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Evaluation of Some Cowpea (*Vigna unguiculata* L. Walp) Genotypes at Mubi, Northern Guinea Savanna Of Nigeria

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ABSTRACT
A filed trial was undertaken in 2011 and 2012 cropping seasons at Mubi, in the northern Guinea Savanna ecology of Nigeria. In the study, five improved erect and semi-erect genotypes (IT97K-499 -35, IT97K -131 – 2, IT98KD – 391, IAR – 07 – 1050 and IAR – 00 -1074) and a local check "kanannado" were assessed to determine their vegetative and yield performances. All the erect and semi-erect genotypes reached 50% flowering earlier than "kanannado". Furthermore, IAR – 00 – 1074 also attained 50% flowering later than the other improved genotypes in the combined analysis. Three genotypes, IT97K -131 – 2, IAR – 07 -1050 and IAR – 00 -1074 produced higher number of pods/plant than the local check in the combined analysis and also out-yielded it in 2011. However, the local check exhibited bigger and heavier seeds than all the improved genotypes throughout the study.

KEY WORDS: cowpea, genotype, evaluation, yield performance

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I. INTRODUCTION

Cowpea (*Vigna unguiculata* L. Walp) a member of the family fabaceae is one of the crops cultivated in the Nigerian Savanna that are rich in protein. It is mainly grown in the semi-arid and humid tropical regions (Tinko , 1992). Different varieties and species of the crop are cultivated in the Savanna ecology of Nigeria (Ng, 1995). The crop is shade tolerant, therefore farmers intercrop it with other crops especially cereals (Blade, 2005). However, some farmers grow it as mono crop at later dates contrast to those grown in mixtures, whose rate of growth is usually affected by the component crops. As a legume cowpea fixes atmospheric nitrogen in its root nodules. Therefore, cultivation of the crop reduces depletion of soil nitrogen and can improve soil fertility and increase the yield of succeeding cereal crops than those under continuous cereal production (Bationo *et al*., 2002).

Farmers in the Savanna ecology of Nigeria grow the crop mainly for its grains, which are prepared and consumed in different ways. The raw grain contain 343 cal. /1000g, 22.8% protein, 1.5g/100g fat, 61.7g/100g carbohydrate, 74 mg/100g calcium, 5.8mg/100g Fe and 0.21mg/10g riboflavin (Watt and Merill, 1975). Furthermore, the fresh leaves as well as the dry leaves are used to prepare soup. Imungi and Potter (1983) assessed dry cowpea leaves to be high in calcium (1556mg/100g), phosphorus (348mg/100k) and Fe (12.0mg/100g). The crop is an easily accessible cheap source of protein to the local population. Also the plant is cut while green, then dried and used as livestock feed during dry season. (Maglare, 2005). Farmers in the Savanna ecology of Nigeria usually cultivate the local varieties which are spreading and of long duration and photosensitive. Thereby restricting the period during which the crop can be cultivated. The improved erect and semi-erect genotypes are usually day neutral and of shorter duration. The introduction of these improved varieties can avail the farmers with shorter duration cultivars that are high yielding. Therefore the objective of the field trial is to evaluate the vegetative and yield performance of some improved erect and semi-erect cowpea genotypes in Mubi area, Adamawa State, Nigeria.

Materials and Method

An experiment was conducted in the field in 2011 and 2012 rainy seasons at the Teaching and Research farm of Adamawa State University, Mubi in the semi-arid zone of Nigeria. Five improved erect and semi-erect cowpea genotypes (IT97K- 499 -35, IT97K -131 – 2, IT98KD – 391, IAR – 07 – 1050 and IAR – 00 - 1074) and a local spreading variety ('kanannado') were evaluated..The experiment was laid out in a randomized complete blade design (RBCD) in three replications. Sowing was done on August 11, 2011 and August 21, 2012. About four seeds were sown per hall at the spacing of 75cm x 20cm and thinned to two seedlings per hill at two weeks after sowing (WAS). Each gross plot was comprised of four rows that were

75cm apart and 5m long ($15m^2$), while the two central rows ($7.5m^2$) constituted the net plot. Fertilizer was applied using single superphosphate at the rate of $P_2O_5kgha^{-1}$ at 2WAS by side placement. The trial was hoe-weeded at 3 and 6 WAS.

Each genotype was harvested by hand picking the pods when got ripe Data that were collected were subjected to statistical analysis and the means separated using Duncan Multiple Range Test (Duncan, 1955)

Results

The genotypes exhibited similar plant height at 6 WAS in the two rainy seasons and the combined data (Table 1). However significant differences were observed among the genotypes with respect to time of 50% flowering in each of the growing seasons and the combined analysis (Table 1). In 2011 and the combined analysis IT97K -499 – 35 reached 50% flowering earlier than IT97K-131-2, IAR-00-1074 and Kanannado but was at par with IT98 –KD -391 and IAR – 07 – 1050. Which in turn had similar days to 50% flowering with IT97K – 131 – 2. The local variety Kanannnado was markedly, the last to attain 50% flowering, followed by IAR – 00 -1074. In 2012 Kanannado was also significantly the last to reach 50% flowering whereas all the other genotypes had comparable days to 50% flowering. It was only in all 2011 and the combined analysis that the genotypes varied in number of pods per plant (Table 2). In 2011 and the combined data all the improved genotypes had similar number of pods per plant, while kanannado had considerably least number of pods per plant. However, in the combined analysis it was at par with IT97K – 499 -35 and IT 98KD – 391. In both years and the combined data, the genotypes differed significantly in 100 – grain weight (Table 2). In 2011 and the combined analysis, Kanannado produced appreciably heavier grains than any of the other genotypes. This was followed by IT 98kKd -391 which produced grains of comparable weight with those of IT 97Kj – 131 – 2 and IAR – 00 -074, which in turn had similar weight with grains of IT 97K – 499 – 35. However, IAR – 07 – 1050 produced grains that had significantly least weight. Also in 2012, Kanannnado produced grains that were considerably heavier than grains of all the other genotypes. It was followed by IT 98 KD – 391, which was at par with other genotypes except IAR – 07 – 1050. This latter genotype which exhibited grains of least weight had grains of similar weight with IT97K -499 – 35, IT 97K -131 – 2 and IAR – 00 – 1074.

In 2011 all the improved genotypes had comparable shelling percentage (Table 3). However, only IT97K – 131 – 2, IT 98 KD – 391 and IAR – 00 1074 gave higher shelling percentage than kanannado. In contrast, in 2012 kanannado gave the highest shelling percentage but was at par with IT 97K – 131 – 2, IT 98KD – 391 and IAR – 00 – 1074. These other three genotypes exhibited similar shelling percentage with IT 97Kk – 499 – 35 and IAR – 07 – 1050. In the combined analysis IT 98 KD –-301 gave the highest shelling percentage that was comparable to those of other improved genotypes except IT97K – 499 -35. The least shelling percentage was exhibited by Kanannado which was at par with IT 97K – 499 – 35 and IAR -07 – 1050.

The genotypes differed in grain yield in 2011 and 2012 but not in the combined data (Table 3). In 2011, IAR – 00 – 1050 produced the highest grain yield, but only out-yielded IT 97K – 499 – 35 and kanannado. The least yielder was kanannado which was at par with IT97K -499 – 35 and IT98KD – 391. In 2012, IAR– 00 – 1074 gave the highest grain yield which was only significantly higher than the yield of IT97K – 499 – 35 and IAR – 07 – 1050.

Table 1 Influence of genotype on plant height at 6WAS and days to 50% flowering of cowpea grown at Mubi 2011 and 2012 rainy seasons

	Plant height at 6 WAS (cm)			Days to 50% flowering (days)		
Genotype	2011	2012	Combined	2011	2012	Combined
IT 97K – 499 - 35	39.91	43.25	41.58	49.67d	51.67b	50.67b
IT 97K -131 – 2	41.24	43.42	42.33	54.33c	52.67b	53.50c
IT 98KD – 391	47.76	40.42	44.09	51.67cd	52.00b	51.83cd
IAR – 07 – 1050	45.06	40.08	42.57	52.33cd	52.67b	52.50cd
IAR – 00 – 1074	46.08	44.75	45.42	64.33b	54.33b	59.33b
Kanannado	41.34	46.25	43.79	77.33a	63.00a	70.17a
SE±	3.148	3.821	3.253	1.163	1.067	0.786
Levelof significance	ns	Ns	Ns	*	*	*

Means followed common letter(s) in each treatment group are not significantly different at 5% level of probability using Duncan Multiple Range Test.

* = Significant at 5% level of probability

ns = Not significant at 5% level of probability

WAS = Weeks after sowing

Table 2: Number of pods per plant and 100 – grain weight of cowpea grown at Mubi in 2011 and 2012 rainy seasons.

	100 grain weight (g)			Number of pods/plant		
Genotype	2011	2012	Combined	2011	2012	Combined
IT 97K – 499 - 35	15.42c	15.38bc	15.40c	20.13a	17.40	18.77ab
IT 97K -131 – 2	16.82bc	16.24bc	16.53bc	18.83a	25.97	22.40a
IT 98KD – 391	17.15b	17.93b	17.54b	21,47a	19.20	20.33ab
IAR – 07 – 1050	12.76d	13.87c	13.32d	28.07a	20.27	24.17a
IAR – 00 – 1074	16.62bc	15.31bc	15.96bc	18.30a	25.03	21.67a
Kanannado	25.76a	24.59a	25.17a	7.50b	20.23	13.87b
SE±	0.486	1.102	0.562	3.241	3.48	2.355
Level of significance	*	*	*	*	Ns	*

Means followed common letter(s) in each treatment group are not significantly different at 5% level of probability using Duncan Multiple Range Test.
* = Significant at 5% level of probability
ns = Not significant at 5% level of probability

Table 3: Shelling percentage and grain yield of cowpea grown at Mubi in 2011 and 2012 rainy seasons

	Shelling percentage (%)			Grain yield (kgha^{-1})		
Genotype	2011	2012	Combined	2011	2012	Combined
IT 97K – 499 – 35	67.65ab	76.27b	71.96bc	1532bc	1144b	1338
IT 97K -131 – 2	75.38a	78.40a	76.89a	2206ab	1224ab	1715
IT 98KD – 391	76.92a	77.32ab	77.12a	2057abc	1272ab	1665
IAR – 07 – 1050	70.28ab	76.57b	73.43abc	2708a	1021b	1865
IAR – 00 – 1074	73.67a	77.76ab	75.71ab	2237ab	1655a	1946
Kanannado	62.89b	78.85a	70.87c	1217c	1618a	1418
SE±	2.716	0.519	1.383	169.502	136.303	160.992
Level of significance	*	*	*	*	*	ns

Means followed common letter(s) in each treatment group are not significantly different at 5% level of probability using Duncan Multiple Range Test.
* = Significant at 5% level of probability
ns = Not significant at 5% level of probability
391 gave the highest shelling percentage that was comparable to those of

Discussion

The study has shown that the genotypes did not differ in plant height at 6WAS. This is an indication that genetically, their rates of increase in plant height up to this stage were similar. The time of 50% flowering revealed that the genotype IT97K -499 – 35 was the earliest to flower while the local check was the latest. The ability of the day neutral erect and semi erect genotypes to flower earlier than the spreading local short day cultivar can be attributed to the genetic make of the improved genotypes which take shorter days to mature than the local cultivar. Furthermore, farmers can benefit from the use of these non-photosensitive cultivars, since they can be grown under irrigation in contrast to the short day local cultivar. Reddy and Reddy (2011) remarked that flowering initiation in short-day cultivars take place when the day length is short.

Also the improved genotypes exhibited comparable number of pods per plant, which were appreciably higher than that of kanannado in 2011. However, only IT97K – 131 – 2, IAR – 07 -1050 and IAR – 00 1074 produced significantly higher number of pods per plant than kanannado in the combined analysis. Furthermore these erect and semi-erect cultivars bear their pods conspicuously above the canopy. This places their green pods in a vantage position to intercept solar radiation better than the low spreading kanannado that bears its pod within the foliage. Reddy and Reddy (2011) noted that dry matter production increases with light intensity, which can affect yield attributes and finally yield. Therefore this advantageous position of pods in the improved genotypes can lead to better assimilate production by their pods than the low spreading local cultivar. This can partly account for why the three improved varieties IAR – 00 -1074, IAR – 1050 and IT 97K – 131 – 2 out yielded the local cultivar in 2011 and good performance in the combined analysis.

However, the local variety exhibited higher grain weight than all the improved genotypes. Mengel and Kirby (2006) remarked that grain size is genetically controlled. Therefore the higher grain weight of kanannad is due to its genetic superiority in this yield attribute.

Summary and Conclusion

The study has shown that three erect and semi-erect genotypes IAR – 00 – 1074, IAR – 02 0 1050 and IT97K – 131 -2 out-yielded the local check kanannado in 2011. Also IAR – 00 – 1074 was the leading genotype with respect to grain in the combined analysis. Therefore it appears to be a promising genotype for farmers' use in area of study.

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