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Effect of Liquid Bio-Fertilizer (Alpha Life) on The Growth, Yield and Proximate Analysis of Okra (Abelmoschusesculentus) on Landmark University Soil

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A B S T R A C T

The effectiveness of liquid bio-fertilizer on the growth, fruit production and nutrient uptake of okra under field condition. The aim of the experiment was to determine optimum fertilizer rate for yield and quality parameters. The result of okra obtained shows that liquid bio-fertilizer affect plant height, number of leaves and number of lateral branches Treatment 3 (1.5ml of liquid bio-fertilizer to 18ml of water) perform well to the application of liquid bio-fertilizer to plant high, number of leaves and total number of pods followed by Treatment 2(1ml of liquid bio-fertilizer to 18ml of water) which has the highest performance in number of lateral branches from week 1 to week 5, followed by Treatment 4 which perform best with the value of (9.2667) compared to control. Treatment 1has the highest Average pods weight with the value (6.5333), while Treatment 3 performs best in pods length (9.40000), in addition liquid bio-fertilizer brought about improvement in the minerals composition of okra fruit. Treatment 4 performs best in Iron (0.027) Calcium (6.8) Magnesium (5.6) and Potassium (27) respectively, and also in proximate analysis, Treatment 1 has the highest Ash and Fat content (7.37 and 1.24) while Treatment 4 has the best performance in Protein content (10.67).Treatment 2 performs best in Crude fiber content with the value of (24.96) compared to treatment 6 which is the control. Treatment 3 (1.5ml of liquid bio-fertilizer to 18ml of water) for optimum yield and fruit quality of okra.

Key words: *Okra, bio-fertilizer, yield and nutrient composition*

Introduction

Okra (Abelmoschus esculentus) production has being known to be the most important vegetable production in Nigeria. It is an annual crop which can be grown all years round across Nigeria and it is grown mainly as fruit and leaf vegetable in both green and dried form, for both animal and human consumption. The crop is cultivated throughout the year in both humid and tropical forest zone (Ahmed et al. 2006). Okra production in Nigeria is predominantly carried out by the resources farmers. According to Awodoyin and Olubode (2009), the immature fruits and leaves of Abelmoschus esculentus are used in soup as a thickener because it is a rich source of vitamins and minerals. It supplies nutritive value to human daily diets. This crop can perform very well in most tropical and provides human supplementary vitamins such as A, B-Complex, C, iron and calcium (Akanbi et al., 2010; Jaibir, et al., 2004) when cooked, okra can give us the following nutrition benefits: Protein, niacin, riboflavin, phosphorus, zinc, copper, potassium, Vitamins A, B6, C, and K, thiamine, magnesium, foliate, calcium, and manganese.

The yield of okra in Nigeria is very low about 2 t ha (Food Agriculture Organization, 2007)) compared to other nation where okra are been planted, due to low native soil fertility status among other factors. Decline in native fertility status in most humid forest soil is due to intensive weathering and leaching, erosion, runoff, nutrient depletion, nutrient fixation, salinization of the soil and heaver equipment use on the soil to losing the soil before planting (Vanlauwe, 2000). Despite the numerous uses of okra, its production is very low in most developing countries because of the dependence on natural fertility of the soil and in addition, dependence on labour which is usually very costly and not economically profitable (Muhammad et al., 2007 and Schippers, 2000).

Bio-fertilizer is useful substitutes to inorganic fertilizers which improves the soil quality. According to Narkhede et al., (2010) the nutrient status of the compost obtained from municipal solid waste and sewage sludge was eminent. Due to increase in prices rate of fertilizers in developing countries the poor farmers are getting highly affected. Although the use of chemical fertilizers, herbicides, pesticides have enhanced the production of farming but there is growing concern over the adverse effects of the use of chemicals on soil productivity and environment quality. Use of chemical fertilizers for a long time has resulted in poor soil health, reduce production, and increase in incidences of pest and disease and

environmental pollution (Ansari and Ismail 2001). For yield expansion of okra (Abelmoschus esculentus (L.) in Nigeria there is a great need to augment the production of the crop by improving the fertilizer status of the soil in order to meet up with the nutrient requirement of the soil. One of the requisites for improving the soil fertility is thus through the use of organic fertilizers. The particular significance of organic fertilizer for soil fertility is that it influences so many different soil properties (Awodun, 2007). It has been reported by many researchers that multi-nutrient foliar fertilization, in relation to balanced plant nutrition, appeared to be the part and parcel of modern sustainable vegetable production during recent past. This mode of applying fertilizers to the crops has been considered a precious supplement to the application of nutrients to soil system (Fageria et al., 2009). With the resent increasing demand for okra in Nigeria, there is limited information on the type of fertilizer and nutrient requirement for optimal nutrient uptake, leaf quality and yield. Hence, the project will help reveal the most effective bio-fertilizer which will in turn be recommended to farmer in other to boost okra production.

Materials And Method

The experiment was carried out in Landmark University teaching and research farm to study the effect of different level of liquid bio-fertilizer (Alpha life) on the growth, yield and proximate analysis of okra fruit (Abelmoschus esculentus) this was to determine the amendment that best support high yield and growth to the crop with respect to the climate prevalent in the region. The experiment was carried out on the field in Landmark University Teaching and Research Farm, Omu-aran, Kwara State (latitude 8° 9° 0°N and Longitude 5° 61° 0°E) located at the Southern Guinea Savannah zone of Nigeria. The climate is tropical maritime with a long wet season, the wealth was moderate subject to modest variation of hot and cool as the season change. It has an annual rainfall pattern which extends between the month of April and October with average annual rainfall of between 600mm-1500mm. The peak rainfall is in May-June and September-October while the dry season is between November and March. The area has maximum temperature of 36c° to33°c and the minimum temperature of 28°c and 22°c humidity of this area is high(47-43%) all year round except in January when the dry wind blows from the north

Soil Sampling And Analysis

The experiment site is composed of a texturally literate soil type which contains high proportion of iron and aluminum as residue. Pre-planting soil sample of the experimental site was taken. Soil sample was randomly taken with auger at the depth of 0-15cm from the site after it had been prepared for cultivation. The sample was collect and packaged into sub-sample and taken for laboratory for analysis to determine the physical and chemical properties of the soil, and the soil analysis was carried out in the crop and soil science laboratory of Landmark University subjected to routine soil analysis. the soil sample was sieve with 2mm sieve and was subjected to routine soil analysis parameters analyzer were soil pH in water, total nitrogen available phosphorus, exchangeable bases (Ca, Mg, Na and K). The soil pH in water was determined 1 :1 soil to water using glass electrode digital pH meter acceding to (Bouyoucous, 1951).Available P WAS determine using Bray No1 solution of Murphy and Riley (1972). Exchangeable bases were determined using Atomic Absorption Spectrometer (ASS) machine while total Nitrogen was also determined by using bruccine method.

Treament And Experimental Design

The treatment was laid out in Randomizer Complete Block Design (RCBD) with three replicates and treatment includes: Treatment 1 = 0.5ml bio-fertilizer to 18ml of water, Treatment 2 = 1ml bio-fertilizer to 18ml of water, Treatment 3 = 1.5ml bio-fertilizer to 18ml of water, Treatment 4 = 2ml bio-fertilizer to 18ml of water, Treatment 5 = 100kg/ha of N.P.K 15:15:15, Treatment 6 = controlled.

Data were collected at 2, 3, 4, 5 and 6 weeks respectively after planting and 5plant per plot were randomly selected for morphological data collection. Data collected include;

Number of leaf per selected plant on each bed.

Number of lateral branches per the selected plant on each beds

Plant high per selected plant.

Pods weight per bed.

Pod length per bed.

Number of pods per bed.

Fresh okra pods was collected and oven dry and proximate analysis for it nutrients determination based on official method of analysis. AOAC (2000).

Statistical Analysis

The data collected on various parameters were subjected to analysis of variance using SPSS package and the mean was separated using Duncan Multiple Range Test (DMRT) at 5% level of probability.

Results And Discussion

The result of soil analysis (Table 1) showed that the soil is a sandy clay loam. It is also noted that the soil has low pH which means that it is acidic. From the recommendations of Ibedu et al.(1988), the soil is also low in total nitrogen, organic matter content, This implies low soil fertility, also the bio-fertilizer have been analyzer by the producer.

Table 1: Initial soil properties and bio-fertilizer concentration be for planting is shows Initial soil properties and bio-fertilizer concentration

Parameter	Value Mg/kg	Bio-fertilizer (component) %
Sand	60.53 %	
Silt	12 %	
Clay	11.88 %	
ph	5.25	4.75
Total Nitrogen	0.16	0.875
Organic Carbon	1.88	-
Organic Matter	3.24	-
Phosphorus (P)	8.55	4.09
Potassium (K)	0.23	2.10
Calcium(Ca)	3.4	0.022
Boron (B)	0.77	1102.22
Copper (Cu)		0.011
Iron (Fe)		1745.21

Plant Height

From table 2: The result of the study presented on Table 4.2 indicated that, there was no significant difference (P = 0.05) on plant height at 1, 2, 3, 4, 5 and 6. However, the value recorded for the parameter increased as the week after planting (WAP) increased, in week 1, 3, and 5 respectively in treatment 2 has the highest performance compared other treatment in that week while treatment 6 has the lowest performance which is the control also in week 4 and 5, treatment 1 has the highest the plant height as observed compare to treatment 6.

Table 2: Effect of different level of liquid bio-fertilizer on plant height

TREATMENT	WK1	WK2	WK3	WK4	WK5	WK6
1	3.8667[a]	6.9000[a]	9.5333[a]	15.2333[a]	16.5667[a]	23.6333[a]
2	4.0667[a]	6.3667[a]	9.9333[a]	14.9333[a]	16.8000[a]	23.2000[a]
3	3.8333[a]	7.0000[a]	9.3333[a]	13.3000[a]	15.2000[a]	23.7000[a]
4	3.8000[a]	6.6000[a]	9.8333[a]	15.0000[a]	15.6666[a]	23.1333[a]
5	3.7667[a]	6.7667[a]	8.5000[a]	14.1000[a]	16.7333[a]	22.4000[a]
6	3.0033[a]	6.2667[a]	8.0003[a]	13.3333[a]	15.0000[a]	21.6776[a]

Each value is a mean of 3 replicated. Mean followed by the same letter along the same column are not statistically different at $p \leq 0.05$

NUMBER OF LEAVES

The result of the study presented on Table 3 indicated that, there was no significant difference (P = 0.05) on number of leaves at 1, 2, 3, 4, 5 and 6. However, the value recorded for the parameter increased as the week after planting (WAP) increased. Treatment 2 showed the highest performance with respect to the number of leaves at 1, 3, 6 and 6 WAP. The control (6) had the least performance when compared to all the other weeks observed, also with N P K 15:15:15.

Table 3: Effect of different levels of liquid bio-fertilizer on Leaf number (Abelmoschus esculentus)

TREATMENT	WK1	WK2	WK3	WK4	WK5	WK6
1	3.7333[a]	6.2667[a]	9.5333[a]	13.3333[a]	15.8000[a]	22.7667[a]
2	4.0667[a]	6.3667[a]	9.9333[a]	14.9333[a]	16.8000[a]	23.2000[a]
3	3.8333[a]	7.0000[a]	9.53333[a]	15.3000[a]	15.2000[a]	23.2000[a]
4	3.8000[a]	6.6000[a]	9.8333[a]	15.0000[a]	15.6667[a]	23.1333[a]
5	3.7667[a]	6.7667[a]	9.3000[a]	14.1000[a]	16.7333[a]	22.0000[a]
6	3.5667[a]	6.0000[a]	8.3333[a]	12.2333[a]	16.5667[a]	21.7333[a]

Each value is a means of 3 replicates. Means followed by the same letter along the same column are not significantly ($p \leq 0.05$) different

Number Of Lateral Branch

Table 4: shows the influence of liquid bio-fertilizer on the okra lateral branches. Lateral branches of okra were significantly ($p< 0.05$) influenced by the application of liquid bio-fertilizer from week 1 to week 6. Treatment 4, have the highest value in week 2, 5 and 6 as compared to treatment 6 with the lowest performance when observed, in week 1, treatment 2 perform best compared to other treatment while there is significant different in treatment 1, 3 and 5 respectively also in week 2and 5 there is no significant different but treatment2 and 4 perform best with highest number of lateral branches compared to other treatment in week 2 and 5. In week 3 and 6, treatment 4 performs best as observed.

Table 4: Effect of different level of liquid bio-fertilizer on the number of lateral branch

TREATMENT	WK1	WK2	WK3	WK4	WK5	WK6
1	2.9333^{ab}	4.9333^{a}	4.6000^{a}	6.0667^{ab}	6.5333^{a}	9.0667^{ab}
2	3.2667^{a}	4.8000^{a}	4.6667^{a}	6.3000^{a}	7.0667^{a}	8.2000^{b}
3	2.8000^{ab}	4.7333^{a}	4.4667^{ab}	6.2000^{a}	6.8667^{a}	7.5333^{bc}
4	2.7333^{b}	4.9667^{a}	4.5333^{a}	6.4333^{a}	7.5333^{a}	9.2667^{a}
5	2.8667^{ab}	4.8000^{a}	4.3330^{a}	6.9000^{a}	7.4677^{a}	8.3333^{b}
6	2.0000^{b}	3.6333^{a}	4.0003^{a}	5.3333^{a}	5.1333^{a}	6.9333^{c}

Each value is a mean of 3 replicated. Mean followed by the same letter along the same column are not statistically different at $p\leq 0.05$

Average Fruit Yield

From figure 1, Treatment 3 which is 1.5ml of liquid bio-fertilizer to 18ml of water has the highest total number of pods per plant compared to treatment 6 which is the control, For the Total Weight of pods (TW) Treatment 2 which is 1ml of liquid bio-fertilizer to 18ml of water has the highest value (15.1000), followed by Treatment 1(10.5333) as compared to treatment 6 which is the control has the lowest performance (9.3333). Also for Average Pods Diameter (APD) Treatment 1 which is 0.5ml liquid bio-fertilizer to 18ml of water which perform best (6.5333) compared with the value of treatment 6 with the value (5.2000) has the lowest performance. Treatment 2 which is 1ml liquid bio-fertilizer to18ml of water perform best with value of (10.5000) , followed by treatment 3 which is 1.5ml liquid bio-fertilizer to 18ml of water, with the value (10.1000) while treatment 6 which is the control have the lowest values (9.4000) For Average Pods Length (APL)

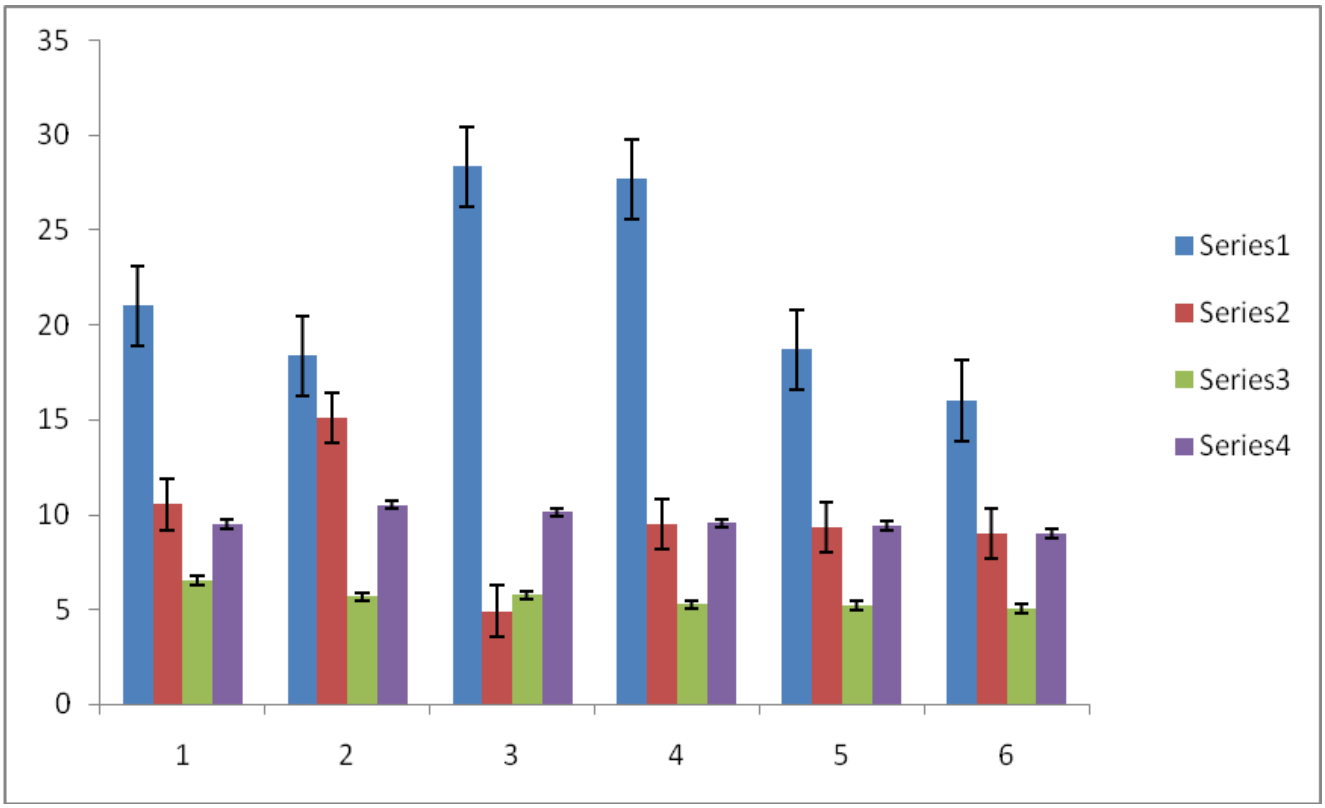

Figure 1: effect of liquid bio-fertilizer on the fruit yield

Minerals Conpoition Of Okra

From table 5: Treatment 4 (2ml liquid bio-fertilizer mixed with 18ml of water) use as treatment on plant shows the highest Manganese content (Mn), Iron (Fe), Magnesium (Mg), Calcium (Ca) and Potassium (K). These results indicate that 2ml liquid bio-fertilizer has the best positive effect on the nutrient composition of okra fruit compared to other levels of treatment used, followed by treatment 3 and 2 respectively.

Table 5: The effect of liquid bio-fertilizer at different levels on the minerals composition of okra (Abelmoschus esculentus)

TREATMENT	Mn	Fe	Ca	Mg	K
		Ppm			
1	0.021	0.020	6.4	3.6	23
2	0.016	0.018	6.6	5.4	21
3	0.022	0.020	6.2	5.7	18
4	0.023	0.027	6.8	5.6	27
5	0.019	0.017	6.0	5.2	25
6	0.016	0.010	5.0	1.9	15

Nutrient Composition Of Fruit (Proximate Annlysis)

From 6 table: treatment 1 with 0.5ml: 18ml of water has the highest moisture content with 13.00% followed by treatment 2 with 2ml: 81ml of water with the value (13.48) compared to the rest treatment while treatment 6 which is control has the lowest moisture content with the value (12.00) also it observed that the protein content in treatment with 2ml of alpha life liquid bio-fertilizer to 18ml of water mixed together has the highest protein value (10.59) compared to other treatment. Ash content in the treatment applied is higher in treatment 1 with 0.5ml of alpha life liquid bio-fertilizer to 18ml of water mixed together with the value (7.37); also the crude fiber has the value (24.26), content is high in plant treated with 1ml, 0.5ml, 1and 4ml of alpha life bio-fertilizer to 18ml of water compared to other treatment used in the experiment.

Table 6: Effect of different level of liquid bio-fertilizer on nutrient composition of fruit (proximate analysis)

TEATMENT	MOISTURE	PROTEIN	ASH	CF	FAT
		(ppm)			
1	13.00	10.59	7.37	21.20	1.24
2	13.48	8.89	7.24	24.96	0.63
3	12.48	8.51	7.02	20.23	0.94
4	12.94	10.67	7.25	19.26	1.13
5	12.59	9.33	6.95	17.08	0.71
6	12.00	8.33	6.65	18.08	0.56

Discssion

The result from the experiments shows that the different soil amendment that is used are; 0.5ml of alpha life liquid bio-fertilizer to 18ml of water, 1ml of alpha life liquid bio-fertilizer to 18ml of water, 1.5ml of alpha life liquid bio-fertilizer to 18ml of water, 2ml of alpha life liquid bio-fertilizer to 18ml of water and NPK15:15:15 has the capacities to improved the performance of okra yield, growth and proximate analysis. From the experiment there is significant different in the number of lateral branches and plant height but there is no significant different in the number of leaves but there is an increase in different figure of the result obtained in the number of leaves for the experiment because of the essential element contains in the liquid bio-fertilizer (alpha life) necessary for plant growth such element are; nitrogen, phosphorus, calcium, potassium and magnesium contain in the liquid bio-fertilizer used. This agreed to the fact that Foliar fertilization not only improves plant growth traits, crop yields and nutrient uptake by crops (Maitlo et al., 2006) but also enhances nutrient use efficiency of crops (Fageria et al., 2009). Hence benefits of foliar fertilizers under study might be related to their multi-nutrient contents, which upon absorption by the leaf tissues improved the growth traits of okra plants and resultantly increased okra yield. And also It facilitates timely translocation of deficient nutrients to plant system through leaf tissues (Fageria et al., 2009) Alkaff and Hassan (2003) reported improved growth and yield traits of okra in relation to foliar fertilization. Early fruit set and fruit maturity was noted by the foliar application of micronutrients in now mandarin (Mishra et al., 2003).

Conclusion And Recommendation

Fertilizer is one of the most important inputs contributing to crop production because it increases productivity and improves yield quantity and quality Going by the reports of Ojeniyi and Akanni (2008) which was confirmed by Agbede et al.(2008),it was worthy to note that most Nigeria soil are usually low in organic matter (OM), N and available P. There for the is need to supplement the soil with nutrient that has high content of available P, organic matter and nitrogen into the soil by using liquid bio-fertilizer which can be easy translocated into the leaves tissue for quick growth and development.

In conclusion that the use of liquid bio-fertilizer enhanced the bioavailability and mobility of plant nutrients and, thus, improved the uptake of nutrients by okra plant roots. Specifically, the compost liquid bio-fertilizer enhanced the uptake of nutrients (N, K, Na, Ca and Cu) more than any of the other soil amendments considered

With the above merit on the use of liquid bio-fertilizer in farming, I recommend that farmer especially the one that are within the North central part of Nigeria should use of liquid bio-fertilizer to boost vegetable production The regular testing of such effective liquid bio-fertilizers and their use, after extensive controlled condition and field scale studies, is recommended for sustainable okra production.

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