THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Evaluation of Different Varieties of Cowpea (*Vigna unguiculata.*) in Sudan Savanna of Borno State

Dalorima T. L.
Assistant Lecturer, Ramat Polytechnic Maiduguri, Maiduguri Borno State. Nigeria
Waziri A.
Assistant Lecturer, Ramat Polytechnic Maiduguri, Maiduguri Borno State. Nigeria
Mohammed T.
Assistant Lecturer, Ramat Polytechnic Maiduguri, Maiduguri Borno State. Nigeria
Kyari Z.
Assistant Lecturer, Ramat Polytechnic Maiduguri, Maiduguri Borno State. Nigeria

Abstract:
A field experiment was conducted at the Teaching and Research Farm Faculty of Agriculture opposite CADZ University of Maiduguri ($11^0$53N; $13^0$16E) during the raining season of 2010 to evaluate different varieties of cowpea in Sudan Savanna of Borno State, Nigeria. The Trail consisted of six (6) treatments, viz; Borno State Agricultural Development Program (BOSADP) Maiduguri. The treatments were each replicated three times and laid out in a Randomized complete Block design (RCBD). The plot size 4 x 3m given a gross plot size of 12m^2. Data were collected on growth and yield parameters. The result showed that the improved varieties produced significantly higher number of branches/plot, number of plant/plot, early days to 50% germination, earlier days to 50% flowering, higher pod yield/plot (g), more number of seed/pod, greater seed yield kg/ha per plot an matured earlier than their local counterparts. However, the local variety produced significantly heavier grain, took more days to reach first and 50% flowering and matured later than the improved varieties in the field trial. The result of the study reveals that cowpea grain/ha was highly and positively correlated with pod yield/plot, seed yield kg/ha per plot, number of plants/plot, number of branches/plant and number of seed/plot. It is recommended that IT 90K-82-2 which gave highest grain yield of 694.4kg/h followed by IT89KD-391. However IT97K-499-35 for earliness especially in drought prone areas.

Keywords*: cowpea, varieties, evaluation*

1. Introduction

Cowpea, *Vigna unguiculata* (L) Walp, also know as black eye pea or southern pea, is a grain crop cultivated in a range of ecologies especially in the Savanna regions and in the tropics and subtopics (Singh et al., 1990, Anon, 2008) cowpea, also popularly called "beans" is mostly grown in dry areas along with millet (*Pannisetum glaucum (*L) R. Br.), sorghum bicolor (1) Monench and maize (Zea mays). It is though that the origin of the cultivated species of cowpea is Africa (Gibbon and Pain, 1988).

Cowpea is a legume of significant economic important worldwide. It is grown in North and South America, Africa, Europe and Asia, primarily in the semi-arid and humid tropical regions lying between 35^0N and 30^0S of the equator (Timko, 2002) of the worlds total production area of about 14 million hectares or 64% and 3 million tons of production (FOA, 2000: Singh, 2007). West Africa is the key cowpea production zone, mainly in the dry savannah and semi-arid agro-ecological zones. The principle cowpea production countries are Nigeria, Niger, Senegal, Ghana, Mali, and Burkina Faso (FOA, 2000). Among these countries, Nigeria and Niger are ahead with a production of 2,099,000 and 641,000 metric tones on 5 million hectares and 3 million hectares of land, respectively. Nigeria is the largest cowpea producer in the world and also has the highest level of consumption (FOA, 2000, Sigh, 2007). In Nigeria cowpea is largely grown in the northern part of the country which has savanna type of vegetation and height rainfall (Anon, 2008).

Cowpea is the most important source of nutrition food and fodder in West Africa (Singh, 2007) with about 23-35% protein in its grains, 62% soluble carbohydrates and small amounts of other nutrients (Steels, 1972; Richardo, 1985; Brader, 2002) and relatively free from anti-nutritive factors (Kay, 1979). Cowpea is an important source of qualitative nourishment to the urban and rural poor who cannot afford protein food such as fish, meat and milk products (Brader, 2002; Anon, 2008). It is estimated that cowpea supplies 40% of the daily protein requirement to most people in Nigeria (Mulebe et al, 1997). The seed are sometimes used as coffee substitute and a form is grown in northern Nigeria for a story fibre, which is obtained from the peduncles (Purseglove, 1988). Cowpea are also cultivated for their leafy vegetables which are good source of mineral including iron, calcium, phosphorus and rice (Kay, 1979), green pods for consumption and a green manure when ploughed into the soil (Singh et al, 1990). Cowpea haulms contain 15% protein and constitute a valuable source of folder. Infact the supplementary feeding of

only 20kg cowpea haums per day along with sorghum store to young rams doubled their weight gain compared to feeding them with sorghum stover alone (IITA, 2001). Cowpea also contributes to soil fertility through nitrogen fixation and production of organic matter (Singh et al., 1990). Also, some legumes have the ability to solibilize occuled phosphorus and highly insoluble calcium bounded by root exudates (Ariihari and Ohwaki, 1989). Its other advantages include soil conservation (Stoop and Staveran, 1981), weed suppression (Quin, 1997; Carsky et al., 2003) and pest and disease control achieved by practicing crop rotation. In addition, some cowpea varieties cause suicidal germination of the seeds of Striga hermonthica, a parasitic weed that in pests the cereals, often with devastating effects (Quin, 1997). Cowpea can be grown during any season. A good crop yields about 1.2 to 1.5 tons of grain and 5 to 6 tons of hausm per hectare (Kerala, 2004). According to Henreith et al. (1997) and Van Ek et al. (1997) the bulk of cowpea production in the Sudan Savanna is produced under intercropping with millet and sorghum/cowpea intercrop lies in improving the performance of the cowpea component which include among others, the choice of appropriate genotype. Currently, improved of cowpea have been developed by the international institute of tropical Agriculture (IITA). These varieties are superior to the local cultivate in many respects (high yielding, resistance to major pest and disease, earlier maturity, etc) Singh, (1997). However, with the predominance of intercropping, increasing attention is being given to developing cultivas that can fit well into the sytems. Therefore, this study was undertaken to evaluate improve cowpea variety from the local varieties.
Cowpea can be used at all stages of growth as a vegetable crop. The tender green leaves are an important food source in Africa and are prepared as a pot herb, like spinach. Immature snapped pods are used in the same way as snapbeans, often being mixed with others food. Green cowpea seeds are boiled as a fresh are boiled as a fresh vegetable, or may be carried, or frozen. Dry matters seeds are also suitable for cooking and canning (Magloire, 2005).
Cowpeas are an important source of vitamins B. and protein in Nigeria diet (Nnanyelugo et al., 1977) and also provide income (Onyibe et al., 2006). In Borno State, it is a major cash crop. The dry grains can be made and fried and makes cakes. Cakes "Kosai", or based to make "Moimoi". Cooked cowpea in tomato and oil sauce and seasoned with onions is a delicacy in Borno State. Cowpea can be cooked sin sauce and canned. Cowpea porridge is a food breakfast food that can be taken alone or with bread (Onyibe et al., 2006). Enutritionality, cowpea leaves compared well with other tropical leaf vegetables and with cowpea seeds (Nielson et al., 1997). Its green pods, green peas and dry grains are consumed as food (Onyibe et al., 2006). Because of its superior nutritional attributes, versatility, adaptability, and productivity cowpeas was chosen be the U.S. national Acronautical and space administration as one of the few crops worthy of study for cultivation in space stations (Ehlers and hall, 1997).
Throughout the developing world, there is increasing emphasis on integrating crop and livestock production to promote more sustainable systems. In many areas of the world cowpea is the only available high quality legume lay for livestock feed. Cowpea many be used green or as dry fodder (Magloire, 2005). Cowpea can make a soil, their use as dual-purpose crops providing both grain and fooder haulms which contain about 20% protein with high digestibility and low fibre are used to livestock particularly during the dry season when feeds are scarce. In the dry savannas of West Africa, the mature cowpea pods are harvested and the haulms are cut while still green had rolled into small bundles containing the leaves and vines. These bundles are stored on the roof tops or on the tree forks for use and for sale as "Harawa" (feed supplement), making cowpea haulms the key factors for crop-livestock system. On the dry weight basis, the price of cowpea haulms constitutes an important source of income (IITA, 2008). Cowpea is an important indispensable component for sustainable crop livestock system of the savanna ecology (Oonyibe et al., 2006). It is also used as a green manure crop, a nitrogen-fixing crop or for increasing organic matter and improving soil structure. It has excellent heat tolerance and food drought tolerance. It can also be used for intercropping with the other main crops like pearl millet or sorghum (Magloire, 2005).

2. Objectives of the Study

This research was conducted to evaluate the performance of varieties of cowpea with aim to find variety or varies with maximum productivity and adaptability under the semi-arid condition of Sudan Savanna Borno State.

3. Materials and Method

3.1. Experimental Sites

The research was conducted in the department of crop production teaching and research farm of the University of Maiduguri, Faculty of Agriculture during the 2010 rainy season located in the Sudan Savanna ecological zone of Nigeria (Lat. $12^0$08' N, long $8^0$32'E, 500m above sea level).
The treatment consisted of six varieties of cowpea viz: two local and four improved varieties of cowpea using Randomize Complete Block Design (RCBD)

3.2. Source of Seeds

Seeds were obtained from Borno State Agricultural Development Programme (BOSADP) Maiduguri six different varieties were used as follows: Borno Brown, White Kananado, IT89KD-288, IT90K-81-2.
IT97K-499-35, IT89KD-391 each variety has it own characteristic this goes under three replication under raining season. The extreme variability of the species has led to a number of commercial cultivars found in Borno State Nigeria. Grouped by the variance in bean shape, size and colour.

3.3. Description of the Varieties Used

	Varieties	Seed Colour	Salient Characteristics
1.	Borno Brown	Brown	Prostrate, brown large-sized seeds and high yielding with some level of resistance to aphid thrips, viruses, several diseases. Need three sprays and late maturity and photosensitive.
2	Kanannado	White	Late maturity photosensitive type, large seeds, susceptible to several disease and insects pests, need 3 sprays during flowering and podding.
3	IT89KD-288	White	Semi-erect. Excellent for relay with cereals medium maturity an photosensitive. Medium sized seeds and require at least 2-3 sprays.
4	IT90K-82-2	Brown	Erect and early maturity, resistance to striga, moderately resistance to insects, pest and disease good for the dry season.
5	IT97K-499-35	White	Erect, striga-resistance, medium maturity and photoinsensitive resistance to insect and disease, high grain and fodder yield, medium sized seeds and require at least 2-3 sprays.
6.	IT89KD-391	Brown	Improved Da'ila, early maturity non-photosensitive, medium-sized seeds, with some level of resistance to a phiod, trhips, viruses and several disease, need 2-3 sprays, good for grain yield.

Source: Onyibe et al. (2006)

3.4. Land Preparation

All debris, shrubs and stone were removed from the experimental field. The field was sprayed by herbicide to kill all unwanted plants and later prepared for sowing to ensure the soil for good seed germination and destruction of newly emerged weeds.
During land preparation, shrubs and plant debris were cut down and cleared on the site manually.

3.5. Planting

Planting was done manually on the 10th of August, 2010 in order to avoid excess rainfall for the crop to grow vegetatively without yield. Seeds were sown based on recommended plant spacing among each genotype. Erect and early maturity on spacing of 50 x 20cm, semi-erect to early/medium maturity on spacing of 75 x 20cm, prostrates (creeping) to prostrate of medium/late maturity on spacing of 75 x 30 and 75 x 50cm.
Sowing depth of 2.5 to 5cm for most varieties is recommended planting seeds more than 5cm depth will delay emergence. The seeds may rot and plants stand will be uneven. These to four seeds were sown per hole and later thinned leaving two seedlings per hole at fourteen (14) days after sowing (DAS).

3.6. Weeding

Weeds were controlled manually which is the most common method used by farmers in cowpea production. Weeding was twice with hoe, first at 2 weeks after planting and secondly at 4-5 weeks after planting to ensure a clean field. Poor weed control drastic reduction in yield.

3.7. Spraying

Generally, 2-3 sprays with insecticides are required for a good crop of cowpea, depending on the severity of insect attack and also on the cowpea variety. Late maturity varieties required more sprays than early maturity varieties because of the staggered flowering period. First spraying was conducted between 30 and 35 days (4-5 weeks) after planting when flower but initiation has started. This will control thrips and an early attack of Maruca pod borer and ensure good flowering by landacyhalothrine 25EC (insecticide) at the rate of 35-70ml in 15L Knapsack (CP-15). Second spraying was done 10n days after the first spraying when the crop is in full flowering and podding. Third spraying was also conducted after 10 days of second spraying for medium/late maturity varieties and when there is a heavy attack of maruca and pod buys.

3.8. Striga Emergence and Control

Among the biotic stress, striga gesneriodes (wild) Vatke and Alectra Vogelli (Benth). Obligate root-parasitic flowering plant of the family scrophulariaceae, but striga has a more devastating effect than alectra in most of the field grown to cowpea. Control used is by hand pulling due to difficulty to control because it produces large number of seed and up to 75% of the crop damage is done before it emerges from the ground.

3.9. Harvesting and Storage

Harvesting was done when the pods are fully natured and dry. In early maturity and erect varieties, one picking is sufficient for in determinate and prostrate varieties; dried pods were picked two-these times. The pods do not mature at the same time because of the staggered flowering period.
The harvest crop was stored in the laboratory after cleaning thoroughly before the new crop is loaded only well dried and properly cleaned seed were stored at least less than 10% moisture content.

3.10. Parameters Taken

- **Days to Germination**
  The number of days from planting to 50% flowering was recorded at the time when about half of the total plants in each plot have emerged.
- **Days to 50% Flowering**
  The number of days from planting to 50% flowering was recorded at the time when about half of the total plants in each plot have flowered.
- **Days to Maturity**
  The number of days from planting to maturity was recorded at the time when about 70% of the pods in each plot have matured and charge from green to brown colour.
- **Number of Plants Per Plot**
  The total number of stand in the net plots was counted in the observation plot of flowering.
- **Number of Branches Per Plant**
  The total number of secondary branches borne on the main branches in the observation plot was counted at harvest.
- **Pod Yield Per Plot (g)**
  The pods from each net plot were carefully harvested and placed in well labeled bags and weighed to give the pod yield per plot.
- **Number of Seed Per Pod**
  The total number of seeds from the pods of five stands each net plot were counted, average is recorded as number of seeds per pod.
- **100 Seed Weight (g)**
  100 seed were selected at random from the seed plot of each plot and weighted to get the 100 see weight per plot.
- **Seed Yield Per Plot (kg/ha)**
  The seed yield per plot was obtained after threshing and weighing each net plot. The seed yield per plot was then converted to kilograms per hectare.

3.11. Data Analysis

The data collected were subjected to analysis of variance using randomized complete block design (RCBD). Means were compared using standard error at 5% level of probability.

4. Result And Discussion

Varieties	Days to 50% Germination	Days to 50% Flowering
Borno Brown	3.6	81
Kanannado white	4.3	80
IT89KD-288	3.0	77
IT90K-82-2	3.0	41
IT97K-499-35	3.0	35
IT89KD-391	3.0	40
SE ±	0.60	1.57
LSD	1.09	2.45

Table 1: Shows the performance of different varieties of cowpea on days to 50% Germination and Days to 50% flowering

Table 1 shows the performance of cowpea varieties on days to 50% germination and 50% days of flowering. No significant differences was observed in days of 50% germination except in Kanannado (white) with the mean average of 4.3 and Borno brown 3.6 compared with the improve varieties with the mean average of 3.0.

Result on number of days to 50% flowering showed significant differences on almost all the varieties as influenced by cowpea varieties in combined analysis. The result indicate that the number of days to first flowering in 50% shows Kanannado and Borno brown varieties had significantly longest number to 50% flowering as compared with the improved varieties followed by IT89KD-288 which had significantly longest days among the improved genotype.

Varieties	Number of Plants Per Plot	Number of Branches Per Plant
Borno Brown	50	2.3
Kanannado white	40	2.0
IT89KD-288	110	4.0
IT90K-82-2	132	3.6
IT97K-499-35	110	3.3
IT89KD-391	132	2.6
SE ±	19.10	0.60
LSD	34.38	1.08

Table 2: Shows the Performance of Different Varieties of Cowpea on Number of Plant Per Plot and Number of Branches Per Plant

Table 2 shows the effect on cowpea varieties on the number of plant per plot and number of branches per plant. There were no significant differences in number of plant at harvest among the local varieties but significant differences were observed between the local an improved varieties, this may be due to earliness attributed to suite the growing area.
There was a significant difference on number of branches per plant. IT89KD-288 variety gave the highest number of branches compared with other varieties with mean average of 4.0 followed by IT90K-82-2 with 3.6 and IT97K-499-35 with 3.3. The local varieties consistently produced the lowest number of branches per plant.

Varieties	Pod Yield Per Plot (g)	Number of Seed Per Pod	100- Seed Weight/Plot (g)	Seed Yield kg/ha per plot
Borno brown	0.50	12	23.01	277.8
Kanannado white	0.26	12	24.36	166.7
IT89KD-288	0.73	15	20.52	444.4
IT90K-82-2	1.16	14	16.18	694.4
IT97K-499-35	0.96	14	17.99	500.1
IT89KD-391	1.00	14	15.85	597.2
SE ±	0.35	1.04	1.47	80.26
LSD	0.63	1.90	2.63	144.5

Table 3: Shows the Performance of Different Varieties of Cowpea on Pod Yield Per Plot, Number of Seed Per Pod, 100 Seed Weight and Seed Yield kg/ha Per Plot

The result in table (3) shows the differences among the cowpea varieties on mean average of pod yield per plot, number of seed per pod, 100 seed weight per plot, seed yield on kg/ha per plot which indicated significant differences between the local varieties (Kanannado white an Borno brown) and the improved varieties but shows no significant differences between the improved and local varieties but no significant differences among other improved varieties, so also between with the local varieties 100-seed weight per plot (g) indicate significant differences between the local and the improved varieties. The local variety (Kanannado white) gave the highest 100-seed weight per plot with mean average of 24.36 (g) among the (6) varieties IT89-KD-288 shows significant differences between the improved varieties IT90K-82-2, IT89-KD-391 with the average mean of 20.52, 16.18, 15.85 respectively, but no significant differences with the improved variety IT97K-499-35 with mean average of 17.99. Seed yield kg/ha per plot shows significant differences though they had comparable significant values with IT89KD-391 and IT97K-499-35 in the combined analysis (Table 3).

5. Conclusion

In this study, the improved varieties performed better than the local varieties in the Sudan Savannah zone of Borno State for the improved varieties had significant higher grain yield per plant and per hectare and matured earlier to escape drought in this agro-ecological zone. Among the improved variety, IT90K-82-2, IT89-KD-391 and IT97K-499-35 were outstanding

6. References

1. Anonymous, (2008). Cowpea; Abuja securities and commodity exchange plc. http://www.abujacomx.com
2. Arihari, J. and Ohwaki, Y. (1989). Estimation of available phosphorus in vertisol and alfisol in view of root effects on rhizosphere soil: in XI colloquium on plant nutrition physiology and application, 30th July to 4th August 1989. Wageningen, the Netherlands.
3. Brader, I. (2002). Forward page VI in challenges and opportunities for enhancing sustainable cowpea production, edited by Fatakun, C.A., Tarawali, S.A, Singh, B.B., Kormowa, P.M. and Tamo, M.IITA, Ibadan, Nigeria.
4. FAO, (2000). http://www.fao.org/statistic
5. Gibbon, D. and Pain, A. (1988). Crop of the drier regions of the tropics. ELBS/Longman. 157pp
6. IITA (2001). Annual report, Ibadan, Nigeria, IITA
7. Kay, D.E (1979). Food legumes. Tropical development and research institute London.
8. Muleba, N., C. Dabire, J.B such, Drabo, I. and Ovedraogo, IT. (1997). Technologies for cowpea production based on genetic and environment manipulation in the semi-arid tropics.
9. Onyibe, J.E., Kamara, A.Y and Omoigui, L.O (2006). Guide to cowpea production in Borno state, Nigeria. Promoting sustainable Agriculture in Borno state (PROSAB). Ibadan, Nigeria. 36pp
10. Purseglove, J.P. (1988). Tropical crops: Dicotyledons. ELBS/Longman. 719pp.
11. Quin, F.M. (1997). Introduction pages IX-XV in advances in cowpea research, edited by Singh, B.B, Mohan Raj, D.R., Dasheil, K.E and Jackai, L.E.N. copublication of international institute of tropical agriculture (IITA) and Japan international Research center for Agricultural science (JIRCAS). IITA, Ibadan, Nigeria.
12. Singh, B.B, (2007). Potential and constraits of improved cowpea varieties in increasing the productivity of cowpea cereal system in dry savanna of west Africa pages 14-26 in Majiwa, P., Odera, M., Muchiri, N., Omanya, G. and Werehire, P. A plan to apply technology in the improvement of cowpea productivity and utilization for the benefit of farmers and consumers in Africa: proceeding of cowpea stakeholders workshop. Nairobi Kenya: African Agricultural Technology foundation.

13. Singh, S.R., Jackai, L.E.N., Dos Santos J.H.R and Adalla, C.B (1990). Insect pest of cowpea pages 43-89 in insect pest of tropical food legumes, edited by Singh, S.R. John Wiley and sons ltd, Chichester, England.
14. Steele, W.M (1972). Cowpea in Africa. Doctoral thesis. University of Reading. United Kingdom. In: Magloire, N. (2005). The genetic, morphological and physiological evalaution of Africa cowpea genotypes. Thesis presented in accordance with the requirements for the degree magisters sciential in the faculty of national and Agricultural science, departments of plant science (plant breeding) at the university of the free state, Bloemfontein.
15. Stoop, W.A. and Staveran, J.P. (1981). Effects of cowpea in cereal rotations on subsequent crops yield under semi-arid conditions in upper volta. Pages 653-657 in Biological nitrogen fixation technology for tropical agriculture, edited by Graham, P.C and Harris, S.C center international de Agriculture Tropical (CIAT), Cali Columbia.
16. Timko, M.P (2002). Molecular donning in cowpea: perspective on the status of genome characterization and gene isolation for crop improvement. Pages 197-212 in challenges and opportunity for enhancing sustainable cowpea production, edited by Fatokun, C.A., Tarawali, S.A., B.B., Kormawa, P.M and Tamo MIITA, Ibadan, Nigeria