INNSPUB

International Journal of Agronomy and Agricultural Research (IJAAR)
ISSN: 2223-7054 (Print) 2225-3610 (Online)
http://www.innspub.net
Vol. 11, No. 2, p. 86-93, 2017

RESEARCH PAPER OPEN ACCESS

Comparative studies of the yield performance of Improved vs local varieties of cowpea (*Vigna unguiculata* L. Walp) in Anyigba environment of Kogi state, Nigeria

Musa Umaru Tanko, Momohjimoh Yusuf

Department of Crop Production, Kogi State University, Anyigba, Kogi State, Nigeria

Article published on August 30, 2017

Key words: Improved variety, Local variety, Grain yield, Pod yield, Number of seeds/pod, Number of pods/ plant, Pod length.

Abstract

Thirty lines of cowpea which consisted of ten local and twenty improved entries were collected from Anyigba environment, Institute for Agricultural Research (IAR), Ahmadu Bello University (ABU) Zaria and International Institute for Tropical Agriculture (IITA) Ibadan for a field experiment to determine the yield performance of the local lines in relation to its improved counterpart during the raining season of 2016. A t-test showed that all characters measured were not statistically significant at 5% level of probability. The mean yield obtained from improved varieties (808.02kg) was though numerically higher by 3.80 % than its local counterparts (778.72kg), this was however not statistically significant. Mean differences of 54.76kg/ha (5.30%), 0.35seeds (3.30%), 0.40pods (4.44%) and 0.21cm (1.46%) was obtained for Pod yield, Number of seeds per pod, Number of pods per plant and Pod length respectively. These were not statistically significant at 5% level of probability. Analysis of variance (ANOVA) conducted for all the varieties showed significant differences (P≤0.05) in individual yield performances. The highest seed yield of 1.147tonha-1 was obtained for IT89KD288, while a least seed yield of 600kgha-1 was obtained with Sampea-5.

* **Corresponding Author:** Musa UmaruTanko ✉ adavize70@gmail.com

Introduction

Cowpea is of major importance to the livelihoods of millions of relatively poor people in less developed countries of the tropics (FAO, 2002). Islam *et al.* (2006) emphasized that all parts of the plant used as food are nutritious providing protein and vitamins, immature pods and peas are used as vegetables while several snacks and main dishes are prepared from the grains (Duke, 1981; Bittenbender *et al.*, 1984).

Egho (2009) reported that Nigeria is the 2nd greatest consumer of cowpea in the whole world. Among the legumes, cowpea is the most extensively grown, distributed and traded food crop consumed, more than 50% (Philips and Mc Walters, 1991; Ogbo, 2009: Agbogidi, 2010a).

Cowpea is an ancient food crop whose origin is reported to be Africa, Nigeria and Ethiopia, Asia-Hindustan and even South America. It is now widely distributed throughout the tropics and it's an important food legumes crop in Africa, south of Sahara particularly in the West African savanna zone. African in fact produces about 95% of world crop in Nigeria, Niger, Upper Volta and Uganda being more important producing countries. Outside Africa, cowpea is also grown in Asia, Especially India, Australia, the Caribbean, the southern U.S.A and the low-land and coastal areas of south and Central America. Nigeria is the biggest producer of cowpea in the world having about 55% of the total 7.7 million hectare worldwide cowpea (Daisy E. Kay 1979).

The use of local or unimproved cowpea varieties is still very common among farmers. These varieties are photosensitive, low yielding, spreading and long seasoned. They flower about the end of September which coincides with the end of rains and consequently there is very low moisture in the soil to sustain stable high grain yield. Most of the photosynthates are diverted to the production of vegetative parts and very little to grain formation there by resulting to poor yield per area. Pods and flowers are hidden by the heavy foliage which makes it possible for direct contact with.

Insecticides for effective pest control and harvesting yield potential is high averaging 1.5-3.0tons/ha (Warni, 1979), but actual yield are the world lowest, averaging 0.2-0.3tons/ha. The current agronomic practices such as plant population, maintenance of soil physical properties and fertility, weed control and cropping patterns strongly influence yield of cowpea. Advances in crop breeding have made it possible to develop new varieties which are resistant to pest and diseases, and can withstand environmental stress for optimum growth and yield.

From the analysis of local farming system, there are emerges leverages point for introduction of short-season high yielding cowpea varieties. These are cowpeas which are favoured food for the rural population.

Although there is a great potential for cowpea production in South Western Nigeria, the yields obtained by farmers are generally low due to high level of diseases and pest infestations (Asiwe, 2007), lack of knowledge of good cultural practices, use of local varieties which are generally low yielding coupled with low soil fertility and weed management problem.

Variety has always been one of the most intriguing factors looked out for by breeders when improving on crops. The varietal characteristic of a crop is a function of its growth behaviour, adaptation and yield.

Series of researches have shown that improved varieties are often more productive and high yielding, early maturing, and resistant to drought and Striga among others when compared with their local counterparts. This help to enhance farmers' productivity and income IITA (1990). Therefore this research seeks to look at the relative performance of local varieties of cowpea Vs improved ones.

Materials and method

Experimental materials

Thirty cowpea lines were collected from Anyigba Environment, institute for agericultural research (IAR), Zaria, and international institute for tropical agriculture (IITA), Ibadan for the field experiment.

S/No	Variety	Collection Centre
1.	IT90K277	IITA
2.	IT89KD288	IITA
3.	Ife-Brown	IITA
4	Kwana	Local (Anyigba)
5	Egwa-kpipa	Local (Anyigba)
6	IT94K440	IITA
7	Sampea-4	IAR
8	Dan potiskum	Local (Lokoja)
9	Sampea-7	IAR
10	ITA81D994	IITA
11	Eleje	Local (Anyigba)
12	IT84S2246-4	IITA
13	Sampea-6	IAR
14	Sampea-1	IAR
15	Sampea-9	IAR
16	IT86D721	IAR
17	Dan-mitsira	Local (Lokoja)
18	Pama	Local (Anyigba)
19	IT82S-124	IITA
20	IT90K76	IITA
21	Sampea-5	IAR
22	TVX3236	IITA
23	Dan-zamfara	Local (Lokoja)
24	IT93K452-1	IITA
25	Sampea-2	IAR
26	IT89K349	IITA
27	Sampea-8	IAR
28	IT88D867-11	IITA
29	Dippa	Local (Anyigba)
30	Tchad	Local (Anyigba)
	Total	30

Land preparation

A 0.5ha of land was acquired cleared, ploughed harrowed, and ridged at 0.75m spacing at the Kogi State University Research farm.

Experimental design

A randomized complete block design with three replications was used. Each replication was subdivided into three blocks to reduce intra-block variation each block consists of 10 plots with each variety occupying a plot within a replication. Each plot was separated from its adjacent plot by a distance of 0.5m. Two ridges discard was used to separate each replication.

Sowing

Eachvariety was allocated to each plot by means of random number system. This is to remove bias in the allocation of the treatments. Sowing was done on 15th August 2016. Three seeds were sown per hill and were later thinned to two, two weeks after germination. A planting depth of 2cm deep, and inter by intra row spacing of 25cm × 75cm (106, 667 plants/ha respectively)

Cultural practices

Fertilizer application

Single superphosphate (SSP) was applied basally at the rate of 37.5kg P_2O_5/ha. This is equivalent to 156.2g SSP (18% P_2O_5) per plot.

Weeding

This was carried out manually at four weeks after sowing to suppress competition resulting from weed interference.

Insect/Disease Control

Insect/pest was controlled using Cypermetrin (10EC) and Dimenthoate (40EC) each at the rate of 1litre/ha. Spraying was carried out twice during vegetative stage of the crop and at weekly interval from the onset of flowering. A combination of Benlate + Dithane M-45 was sprayed (15g a.i/ha) 3times during the growing period to control fungal and bacterial diseases.

Data collection

i. Data on the following characters was collected on individual basis;
ii. Yield: (weight of grain/seed in g/plant).
iii. Number of seeds per pod: total number of seeds/plant divided by the number of pods/plant.
iv. Number of pods/plant: total number of matured pods/plant at time of harvest.
v. Pod yield: (weight of empty pods in g/plant).
vi. Pod length: total lengths of the pods from the peduncle to the tip end averaged over number of plants.
vii. Days to first flowering: number of days from sowing to the day of first bud opening.

viii. Plant height: the heights of plants using a meter rule were taken from the base of the plant to the terminal bud end at full maturity.

ix. Number of branches per plants: the total number of branches produced/ plant was averaged over the total numbers of plants.

x. Days to maturity: number of days from sowing to the day when 90% of pods turn brown.

xi. Days to 50% flowering: this is the number of days from sowing to the day at which ≥50% of the buds opens.

Note: All growth parameters taken were averaged over three tagged plants.

Analysis of data

Data collected were subjected to Independent Sampled t-test' for comparative yield performance of the 'Local Vs Improved' varieties of cowpea as described by Welch (1947). Furthermore, analysis of variance (ANOVA) was also carried out on the grain yield for detecting the real differences among the treatment means as described by Snedecor and Cochran (1976).

Result and discussion

Table 2 shows the results of the comparative performance of some Local Vs Improved varieties of cowpea in Anyigba environment.

The Unpaired t-test used shows no predicted direction. Also unpaired t-test was used due to the unequal distribution of samples which include local and improved varieties (Local varieties =10entries, Improved varieties= 20 entries). The result obtained for grain yield shows that there exist no significant differences between yields obtained among the two varieties in Anyigba. The mean yield with improved varieties (808.02kg) was though numerically higher by 3.80 % than the yield obtained with their local counterparts (778.72kg). However, t-test have shown that this yield is not significantly different (P≥0.05) at 5% level of probability; the infinitesimal difference observed is not real perhaps, due to chance.

Table 1, shows the pooled grain yield between local and improved varieties as subjected to analysis of variance (ANOVA), it can be seen that yields obtained among improved varieties are significantly not different (P≥0.05) within the sampling periods, this is the same case as seen among their local counterparts.

As represented in figure 1, lines which represent the yield obtained from the two groups of varieties are intercepted across various points, showing that they have virtually same potential for grain yield and are thus statistically at par with one another.

Table 1. Pooled grain yield of Local and improved varieties of cowpea as subjected to ANOVA.

S/No	Improved Variety	Yield (kg/ha)	S/no	Local variety	Yield (kg/ha)
1.	IT90K277	880.00^{abc}	1.	Kwana	813.00^{abc}
2.	IT89KD288	1147.00^{a}	2.	Ife-Brown	920.00^{abc}
3.	IT94K440	720.00^{abc}	3.	Egwa-kpipa	1000.00^{ab}
4	Sampea-4	1027.00^{a}	4.	Dan Potiskum	707.00^{abc}
5	Sampea-7	760.00^{abc}	5.	Dan-mitsira	720.00^{abc}
6	ITA81D994	630.00^{c}	6.	Eleje	613.00^{c}
7	IT84S2246-4	906.70^{abc}	7.	Pama	840.00^{c}
8	Sampea-6	866.67^{abc}	8.	Dan-zamfara	733.30^{abc}
9	Sampea-1	893.30^{abc}	9.	Dippa	733.30^{abc}
10	Sampea-9	840.00^{c}	10.	Tchad	706.70^{abc}
11	IT86D721	680.00^{bc}		LSD	340.10
12	IT82S-124	853.30^{abc}		S.E	±114.31
13	IT90K76	746.70^{abc}		C.V (%)	21.5
14	Sampea-5	600.00^{c}			
15	TVX3236	853.3^{abc}			
16	IT93K452-1	720.0^{abc}			
17	Sampea-2	693.30^{abc}			
18	IT89K349	853.3^{abc}			
19	Sampea-8	800.00^{abc}			
20	IT88D867-11	693.30^{abc}			
	LSD	340.10			
	S.E	±114.31			
	C.V (%)	21.5			

Means followed by the same letter(s) within agronomic characters are not significantly different at 5% level of probability using N-DMRT.

Other characters such as pod yield, number of seed/pod, number of pods/plant and pod length were statistically not significant at 5% level of probability (table 2). However mean differences obtained with these characters were too infinitesimal to justify true mean difference between local and improved lines of cowpea tested in the environment.

These observations may be unconnected with the fact that these varieties may have had close genetic heritability, widely gapped phenotypic variance, high resistance to pest and diseases, environmental adaptability and thus behave alike. These varieties which consisted of local and improved have their local varieties which have lost their names to farmers as they were originally improved varieties introduced into the environment long time ago (Musa personal communication, Anonymous (1992). Leleji (1975) had earlier ascertain that since cowpea is a self-pollinating crop, there is every tendency that the seed can be maintained for a long generation with minimal contamination, thus it follows that the originally improved cowpea. varieties which had earlier lost their names have maintained their seed vigor despite the fact that they are being given local names by resident farmers. The non-significant differences obtained across all the characters measured for both improved and local varieties supports Nwofia *et al.,* 2012 findings which suggested the possibility of improving cowpea traits through genotypic selection studies as he found significant differences between local and improved cowpea varieties in 2010 and 2011 respectively.

The observed performance in both improved and local varieties shows close similarities in the anatomical, morphological and physiological structures which made these varieties readily able to absorb nutrients and water from the soil, carry out effective photosynthetic process and able to store photosynthates. This observation supports the earlier reports of Agbogidi and Ofuoku (2005) that plants respond differently to environmental factors based on their genetic makeup and their adaptation capability indicating that variability among species.

Table 2. Independent sample t-test for Comparative performance of Ten Local and Twenty Improved Cowpea Lines in Anyigba environment.

Characters	Samples	Sample size (N)	Sample mean	Standard deviation	Mean difference	SE difference	DF	Tα 0.05	
								cal	tab
Grain yield	Improved varieties	20	808.02	132.93	29.30	49.36	28	0.594^{NS}	2.048
	Local varieties	10	778.72	115.03					
Pod yield	Improved varieties	20	1089.41	237.793	54.76	473.27	28	0.116^{NS}	2.048
	Local varieties	10	1034.65	215.738					
Number of seeds/pod	Improved varieties	20	10.65	1.23	0.35	0.48	28	0.73^{NS}	2.048
	Local varieties	10	11.00	1.33					
Number of pods/plant	Improved varieties	20	9.40	1.64	0.40	0.69	28	0.58^{NS}	2.048
	Local varieties	10	9.00	2.06					
Pod length	Improved varieties	20	14.59	0.93	0.21	0.35	28	0.59^{NS}	2.048
	Local varieties	10	14.39	0.81					

NS: not significant at 5% level of probability.

The result of the t-test also conforms to Nwofia *et al.,* 2012 who found that the genotypic variances were lower than the phenotypic variances in all the traits of cowpea varieties which he studied, this indicate their similar interaction with the environment. Fig. 1-5 shows the behaviour and response of the varieties with respect to yield among various characters measured.

The improved varieties seem to follow the same trend just as the local varieties this fluctuation and inconsistency which the two groups of lines exhibited is an indication that they have close genotypic/phenotypic heritability and little or no contrasting traits required for growth, yield and environmental adaptation.

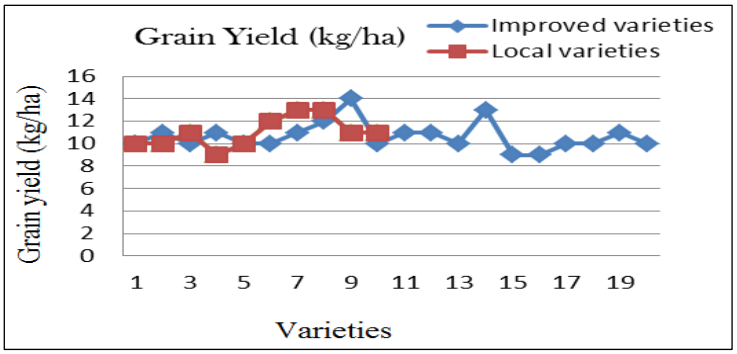

Fig. 1. Grain yield of Local Vs Improved cowpea variety.

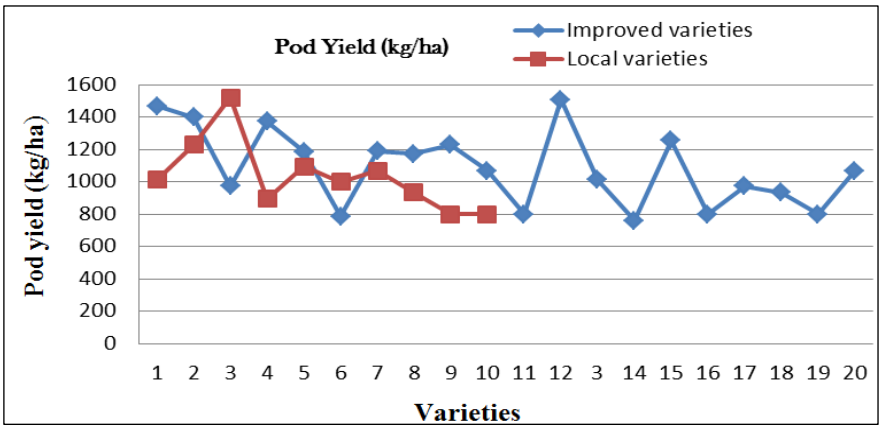

Fig. 2. Pod yield of Local Vs Improved cowpea varieties.

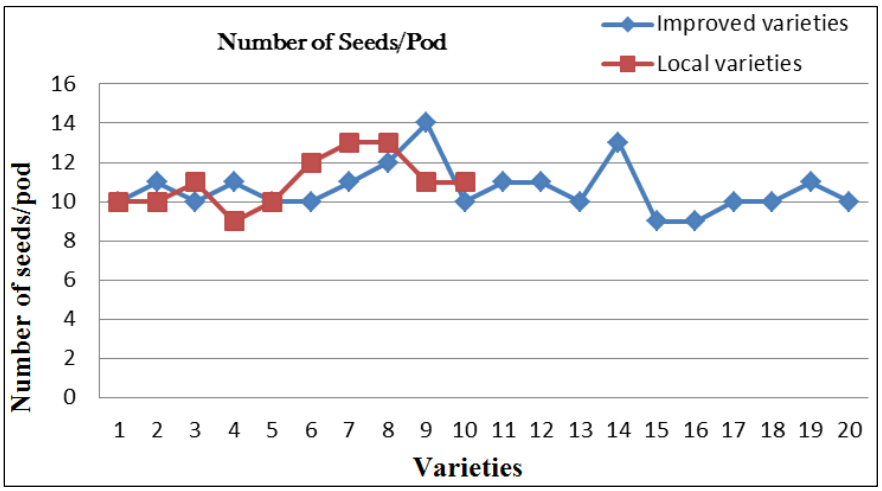

Fig. 3. Influence of Local Vs Improved cowpea varieties number of seeds/pod.

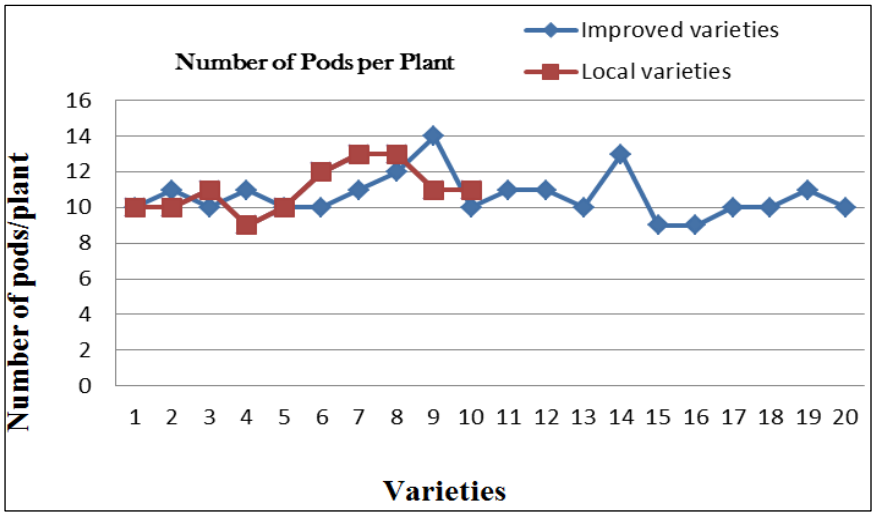

Fig. 4. Influence of Local Vs Improved cowpea varieties on number of pods per plant.

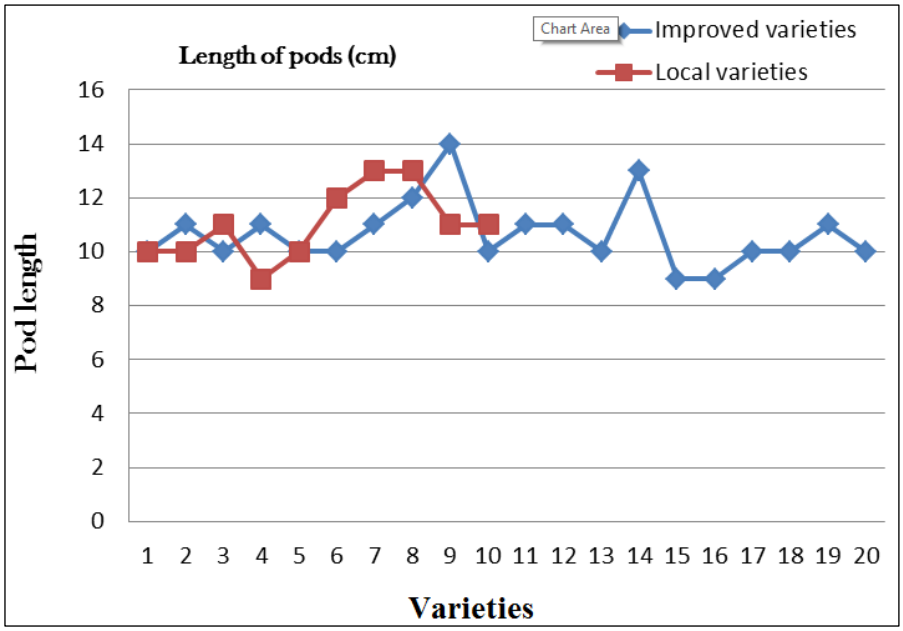

Fig. 5. Influence of Local and Improved varieties of cowpea on length of pods.

Conclusion

From the study carried out, the following can be deduced; That an average maximum yield of 1027kg/ha was recorded for sampea-4 (Improved) and a least yield of 613kg/ha for Eleje (Local). Also, the average grain yield of 808.02kg/ha and 778.72kg/ha for improved varieties and local varieties of cowpea was obtained in Anyigba environment. Though improved varieties were higher in yield than their local counterparts were mere due to chance. The so-called local varieties may not after all be local as evident by yield, growth and flowering characteristics. From the fore-going, therefore, the 'Local' varieties grown in Anyigba could be improved varieties that must have lost their names and identity introduced during the early Anyigba Agricultural Development Project (A.A.D.P)

References

Agbogidi OM, Ofuoku AU. 2005. Response of sour sop (*Annona muricata* Linn) to crude oil levels Journal of Sustainable Tropical Agricultural Research **16,** 98-102.

Agbogidi OM. 2010a. Screening six ciltivars of cowpea (*Vigna unguiculata* (L.) Walp) For adaptation to soil contaminated with spent engine oil Journal of Environmental Chemistry and Ecoloxicology **7,** 103–109.

Anonymous. 1992. Introduction to on-farm adaptive research in Igala land, in developing on-farm research. The board picture by Nora Me Namara and Stephen Morse (Idah Diocesan development series) 76-81.

Asiwe JAN, Kutu RF. 2007. Effect of plant spacing on yield weeds insect infestation and leaf bright of Bambara groundnut. Proceedings of African Crop Science Society **4,** 1947-1950.

Bittenbender HC, Barret RP, Indire-Lauvsa BM. 1984. Beans and cowpeas as leaf vegetables and grains legumes. Monograph No. 1 Bean/Cowpea Collaborative Research Support Programme. Michigan State University, East Lansing.

Daisy EK. 1979. crop and product digest NO.3, Food legumes. Published by tropical product institute, London 86-99.

Egho EO. 2009. Control of major insect pests of cowpea (*Vigna unguiculata* (L.) Walp using conventional and non-conventional chemicals. APHD Thesis submitted to the Department of Agronomy, Delta State University, Asaba Campus 224p.

FAO. 2002. Summary report, Rome World Agriculture: towards 2015/2030.

IITA. 1990. "Advanced research confronts intractable cowpea pests", Gatisby Cheritable Foundation: Agricultural Research Project.

Islam S, Cowmen RC, Ganer JO. 2006. Screening for tolerance of stress temperature during germination of twenty-five cowpea (*Vigna unguiculata* L. Walp) cultivars. Journal of Food, Agriculture and Environment **4(2),** 189-191.

Leleji OI. 1975. Inheritance of three agronomic charcters in cowpea *(Vigna sinensis* L. Savi*)* Madras Agricultural journal **62,** 95-97.

Nwofia GE, Nwanebu M. Agbo CU. 2012. Variability and Inter- Relationships Between Yield and Associated Traits in Cowpea (*Vigna unguiculata* (L.) Walp as Influenced by Plant Populations. World Journal of Agricultural Sciences **8(4),** 396-402.

Ogbo EM. 2009. Effects of diesel fuel contamination on seed germination of four crop plants-*Arachis hypogaea*, *Vignia unguiculata* Sorghum bicolorand Zea mays. African Journal of Biotechnology **8(20), 250-253.**

Philip RD, Mc Watters KH. 1991. Contribution of cowpea to nutrition and health. Food Technology **9,** 127-130.

Snedechor GW, Cocheran WG. 1976. Statistical methods; 6th Ed. IOWA State Univ. press Ames, IOWA USA.

Warni CM. 1979. Review of cowpea yield potential in coast province, Kenya. In IITA first Annual Research Conference 15-19.

Welch BL. 1947. Generalization of 'students' problem when several different population variances are involved. Boimetrika **34(1-2),** 28-35.