



EFFICACY OF SELECTED PLANT EXTRACT AGAINST MAJOR INSECT PEST ON TWO (2) VARIETIES OF COWPEA (*Vigna unguiculata* L. Walp) IN GUINEA SAVANNAH OF NIGERIA

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ABSTRACT

The Field experiment was conducted at Prince Abubakar Audu University Student Demonstration and Research Farm (Lat 7 °6¹N and Long 7 °43¹E) in guinea savannah of Nigeria The main objective of the study is to investigate the efficacy of selected plant extract against major insect pest on two (2) varieties of cowpea (*vigna unguiculata* l. walp) in guinea savannah of Nigeria. The experimental Design was laid in a Randomized Complete Block Design. The experiments were replicated four times making a total of 24 plots in all. Treatments consisted of (Fumpea I (V₁) and Sampea, 20 (V₂) and Control, Neem leaf extract, Cypermethrin and Jatropha leaf extract this gives 2 x 4 factorial combinations of treatments. The parameters measured includes: plant height (cm) number of leaves, Leaf Area (cm²), Number of Pods/Plant, Number of Seeds/Plant, Pod Length (cm), and Grains Yield (kg/ha). Results showed insecticide treatments significantly affected only plant height (28.81 cm), leaf number (55.96), and grain yield (1820.69 kg/ha) at 6 weeks after sowing, with Neem extract yielding the highest values. Variety significantly influenced only leaf area at 2 weeks (Sampea-20: 15.72 cm²). No treatment significantly impacted leaf area (overall), pods/plant, seeds/plant, or pod length. Interactions between insecticides and varieties were not significant for any parameter. It was concluded that Neem leaf extract enhances key growth components and grain yield in cowpea. Sampea-20 is recommended alongside Neem extract for optimal cowpea production in the study area and similar ecologies.

Keywords: Extract, Varieties, Bio-pesticide, Growth and Yield

INTRODUCTION

Cowpea, (*Vigna Ananguiculata* L.), is the most ancient human food source and is probably used as crop plants from Neolithic times. Some literature shows that the origin of this product is Africa. Cowpea's introduction was India from Africa about 2000 to 3500 years ago. Currently, it is widely convenient and grown around the world (Herniter *et al.*, 2020). In recent years, it has become an important crop in many countries of tropical Africa, Asia and South America (Oyewole *et al.*, 2025). Annual World Cowpea crop is grown at 12.5 million hectares. Also, the total grain production is 3 million tonnes. In Central and West Africa, the Million is more than 64% of the million hectares, followed by about 1.4 million hectares in Central and South America, 1.3 million hectares in Asia and 0.8 million hectares in East and Central Europe. Nigeria is the largest manufacturer of Cowpea in the world. Cowpea has high social and economic values as well as cultural, nutritious and inal elemental importance. It is an efficient nitrogen fixing, heat and drought-tolerant leaguum (Carvalho, 2017). In East and South Africa and many parts of South Africa and Asia, Cowpea is used as leafy vegetables and this plant leaf is the main final product (Gondwe *et al.*, 2019). Cooked leaves contain protein, calcium, iron, phosphorus, riboflavin, niacin, ascorbic acid and beta-carotene. In many parts of the world, the Cowpea is grown directly for the production of cereals. Cowpea seeds provide a rich source of protein and calories, as well as minerals and vitamins (Affrifah *et al.*, 2022). Seeds can include 23-25% protein, 50-67% carbohydrates, 8-9% moisture and contain very low-fat amounts (3.99%) (Lyngdoh *et al.*, 2017)

Depending on the size of the seed and the time of color, taste, yield and maturation, there are two types of Cowpea prostate or intermediate type and vertical or determined type. An indefinite type, large and small seeds are both initial and late-assembly, while the defined type is the initial ripening type with small leaves and seeds (Lopes, 2018). Despite its importance, the Cowpea yield on the field



of farmers is a low average $<500\text{kg ha}^{-1}$. This is mainly due to insect pests associated with various development stages of the crop, especially during the phase of flowers and pod formation. These include flower thrips, megalurotherips sjostedti tribom (*Thaisoptera*: 3Pide); Legum pod borer, Maruka Vitrata Fabricius (*Lepidoptera*: Crambid); Pod Sking Bugs (PSB), Klevigrala Tomentsicolis St.L (*Hemipter*: *Corida*), Reportes Dentips F. And follom-feeding Cowpea aphids, *Ephis Cracivora* coach (*Hemiptera*: *Aphidida*) (Souleymane *et al.*, 2020). Management options have been tested and proven at various levels for the control of these pests. For example, weekly alternative applications of aqueous extracts of botanics, piper ginnins shum and throne and aphemom melaguta (Rosco), m. Similarly, aquatic lemon (*Azadiracha Indica A. Juice*) Thrips from seed and leaf extract, c. Tomentsicolis and Maruka spp. The event was reduced, resulting in the increase in the yield (Sokame, 2021). Intercropping cowpia with cereals like maize has also been registered to reduce the population of thrips (Abdoulaye, 2023).

Despite this, pesticide application in Cowpea in most African countries is the main insect pest control practice. This is partly due to the wonderful results associated with their application. Cowpea is a popular and nutritious important leaguum crop in many parts of the tropical world. Despite this, due to the numerous pest problems associated with it, it is considered very dangerous by many growers. Insect problems continue on the cows, at least due to the lack of diversity in research interests in the control of insects. (Sokame *et al.* 2021) Very effort is dedicated to simple problems (aphids, brochids, lifhoppers, etc.), while major problems (eg thrips. Pod borer and pod bugs) remain unresolved. (Asiwe 2018). The problem on the cows is complicated, and requires different efforts. More repeated posts of this crop will be a slow and disappointing process of removing the distance between the current and potential production of the Cowpea, without any major success in the control of the field of flowering fields. However, pesticides are expensive and they have potential negative effects on human health and environment (Lekei *et al.*, 2018). So there is a need to develop pesticide management strategies that are cost-effective and durable for farmers, especially on minimum pesticide application.

MATERIALS AND METHODS

Location of the Study Area

The Field experiment was conducted at Prince Abubakar Audu University Student Demonstration and Research Farm (Lat $7^{\circ}6'1''\text{N}$ and Long $7^{\circ}43'1''\text{E}$) in the southern guinea savannah zone with an altitude of 420 m above sea level. The general climate is humid, having a distinct raining and dry seasons. The mean annual temperature and rainfall are 27°C and 1260 mm respectively.

Treatments and Experimental Design

Treatments consisted of two (2) different Cowpea, *Vigna unguiculata* (L.), varieties (Fumpea I (V_1) and Sampea - 20 (V_2) and Control, *Neem* leaf extract, *Cypermethrin* and *Jatropha* leaf extract this gives 2×4 factional combinations of treatments. The experimental Design was laid in a Randomized Complete Block Design. The experiments were replicated four times making a total of 32 plots in all. The main areas were $3\text{m} \times 3\text{m} = 9\text{m}^2$ each plot respectively.

Soil Sample Preparation

Soil samples were taken from the top layer (1–15 cm) of field soil at four different locations and then pooled together and mixed well to form a composite sample. Soil samples were analyzed for physical and chemical properties at the Soil Science Laboratory of Prince Abubakar Audu University using the methods described in Black (1965).

Land preparation

The experimental site measuring an area of $32\text{m} \times 9\text{m}$ (0.02ha) was cleared, ploughed, harrowed to a fine tilt and ridged. The ridges were spaced 75cm apart as the only ridge available to the university had been so calibrated.

Sowing and Sowing Materials

Four seeds were sown 25 cm apart within the ridges, then the young plants were thinned to two vigorously growing plants, two-weeks after sowing.



Weed Control

The crops were manually hoe weeded at 3 and 6 after sowing. However, after flowering, only hand pulling of few weeds that emerged was applied.

Insect Pest and Disease Control

For control of field pests like grasshoppers, crickets and beetles, *neem* leaf extract, *cypermethrin* and *jatropha* leaf extract were used at the rate of 100 ml/20 liter of water using CP3 knapsack sprayer. At the time of flowering, some pod sucking insects like *clavigrula* and aphids were prevalent, *neem* leaf extract, *cypermethrin* and *jatropha* leaf extract at the rate of 50 ml/15 liter of water were used from flowering till maturity.

Data Collection and Analysis

Plant height (cm)

The height of each of the tagged plants were measured using a meter ruler.

Number of leaves per plant

This parameter was obtained by simple counts of the total functional leaves produced for the six tagged plants.

Leaf area per plant (cm²)

This was determined by measuring the areas of the middle leaflets and multiplying it by a constant of 2.7.

Yield Data

Mature pods were harvested when 90 – 98% of the pods turned brown and dried. This happened at about 13 – 15 WAS.

Number of pods per plant

The number of pods per plant was determined by counting the total number of pods in the net plot and dividing it by the total number of plants.

Number of seeds per pod

From the harvested pods a total of 10 randomly selected pods were carefully shelled and counted. The average number of seed/pod was obtained by dividing the total number of grains by 10.

Pod length (cm)

The length of five pods was measured per plant and the average taken.

Grain yield per hectare

Grain yield per plot was determined by weighing the grains after shelling and winnowing in the air the pods harvested from each plot. The grain yield per plot was expressed in Kg/ha by multiplying the grain weight from each net plot.

Analysis of data

The collected data were aggregated and subjected to analysis of variance (ANOVA). Significantly different means were separated using the Fisher least significant difference test (F-LSD) at the 5% probability level.

RESULT

Pre-Sowing Soil (0-15) Test Value for the Experimental Site

Physical properties indicate that the soil is of a sandy loamy textural class and is slightly acidic with a pH of 4.65. It had organic carbon of organic matter 1.85% and 1.05%. N, milligrams and contents are 0.22%, 0.19 mg kg⁻¹ and 1.10 cm respectively.



Table 1: Result of Pre-Sowing Soil Test Value for the Experimental Site

Soil Characteristics	Value
P ^H (H ₂ O)	4.65
P ^H (CaCl)	4.38
%Organic matter	1.85
%Total N	0.052
Available P ppm	10.33
Ca (cmol/kg)	0.267
K (cmol/kg)	1.102
N (cmol/kg)	0.222
Mg (cmol/kg)	0.19
% Sand	75
% Silt	8
% Clay	17
Textural Class	Sandy Loam

Plant Height (cm)

The result in Table 2 shows that pesticide had no significant ($p>0.05$) effect on plant height (cm) at 2 and 4 weeks after sowing. However, it was significant ($p<0.05$) at 6 weeks after sowing. The plot treated with *neem* leaf extract had the tallest plant with an average value of 28.81 cm, while the control plot had the shortest plant with an average value of 25.04 cm. Variety had no significant ($p>0.05$) effect on plant height (cm) during sampling period of 2, 4 and 6 weeks after sowing. The interaction of pesticide and variety on height (cm) was not found significant ($P > 0.05$) during the sampling period of 2, 4 and 6 weeks after sowing.

Number of Leaves

The result in Table 2 shows that there was no significant ($p>0.05$) effect of insecticide on the number of leaves at 2 and 4 weeks after sowing. However, it was significant ($p<0.05$) at 6 weeks after sowing. The plot treated with *neem* leaf extract had the highest number of leaves with an average value of 55.96, while the control plot had the lowest average value of 45.96. There was no significant ($p>0.05$) effect of variety on the number of leaves during the sampling period of 2, 4 and 6 weeks after sowing. The interaction of pesticide and variety on leaf number was not found significant ($p>0.05$) during the sampling period of 2, 4 and 6 weeks after sowing.

Leaf Area (cm²)

The result in Table 2 shows that insecticide had no significant ($p>0.05$) effect on leaf area (cm²) at 2, 4 and 6 weeks after sowing. There was a significant ($p<0.05$) effect of variety on leaf area (cm²) 2 weeks after sowing. However, it was not significant ($p>0.05$) at 4 and 6 weeks after sowing. Sampia-20 produced the highest discharge with an average value of 15.72 (cm²), while Sampia I produced the least with an average value of 12.02 (cm²). The interaction of pesticide and variety on leaf area (cm²) was not found significant ($P>0.05$) during the sampling period of 2, 4 and 6 weeks after sowing.

Table 2: Efficacy of Selected Plant Extract against Major Insect Pest on Plant Height (cm), Number of Leaves and Leaf Area (cm²) of Two (2) Varieties of Cowpea (*Vigna unguiculata* L. Walp).

Treatments	Plant Height (cm)			Number of Leaves			Leaf area (cm ²)		
	Sampling Periods (Weeks After Sowing)								
	2WAS	4WAS	6WAS	2WAS	4WAS	6WAS	2WAS	4WAS	6WAS
Insecticides (I)									
Control	10.07	18.68	25.04	5.04	18.04	45.96	14.59	33.82	38.36
<i>Neem</i> Leaf Extract	11.69	20.42	28.81	5.04	21.29	55.96	14.84	38.14	40.50
<i>Cypermethrin</i>	11.56	19.07	27.25	5.00	19.29	55.21	14.16	43.49	45.97
<i>Jatropha</i> Leaf Extract	10.96	19.81	27.04	5.12	18.83	54.50	15.89	37.50	38.36
LSD (0.05%)	NS	NS	1.85*	NS	NS	7.45*	NS	NS	NS
Variety (V)									
Fumpea-I	9.82	20.03	27.24	5.00	20.21	53.23	12.02	40.15	42.63
Sampea-20	10.33	18.96	26.83	5.10	18.33	52.04	15.72	36.33	42.34
LSD (0.05%)	NS	NS	NS	NS	NS	NS	3.59*	NS	NS
Interaction									
I x V	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV%	10.80	8.61	10.00	3.22	16.87	27.57	30.37	40.72	22.27

* = significant at 5% level of probability

NS = not significant at 5% level of probability

Number of Pods/Plant, Number of Seeds/Plant, Pod Length (cm) and Grains Yield (kg/ha)

The result in Table 3 shows that pesticide had no significant ($p > 0.05$) effect on the number of pods/plants. There was no significant ($p > 0.05$) effect of variety on the number of pods/plants. The interaction of pesticide and variety on number of pods/plants was not found significant ($p > 0.05$).

The result in Table 3 shows that pesticide had no significant ($p > 0.05$) effect on the number of seeds/plants. Variety had no significant ($p > 0.05$) effect on seed/plant number. The interaction of pesticide and variety on number of seeds/plants was not found significant ($p > 0.05$).

The result in Table 3 shows that pesticide had no significant ($p > 0.05$) effect on pod length (cm). There was no significant ($p > 0.05$) effect of variety on pod length (cm). The interaction of pesticide and variety on pod length (cm) was not found significant ($p > 0.05$).

The result in Table 3 shows that pesticide had significant ($p < 0.05$) effect on grain yield (kg/hectare). The plot treated with *neem* leaf extract had the highest yield with an average value of 1820.69 (kg/hectare), while the control plot had the lowest yield with an average value of 1456.56 (kg/hectare). There was no significant ($p > 0.05$) effect of variety on grain yield (kg/hectare). The interaction of pesticide and variety on grain yield (kg/hectare) was not found significant ($p > 0.05$). The interaction of pesticide and variety on grain yield (kg/hectare) was not found significant ($p > 0.05$).

Table 3: Efficacy of Selected Plant Extract against Major Insect Pest on Number of Pods/Plant, Number of Seeds/Plant, Pod Length (cm) and Grains Yield (kg/ha) of Two (2) Varieties of Cowpea (*Vigna unguiculata* L. Walp).

Treatments	Number of Pods/Plant	Number of Seeds/Plant	Pod Length (cm)	Grains Yield (kg/ha)
Insecticides (I)				
Control	10.04	10.88	16.22	1,456.56
<i>Neem</i> Leaf Extract	12.08	11.50	18.36	1,820.69
<i>Cypermethrin</i>	11.04	11.04	17.48	1,797.45
<i>Jatropha</i> Leaf Extract	12.04	10.88	16.22	1,673.50
LSD (0.05%)	NS	NS	NS	232*
Variety (V)				
Fumpea-I	10.94	11.58	17.12	1,756.80
Sampea-20	11.67	10.56	17.35	1,820.50
LSD (0.05%)	NS	NS	NS	NS
Interaction				
I x V	NS	NS	NS	NS
CV%	21.33	12.79	8.90	12.45

* = significant at 5% level of probability

NS = not significant at 5% level of probability

DISCUSSION

Treatment imposed on cowpea greatly influenced the growth and yield performance of the plants. This could be related to the fact that the applied treatments had wide spectrum activities against other pests and pathogens which could hinder the normal development of the crop. The result of the study did not show any significant increase in the vegetative traits but at the early stage plant height (cm) number of leaves, Leaf Area (cm²), however Number of Pods/Plant, Number of Seeds/Plant, Pod Length (cm), however was significant for yield (Grains Yield (kg/ha)). (Sobhy *et al.* 2022) reported that regular spraying of pesticidal plant extracts could facilitate direct protection against other forms of plant pathogens. In addition, there are several researches reporting the improvement of plant growth and yields after treatment with plant extracts and insecticides (Dhungana *et al.* 2020). The results obtained on the yields of showed that *neem*-sprayed cowpea produced well compared those of insecticide-sprayed plants this was confirmed with (Shah *et al.*, 2021) who reported similar results in which the yields of wheat sprayed with seed extracts of *neem* produced out rightly compared to the yields of *imidacloprid*-sprayed wheat. This also agrees with the study of Oparaeke and Onu (2021) in which the insecticidal effects of *neem* extracts against some pests of cowpea including aphids were reported. Aphid infestations in cowpea plants were better controlled in *neem*-sprayed plots than the unsprayed plots. This conforms to the report of Mondedji (2021) in which *neem* extracts reduced the population of *Lepidopteran* pests in *Solanum macrocarpon* than the control field which was not sprayed. This implies that *neem* is a good bio-pesticide for the control of pest. Several authors have reported the use of *neem* oil and other plant extracts in reducing *tobamovirus* infections (El-Shafey *et al.*, 2022) also reported that *neem* and other plant extracts shows antiviral properties against cowpea common mosaic virus in bean plant. According to the ELISA results, CABMV was absent in *neem* extract and insecticide sprayed crop. The reduction in concentrations of *tobamovirus* by the latex of *Euphorbia tirucalli* was reported by (Ramesh *et al.*, 2020). The high concentration of LC in the grains of Ife BPC confirmed that insecticides accumulate to high concentrations in crops (Alengebawy *et al.*, 2021).

CONCLUSION AND RECOMMENDATION

Based on the research findings, the study concludes that the leaf extract of *neem* (*Azadirachta indica*) in Guinea Sawana, Nigeria, has significantly increased key growth and yielding components of the cowpea. In particular, as a result of the *neem* extract application, with plant height (28.81 cm), the highest number of leaves (55.96) and the highest grain yield (1820.69 kg/ha) control, *cypermethrin*, and



Jatrofa leaf extracts after 6 weeks after sowing. It was the only treatment to significantly improve grain yields. However, no disinfectant therapy has a significant effect on the leafy area overall, pods per plant, seeds per plant or pod length. Regarding varieties, the SAMPEA -20 showed significantly larger leafy field (15.72 cm) after 2 weeks compared to the Fumpea -I, but the height of the plant, the number of leaves, or any yielding parameters (pods/plants, seeds/plants, pod lengths, grain yields) are not affected. Seriously, no significant interaction between pesticide therapy and cocopia varieties has been observed for any measured parameter during the study period. For the production of the best Cowpea, farmers should integrate the use of lemon leaves extracts with a variety of SAMPEA -20. This combination benefits the growth-promoting and yielding properties of the *neem* extract with the initial vegetable enthusiasm of SAMPEA-20.

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