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Performance of Different Varieties of Cowpea (Vigna Unguiunlata) in Mubi Adamawa State, Nigeria

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Abstract

Field trial was conducted at the research and Teaching Farm of the department of Crop Science, Faculty of Agriculture Adamawa State University Mubi, during 2022 rain fed cropping season to determine the performance of different cowpea varieties in Mubi Local Government Area. Four treatments were used viz; T1 (White kananado) T2 (White iron), T3 (Red kananado) and T4 (Red BOSADP) led in a randomized complete block design (RCBD) replicated three times. Data were collected on a plant height, number of leaves, number of branches, dry matter, pod weight, gain yield, and shelling percentage. The results were subjected to analysis of variance (ANOVA) using Duncan's Multiple Range Test (DMRT). Result revealed that variety has great influence on the performance of cowpea and the need to plant improved varieties is important. Significantly, T2 (White iron) recorded higher pod weight of 12.20g and T3 (Red kananado) the least 10.60g. The result showed that T4 (Red BOSADP) gave the highest grain weight of 607.10g and shelling percentage of 22.48, Farmers in Mubi should therefore, adopt T4 (BOSADP) for high performance in most of the parameters collected compared to other treatments.

Keywords: Cowpea, Farmers, Cropping season, White kananado, Red kananado, Red BOSADP, White iron.

Introduction

Cowpea *(Vigna unguiculata [L] Walp)* is a leguminous, annual, herbaceous legume and an important source of proteins, present in tropical and sub-tropical areas (Behura *et al.*, 2015, Garjani, 2016) Cowpea is adapted to warm weather and requires less rainfall than most crops; (Yoseph, *et al;*, 2014), therefore, it is primarily cultivated in the semi-arid regions of low land tropics and sub-tropics, where so are poor and rainfall is limited (Singh et al., 2003).. The crop is often grown without inputs and consequently the yields are poorer. The average World grain yield is 0.4 tons per hectare. Cowpea is of vital to the livelihoods of millions of people in the semi-arid regions of west and central Africa (Tanko, 2022). It is the most important grain legume crop in sub-Sahara Africa. Cowpea is a protein rich grain that complements staple cereal and starchy tuber crops. It also provides fodder for livestock improves the soil by fixing nitrogen and benefits households by bringing in cash and diversifying source of income. The sale of cowpea stems and leaves for animals feed during the dry season provides essential household income (Khan *et al.*, 2016). Cowpea was said to have originated in Africa and became an integral part of traditional cropping system throughout Africa, particularly in the semi-arid zone of West Africa Savanna (Yoseph, *et al;*

2014) Centres of diversity have been identified in both Africa and Asia; however, the exact region of domestication is still under speculation. Cowpea is a dicotyledonous belonging to the family fabaceae. Of the World total of about eight million hectares, African accounts for six million hectares. Cowpea is important grain legume in West Africa.(Horn & Shimelis, 2020). All the plant parts used for food are nutritious, providing protein, vitamins and minerals. It contains average of 23.25% protein and 50 -60% starch. Besides its health-related benefits, beans are inexpensive, considerably cheaper than rice or any other dietary fibre type. It is a good food security item as it mixes well with other recipe (Agbogidi & Egho, 2012). The plant is favoured by farmers because of its ability to maintain soil fertility through its capacity to fix nitrogen which allows it to grow on an improve poor soils having pH range 4.5 – 9.0, organic matter less than 0.2% and a sand content of more than 85% (Meissner & Żółkoś, 2008). Cowpea is of major importance to the nutrition and livelihood of millions of people in poor Countries of the tropics (Singh *et al.,* 2003). The species can play significant role in food security initiatives aimed at addressing problem of food production in these regions. The crop can be harvested at three stages; Viz: when the pods are young and green, when the pods are matured and green, and when the pods are dry (Da Silva Moraes *et al.,* 2009). The legume is consumed in several ways. The dry seeds are important protein source 22 – 23% protein contents and can be ground into meal which is used in a number of ways. Fresh seeds and immature pods are frozen or canned and consumed as green beans in developed Countries. The young shots and leaves are eaten as leafy vegetable and provide the most widely used pot herbs in tropical Africa which are often dried and can be stored and use in dry season. Cowpea is equally essential as nutritious fodder for livestock (Yoseph, *et al;* , 2014). In West Africa matured cowpea pods are harvested and the haulms are cut whilst still green; these are stored for use and for sale as livestock feed supplement in the dry season (Da Silva Moraes et al., 2009). The specie can also be used as a green manure or cover crop. The seed are also used as coffee substituents Cowpea also has the ability to be intercropped with cereals such as millet and sorghum. Coupled with these attributes, (Agbogidi & Egho, 2012)its quick growth and rapid ground cover have made cowpea as essential component of sustainable subsistence agriculture in marginal lands and drier region of the tropics, where rainfall is scanty and soils are sandy with little organic matter ((Singh et al., 2003). However, most of the World's cowpea is grown primarily in dry regions where drought is prevalent among several yield reducing factors (Hayet et al. 2021). Regions where cowpea is highly cultivated, such as sub-Saharan Africa, overlap with areas predicted to suffer from increased food insecurity due to climate change. Among the expected effects are more extreme weather events, including deeper and longer droughts and increased heat. (Hayet et al., 2021). Cowpea is grown in the arid and semi-arid regions of the world including Asia, Africa, Asia, Southern Europe and Central and South America. Cowpea used as staple food crops for humans in low income arid-regions and also it improves soil amendments. Being a drought tolerant and hot weather crop, cowpea is well adapted to the well, (Khan et al., 2016), observed that the rainfall requirement for cowpea in South Africa can be as low as 300mm, spread over the growing

season. In the Sahel Region, yields of up to 1000kg/ha have been recorded under condition of limited moisture 181 mm per year, and high temperatures. Yields are reported to range between 2500 kg/ha in Southern Africa to 400 kg/ha at the International Institute of Tropical Agriculture (IITA) Ibadan, Nigeria. In Nigeria, Adamawa State is one of the major cowpeas producing State. Although cowpea is an important crop, not many countries have initiated cowpea improvement programme (Singh et al., 2003).. No recent reliable data on global cowpea production can be found since FAO stopped publishing cowpea statistics (Barzegar *et al.,* 2006)The production data for cowpea is pooled with that of common bean.. However, it is estimated that the World wide area under cowpea is about 14 million hectares with over 4.5 million tons annual production (Singh et al., 2003).. More than 60% of the production and 75% of the area is spread over the arid and semi-arid regions of sub-Saharan Africa (Behura et al., 2015). The success of most of the cowpea improvement programmes largely depends upon the genetic variability and heritability of desirable traits. It has been shown that most legumes including cowpea have lost many alleles for high production, seed quality and pest disease resistance in the process of adaptation to environmental stress (Yoseph, *et al;* 2014). Cowpea are grown under both irrigated and non-irrigated requires. The crop response positively to irrigation, but will also produce well under dry land conditions. It is more drought resistant than common bean. Drought resistant is one reason that cowpea is such an important crop in many under developed parts of the World. If irrigation is used more vegetative growth and some delay in maturity may result. Application rate should insure that the crop is not over crowded, especially in northern latitudes (Yoseph, *et al;* 2014).Fifty-two percent of African's production is used for food,13% animal feed, 10% for feed, 9% for other uses and 16% is wasted (Barzegar et al., 2006). An estimated 14.5 million hectares of land is planted to cowpea each year Worldwide. Global production of dried cowpea in 2010 was 5.5 million metric tons. Africa was responsible for 94%. Nigeria is the largest producer, followed by Burkina Fasso, Cameroun and Mali. The average yield Worldwide is estimated at 450 kilograms per hectare, the lowest of the major tropical grain, legumes. An estimated 3 million households (194 million people) grow cowpea in Sub-Saharan Africa, but productivity has not been seen sustained growth over the last two decades, total area yield and production grew by 4.2%, 1.5% and 5.0% respectively (Horn & Shimelis, 2020; Haruna & Abimiku, 2012). We therefore, looked into the significance information on the performance of specific local cowpea varieties and also the variety that gives better yield to farmers in Mubi Local Government of Adamawa State – Nigeria.

Materials and Methods

The experiment was conducted at the Research and Teaching Farm of the department of Crop Science, Faculty of Agriculture, Adamawa State University Mubi.

Mubi town is located between Latitude 10°16'8"N and 10°20'00"N as well between Longitude 13°16'14"E and 13°20'00"E. Temperature in Mubi is normally warm throughout

the rainy season, minimum temperature could be as low as 12°c and can go as high as 37°c, the mean annual rainfall is 1000 mm (Adebayo et al., 2012).

Mubi is bordered by Michika Local Government Area to the North, Mandara mountain of Cameroun to the east, Askira/Uba to the west and Hong and Maiha local govern areas to South. Mubi has a population of 225,721 (NPC 2006) and has a total land area of 25 km² (2,500 hectares) including the floodable areas, rivers, and streams. Figure 1 describes the location of Mubi in Adamawa State and at national level (Nigeria) as well as the international cattle routes, currently cattle market and the location of the proposed one. Mubi is a commercial town owing to its location on the border, many individuals from Nigeria and the neighbouring countries namely Cameroon, Chad, and Central Africa coming to make purchases in Mubi market and the cattle market, as well,. (Joshua *et al.*, 2018) This study was to determine the performance of cowpea varieties during the 2023 rain fed cropping season. The experiment was conducted between the months of August to December 2022.

Land Preparation

The materials used were cutlass for clearing, Axe for cutting stubborn shrubs, tractor for ploughing, hoe for leveling of the land and sowing, pegs and tread for farm layout, wood used for demarcation of plots, others include rope, meter rule and tape for measurements. The land was cleared, ploughed and harrowed in order pulverize the soil. Leveling was carried out at later using hoe. The site was marked out into blocks and plots in a randomized complete block design (RCBD) replicated three times and each replicate has four plots. Each replication was separated with pathway of 1M and later plot pathway of 0.5M. Total trial area was 19M x 16M (304 M²).

	R1	**R2**	**R3**
	T1	T2	T4
19.0M	T2	T1	T3
0.5M			
	T3	T4	T1
T4	1.0M T3		T2
16.0M			

Fig.1 Field layout experimental designs

Key: R – Replication, **T** – Treatment, **T1 –** White kananado, **T2 –** White iron, **T3 -** Red kananado, **T4 –** Red BOSADP.

Source of seeds; the cowpea seeds were obtained locally in Mubi markets and its environs.

Sowing and Spacing; sowing of the cowpea cultivars was done in August. The same spacing pattern will be adopted at 90 x 30 cm.

Weed control; Weeding was carried out three times during the research period to reduce weed competition on the growth and development of the crops and to keep the farm neat.

Application of insecticides in kilogram; Insecticides were applied at 8 – 12 weeks after sowing against natural enemies at the interval of four days. The insecticides applied were, Lara force, Best, Attack and shape shooter respectively.

Harvesting; Harvesting were carried out manually by hand picking at 12 weeks after attaining physiological maturity.

Data collection; Data were collected on the following parameters.

Plant height; The height of four randomly selected plants using meter rule, from the ground level to the top of the plant in each plot at 12 weeks after sowing (WAS). The mean of the plant height was computed and recorded.

Number of leaves; the number of leaves for four randomly selected plant were counted in each plot at 12 WAS. The mean was computed and recorded.

Number of branches; this was done by counting the branches of each tagged plant and the mean was computed and recorded.

Dry matter; Four samples were uprooted from each plot in the net plot at 12 WAS. The sample was to screen house for constant dry weight and the mean of the dry matter was computed and recorded.

Pod weight; Ten samples were randomly collected and their yield weighed and average taken as pod yield.

Grain yield; Yield of four randomly selected pants were taken, average and converted into grain yield per hectare.

100 Seed weight; It was done by counting 100 seeds from every treatment, and weighed to determine the 1000 weight.

No. of seed pod; Ten pods were counted from each plot and the seed counted as No of seed pods.

Shelling percentage; Weight of grain times 100 divided by weight of pod.

Statistical Analysis;

Data collected were subjected to analysis of variance (ANOVA). Differences among treatment means were compared using the least significant difference (LSD) and Duncan's Multiple range Test (DMRT) at 5% level of probability.

Results

The effect on plant height, number of leaves, and number of branches of cowpea are presented in Table 1. No significant difference was observed among the varieties 12 WAS, although, T 2 recorded the tallest height of 158.81 cm and T1 recorded the least height of 123.37 cm. Similarly, there was no significant difference to number of leaves among treatment at 12WAS. The height number of leaves 126.42 was recorded with T1. This was not the case with number of branches at 12 WAS, where T3 gave 12.08 as the highest and T2 recorded 10.67 as the lowest, but structurally, did not differ.

Table 1. Effect of varietal differences on plant height, number of leaves and number of branches of cowpea.

Treatment	Plant height (cm) 12WAS	Number of leaves 12WAS	Number of branches 12WAS
T1	123.37	92.95	11.17
T2	158.81	119.25	10.67
T3	138.66	116.67	12.08
T4	153.10	126.42	11.42
SE ±	2.895	2.757	0.691
LSD (0.05)	NS	NS	NS

Note: mean with the same letters are not significantly different [Duncan's Multiple Range Test (DMRT) P ≤ 0.05]

The effect of varietal difference on dry matter, crop growth rate and pod weight of cowpea is presented in Table 2. Statistically, no significant difference was recorded among all the treatment, but T3 (Red kananado) higher dry matter of 58.49 g with T2 (White iron) recording 32,22 g. Similarly, no statistical difference was observed among all the treatments of crop growth rate. Higher crop growth rate of 131.25 was recorded with T1 (White kananado) with T2 (White iron recording the least crop growth rate of 116.42. There was statistical difference among all the treatments as regards to pod weight. T2 (White iron) recorded higher pod weight of 12.20g and T3 (Red kananado) recorded statistically (p = 0.05) the lowest pod weight of 10.60g. This type of result might be attributed to differences recorded among all treatments which could be due to the differences in their growth habit and requirements for growth resources.

Table 2. Effect of varietal difference on dry matter, crop growth rate and pod weight of cowpea.

Treatment	Dry matter	Crop growth rate	Pod
T1	45.59	131.25	11.63
T2	36.22	116.42	12.20^{ab}
T3	58.49	124.37	10.60^{a}
T4	56.94	130.15	12.13^{a}
SE ±	1.847	4.459	6.455
LSD (0.05)	NS	NS	NS

Note: means with the same letter Are not significantly different [Duncan's Multiple Range Test (DMRT) P ≤ 0.05]

The effect of varietal difference on seed per pod, 100 seeds weight, grain yield and shelling percentage is presented in Table 3. Analysis of variance revealed that, there was no significant (p = 0.05) difference for seed per pod was recorded due to the treatment effect. However, T3 recorded the least seed per pod of 15.98g, and T4, 18.18g recorded the highest seed per pod. Statistical difference among all the treatments was recorded with 100 seed weight; with T3 recording statistically least 100 seed weight of 178.35g, and T1 also statistically is recording the highest 100 seed weight of 577.68g. Significant (p = 0.05) difference due to treatment effect with grain weight of (g) with T4 recording the highest grain weight of 607.10g and T3 statistically recorded the least grain weight of 225.40g. No significant (p = 0.05) difference was observed due to varietal difference with shelling percentage, but T4 maintained a higher shelling percentage of 22.48 as compared to other treatments with T3 recording the least shelling percentage of 16.68 compared to other treatments.

Table 3: effect of varietal difference on seed / pod, 100 seed weight, grain weight and shelling %.

Treatment	Seed/Pod (g)	100 seed weight (g)	Grain yield Kg/ha	Percentage
T1	17.63	577.68	50.358^{a}	18.18
T2	17.80	297.09	30.533^{bc}	18.94
T3	15,95	178.35	18.783^{c}	16.68
T4	18.18	421.23	50.597^{ab}	22,48
SE ±	0.556	0.853	5.293	1.287
LSD (0.05)	NS	*	*	NS

Key: T =Treatment, T1 = White kananado, T2 = White iron, T3 = Red kananado, T4 = Red BOSADP, SE = Standard error, LSD = least significant difference, * = significant and g = gram.

Discussion

In general, the result of this study clearly brought out the fact that the degree and trend in plant height varied with varieties. Such results re not unsual and have been reported by several researchers (Lim et al., 2017) (Pal, *et al;* 1983, Olufajo and Pal 1991) in tropical climate. Higher number of pods were were recorded with T1 –White Kananado and T4 = Red BOSADP more than other treatments. This was in line with the findings of (Nadi and Lazim 1974) who attributed the also reported that, yield was directly influenced by seed weight and followed by number of pods/plants. The higher grain yield produced by T4 =Red BOSADP may be due to varietal influence. This finding is supported by (Roheja 1986), who found that improved varieties of cowpea are early maturing photoperiod sensitive with high yield potential even with less rainfall. Cowpea varieties have varied degree of yield despite the high yield potentials of improved varieties, their adoption by farmers may be of concern. For (Kamara *et al;* 2010) reported that despite the yield benefits of new varieties, farmers have shown preference for local ones, even when introduced varieties give higher grain yields. The difference recorded in yield potentials of this study is in agreement to the findings of who observed that edaphic factors, such as soil properties and fertility could also influence the yield potential of an environment.

Conclusion

The performance of different varieties of cowpea (*vigna unguiunlata)* in Mubi Adamawa State – Nigeria, to study the significance information on the performance of specific local cowpea varieties and also the variety that gives better yield to farmers in Mubi Local Government of Adamawa State – Nigeria, was successfully conducted. Variety play a great role in the performance of cowpea and farmers are still keen on using the local varieties rather than the improved one despite its potential. However, it therefore worth to evaluate the performance of different cowpea varieties with the view of getting the one that performs best for better utilization by farmers. This study therefore, clearly revealed that in all the data collected seed per pod was lower with T3 (15.98), 100 seed weight with T3 (178.35) grain yield with T3 (18.783 Kg/ha) and shelling percentage was lowest with T3 (16.68). The performance depended on the varieties and the characters recorded. T4 (Red BOSADP) and T1 (White kananado) should be planted by farmers in Mubi for high grain yield and seed weight respectively.

Recommendation

It may therefore be recommended that T4 (Red BOSADP) and T1 (White kananado) should be planted by farmers in Mubi for high grain yield and seed weight respectively.

Conflict of Interests

The authors have not declared any conflict of interest.

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