (g)	Days of pod maturity in plant	No. of seed per pod	Pod yield per plant (g)	T.S.S
G ₁	VNRCP-27	32.11	10.37	53.67	17.8	218.13	5.9
G ₂	Jaripa	38.87	14.53	53.13	15	277.33	5.2
G ₃	C.G.01	18.33	10.97	82.67	10.93	166.8	4.9
G ₄	C.G. 02	23.67	8.23	78.33	13.73	189.87	4.8
G ₅	C.G. 03	27.72	12.4	79.6	11.47	156.67	4.1
G ₆	C.G. 04	32.17	10.43	79.27	15.8	176	5.1
G ₇	C.G. 05	39.53	16.49	72.53	17.33	177.27	4.8
G ₈	Super Ujjwal	29.93	9.93	58.07	14.8	187.27	4.9
G ₉	Ujala	31.21	12.47	54.13	16.6	218.27	5.3
G ₁₀	Sheetal	86.53	23.07	53	18.53	556	4.2
G ₁₁	Ujjawal	29.77	11.03	58.07	15.6	204.73	4.7
G ₁₂	Kashi Nindi	32.5	12.43	53.93	15.2	269.47	5.3
G ₁₃	Kashika-6	30.63	11.4	55.73	16.07	244.27	4.8
G ₁₄	Kashi Kohinor	30	11.53	56.73	15.27	234.27	5.4
G ₁₅	Kashi Gouri	22.87	8.5	52.8	12	339.47	4.9
G ₁₆	Kashi kanchan	29.23	7.93	58.53	12.93	324.73	5.4
G ₁₇	Danmantri	22.87	14.77	56.8	16.07	272.53	4.9
F- test		S	S	S	S	S	S
SE(m)		7.204	1.45	1.46	0.2	10.968	0.01
C. D. (P = 0.05)		14.868	2.99	3.02	0.41	22.638	0.03
C.V.		73.4	14.79	14.91	2.03	111.75	0.14

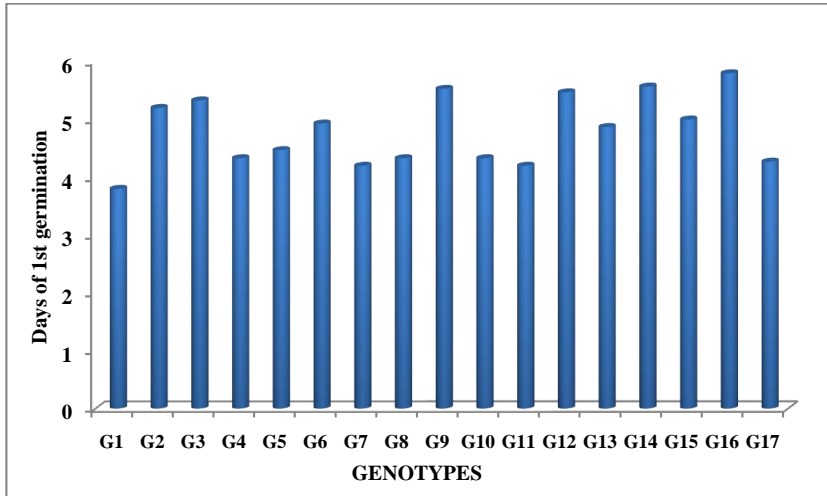


Fig.No 1. Days to germination of various cowpea genotypes

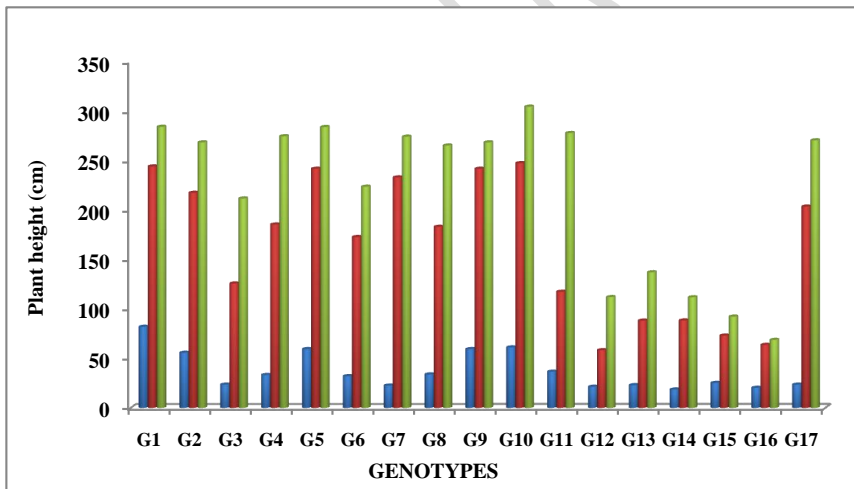


Fig.No 2. Plant height at 20, 40, 60, days of various cowpea genotypes

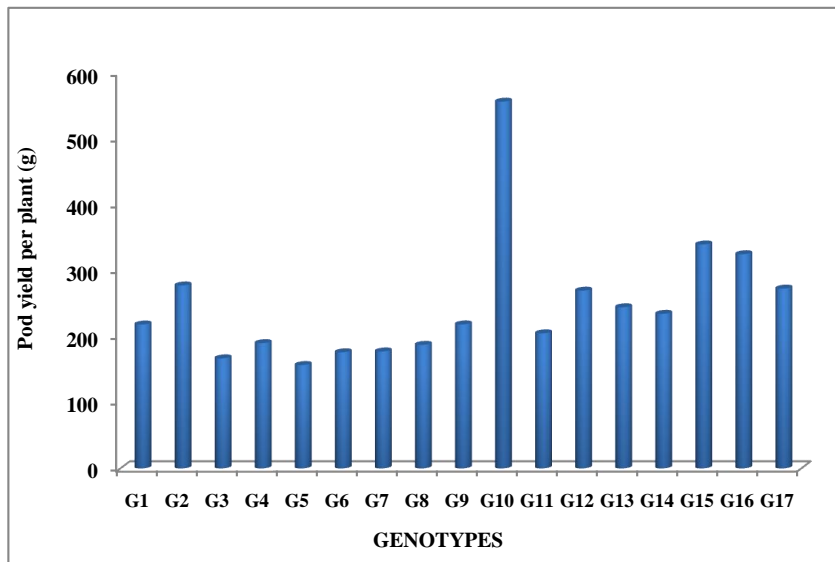


Fig.No 3. Yield of various cowpea genotypes

CONCLUSION

From the above experiment finding it was concluded that, all the characters viz., growth parameters, flowering behaviour, yield and yield attributing characters, pod parameters varied significantly. Further, while studying the flowering behavior, Cowpea genotypes VNRCP-27 (G_1) found to be the earliest. The Cowpea genotypes Sheetal (G_{10}) had noticed more yields per plant and per ha. under Allahabad agro climatic conditions. These variety also recorded desirable values for pod parameters like length of pod, weight of pod, which are parameters deciding a better market acceptability. Thus, on the basis of growth characters, flowering behaviour, yield and yield attributing characters, pod parameters and Cowpea genotypes Kashi Gouri (G_{15}) and Cowpea genotypes Sheetal (G_{10}) were found to be promising. However, it needs confirmation by conducting same investigation for next 2-3 seasons. From the above experimental finding, it was concluded that the highest profit and maximum benefit cost ratio was observed in cowpea genotypes Sheetal (G_{10}).

Comment [A25]: Behavior

REFERENCES:

AlhajiHamza Ibrahim. (2008). Yield Performance of Some Cowpea Varieties under Sole and Intercropping with Maize at Bauchi, Nigeria. *An International Multidisciplinary Journal, Ethiopia*. 2(3): 278-291.

Basaran, U., Ayan, I., Acar, Z., Mut, H., & Asci, O. O. (2011). Seed yield and agronomic parameters of cowpea (*Vigna unguiculata* L.) genotypes grown in the Black Sea region of Turkey. *African Journal of Biotechnology*, 10(62), 13461-13464.

Comment [A26]: *Vigna unguiculata* L.

Dongarkar K. P., Pawar W. S., Khawale V. S., Khutate N. G. and Gudadhe N. N. (2005). Effect of nitrogen and sulphur on growth and yield of cowpea (*Brassica juncea* L.). *J Soils Crops* 15: 163-67.

Comment [A27]: *Brassica juncea* L.

Ekpo, I. A., Agbor, R. B., Osuagwu, A. N., Okpako, E. C. and Ekanem, B. E. (2012). Evaluation of Eight Cowpea (*Vigna unguiculata* Walp). *Int. J. Pure Appl. Sci. Technol.* 12(2): 1-7.

Comment [A28]: *Vigna unguiculata*

Fageria N.K, Baligar V.C, Jones C.A (2011). Growth and Mineral Nutrition of Field Crops. CRC Press, Boca Raton.

Kumar A., Mahapatra B.S., Singh V.P., Shukla A., Negi M.S., Yadav A. S., Singh P., Gaurendra G. and Singh M. (2017). Effect of nutrient levels on yield, nutrient uptake and economics of Indian cowpea (*Brassica juncea*) in tarai region of Uttarakhand . *Indian Journal of Agronomy* 62 (3): 378-381.

Comment [A29]: *Brassica juncea*

Naim, M. E. Ahmed, Jabereldar, A. A. and Mohamed, E. A. (2011). Effect of seed rate and varieties on vegetative growth attributes of cowpea (*Vigna unguiculata* L. Walp) under rain-fed in Sudan. *Asian Journal of Science and Technology*. 2 (3) : 022-026.

Comment [A30]: *Vigna unguiculata*

Nigude. A. I., Dumbre. A. D., Lad. D. B. and Bangar. N. D. 2004a. Genetic variability and correlation studies in cowpea . *Journal of Maharashtra Agricultural Universities*. 29(1): 30-33.

Comment [A31]: Delete

Panse VG, Sukhatme PV. 1995. Statistical methods for Agriculture workers. ICAR, New Delhi.

Quaye-Addo, A. A., Darkwa, A. A. and Ampiah, M. K. P. (2011). Performance of three cowpea (*Vigna unguiculata* (L) Walp) varieties in two agro-ecological zones of the central region of Ghana ii: grain yield and its components. *ARNP Journal of Agricultural and Biological Science*. 6 (2): 1-9.

Comment [A32]: *Vigna unguiculata*

Sawardekar, P. S. (2007). Studies on Evaluation of Yard Long Bean genotypes (*Vigna unguiculata* sub sp. *Sesquipedalis* (L.) Verdcourt) under Konkan agroclimatic conditions of maharashtra. M.Sc (hort.) Thesis, Submitted to konkankrishividya peeth, dapoli (M.S.). Unpublished.

Comment [A33]: *Vigna unguiculata*

Selvam, Y.A., N. Manivannan, S. Marugan, P. Thangavelu and J. Ganesan (2000). Variability studies in cowpea (*Vigna unguiculata* (L.) Walp). *Legume Research*, 23(1) : 279-280.

Comment [A34]: *Vigna unguiculata*

Singh, B. B., Chambliss, O. L., & Sharma, B. (1997). Recent advances in cowpea. In B. B. Singh, D. R. Mohan Raj, K. E. Dashiell, & L. E. N. Jackai (Eds.), *Advances in cowpea research. Co-publication of International Institute of Tropical Agriculture (IITA) and Japan International Research Center for Agricultural Sciences (JIRCAS)* (pp. 30-49).

Vir O, Singh AK. Genetic variability and inter-characters associations studies in the germplasm of Cowpea [*Vigna unguiculata* (L.) Walp] in fragile climate of western Rajasthan, India. *Legume Res.* 2014; 37(2):126-132

Comment [A35]: *Vigna unguiculata*

Comment [A36]: All these references not found in the manuscript are added