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Varietal Response of Cowpea (*Vigna unguiculata WALP*) to Moringa Leaf Extract in a Derived Savanna of Cross River State

Kekong M. A[1] and Eteng E. U[2]

[1]Dept. of Agronomy, Cross River University of Technology Calabar

[2]Dept. of Soil Science and Land Resources, Michael Okpara University of Agriculture Umudike

ABSTRACT

A two year field experiment was conducted at the Teaching and Research Farm of the Cross River University of Technology in 2021 and 2022 to evaluate the response of cowpea varieties to moringa leaf extract. The experiment composed four varieties of cowpea: FUAMPEA 1, FUAMPEA 2, SAMPEA 14 and SAMPEA 15 as V_1, V_2, V_3 and V_4, respectively, and two levels of moringa leaf extract M_0 (no extract) and M_1(applied extract). This gave a total combination of $V_1 M_0$, $V_2 M_0$, $V_2 M_0$, $V_4 M_0$, $V_1 M_1$, $V_2 M_1$, $V_2 M_1$, $V_3 M_1$ and $V_4 M_1$. The eight treatments were laid out in Randomized complete block (RCBD) and replicated three times. Results obtained indicated that variety, moringa leaf extract and their interaction significantly affected the growth and yield of cowpea. FUAMPEA 1 produced tallest plants (62.3cm) followed by SAMPEA 14 (60.2cm) and least height of 56.4cm from FUAMPEA 2. The number of leaves was highest with FUAMPEA 1 (73.4), followed by SAMPEA 14 (71.2) and least number of leaves was FUAMPEA 2 (68.6). Moringa leaf extract produced taller plants (71.5cm) than no extract (63.4cm) while number of leaves 78.4 in moringa extract plants and 63.5 in no extract plants. SAMPEA 15 reached 50% flowering at 40 days after planting, followed by FUAMPEA 2 with 41 days and SAMPEA 14 with highest number of days of 46 to 50% flowering. SAMPEA 14 produced highest number of pods per plant and highest grain yield (1.62 t ha^{-1}) followed by FUAMPEA 1 with yield (1.23 tha^{-1}) and least yield in SAMPEA 15 (0.80 t ha^{-1}). Moringa extract produced higher yield (1.28 t ha^{-1}) than no extract (0.80 t ha^{-1}). SAMPEA 14 with moringa leaf extract produced best result in the yield of cowpea in the study area. SAMPEA 14 applied with moringa leaf extract, therefore, is more adaptable to Cross River derived savanna ecological zone for optimum grain yield.

Key Words: Moringa, extract, cowpea, variety, yield componen

INTRODUCTION: Cowpea is a tropical leguminous food grain for human and livestock. The crop is commonly cultivated as a nutritious and highly palatable food source, especially in Africa. Studies conducted by Kormawa et al. (2000) revealed that in Nigeria more urban households (72%) consume cowpea than any other grain legume. The crop is a quick-growing cover crop that produces large amount of dry matter while producing nitrogen to subsequent crops grown on the same area (Clark, 2007). Apart from the nitrogen fixing ability of cowpea, the organic matter supplied through residues of leaf, pods, shoots and roots generate half amount of organic matter required for sustainable soil management, particularly in the tropics. The seed is reported to contain 24% crude protein, 53% carbohydrates and 2% fat (FAO, 2012). In spite of the food, feed and fertility restoration value of cowpea, the production of this crop is still low in Cross River State, South East Nigeria. Oparaeke, (2013) reported that most of the cowpea consumed in Nigeria is cultivated in the Northern Nigeria Savanna where the climate favours its production. Apart from diseases of cowpea attributable to the southern Nigeria climate, cowpea yield is affected by the variety. Sheahan (2012) noted that one of the primary aim varietal screening in cowpea is to achieve locational adaptability in terms of disease resistance and yield advantage.

The role of the crop in soil fertility restoration as well as its compatibility with a variety of crop mixtures has made it a common component of most cropping systems in the tropics. However, low soil fertility limits its yield. Although the crop fixes Nitrogen (N) in symbiotic association with rhizobium bacteria, it suffers from temporary N deficiency during seedling growth when the food reserve in the cotyledons are exhausted. To increase soil productivity and crop yields, farmers apply mineral fertilizers. Fertilizer use in tropical soils has been a major challenge when sustainable crop production is envisaged. This is so because inorganic mineral fertilizers have been implicated in soil acidification, decrease in base saturation and deterioration and degradation of soil physical properties (Isherwood, 2008). Apart from soil acidity neutralization, Kekong et al; (2010) reported that organic fertilizers provide N, P, K, Mg and micronutrients in addition to soil physical structure improvement. Fresh *moringa oleifera* leaves have been shown to have high zeatin content, moringa leaves gather from various parts of the world were found to have high zeatin concentration of between 5mg and 200mg/g of leaves (Davies, 2010, Davies 2015, Mona, *et al;* 2013).

The dependency on the use of Inorganic fertilizer as a source of plant nutrient by farmers and their high cost is further associated with land and soil degradation and environment pollution. Thus, there is need to search for alternative safe natural sources of plant nutrients Mona, *et al;* (2013). *Moringa Oleifera* is one of such alternative been investigated to ascertain it effects on growth and yield of crops and thus can be promoted among farmers as a possible supplement or substitute inorganic fertilizers. Moreover, several researchers have indicated that Moringa Oleifera lam (family: Moringaceae) is a highly valued plant with multipurpose effects. *Moringa Oleifera* as a novel natural biostimulant for plant growth could play a role in improving drought tolerance in plants under saline condition (Abd El. Magged *et al* 2017, Howladers 2014).

Organic fertilizers have an important role in improving the soil quality by providing basic macro and micro nutrients (Palaniappan *et al*; 1999) organic fertilizer can be applied as foliar spray or directly to soil for improving crop growth and quality. Similarly, Yadav et al., (2019) reported increased yield of cowpea by 46 % under treatments that received organic manures and biofertilizers over inorganic fertilizers and the control. Fageria *et al* (2002) reported that foliar spray of fertilizer are more effective than soil treatment particularly where soil pH and other factors limit applied nutrients availability. In same vein, Sakpal et al., (2022) reported that foliar application of fertilizer is credited with the advantage of quick and efficient utilization of nutrients, elimination of losses through leaching, fixation and regulating uptake of nutrients by plants. The limited availability of soil fertilizer makes the foliar fertilizer more important (Verma, 2000). In recent years the importance of organic fertilizer or bio-stimulant has increased due to several reasons. Bio-fertilizers are used for improving nutrient uptake stimulating growth and raising plant tolerance to environmental stresses (Ghatas, *et al.*, 2021). The seaweed extracts that are considered as bio-stimulants have positive effect on the growth and development of plants (Hernandez *et al;* (2014). In addition to improving plant growth, seaweeds are also use for increasing yield and quality and improving chemical composition of secondary metabolite (Spinelli, *et al*., 2009). Being environment friendly, natural organic products are gaining popularity for use in agriculture (Khan, *et al*., 2009). Liquid extracts obtained from

seaweed have been recently use as foliar fertilizer for many plants (Karthikeyan *et al.,* 2016).

Exogenous application of moringa leaf extract has improved productivity in many crops because moringa leaf extract possesses great antioxidant activities and is rich in plant secondary metabolites such as ascorbic acid and total phenols, making it a potential natural growth stimulant (Yasmen, *et al* 2012). It was further reported that several studies have focused on the role of moringa leave extract in improving plant growth and increasing the production of numerous crops. Adaptable and high yielding cowpea varieties have been a challenge to increased cowpea production in Nigeria. Fertilizer type, cost and availability has also posed serious constraints to farmers. Despite the development of large number of improved cowpea varieties farmers in the major cowpea growing area have continued to grow predominantly local varieties (Kamara et al., 2009). This use of local varieties could be due to lack of information on improved varieties and availability of seeds. Moreover, the dependency on the use of soil applied inorganic fertilizers as a source of plant nutrients is associated with land and soil degradation. There is therefore need to investigate the yield potentials of new cowpea varieties and to search for alternative safe sources of plant nutrients for cowpea production. It is on this basis that this study was designed to identify the best cowpea variety among the four cultivars, evaluate the potency of moringa leaf extract as a source of nutrients for cowpea and determine the interactive effect of moringa leaf extract and cowpea varieties on the growth and yield of the crop.

MATERIAL AND METHODS.

Experimental Site.: This study was carried out at the Teaching and Research Farm of the Faculty of Agriculture and Forestry, Cross River University of Technology during the 2021 and 2022 cropping season. Obubra is located on longitide $8^0 – 9^0$E and latitude $6^0 – 7^0$N of the Equator. The mean annual rainfall of the area ranges from 500mm to 1070 mm, with a warm weather and ambient temperature of about 20^0c $–30^0$C (Mfam, 2002).

Experrimental Materials: The improved cowpea seeds were obtained from the seed bank of the Molecular Biology Laboratory of the University of Agriculture, Makurdi and Moringa leaves were obtained from the experimental site for the extract. The cultivars were: C_1- FUAMPEA1, C_2 - FUAMPEA 2, C_3 - SAMPEA 14 and C_4 – SAMPEA 15.

Experdimental Design and Treatments: A Randomized Complete Block Design (RCBD) in factorial combination of four cowpea varieties and two levels of moringa leaf extract were laid out in three replications. Each replication was separated by 1 m as block boundaries and 0.5m as plot boundaries. Treatments combination were C_1M_0, C_2M_0, C_3M_0, C_4M_0, C_1M_1, C_2M_1,C_3M_1, C_4m_1 where C_1= FUAMPEA1, C_2= FUMPEA 2, C_3=SAMPEA 14, C_4=SAMPEA15. Mo = no moringa extract and M_1= moringa extract. Each variety was allocated to each plot by means of random number system. This is to remove bias in the allocation of the treatments.

Land Preparation and Planting: The land was manually cleared, ploughed and raised to beds. Sowing of the seeds was done on the 23rd September in 2021 and 21st September in 2022. The seeds were sown 3 per hole and were later thinned to two, two weeks after germination. A planting depth of 2cm and inter and intra row spacing of 25cm ×75cm were used. The experiment lasted from September to December for each year, being the appropriate planting date of cowpea in the humid region of Nigeria.

Moringa Extract and Application: Moringa leaves were collected and extraction was carried out at the Soil Science Laboratory of the Department of Agronomy. Ten kg of leaves were added one liter of water and pounded in porcelain thoroughly. This was filtered using a screen mesh to get the extract. The extract was then diluted in the ratio 1:32 (extract : water) as outlined and recommended by Price (2000). The extract was applied every two weeks from 2 weeks of germination up to 12 weeks. Each plant in rows that received the extract was given 25 mls as recommended by Price (2000).

DATA COLLECTION AND ANALYSIS : Soil samples were collected at random points within the experimental plot before treatments application and bulked to form a composite sample. This was air dried and sieved with a 2mm mesh. This soil sample was later subjected to standard laboratory analysis. Plant data on the following parameters were collected: plant height, number of branches per plant, days to 50% flowering, days to maturity, number of seeds per pod, number of pods/plant and grain yield per unit area. Data were subjected to analysis of variance (ANOVA) and the means were separated using Least Significant Difference (LSD) test to detect the real differences among the treatment means as described by Gomez (1984).

RESULTS AND DISCUSSION

4.1 Soil Properties of the Experimental Site: Result of soils of the experimental site before treatments application is presented in Table 1.

Table 1: Some Physical and Chemical Properties of the Soil of the Experimental Site before Treatment Application

Parameter	Value	
	2021	**2022**
Clay	11.2	11.1
Silt	12.1	10.8
Sand	76.7	78.1
pH (H_2O)	5.93	6.15
pH (KCl)	4.95	4.03
Organic matter (%)	1.31	1.42
Total N (%)	0.072	0.09
Available P (mg/kg)	2.74	3.74
Exchangeable K (cmol/kg)	0.23	0.25
Exchangeable Mg (cmol/kg)	1.49	1.36
Exchangeable Ca (cmol/kg)	3.14	3.76
Exchangeable Na (cmol/kg)	0.59	0.49
CEC (cmol/kg)	5.80	6.30

Results of the physical and chemical properties of the experimental site before treatments application (Table 1). Texturally, the soil is classified as Sandy-loam, with sand particle content of 76.7g/kg and 78.1g/kg and Clay particle of 11.2g/kg and 10.8g/kg, respectively for 2021 and 2022. The soil is moderately acidic with pH of (5.93) in H_2O and 4.95 in KCl and 6.15 in water and 4.03 in KCl for 2021 and 2022 respectively. The organic matter content and total Nitrogen were low with values of 1.31g/kg and 0.072g/kg and 1.42g/kg and 0.09g/kg for 2021 and 2022 respectively. The available Phosphorus was low with value of 2.74mg/kg. The exchangeable cations (Ca, Mg, Na, and K) were equally low in status with values of 3.14 and 3.74 cmol/kg for Ca^{2+} and 1.49 and 1.36 cmol/kg for Mg^{2+}. The value obtained for Na^{+} was 0.59 and 0.49cmol/kg, which were moderate while that for K^{+} were 0.23 and 0.25cmol/kg, which were low. The CEC was 5.80 and 6.30 cmol/kg respectively, for 2021 and 2022.The low N, P, OM, pH and other nutrients are the characteristics of soils in Cross River State (tropical soils) as described by Chude (1998); Ojeniyi (2002).

Growth of Cowpea Varieties as Influenced by Moringa Leaf Extract.: Result of plant height, number of leaves and number of branches of cowpea varieties as affected by moringa leaf extract (Tables 2 and 3).mCowpea varieties and moringa leaf extract significantly affected the growth of the cowpea. FUAMPEA 1 produced tallest plants which was followed by SAMPEA 14. For the moringa leaf extract, all treatments that receive the extract produced taller plants than the control where the plants did not receive the extract (Table 3). There was significant interaction effect of cowpea varieties and moringa leaf extract. Table 2 SAMPEA 14 treated with moringa leaf extract produced tallest plants. This was followed by FUAMPEA 2 treated with leaf extract. The least height was obtained from FUAMPEA 2 without

moringa leaf extract. The result of number of leaves produced by cowpea varieties as affected by moringa leaf extract application indicated that for the two years, the varieties of cowpea and moringa leaf extract significantly affected the number of leaves per plant as well as the interaction of cowpea varieties and the extract. In 2021, FUAMPEA 1, FUAMPEA 2, SAMPEA 14 and SAMPEA 15 applied with moringa extract produced the highest number of leaves per plant as 62, 60, 59 and 61 respectively, closely follow by FUAMPEA 1 without moringa leaf extract while the least number of leaves per plant was obtained from SAMPEA 15 without extract. The result followed the same trend in 2022. At cowpea variety, FUAMPEA 1 and SAMPEA 14 produced the highest number of leaves of 50.1 and 49.3 leaf/plant respectively, while the least number of 46 leaves was produced by SAMPEA 15

The number of branches per plant was significantly (P=0.05) affected by the variety and the extract. SAMPEA 14 and FUAMPEA 1 applied with moringa leaf extract produced the highest number of 17 and 16 branches respectively in 2021 and 19 and 17 branches in 2022. This was followed by FUAMPEA 2 treated by leaf extract while FUAMPEA 2 without extract produced the least number of branches in both years. At individual factor levels, SAMPEA 14 produced the highest number of branches among the varieties followed by FUAMPEA 1 and the least number of branches was produced by FUAMPEA 2 and SAMPEA 15. This result indicated that moringa leaf extract is a nutrient source for good plant growth. This growth increase in cowpea plant that received moringa leaf extract agrees with the assertion of Ghatas *et al;* (2021) who stated that organic fertilizers or biostimulants are used for improving nutrients intake by plants and stimulating growth. The significant increase in the number of leaves per plant among the varieties could be due to genetic influence. Different crop varieties show different attributes in terms of plant parameters. The higher number of leaves and branches in the moringa leaf extract treated plants also is an indication of external application of nutrients effect on crop performance. This cowpea response to moringa leaf extract is similar to the report of du Zardin (2015) who reported growth stimulating effect of bio-fertilizers and its increases in plants tolerance to environmental stresses and Fernandez *et al*., (2014) who reported improved plant growth due to natural organic products using seaweed.

Table 2: Growth of Cowpea Varieties as influenced by Moringa leaf extract - Interaction

Treatment	2021			2022		
	Plant height	Numbers of leaves	Number of branches	Plant height	Numbers of leaves	Number of branches
	8 WAP	8WAP	8 WAP	8 WAP	8WAP	8 WAP
FUAMPEA 1. NO EXTRACT	63.4	70	21	64.1	71	19
FUAMPEA 2. NO EXTRACT	61.5	68	20	61.7	69	21
SAMPEA 14. NO EXTRACT	63.5	69	22	63.5	69	22
SAMPEA 15. NO EXTRACT	68.2	71	21	69.1	71	21
FUAMPEA 1. WITH EXTRACT	71.3	92	23	72.0	92	23
FUAMPEA 2. WITH EXTRACT	68.1	82	22	68.8	83	21
SAMPEA 14. WITH EXTRACT	74.3	85	25	75.0	84	26

SAMPEA 15. WITH EXTRACT	73.2	87	22	72.8	88	23
LSD	2.6	8.2	2.0	2.5	8.3	2.1

Table 3: Growth of cowpea varieties (cm) as influenced by moringa leaf extract

VARIETY	2021			2022		
	Plant height	**Numbers of leaves**	**Number of branches**	**Plant height**	**Numbers of leaves**	**Number of branches**
	8WAP	**8WAP**	**8WAP**	**8WAP**	**8WAP**	**8WAP**
Fuampea 1	62.3	73.4	18	63.0	73.8	19
Fuampea 2	56.4	68.6	16	55.7	68.1	17
Sampea 14	60.2	71.2	20	61.0	71.9	21
Sampea 15	58.4	69.3	17	58.9	68.8	18
LSD	2.0	2.1	1.08	2.1	2.2	1.06
Moringa						
No extract	63.4	63.5	14	64.1	64.1	15
Extract	71.5	78.4	18	71.6	79.0	17
LSD	6.9	8.5	1.1	6.8	8.2	1.1

Number of days to flowering and podding of cowpea varieties as influenced by moringa leaf extract.: Result of number of days to 50% flowering and 50% podding of cowpea varieties as influenced by moringa leaf extract is presented in Tables 4 and 5. The varieties of cowpea planted significantly influenced the number of days to 50% flowering and 50% podding. SAMPEA 15 and FUAMPEA 2 produced flowers first at 40 to 41 days after planting for the two years. This was followed by FUAMPEA 1 (43 to44 days) and highest number of days from SAMPEA 14 with 46 to 47 days to produce 50% flowering (Table 9) FUAMPEA 1 and SAMPEA1 produced 50% podding at 64 and 66 days after planting. This was closely followed by FUAMPEA 2 which took 67 days and the highest number of days of 69 to 70 was recorded in SAMPEA 14. Moringa extract application did not affect number of days to flowering and number of days to podding. There was no interaction effect of variety of cowpea and moringa extract application. The effect of variety on number of days to flowering can be attributed to the genetic variability among the different varieties. The non-significant result recorded in extract indicated

that the effect of variety was more dominant in flowering than the fertilizer.

Table 4: Days to 50% flowering and 50% podding - Interaction

Treatment	2021		2022	
	50% flowering	**50% podding**	**50% flowering**	**50% poding**
FUAMPEA 1 – NO EXTRACT	45	65	44	66
FUAPEA 2 – NO EXTRACT	44	66	45	66
SAMPEA 14 – NO EXTRACT	48	70	48	71
SAMPEA 15 – NO EXTRACT	43	67	42	67
FUAMPEA 1 – WITH EXTRACT	46	68	45	67
FUAMPEA 2 – WITH EXTRACT	44	69	45	69
SAMPEA 14 – WITH EXTRACT	47	71	48	71
SAMPEA 15 – WITH EXTRACT	43	68	43	67
LSD	NS	NS	NS	NS

Table 5: Days to 50% flowering and podding of cowpea varieties as influenced by Moringa leaf Extract

Variety	2021		2022	
	50% flowering	**50% podding**	**50% flowering**	**50% poding**
FUAMPEA 1	44	64	43	65
FUAMPEA 2	41	67	40	66
SAMPEA 14	46	69	45	70
SAMPEA 15	40	66	40	66
LSD	2.0	2.4	2.1	2.3
Moringa Extract				
No extract	40	66	41	65
Extract	41	65	41	66
LSD	NS	NS	NS	NS

4.5 Yield and yield components of cowpea varieties influenced by moringa leaf extract.:
Result of yield and yield components of cowpea varieties as affected by moringa leaf extract is presented in Tables 6 and 7.

The result of number of pods per plant, number of seed per pod and grain yield per unit area was highly significant. Result of weight of 100 seeds was not significant for both variety and moringa leaf extract for the two years. SAMPEA 14 produced highest number of pods per plant (28 and 29) in 2021 and 2022, respectively, followed by FUAMPEA 1 with 21 pods per plant while FUAMPEA 2 and SAMPEA 15 produced least number of pods per plant (18 and 17) respectively (Table 11). Moringa leaf extract produced a higher number of pods per plant (21 and 22) in 2021 and 2022, respectively than the no extract plants (16 and 15). Number of seeds per pod for SAMPEA 14, FUAMPEA 1 and FUAMPEA 2 were 12, 11 and 10 respectively which were higher than SAMPEA 15 with 8 seeds per pod. Moringa extract treated plants produced higher number of seeds per plant produced higher number of seed per pod (9) than the no extract treated plants with a mean number of seeds of 5. The yield per unit area in tonnes per hectare for the varieties was highest in SAMPEA 14 (1.43 and 1.62 t ha^{-1}), respectively in 2021 and 2022, followed by FUAMPEA 1 (1.16 and 1.23t ha^{-1}) then FUMAPEA 2 (1.01 t ha^{-1}) and the least yield was obtained in SAMPEA 15 with a yield of 0.80 t ha^{-1}. Moringa leaf extract treatment produced higher grain yield of 1.22 and 1.28 t ha^{-1} respectively for 2021 and 2022 than the no extract treatment with yield of 0.81t ha^{-1}. At interaction, (Table 6) SAMPEA 14 treated with extract produced the highest grain yield per unit area (1.38t ha^{-1}) highest number of pods per plant. This was followed by FUAMPEA 1 with grain yield of 1.26 t ha^{-1} with same number of seeds per pod as SAMPEA 14. The least grain yield was obtained from SAMPEA 15 with no extract with a grain yield of 0.82 and 0.81t ha^{-1}. Respectively for 2021 and 2022.

The consistent significant differences recorded in the yield and yield components of cowpea varieties for the two years, was a genetic variance between different varieties in plant species. This result agrees with the report of Thorp *et al;* (2012) who stated that beans varietal differences significantly affected yield of cowpea while Sangakkara (1997) reported that varietal differences influence nodulation and yield of cowpea. The higher yield of cowpea varieties treated with moringa leaf extract could be due to the nutrient content of the extract. This is so because Ghatas *et al;* (2021) noted that biofertilizers contain biostimulants that could have resulted in the higher yield of cowpea varieties treated. The higher yield of cowpea varieties treated with foliar moringa leaf extract is in conformity with the results reported by Sakpal (2022) who observed higher yield and better economic returns of cowpea from foliar fertilizer application; Vighnesh et al., (2021) who reported higher number of pods per plant, number of seeds per pod, higher seed yield and net returns with application of foliar nutrients sources. Chakanyuka et al., (2019) also reported a significant effect on cowpea pod number and grain yield. Similarly, Brady and Weil (2014) proved an increase in yield of cowpea from 12 – 25 % under foliar fertilizer application I comparison to soil applied fertilization alone. It can also be noted that the varietal yield difference in response to application of moringa leaf extract is in line with the assertion of Sanginga *et al;* (2000) who stated that some crop genotypes tend to have greater need for nutrients and are often more responsive to nutrients input.

Table 6: Yield and yield components of cowpea varieties as influenced by moringa leaf extract – interaction

Treatment	2021				2022			
	No of pods/plant	**No of seed/pod**	**Seed 100 wt (g)**	**Yield t ha^{-1}**	**No of pods/plant**	**No of seed/pod**	**Seed 100 wt (g)**	**Yield ha^{-1}**
FUAMPEA 1 – NO EXTRACT	23	11.1	15.3	0.96	23	11.4	15.4	0.98
FUAMPEA 2 – NO EXTRACT	21	12.2	15.6	0.89	22	12.4	15.7	0.88
SAMPEA 14 – NO EXTRACT	25	14.2	15.5	0.98	26	14.4	15.5	1.00

SAMPEA 15 – NO EXTRACT	22	12.1	15.4	0.82	21	12.3	15.7	0.86
FUAMPEA 1 – WITH EXTRACT	27	15.1	15.2	1.26	28	15.4	15.7	1.46
FUAMPEA 2 – WITH EXTRACT	26	11.8	16.1	1.18	27	11.9	16.1	1.32
SAMPEA 14 – WITH EXTRACT	33	16.3	15.3	1.38	34	16.6	15.7	1.40
SAMPEA 15 – WITH EXTRACT	29	12.5	15.4	1.02	28	12.7	15.8	1.07
LSD	5.8	3.1	NS	0.09	5.7	3.09	NS	0.09

Table 7: Yield and Yield component of cowpea varieties as affected by moringa leaf Extract

Varieties	2021				2022			
	No of pods/plant	**No of seed/pod**	**Seed 100 wt (g)**	**Yield t ha^{-1}**	**No of pods/plant**	**No of seed/pod**	**Seed 100 wt (g)**	**Yield t ha^{-1}**
FUAMPEA 1 – NO EXTRACT	21	10	14	1.16	22	11	14	1.23
FUAMPEA 2 – NO EXTRACT	18	11	15	1.01	18	12	14	1.03
SAMPEA 14 – NO EXTRACT	28	12	13	1.43	29	13	13	1.62
SAMPEA 15 – NO EXTRACT	17	8	14	0.80	18	8	14	0.83
LSD	2.4	2.6	NS	0.11	2.4	2.5	NS	0.12
Moringa Extract								
No Extract	16	5	12	0.81	16	5	12	0.82
Extract	21	9	13	1.22	21	9	13	1.28
LSD	3.2	3.1	NS	0.91	3.2	3.2	NS	0.92

CONCLUSION: From this study, it can be concluded that the growth and yield of cowpea depends on the variety of the plant as SAMPEA 14 did best among the four varieties. Also the growth and yield of cowpea variety depends on the amount of nutrient given to the plant as the moringa leaf extract treated plants did better than the no extract plants. Therefore the best adaptable and high yielding cowpea, SAMPEA14, be selected and be applied with fertilizer especially bio-fertilizer like moringa leaf extract at the rate of 25mls per plant.

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