

## **Characterization Studies and Yield Attributes of Some Varieties of Cowpea (*Vigna unguiculata* L.)**

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Issued 8 June 2007

### **ABSTRACT**

Investigations were carried out on sixteen improved varieties of cowpea (*Vigna unguiculata* L walp) obtained from International Institute for Tropical Agriculture, Ibadan. These varieties were grown in the Department of Biological Sciences Garden, of the University of Ilorin. Qualitative and quantitative characters were observed for the study. Positive correlations were obtained between leaf number and stem diameter, leaf number and number of seeds per pod, number of branches and plant height. Negative correlation existed between number of pods per plant and number of seed per pod. Analysis of variance (ANOVA) showed significant difference in all the quantitative characters analyzed among the varieties. Each character was also analyzed using Duncan test and F-LSD. The result showed that IT99K-529-1, IT99K – 429 – 2, IT97K – 461 – 4, IT98K – 506 – 1 and IT99K- 1122 were outstanding in term of vegetative and yield performances in Ilorin, Kwara State of Nigeria

### **INTRODUCTION**

Differences between individual organisms have two causes: variation in the genetic material which all organisms possess and which is passed from generation to generation; and variation caused by environmental influence on each individual organism (Elrod and Stansfield 2003). Heritable variation is the raw material for both natural and artificial selection and is ultimately therefore the basis for all observable biodiversity. Genetic diversity is particularly important for agricultural productivity and development (Fadconer, 1989).

Cowpea contains about 25% protein, making it extremely valuable where many people cannot afford protein food such as meat and fish

(IITTA 2002). Hall (2003), Ogbuiya (1997) and Adams (2003) also reported on the various uses to which different parts of cowpea can be put to. As reported by IITA (2002), the fast growth and spreading habit of traditional cowpea ensures maturity at the end of the rainy season, spreading the harvesting operation overtime and enable better and efficient use of family labour.

Johnson et. al. (1955) reported that it is very important in any breeding programme to select and evaluate varieties for quantitative and yield ability before such varieties can be introduced to a given local environment. The aim of this work is, therefore, to characterize these improved varieties and evaluate the yield with a view to determining the best variety(ies) for introduction into the locality where the experiment was conducted.

## **MATERIALS AND METHODS**

Sixteen different improved varieties of cowpea (*Vigna unguiculata*) seed were obtained from International Institute for Tropical Agriculture (IITA), Ibadan Nigeria. The accessions ascribed on the sixteen varieties from IITA were used.

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|---------------------|---------------------|
| 1. IT99K – 316-2    | 9. IT97K – 461 – 4  |
| 2. IT97K – 568 – 18 | 10. IT00K – 1150    |
| 3. IT96K – 610      | 11. IT98K – 205 – 8 |
| 4. IT98K – 506 – 1  | 12. IT99K – 429 – 2 |
| 5. IT98K – 491 – 4  | 13. IT99K – 529 – 1 |
| 6. IT99K – 491 – 7  | 14. IT00K – 901 – 5 |
| 7. IT99K – 1060     | 15. IT98K - 128 – 4 |
| 8. IT00K – 898 – 5  | 16. IT99K – 1122    |

The work was carried out on a plot of land in the Biological Garden of the University of Ilorin Permanent site. Clearing was done and sixteen beds were made. Planting was done in a randomized block manner. Three rows of five columns were made for each treatment giving fifteen plant stands per bed. Three seeds were sown per hole at about 3cm deep. Spacing of 30 cm between rows and 20 am between column was maintained for each variety. Each seedling stand was reduced to two seedlings per stand and beds were labeled accordingly to avoid confusion during the study. Weeding was done twice within the first five weeks of planting after which

the crops can compete favourably with in its environment. The crops were sprayed with pesticide, cypermethrin (Karate) made to a solution of 0.2ml per 150ml of water. Spraying was done using a hand sprayer with spraying nozzle. Spraying was done two weeks after planting and subsequent application was done at two weeks interval until flowering begins when the spraying was reduced to weekly application. Quantitative characters studied are plant height, numbers of primary branches per plant, maturity period, stem girth, number of leaves per plants, pod length, pod circumference, number of pods per plant, number of seeds per pod, seed weight. Qualitative characters studies were fruit colour, seed colour, leaf shape and size, seed shape, flower colour and hairiness of different parts. Pollen viability test was conducted by collecting mature flower of each variety from the plants, pollen grains from each variety were dusted on a clean glass slide and a drop of methylene blue stain was introduced onto the slide and covered with clean coverslip and focused under a microscope. In each case, at least 400 pollen grains were counted and the percentage pollen viability of each variety was determined. The values obtained were subjected to Analysis of variance (ANOVA), Duncan multiple test and Fisher's Leaf significant Difference Test (F-LSD).

## **RESULTS AND DISCUSSION**

Table 1 shows coefficient of variation for characters studied and it was observed to be high for number of branches per plant, number of leaves per plant, number of seeds per pod and number of pod per plant ie. 34.13%, 34.00%, 31.61% and 31.21% respectively. This implies that the varieties were different from one another in terms of leaves, branches, seed and pod producing ability but low coefficient of variation was observed for characters such as pod length and pod diameter (13.10% and 12.28% respectively). The finding agrees with Wien and Ackah's (1978) conclusion. Result of qualitative characters studied showed that there are differences among the cowpea varieties (Table 2). This indicates that these varieties were of distinct genotype. Dulley and Moll (1969) stated that varieties of different qualitative characters are of distinct genotype and may breed for the manifestation of different traits in crop improvement.

Correlation Coefficient (Table 3) showed that there is a strong positive correlation between leave number and stem diameter and also a positive correlation between leaf number and number of seeds per pod. This implies that the more the number of leaves, the wider the stem girth

and the more the number of seeds produced per pod on each plant. There also exists positive correlation between number of branches and height. According to Falconer (1989), the phenotypic variability of quantitative traits in a population usually has an environmental component. So, it is inferred that those characters with positive correlations are influenced and controlled by similar gene combinations and environmental factors.

There existed a negative correlation between pod number and number of seeds per pod. This implies that the more the pods on a plant, the less the number of seeds in a pod. So improvement on number of pod may contribute adversely to the number of seeds in such pods. This is in line with Dhagat et. al. (1978) who opined that negative genotypic correlation between characters selected for in breeding programme may result in reduction in the rate of improvement that could be attained if the correlation were positive or non-existing.

Analysis of variance table showed that there are significant differences in all the characters studied among the varieties. This is an indication that genetic variability existed for all the quantitative characters analyzed. This is because the basis of any crop improvement is the availability of genetic variability within a population (Henry 2004).

Multiple comparison for all the vegetative characters studied have shown that IT99K – 1122 had the highest means for three out of the four vegetative traits analyzed i.e height of plant, leaf number, and number of branches. IT99K – 429-2 had highest stem diameter (Table 4). This shows that these varieties (IT99K-1122 and IT99K-429-2) are the most adapted in term of vegetative performance in the environment of study. Faluyi (1978) stated that cowpea varieties with better vegetative characters can be used in the tropics for controlling erosion and as animal feeds. IT99K-316-2, which had the least mean values for leaf number and stem diameter, is the least adapted variety in term of vegetative characters. These two varieties are recommended if the purpose of planting is for their vegetative parts.

IT97K-461-4, IT98K-506-1, IT99K-529-1 and IT99K-1122 had highest mean values which were significantly different from every other variety in term of pod number, pod length, pod diameter and seed per pod respectively (Table 5). This indicated that the four varieties were of outstanding performance in term of yield attributes. IT 99K-1122, though had least mean number of pod per plant, it distinguished itself by been

significantly different from others in term of mean member of seeds per pod.

In conclusion, this work revealed the existence of genetic variability among the sixteen improved cowpea varieties studied. The work has also helped to select, evaluate and indicate those varieties that were of best performance in terms of quantitative and quantitative traits studied. Of all the sixteen varieties of cowpea used in this work, IT97K-461-4, IT99K-529-1, IT99K-429-2, IT99K-1122 and IT98K-506-1 were quite outstanding and thus, these varieties were recommended for cultivation in this part of Nigeria because they will perform better than other varieties studied.

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**TABLE 1.** Mean and coefficient of variation for the characters studied in the cowpea varieties.

Varieties	NL	NB	PH	SD	PL	PP	PD	SP
1	27.0+	8.40	33.20	1.52	12.22	8.00	2.54	10.20
2	36.2	8.20	46.76	1.74	14.66	10.40	2.24	11.40
3	45.6	7.60	35.48	2.04	12.70	11.00	2.20	9.00
4	45.6	11.40	39.98	2.42	15.10	8.00	2.28	10.80
5	31.8	12.00	41.88	2.08	11.78	11.20	2.12	6.80+
6	31.8	7.20+	44.88	2.12	12.72	7.20	2.36	12.00
7	31.4	9.60	41.62	1.92	12.98	9.60	2.16	9.00
8	50.6	16.20	47.06	2.16	12.55	8.40	2.18	5.80
9	45.6	12.60	40.30	1.72	12.02	12.60	2.52	8.40
10	29.2	8.80	32.40	1.64	11.66	10.20	2.22	9.80
11	34.2	9.00	45.54	2.24	14.26	9.40	2.40	8.80
12	68.8	17.20	48.90	2.64	11.22	10.60	2.44	10.60
13	65.0	15.00	42.14	1.80	14.36	8.60	2.92	11.80
14	41.8	12.60	39.48	1.60	11.88	10.20	2.02	11.80
15	44.6	12.8	44.42	2.78	14.00	1.00	2.20	10.20
16	72.2	17.60	49.32	1.92	13.00	6.00	2.76	16.80
17	34.00	34.13	19.07	18.86	13.10	31.21	12.28	31.60

CV- means Coefficient of Variation  
 NL - Number of Leaves Per Plant  
 NB - Number of Branches Per Plant  
 PH- Plant Height At Flowering  
 SD - Stem Diameter  
 PL - Pod Length  
 PP - Number of Pod Per Plant  
 PD - Pod Diameter  
 SP - Number of Seeds Per Pod

**TABLE 2.** Qualitative characters for the cowpea varieties.

S/No.	Varieties	Habit	Seeds shape size and colour	Flower colour	Texture	Leave shape and size
1.	IT99K-316-2	Erect	Smooth, moderate and cream coloured	White	Smooth	Trifoliolate, moderate size shape
2.	IT97K-568-18	Semi-erect	Smooth, moderate, and brown	White	Smooth	Trifoliolate, moderate, size ovate shaped
3.	IT96K610	Erect	Smooth, moderate and white	White	Smooth	Trifoliolate, moderate, ovate
4.	IT98K-506-1	Semi-erect	Smooth, moderate and white	White	Smooth	Trifoliolate, moderate, ovate
5.	IT98K-491-4	Erect	Smooth, moderate and white	White	Smooth	Trifoliolate, moderate, ovate
6.	IT99K-491-7	Erect	Smooth, moderate	White	Smooth	Trifoliolate small,



Observation								
SEED Pearson Correlation	.261	125	.061	090	.224+	1.000	1.000	.151
P. Value	.019	268	590	429	.046	.007		.183
No of Observation	80	80	80	80	80	80	80	.80
PODLENGT Pearson Correlation	.062	189	167	095	.006	.083	.151	.080
P. Value	.584	268	139	403	.957	.462	.183	+
No of Observation	80	80	80	80	80	80	80	80

**TABLE 4.** Means and least significant difference (f-lsd at 5% probability) for vegetative characters in cowpea varieties.

S/N	VARIETIES	PLANT HEIGHT	LEAF NUMBER	STEM DIAMETER	BRANCH NUMBER
1	IT99K-316.2	33.2 ± 9.2609c	27.0±5.3852e. *	1.52 ± 0.2588i	8.4 ± 3.1305fe
2	IT97K-568.8	46.76 ± 4.6226a	36.2 + 7.1554cdc	1.74 ± 0.1517ilgf	8.2 ± 1.7889fe
3	IT96K-610	35.48 ± 8.152cb	32.8 ± 6.7602c	2.04 ± 0.1140fcdc	7.6 ± 1.1402f
4	IT98K-506.1	39.98 ± 3.6928ca	48.6 ± 2.8810b	2.42 ± 0.3962ba	11.4± 2.7012cdc
5	IT98K-491.4	41.88 ± 10.5554cba	54.6 ± 10.6911b	2.08 ± 0.134cdcb	12.0 ± 1.8708dcb
6	IT99K-491.7	44.88 ± 5.5657ba	31.8 ± 7.7910c	2.12 ± 0.1483edcb	7.2 ± 1.7889f *
7	IT99K-1060	41.62 ± 6.1941cba	31.45 ± 4.3932c	1.92 ± 0.2387hgfed	9.6 ± 1.402fcdc
8	IT00K-898-5	47.06 ± 5.9416a	50.6 ± 7.3007b	2.16 ± 6.1517dcb	16.2 ± 1.4832a
9	IT97K-461-4	40.3 ± 7.0512cba	45.6 ± 7.8294b	1.72 ± 0.1483ihg	12.6 ± 1.9494cb
10	IT00K-1150	32.4 ± 8.1403c	29.2 ± 5.2631c	1.64 ± 0.944ih	8.8 ± 0.8367fed
11	IT98K-205-8	45.45 ± 9.2479ba	34.2 ± 4.6583cd	2.24 ± 0.4336dcb	9.0 ± 2.000fcd
12	IT99K-429-2	48.90±2.5348a	68.8 ± 5.8052a	2.64 ± 0.3782a +	17.2 ± 3.03329
13	IT99K-529-2	42.14 ± 7.3238cba	65.0 ± 1.5811a	1.80 ± 0.1581ihgfe	15.0 ± 2.00ab
14	IT00K-901-5	39.48 ± 5.0796cba	41.8 ± 7.3959dcb	1.60 ± 0.2000ih	12.6 ± 4.6373cb
15	IT98K-128-4	44.42 ± 8.5596ba	44.6 ± 8.5332cb	2.28 ± 0.3347cb	12.8 ± 201679cb
16	IT99K-1122	49.32 ± 8.0272a +	72.2 ± 1.9235a +	1.92 ± 0.3670hgfed	17.6 ± 3.5777a
	FLSD	9.35	8.66	3.24	4.65

**TABLE 5.** Means and least significant difference (f-lsd at 5% probability) for yield characters in cowpea varieties.

S/NO	VARIETIES	POD NUMBER PER PLANT	POD LENGTH	POD DIAMETER	SEED PER POD
1	IT99K-316.2	8.0 ± 0.7071 cb	12.22 + 1.3554d	2.54 + 0.1673 cb	10.2+ 2.5884dcb
2	IT97K-568.18	10.4 ± 1.8166ab	14.66 + 0.9099ba	2.24 + 0.2074 gfed	11.4 + 2.4053cb
3	IT96K-610	11.0 + 3.1633 ab	12.70 + 1.4457 dcb	2.20 + 0.1225gfed	9.0 + 2.3452cdc
4	IT98K-506.1	8.0 + 2.6458 cb	15.10 + 0.4301a +	2.28 + 0.2168gfed	10.8 + 2.1678cb
5	IT98K-491.4	11. + 4.7117 ab	11.78 + 1.8660d	2.12 + 0.1304gf	6.8 + 0.8367cd
6	IT99K-491.7	7.2 + 2.5884 cb	12.72 + 0.9257 dcb	2.36 + 0.2881 gfed	12.8 + 1.9235b
7	IT99K-1060	9.6 + 1.9494 ab	12.98 + 1.1979 dcb	2.16 + 0.1817gfe	9.0 + 2.3452cdc
8	IT00K-898-5	8.4 + 2.0736 cb	12.50 + 1.979dc	2.18 + 0.1643gfed	5.8 + 0.8367c*
9	IT97K-461-4	12.6 + 3.3615 a +	12.02 + 1.0756d	2.52 + 0.1304 cb	8.4 + 1.8166cdc
10	IT00K-1150	10.2 + 3.1145 ab	11.66 + 1.0455d	2.22 + 0.1643gfed	9.8 + 1.7889dcb
11	IT98K-205-8	9.4 + 1.6733 ab	14.26 + 1.0455cba	2.40 + 0.1871edc	8.8 + 2.1678cdc
12	IT99K-429-2	10.6 + 3.5777 ab	11.22 + 1.7641d	2.44 + 0.2966dc	10.6 + 3.5071cb



13	IT99K-529-2	8.6 + 2.4083 ab	14.36 + 2.7574 cba	2.92 + 0.1095 a +	11.8 + 2.3875cb
14	IT00K-901-5	10.2 + 1.9235 ab	11.88 + 1.3664 d	2.02 + 0.1095g *	11.0 + 4.0620cb
15	IT98K-126-4	11.0 + 3.7417 ab	14.50 + 0.8367ba	2.20 + 0.1011g fed	10.2 + 2.4900dcb
16	IT99K-1122	6.0 + 1.2247 c*	13.00 + 0.868.9dcb	2.76 + 0.2302bs	16.8 + 1.3038a +
	FLSD	3.68	1.81	2.492.49	3.14