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Evaluation of cowpea (*Vigna unguiculata* L. Walp) genotypes for yield and associated traits

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Abstract
Twenty cowpea (*Vigna unguiculata*) genotypes were evaluated for thrip and aphid resistance and yield and associated traits. The associated parameters studied were Thrip score, aphid score, plant height, number of branches, number of clusters, number of pods, seeds per pod and yield and the result obtained showed significant differences . From the result obtain it can be concluded that GCP-400, GCP-387 and GCP-287 had the best results in most of the parameters evaluated.

Keywords: Cowpea, yield, associated trait and evaluation, thrip resistance, aphid resistance

Introduction
Cowpea (*Vigna uniguiculata*) commonly known as beans is an important, versatile food crop. It is the most ancient human food. It belongs to family of fabaceae (Leguminoisae) and subfamily of papillnoideae. Cowpea has been intercropped for long time with various other crops such as maize, wheat, millet, sorghum (Johnson, 1970) [7]. It can be utilized in various ways ranging from the use of young green seedling as vegetables and also forage for livestock to its consumption as beans (Kay, 1979) [11]. It is an excellent source of protein which is enriched by amino acids, lysine and tryptophan. It is very nutritious with free metabolites or other toxins (Kay, 1979) [11]. Economically, cowpea is utilized by man in different ways. The seed contains approximately 49% protein and 20-30% fat and oil (Donald, 1970) [9]. Generally, cowpea grows in areas of low rainfall as high rainfall lead to crop failure. The success of most crop improvement programme largely depends upon the genetic variability and the heritability of desirable traits in reproductive period and grain yield of cowpea under high temperature condition and the duration of reproductive period (Singh, 1997) [1]. Most cowpea breeders employ back cross or bulk breeding method to handle segregating population because cowpea is self pollinating specie and varieties are pure lines. Cowpea is also well recognized as a key component in crop rotation schemes because of its ability to help restore soil fertility for succeeding cereal crops (Carsky *et al.*, 2002) [8]. Certain characteristics of traits and hereditary exist in agricultural crops which are of breeders interest. Varietals differences of cowpea in terms of growth pattern, seed maturity date are extremely diverse from plant to plant, making breeding programs for cowpea more complex than other crops (Baker, 1989) [10]. Therefore, there is great need for genetic improvement and development of cowpea varieties with acceptable and better traits which can be achieved through the study of the different growth and yield component that occur in different varieties of cowpea.

Materials and Methods
Twenty genotypes were planted at Breeder Seed Production Centre, GBPUAT, Pantnagar during Kharif season in 2019. Spacing was kept at 45x10cm. Data were collected on the following parameters: thrip score, aphid score, plant height, number of branches, number of pods, seeds per pod. Data collected were subjected to analysis of variance test and the means separated using the least significant difference (LSD) test in cases of significance.

Results and Discussion
The mean values of the yield and associated traits component of the genotypes of cowpea are presented in Table 1. The result shows that there were significant differences in the parameters Studied.

Table 1: Data recordrd on different parameters in 20 genotypes of cowpea

Sl. No.	Entries	Characters					
		50% Flowering (days)	Maturity (days)	Plant Height (cm)	Peduncle Length (cm)	Branches	Cluster / Plant
1	PGCP-28	36	57	65.33	42.00	4.0	14.67
2	GCP-232	35	59	68.00	38.33	3.0	13.33
3	GCP-234	34	56	62.33	37.33	3.7	9.67
4	GCP-287	39	59	74.67	41.67	2.7	12.67
5	GCP-297	35	58	64.00	42.67	2.7	13.00
6	GCP-350	32	57	65.67	33.67	3.3	16.00
7	GCP-351	35	55	60.67	27.67	3.0	12.00
8	GCP-356	36	56	68.33	40.00	3.3	13.67
9	GCP-359	43	63	81.00	50.00	2.0	16.00
10	GCP-360	36	56	61.67	36.00	3.0	10.33
11	GCP-386	34	54	82.33	53.00	2.0	8.67
12	GCP-387	35	58	82.33	44.00	1.7	9.67
13	GCP-390	33	53	56.00	33.00	1.3	9.00
14	GCP-392	35	54	60.67	33.67	2.3	12.67
15	GCP-395	34	58	67.33	44.33	2.3	10.33
16	GCP-399	35	59	62.33	37.00	2.7	13.00
17	GCP-400	35	55	80.67	45.67	1.0	7.33
18	PL-1	34	56	52.33	27.33	2.0	10.67
19	PL-3	32	53	60.00	30.67	2.3	8.67
20	RC-101	33	55	63.33	32.00	2.7	11.00
CD at 5%		7.52	8.24	11.28	10.57	2.54	3.48
CV (%)		8.45	7.42	10.58	11.72	12.14	11.87

Sl. No.	Entries	Pods /Plant	Seeds /Pod	Characters Pod Length (cm)	Yield (qtl/ha)
1	PGCP-28	23.3	13.3	17.0	6.13
2	GCP-232	19.3	15.0	18.7	4.76
3	GCP-234	16.3	14.0	18.3	9.23
4	GCP-287	19.0	15.0	20.3	15.61
5	GCP-297	17.3	15.7	17.7	8.49
6	GCP-350	23.0	12.0	16.0	12.40
7	GCP-351	19.7	14.3	16.3	6.47
8	GCP-356	22.0	14.0	14.7	7.48
9	GCP-359	15.3	12.0	13.0	1.83
10	GCP-360	15.7	15.0	18.7	8.81
11	GCP-386	14.7	16.3	23.7	14.80
12	GCP-387	15.0	16.7	20.7	16.23
13	GCP-390	14.0	13.3	17.7	7.27
14	GCP-392	16.3	13.7	15.3	5.83
15	GCP-395	15.0	13.3	18.7	8.69
16	GCP-399	20.0	16.0	16.3	9.67
17	GCP-400	14.7	15.7	16.7	16.23
18	PL-1	24.0	11.7	14.7	5.28
19	PL-3	16.0	16.3	18.7	6.60
20	RC-101	15.3	16.0	15.3	7.61
CD at 5%		7.85	2.05	2.47	5.16
CV (%)		11.46	9.87	5.47	11.69

In this study growth and yield components of cowpea varieties were evaluated. The result of this study showed significant differences in days to 50% flowering, number of pods, plant height, number of branches, pod length and no. of seeds This study revealed that the earliest to show 50% flowering was PL-3 (32 days), RC-101 (33 days) and GCP-390 (33 days). Walters and Wehner (1994) [4] also evaluated African yam bean germplasm from West Africa for early flowering as well as the correlation between early flowering and total yield. The earlist to mature was PL-3 (53 days) and GCP-390 (53 days). The maximum plant height was shown by GC-386 and GCP-387 (82.33 cm). Cramer and Wehner (1998) [2] also reported that plant height contributed to yield as it leads to resulting increase in the number of female flowers and in number of pods. This fact was supported by (Takang, 2002) [6], the result of these study also shows that the plant height can also contribute positively to the yield of the plant. The maximum pod length was shown by GC-386 (23.7 cm) and GCP-287 (20.3 cm). The observation is in line with the work of (Ehlers *et al.*, 1997) [5] who observed that there is variability in the growth habit within the species. Pod length is an important trait in cowpea, plant breeders are interested in developing new species with concentrated seed set for the benefit of growers using expensive hand labor or machine harvest systems. The maximum number of pods was shown by PGCP-28 (23.3) and GCP-350 (23.0).The maximum no. of seeds per pod was shown by GC-386 (16.3) and GCP-387 (16.7). The most important parameter i.e. yield is shown by GCP-387 (16.23 qtl/hac) and GCP-400 (16.22 qtl/hac).

Conclusion

It can thus, be concluded that GCP-387, GCP-400 and GCP-287had the best results in most of the parameters evaluated. However, base on their growth performance they should be widely cultivated in order to ensure their availability in market.

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