



EVALUATION OF PERFORMANCE OF DIFFERENT VARIETIES OF COWPEA (*Vigna unguiculata* L. Walp) IN MADAGALI LOCAL GOVERNMENT AREA OF ADAMAWA STATE, NIGERIA

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Abstract

Field trial was conducted at Shuwa town in Madagali Local Government Area of Adamawa State during the 2024 rain fed cropping season to evaluate the performance of different varieties of cowpea. Five varieties were use viz: White Kanannado, Red Kanannado, Banjaram Beans, Black Eyed Bean and Red BOSADP laid in a Randomized Complete Block Design (RCBD) replicated three time. Data were collected on the following parameters: plant height, number of leaves, and number of branches, dry matter, crop growth rate, pod weight, 100 seed weight, gran yield and shelling percentage. Results were subjected to analysis of variance (ANOVA) using Duncan's multiple range test (DMRT). Results revealed that variety has great influence on the performance of cowpea and the need to plant improved variety is very important. Significantly White Kanannado recorded the highest 100 seed weight, pod weight and grain yield while Banjaram Beans recorded least in all the parameters. Black eyed beans recorded the highest plant height, the highest number of leaves, highest number of branches and the highest shelling percent while the least plant height, number of leaves and number of branches were recorded by Banjaram Beans. Farmers in Magadali Local Government Area of Adamawa State should therefore adopt White Kanannado and Black eye beans for higher yield and for better utilization.

Keywords: Cowpea, Evaluation, Performance, Varieties, *Vigna unguiculata*.

INTRODUCTION:

Agricultural production plays a crucial role in ensuring food security, alleviating poverty, and promoting human and national development. In Nigeria, agricultural growth is increasingly been recognized to be the sector that sustained economic development. Agriculture provides income, food, raw materials, foreign exchange, and employment to the nation, with over 65% of the population living in rural areas (Tanko, 2022). Therefore, the growth of the agricultural sector is crucial, particularly for increasing food self-sufficiency in the country. According to FAOSTAT (2021), In Africa 2014, cowpea was grown on an estimated 12.3 million hectares, with the majority of production occurring on 10.6 million hectares in West Africa, particularly in Nigeria, Niger, Burkina Faso, Mali, and Senegal. Cowpea production and consumption is in sub-Saharan Africa, especially in the Sudano-Sahelian Zone (Khan *et al.*, 2019).

Cowpea one of the agricultural crops, a leguminous annual herbaceous legume and an important source of proteins, present in the tropical and sub-tropical regions (Ehlers and Hall, 1997). Cowpea is adapted to warm weather and requires less rainfall compared to most crops. Cowpea is one of the most widely adapted, versatile, and nutritious grain legumes. It is a vital legume crop commonly grown under low-input production systems and in arid and semi-arid agroecologies around the world (Horn and Shimelis, 2020). The crop is a centuries-old human crop, having originated in Africa and spread throughout Latin America and Southeast Asia, a warm-season, vascular annual pulse crop with a wide range of uses. It is a member of the Fabaceae (Belete and Mulugeta 2022). A most popular crops and a valuable component in the farming systems of the majority of resource-poor rural households in Sub-Saharan Africa (Antonio *et al.*, 2017). Cowpea can grow under harsh environmental conditions where other main crops fail to grow (Belay *et al.*, 2017). Its foliage is considered an essential source of high-quality livestock feed and can restore soil fertility through nitrogen fixation, making it useful for crop rotation. It is rich in fiber, protein, iron, and potassium (Haruna & Abimiku, 2012) and widely available in both rural and urban areas. Cowpea is a diploid warm-season legume that serves as a significant source of calories and protein for many people, especially in developing countries (Zewdu *et al*, 2021). Cowpea is a staple food crop used by humans in low-income arid regions, and it also enhances soil fertility (Amina & Bake, 2023). It has

always been called 'poor man's meat' because it contains a great deal of protein. However, it is relatively less expensive than maize, rice, and other cereals (Agbogidi & Egho, 2012). Cowpea is consumed either as a vegetable for the leaves, fresh pods, or grain. It is regarded as an inexpensive source of protein for poor resource farmers whose diet largely depends on starchy foods such as sorghum and cassava, making it a potential crop to contribute to the easing of famine. The protein content in cowpea varieties ranges between 17 and 32% on a dry weight basis and about 64% of vitamins, and fibre, carbohydrates. The amino acid and vitamin profiles of cowpea grain make it an essential complement to cereals. Its leaves, green pods, and grains are consumed as a dietary source of protein among many families in Africa and its nutritional component. The crop has multiple benefits to farmers, including its ability to grow and produce high yields on poor, sandy soils unsuitable for the production of other crops, high rates of symbiotic nitrogen fixation, and lower fertilizer application.

Additionally, it is relatively inexpensive compared to other protein sources, such as milk, meat, or eggs (Agbogidi & Egho, 2012). Cowpea is mainly cultivated in the lowland areas of Madagali for its' edible seeds, pods, and leaves. Additionally, it provides feed, forage, hay, and silage for livestock, green manure, and cover crops that preserve soil productivity (Alemu *et al.*, 2016).

Although Nigeria is a center of cowpea production, Adamawa State is one of the largest producers of cowpeas in the country. There is however little or no documentary evidence from previous studies on the Performance of different variety of Cowpea in Madagali area of Adamawa State. This therefore highlights the need to evaluate the performance of some selected varieties of cowpea in the area. Similarly, not much is known about the yield, productivity, importance, and distribution in the study area. Thus, this research study aims to reveal the performance of five varieties of cowpea in Shuwa town of Madagali Local Government Area of Adamawa State, Nigeria.

Materials and Method

Experimental site

This research was carried out in Shuwa, Madagali local government area of Adamawa State. Geographically, it is located between longitude 13° 15" East of Greenwich meridian and latitude 10° 30" Northern of the Equator, it is the bordered by Borno

state to the North, Cameroun republic to the East, Michika Local Government to the South, and Askira/Uba Local Government to the West. Majority of the people of the area are farmers who produce varieties of agricultural crops such as sorghum, maize, groundnuts, cowpea, rice, sugarcane, sweet potatoes and vegetables as well as tree crops of various species and types (Zhu *et al.*, 2022).

The area has an estimated population of 134,827 people. (National Population Commission NPC, 2006). The people are predominantly Margi, Sukur, Waga, Matakam, Higgi tribes as well as the Hausa and Fulani tribes who are mostly engaged as farmers or cattle rearers (Tanko, 2022). The vegetation of the area is made up of grasses and some stunted trees with an average rainfall of 700,000mm per annum lasting for 4-5 months in a year. (Adamawa State Ministry of Land and Survey ASMLS, 1999).

Land Preparation;

Land was cleared, ploughed and harrowed in order to pulverize the soil. Leveling was carried out later using hoe, the site was marked out into blocks and plots replicated three times and each replicate was separated with pathway of 1.5 m and 1.0 m between plots respectively. The total trial area was 387 m² (21.5 m x 18 m)

Treatment and Experimental Design

The treatment consist of five different varieties of cowpea viz: White Kanannado, Red Kanannado, Banjaram Beans, Black eyed beans and Red BOSADP respectively. The treatments were laid out in a Randomized Complete Block Design (RCBD).

Materials

The materials used in the experiment include: Herbicide, insecticide, fungicide, knapsack sprayers, hoes, and water.

Sources of Seed

Cowpea seed was obtained locally in Madagali open market sowing of cowpea cultures was done in August. The spacing of 90 cm x 40 cm was adopted for all treatments.

Weed Control

Weeding was carried out as soon as weed emerge to reduce weed competition on growth and development of crops and to the farm neat.

Application of Insecticide

Lara force@ and Best@ insecticides were applied at 8-12 weeks after sowing against insect and pest repeatedly at the interval of four days.

Harvesting

Harvesting was done manually (hand picking) at 12 weeks after attaining physiological maturity.

Data Collection and Analysis

Data were collected on some parameters as follows:

Plant height (cm): The height of five randomly selected plant was measured using meter rule, from the ground level to the tip of the plant at both 8 and 12 weeks after sowing (WAS), the mean of the plant height was computed and recorded.

Number of leaves: the number of leaves of five randomly selected plants was counted in each plot at 8 and 12 WAS. The mean was counted 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 (Kg) five sample was up rooted from each plot in the net plot at 12WAS and the sample was taken to screen house for constant dry weight and the mean of the dry matter was computed and recorded.

Pods weight (g): Five sample pods were randomly collected and weighed. The average taken as pod yield.

Grain yield (Kg): Yield of Five randomly selected plant was taken averaged and converted into grain yield per hectare.

Crop growth rate: Destructive sampling of plants was done at 6 and 12 weeks after sowing and all plants were dried at 65°C in an air circulating oven during 72 hours to calculate the crop growth rate using the formula as given below:

$$GR = \frac{W_1 - W_0}{t_1 - t_0}$$

Where; W_1 and W_2 are dry matter (g) produced at time t_1 and t_0 (Hunt et al., 2002)

100 seed weight (g): This was done by counting 100 seeds from every treatment and weighed to determine the 100 seeds weight.

Shelling Percentage (%): This was calculated using:

(%) = Weight of grain X 100 / weight of pod

The data generated were subjected to analysis of variance (ANOVA) using Duncan's Multiple Range Test (DMRT) and the mean values showing levels of significance differences were separated using Least Significant Difference (LSD) at 0.05% level of probability (Gomez and Gomez, 1984).

Result

The effect of varietal difference on cowpea plant height, number of leaves and number of branches are presented in Table 1. Significant difference was observed among the varieties at 12 WAS. Black eye bean (172.31cm) was significantly ($P > 0.05$) taller compared to Red BOSADP and Banjaram Beans. Banjaram beans recorded the least plant height of 90.50 cm. The number of leaves indicates more foliage with Black eye beans compared to Red BOSADP, Red and White Kanannado but varies significantly ($P > 0.05$) with Banjaram that has fewer foliage. Table 1 further shows a trend number of branches where Banjaram beans recorded a significantly ($P > 0.05$) lower number of branches though not significantly ($P > 0.05$) different from Red Kanannado at 12 WAS. there is no significant difference in number of branches between white Kanannado Red Kanannado, Black eye and Red BOSADP.

Table 1: Effect of varietal difference on plant height, number of leaves and number of branches of cowpea

Treatment	Plant height at 12 WAS	Number of leaves at 12 WAS	Number of branches at 12 WAS cm
White Kanannado	163.90ab	100.30 bc	18.20a
Red Kanannado	164.20ab	106.06 bc	13.12ab
Banjaram	90.50d	40.30 d	12.40b
Black Eye	172.31a	136.60 a	15.70a
Red BOSADP	148.40bc	112.02 bc	16.50a
LSD	7.8	7.21	3.32
P=0.05	*	*	*

Note: mean with the same letter are not significant different Duncan's Multiple Range Test (DMRT) at 0.05%, LSD = least significant different, *= Significant, NS= Not significant

The effect of varietal difference on dry matter, crop growth rate and pod weight of cowpea is presented in Table 2. Statistically is a significant difference ($P \leq 0.05$) recorded with dry matter, crop growth rate and pod weight. Black eye bean turned in more dry matter compare to all other treatments recording a significant ($P > 0.05$) mean dry matter weight of 65.40 g. The Crop growth rate witnessed a new trend as Red BOSADP and Red Kanannado were not significantly ($P < 0.05$) different as they give the same dry matter yield. However, a significantly higher Crop growth rate of $50.15 \text{ g m}^{-2} \text{ d}^{-1}$ was recorded with white Kanannado compared to all other treatments. Banjaram beans recorded a significantly lower crop growth rate of $20.10 \text{ g m}^{-2} \text{ d}^{-1}$. Similarly, pod weight has shown a significant difference ($P \geq 0.05$) with white and Red Kanannado showing a same pod weight. Banjaram bean recorded a significantly ($P < 0.05$) lower pod weight (Table 2). The yield in Black eye and Red BOSADP are same. This difference in parameter might be attributed to growth habit as a result of varietal difference or requirement for growth resources.

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

Treatment	Dry matter (g)	Crop growth rate (g m ⁻² d ⁻¹)	Pod weight (g)
White Kanannado	55.80c	50.15a	18.20 ^a
Red Kanannado	60.30b	30.00b	17.50 ^a
Banjaram	40.30d	20.10bc	12.40 ^d
Black Eye	65.40a	35.00b	15.70 ^b
Red BOSADP	60.10b	25.00b	16.50 ^b
LSD	2.32	12.81	1.26
P=0.05	*	*	*

Note: Means within columns with similar letters are not significantly different ($P \leq 0.05$) Duncan's Multiple Ranges Test (DMRT) at 0.05% level of probability. LSD = least significant different, *= Significant, NS= Not significant

Effect of varietal difference on 100 seed weight grain yield and shelling percentage is presented in Table 3.

White Kanannado recorded a significantly ($P \geq 0.05$) higher 100 seed weight (617.13 g) compared to all other treatments. Banjaram bean, Red BOSADP, Black eye as well as Red Kanannado and displayed a significantly lower ($P \leq 0.05$) weight of 100 grains each respectively as compared to White Kanannado. Shelling percentage due to varietal difference was not significantly ($P \leq 0.05$) different amongst treatment. Black eye beans recorded a mean shelling percentage of 19.80 while Banjaram recorded the mean shelling percentage of 14.10.

Table 3: Effect of varietal difference on 100 seed weight grain yield and shelling percentage

Treatment	100 Seed weight (g)	Grain yield (kg ha ⁻¹)	Shelling percentage (%)
White Kanannado	617.13 ^{ga}	368.20 ^a	17.18
Red Kanannado	299.12 ^b	250.38 ^b	15.60
Banjaram	214.50 ^{bc}	180.20 ^c	14.10
Black Eye	315.16 ^b	260.70 ^b	19.80
Red BOSADP	414.15 ^b	295.15 ^b	17.50
LSD	150.59	52.34	6.26
P= 0.05	*	*	NS

Note: Means within columns with similar letters are not significantly different ($P \leq 0.05$) Duncan's Multiple Ranges Test (DMRT) at 0.05% level of probability. LSD = least significant different, *= Significant, NS= Not significant

DISCUSSION

Cowpea varieties has varied degree of yield despite the high yield potential of improved varieties, their adoption by farmer may be of concern. Kamara *et al.*, (2018a) reported that despite the yield benefit of new varieties, farmers have shown preference for local ones even when introduced varieties give higher grain yield.

The result of this study clearly depicts the trends in plant height to vary with varieties, such result are not unusual but have been reported by Belel *et al.*, (2014) in the tropics. Higher number of pods were recorded with white Kanannado and Red BOSADP more than other treatment may be due to the genetic composition and their ability for adopting to the environmental challenges in the new environment (Belel & Amina, 2022; Omar *et al.*, 2023). Seed per pod and 100 seed weight that were higher with White Kanannado and Red BOSADP falls in line with the finding of Kamara *et al.*, (2018b) who attributed the increase to better foliage production which may have according to Belel *et al.*, (2014) increased the photosynthetic surface for better assimilation of nutrients by the plants. The yield increase as well higher number of pods per plant, seed per plant and 100 seed weight were attributed to better utilization of assimilates during photosynthesis (Gezahegn *et al.*, 2016). Higher grain yield produce by white Kanannado may be due to varietal influence. This finding is supported by Javanmard *et al.*, (2020) who found that improved varieties of cowpea are early maturing, photoperiod Sensitive with high yield potential even with less rain fall. The difference recorded in yield potentials of this study is in line with the finding of Salama & Abdel-moneim (2021) who observed edaphic factor such as soil properties and fertility could also influence the yield potential of an environment.

CONCLUSION

Varietal difference plays an important role in cowpea production. The performance of the different varieties was clearly observed in all the parameter or data collected. White Kanannado and Red BOSADP have shown a better potentials to perform in

Shuwa Environment while Banjaram beans and Red Kanannado exhibit ability for environmental adaptiveness to the Shuwa environment.

RECOMMENDATION

The varying morphological performances shown by different Cowpea varieties evaluated suggests that White Kanannado and Red BOSADP is recommended for planting by farmers in Shuwa village of Madagali local government Area of Adamawa State especially for high grain yield and seed weight.

Declaration of conflict of interest: authors wish to declare that there is NO conflict of interest in preparing and publishing this article.



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