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# EFFECT OF DIFFERENT RATES OF PARKIA LEAF LITTER (PARKIA BIGLOBOSA) AND POULTRY MANURE ON SELECTED GROWTH PARAMETERS OF MAIZE (ZEA MAYS L.) AT AFAKA KADUNA, NIGERIA

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## ABSTRACT
A field experiment was conducted at the experimental site of Crop Production Technology Department during 2017 and 2018 rainy seasons at Federal College of Forestry Mechanization, Afaka Kaduna to study the effect of rates of *Parkia biglobosa* leaf litter and Poultry manure on growth parameters namely shoot girth, plant height, leaf area, number of leaves and yield of Maize (*Zea may* L). The trial consisted of seven treatments, combination of both *Parkia biglobosa* leaf litter and Poultry manure at the ratio of 1:1, 2:1, 3:1 and 4:1 respectively, and three other treatments as soil + *Parkia* leaf litter alone, soil + poultry manure alone and soil alone. The field was laid out in a Randomized Complete Block Design (RCBD) and replicated three times. The selected growth parameters namely shoot girth, plant height, leaf area and number of leaves were observed and readings taken at 3, 6, 9 and 12 WAP respectively. The yield and yield components such as cob length, number of seed per cob, cob weight, 100 seed weight and grain yield were also observed and reading taken after harvesting The data obtained were subjected to Analysis of Variance (ANOVA) using SAS, means were separated using Duncan Multiple Range Test (DMRT). The result obtained from the analysis showed that treatment combination of *Parkia biglobosa* leaf litter + Poultry manure at ratio 4:1 performed better with respect to the selected growth parameters namely shoot girth, plant height, leaf area and number of leaves than 3:1, 2:1, 1:1, and all other treatments. Similarly the result obtained from the analysis also showed that treatment combination of *Parkia biglobosa* leaf litter + Poultry manure at ratio 4:1 performed better and produced yield and yield components such as cob length, number of seed per cob, cob weight, 100 seed weight and grain yield than 3:1, 2:1, 1:1, and all other treatments The study therefore recommends that incorporation of tree leaf litter and poultry manure into farm land should be encouraged among the farmers in Afaka environs to ameliorate the soil for improved growth rate in maize plant which in turn will enhance greater yield of maize to the farmers.

## KEY WORDS
Effect, Parkia leaf litter, poultry manure, maize, growth parameters, yield, yield components.

Maize (*Zea mays* L.) is the most widely and popular cereals in Nigeria that has found its usage in every home either as food for human being or feed for animals and importantly raw materials for industries. Maize crop started as a subsistence crop in Nigeria and has gradually risen to a commercial crop on which many agro-based industries depend on as raw materials (Iken and Amusa, 2014). It has become an important irrigated crop and increasingly being used as a coping strategy against the ever worsening climatic anomalies throughout the country. Maize provides energy, vitamins and has some amount of protein. Maize also provides food and feeds, employment and income generation for small holder farmers. World total cereal production in 2012 showed that maize was the first most important cereals in Nigeria followed by sorghum and rice as stated by (FAO; 2012). Africa produced 7.9% of the world total from 34.7 million hectares. Nigeria which came second after South Africa in Africa produced 8.7 million metric tons from 5.7 million harder which represent 1% of the world total in 2012. Maize require annual rainfall of 600-900mm (IITA,2006), temperature for its growth ranges between 21-27C, it grows best in sandy loamy

soil containing adequate organic matter and tolerates soil $P^H$ from 5.5 to 8.0 but the optimum range is 5.5 – 7.0 for good growth (Wolkowski, 2001).

Leaf litter is dead plant material (such as leaves, bark, twigs and cladode) that has fallen to the ground. This detritus or dead organic material and its constituents' nutrients are added to the top layer of the soil commonly known as leaf litter (Ochoa-Hueso *et.al.,* 2018). Litter aids in soil moisture retention by cooling the ground surface and holding moisture in decaying organic matter. The benefit of *Parkia* includes the use of leaf shed, which provides litter and hence organic matter to the soil. As litter decomposed nutrient are released into the environment. They protect the soil from heat, wind and potent nutrient cyclers from the deep soil layer. Litter production and decomposition rate have great important in maintaining the fertility of the soil. A substantial portion of nutrients accumulate by plants is return to the soil as litter fall followed by it decomposition. Standing crop of litter acts as an input-output system of nutrients. The rate at which litter falls and subsequently decays regulate energy flow, primary productivity and nutrient cycling in forestry ecosystem (Sundarpandia and Swany, 1999). African locust bean trees provide shade for forage grasses livestock as livestock stands under the tree; they fertilized the soil with their dung. Soil respiration and litter of decomposing biomass particles combine energy source for micro and microorganism.

This study therefore aimed at determining the effect of different rate of *Parkia* leaf litter (*Parkia biglobosa*) and poultry manure on growth parameters and yield of maize (*Zea mays* l.) at Afaka Kaduna.

## METHODS OF RESEARCH

The experiment was conducted at the experimental site of Crop Production Technology Department Federal Collage of Forestry Mechanization Afaka Kaduna State. It is located at latitude $10^o37^0$N and longitude $7^0$ $21^0$E within the northern guinea savanna agro ecological zone.

The soil sample at the experimental site was randomly collected diagonally on the site at the depth of 0-15cm using hand augur. The soil sample was bulked, mixed thoroughly and air dried, put in a sealed envelope for analysis. The analysis was to determine the physical and chemical properties of the soil.

Sample of *Parkia biglobosa* leaf litter droppings was collected within the college premises. This was air dried at room temperature in the soil science laboratory. The air dried sample was crushed, cured and collected into a marked envelope. Poultry manure sample was collected from the college poultry farm, the poultry manure collected was air dried and crushed to powder form. The sample was collected into another marked envelope for analysis.

The experimental treatments comprised of seven*. Parkia* leaf litter in combination with poultry manure at varying ratio of (1:1, 2:1, 3:1, 4:1) respectively, Soil + leaf litter, soil + poultry manure and Soil alone. The treatment was replicated three times and was laid out in a Randomized Complete Block Design (RCBD).

The field laid out comprise of gross size of 4.5m x 1.5m plot dimension per treatment. The net plot size was 1.5m x 1.0m. The spacing between each replicate was 1m and within plots was 0.5m. The total area required for the experiment was $127.5m^2$ which was equivalent to 0.0126ha.

Extra early maize variety (Sammaiz22) was purchased from Institute of Agricultural Research (IAR) Seed Unit Ahmadu Bello University Zaria. It was treated with Apron star at the rate of 10ga.i/ha. The seed was poured into the gourd and mixed thoroughly with Apron star until uniform color is attained.

The experimental site was cleared of debris, ploughed, harrowed and ridged. The plot was labelled according to treatment specification as contained.

Both the *Parkia* leaf litter and the poultry manure were crushed separately into powder, ($1kg/m^2$) of *Parkia* leaf litter and ($1kg/m^2$) of poultry manure respectively were taken for uniformity and measured at the treatment ratio. The *Parkia* leaf litter was mixed with poultry manure and water was applied sparingly 7 days prior to incorporation into the soil to facilitate

decomposition process. The mixture was broadcast and incorporated into the soil to ensure uniformity in the application. On the control plot no treatment was applied.

The treated maize seed was planted within the prepared soil two weeks after nutrient application. The seed was planted at recommended rate of two seed per hole during the rainy season on the experimental plot.

Pre-emergence herbicides (Atrazine) was applied using knapsack sprayer, with green deplete nozzle at recommended rate of l/ha at a pressure of 2.1kg/$m^2$ to 250 l/ha spray solution.

Thinning was carried out to one plant per stand two weeks after planting (WAP).

Supplementary hoe weeding was carried out at 6 WAP when weeds are observed.

The assessment of growth parameters such as shoot girth, plant height, leaf area and number of leaves were taken from randomly sampled plants (four) tagged from each net plot.

The shoot girth of each tagged plant was measured with Vernier caliper at 3, 6, 9 and 12 weeks after planting to determine the plant diameter at the base close to the ground level. The mean was determined and recorded.

The plant height was measured from the tagged plants in each net plot from the base of each plant to the highest growth point using meter rule at 3, 6, 9 and 12 weeks after planting. The mean was also determined and recorded.

The leaf area was determined by measuring the length and the widest point of function leaf at 3, 6, 9 and 12 weeks after planting. The leaf area was calculated using the constant equation of L x B x 0.75 as suggested by Harper (1999).

The number of leaves from each tagged plants was counted and recorded.

The number of cobs harvested per tagged plant was counted; the mean was calculated and recorded.

100 Seed from tagged plant was weighed in (g) and the mean weight was recorded accordingly.

The cob weight per plant was taken and the mean was recorded.

The length of cob per plant was measured using a meter rule and the mean was recorded.

The yield was obtained from the net plots size and this was further extrapolated to yield per hectare.

All data collected were subjected to Statistical Analysis of Variance [ANOVA] using the F-fest as described by Snedecor and Cochran (1994). Means separation was done, at 5% level of probability using Duncan Multiple Range Test (DMRT) as described by Duncan (1955). The relationship between maize yield and other parameters were determined using simple correlation coefficient analysis as suggested by Little and Hills (1978).

## RESULTS OF STUDY

The result of soil sample, poultry manure and *Parkia* leaf litter analysis for the experiment site are as contained on Table 1, for the study carried out on the effect of different rates of *Parkia* leaf litter and poultry manure on growth and yield of maize during 2017 and 2018 rainy seasons at Afaka. The result showed that the $p^H$ is 6.40, 7.85 and 6.40 for leaf litter and poultry manure respectively. The result of analysis indicated that the total nitrogen is 0.03%, 1.26% and 0.69% and cumulative total nitrogen of 1.98% from all the nutrient sources, while organic matter is 0.65%, 6.69% and 13.39% for leaf litter and poultry manure respectively.

Others are organic carbon 0.38%, 3.87% and 7.74%. Potassium ($K_2O$) are 0.03 (cmol/kg), 0.21% and 0.15% soil, *Parkia* leaf litter and poultry manure respectively. The available phosphorus includes 7.41mg/kg in poultry manure and 0.23mg/kg in *Parkia* leaf litter. The textural class was loamy sand. Both soil and *Parkia* leaf litter had lower $P^H$ values than poultry manure indicating slight acidity. The percent nitrogen in the soil and other nutrient sources are low. However, the cumulative total is quite moderate on the recommendation of 2.0% Nitrogen per plant (Chude *et al*., 2011). All other nutrient elements could cause increase in nutrient status of the crop that is beneficial to crop uptake. The

effective cation exchange capacity was also available and relevant in soil fertility that could sustain the soil due to continuous cultivation. Both *Parkia* leaf litter and poultry manure had considerable amount of organic matter of (13.39% and 6.69%) and organic carbon of (7.74% and 3.87%) that could ameliorate the soil content that was initially poor as indicated in Table **1.** Due to the texture of the soil of sandy loam, it could enhance better drainage and structure required for good root penetration.

Table 1 – The mean value for physico-chemical & physical characteristic of soil sample, poultry manure and *Parkia* leaf litter on influence of rates of *Parkia* leaf litter and poultry manure on maize plant during the sampling periods of 2017 and 2018 rainy seasons at Afaka

| Chemical Characteristic | Soil | Poultry Manure | *Parkia* Leaf Litter |
|---|---|---|---|
| $P^H$ ($H_2O$) | 6.40 | 7.85 | 6.40 |
| Total Nitrogen (%) | 0.03 | 1.26 | 0.69 |
| Calcium (cmol/kg) (%) | 0.71 | 0.52 | 0.19 |
| Magnesium (cmol/kg) (%) | 0.06 | 0.08 | 0.07 |
| Organic Matter (%) | 0.65 | 6.69 | 13.39 |
| Organic Carbon (%) | 0.38 | 3.87 | 7.74 |
| Potassium ($K_2O$%) | 0.03 | 0.21 | 0.15 |
| Phosphorus (mg/kg) | - | 7.41 | 0.23 |
| Exchangeable acidity (cmol/kg) | 0.50 | | |
| Effective cation exchange capacity (cmol/kg) | 1.35 | | |
| Electrical Conductivity (ds/m) | 0.09 | | |
| Sand | 80.40 | | |
| Clay | 3.60 | | |
| Silt | 16.00 | | |
| Textural Class | Sandy loam | | |

Effect of rates of *Parkia biglobosa* leaf litter and Poultry manure on shoot girth of maize plant during the sampling periods at 3, 6, 9 and 12 WAP of 2018 rainy season is countered in Table 2 below. All the sampling periods resulted in significantly wider shoot girth with *Parkia biglobosa* leaf litter + poultry manure at ratio of 4:1 and was comparable to the narrow shoot girth obtained with all other treatment applications. The shoot girth increased progressively at 3, 6, 9 and 12 WAP, with higher values of 3.63cm, 6.45cm, 10.32cm and 11.24cm obtained respectively, with ratio of 4:1 compared to the least shoot girth with soil + poultry manure at 1 kg/m² at 3 WAP, (4.22cm) at 6, 9 and 12 WAP with soil alone 6.68cm and 7.58cm respectively. Maize plants produced wider girth due to available nutrients in the soil that enabled better growth performance of shoot and leaves of the plant throughout the growth period. The shoot played significant roles in maize production as source of assimilate translocation and partitioning, thereby resulting in increased leaf production.

Table 2 – Effect of rates of Parkia leaf litter and poultry manure on mean value of shoot girth of maize plant during 2017 and 2018 rainy seasons at Afaka

| | | shoot girth at | | | |
|---|---|---|---|---|---|
| Treatment | Rates | 3 | 6 | 9 | 12 (WAP)[1] |
| PLL[2] + PM[3] | 1:1[4] | 3.14abc[5] | 4.37cd | 9.58ab | 10.33b |
| PLL + PM | 2:1 | 3.47a | 4.69bc | 10.50a | 10.00bc |
| PLL + PM | 3:1 | 3.33ab | 4.88b | 10.03ab | 10.50b |
| PLL + PM | 4:1 | 3.63a | 6.45a | 10.32a | 11.24a |
| Soil + LL | -:1 | 2.51bc | 4.43cd | 8.63bc | 9.25cd |
| Soil +PM | -:1 | 2.30c | 4.30cd | 7.28bc | 8.85d |
| Soil alone | - | 2.79abc | 4.22d | 6.68d | 7.58e |
| SE± | | 0.17 | 00.91 | 0.29 | 0.18 |

*[1]week after planting; [2]parkia leaf litter; [3]poultry manure; [4]1:1 1 kg/m² [5]mean followed by similar letters are not significantly different at p >0.05 using Duncan Multiple Range Test (DMRT).*

Table 3 below indicated that plant height was significant during the sampling periods of 3, 6, 9 and 12 WAP of 2017 and 2018 rainy seasons on influence of rates of *Parkia biglobosa* leaf litter and Poultry manure on maize plant. Plant height at 3 WAP sampling

period showed significantly taller maize plant of 37.50cm with combination of 3:1and 34.42cm at 4:1 respectively, and was comparable to 2:1 and also compared to treatment combination of 1:1 (26.75cm). The least plant height was observed with soil + leaf litter at 1 kg/m² (24.67cm) soil alone (22.58cm) and soil + poultry manure at 1kg/m² (21.37). During the sampling periods at 6 WAP, combination of *Parkia biglobosa* + poultry manure at ratio of 4:1(1kg/m²) gave taller maize plant of 99.58cm and was also comparable to 99.50cm obtained with ratio 3:1. All other treatments had lower plant height. The factor of production was not limiting during the periods of growth of the crop thereby competition hardly existed amongst the plant. The situation was further improved with availability of both nutrient source that could enhance the growth performance of the maize. The least plant height was observed with soil alone and soil + poultry manure showed the superiority of leaf litter in the soil than all other treatments application. The combined effect could also be an indication of the soil $P^H$, organic matter and organic carbon that allowed the availability of the nutrients.

Table 3 – Effect of rates of Parkia leaf litter and poultry manure on mean value of plant height of maize plant during 2017 and 2018 rainy seasons at Afaka

| | | plant height at | | | |
|---|---|---|---|---|---|
| Treatment | Rates | 3 | 6 | 9 | 12 (WAP)[1] |
| PLL[2] + PM[3] | 1:1[4] | 26.75bc[5] | 82.08b | 175.96ab | 220.68a |
| PLL + PM | 2:1 | 32.08ab | 89.75b | 169.46ab | 218.47a |
| PLL + PM | 3:1 | 37.50a | 90.50ab | 173.99ab | 212.04a |
| PLL + Pm | 4:1 | 34.42a | 99.58a | 201.46a | 224.79a |
| Soil + LL | -:1 | 24.67c | 71.50c | 137.10b | 162.84b |
| Soil +PM | -:1 | 21.37c | 68.13c | 201.46a | 151.20b |
| Soil alone | - | 22.58c | 67.75c | 140.92b | 160.33b |
| SE± | | 1.49 | 1.96 | 4.55 | 5.61 |

*[1]week after planting; [2]parkia leaf litter; [3]poultry manure; [4]1:1 1 kg/m² [5]mean followed by similar letters are not significantly different at p >0.05 using Duncan Multiple Range Test (DMRT).*

During the periods of investigation at 3,6,9and 12 WAP of 2017 and 2018 rainy seasons, all the leaf area obtained were significant on the treatments applied as shown in Table 4. At 3, 6, 9 and 12 WAP was sampling periods, combination of *Parkia biglobosa* leaf litter and poultry manure at ratio 4:1 produced significantly higher leaf area of mean 101.61cm, 201.46cm and 747.47cm respectively and was comparable to the combination ratio of 1:1, 2:1, 3:1, and soil +leaf litter at 1kg/m² compared to the least obtained with treatment applications of soil + poultry manure at 1kg/m² and soil alone. Lower leaf area produced with the control plots at 3, 6, 9 and 12 WAP, could be due to the low nutrient available for plant growth. Lower leaf area of plants could lead to reduce photosynthetic rate thereby affecting the growth of the crop. However, higher nutrients that exist in the combination of *Parkia biglobosa* and poultry manure at ratio 4;1 could be evidence of soil amendments by the nutrients content with high organic matter and organic carbon including the CEC that could improve crop performance.

Table 4 – Effect of rates of Parkia leaf litter and poultry manure on mean leaf area of maize plant during 2017 and 2018 rainy seasons at Afaka

| | | Leaf area at | | | |
|---|---|---|---|---|---|
| Treatment | Rates | 3 | 6 | 9 | 12 (WAP)[1] |
| PLL[2] + PM[3] | 1:1[4] | 64.00ab[5] | 308.23ef | 673.34ab | 826.54a |
| PLL + PM | 2:1 | 74.83ab | 434.04b | 704.68ab | 735.75a |
| PLL + PM | 3:1 | 84.69ab | 387.25c | 663.60ab | 794.65a |
| PLL + PM | 4:1 | 101.61a | 574.78a | 747.47a | 833.70a |
| Soil + LL | -:1 | 63.06ab | 358.96cd | 633.30b | 631.08ab |
| Soil +PM | -:1 | 60.77b | 334.92de | 616.03b | 624.40ab |
| Soil alone | - | 67.86ab | 295.82ef | 478.74c | 484.56b |
| SE± | | 7.59 | 10.76 | 19.51 | 40.94 |

*[1]week after planting; [2]parkia leaf litter; [3]poultry manure; [4]1:1 1 kg/m² [5]mean followed by similar letters are not significantly different at p >0.05 using Duncan Multiple Range Test (DMRT).*

Number of maize plant leaves influenced by the rates of *Parkia* leaf litter and poultry manure produced during the sampling periods at 3,6,9 and 12 weeks after planting (WAP) of 2017 and 2018 rainy seasons is contained in Table 5 below. At 3 WAP all the treatment application combination of *Parkia biglobosa* leaf litter and poultry manure at various ratio of 1:1, 2:1, 3:1, 4:1, soil +leaf litter, soil + poultry manure and soil alone did not differ significantly on maize yield.\However, at 6, 9 and 12 WAP influence of rates of combination of *Parkia biglobosa* leaf litter and poultry manure were significant on number of leaves. The result of the treatment combination of ratio 4:1 at 6 WAP sampling period produced was significantly higher number of leaves and was comparable to ratio 3:1 and 1:1 compared to the least number of leaves obtained from other treatments. The mean number of leaves produced on soil alone was 8.08 being the least. At 9 WAP, higher number of leaves were significantly observed from *Parkia* leaf litter + poultry manure combination at 1:1 and 2:1 that resulted in 11.58 and 11.25 respectively, comparable to the mean number of leaves produced with treatments ratio of 4:1, 3:1 and soil + 1kg/m$^2$ leaf litter. The least number of leaves were observed with treatment applications of soil alone. At 12 WAP, higher number of leaves were observed with *Parkia* leaf litter + poultry manure combination ratio of 4:1 and 2:1 resulting in 13.00 and 12.50 respectively compared to the lower number of leaves obtained with 3:1, 1:1 and application of either soil alone and + 1 kg/m² leaf litter. The non-significant number of leaves obtained at 3 WAP could be due to slow release of nutrients applied initially at 6, 9 and 12 WAP, sampling period, thereafter the effect of the nutrients manifested on the plants and produced more number of leaves. *Parkia* leaf litter and poultry manure at 4;1 that produce higher number of leaves throughout the investigation could be due to increased nutrient availability, leading to better crop growth performance. The result conforms with (Chude *et al,* 2012) who revealed that higher nutrient availability could lead to better crop performance. In addition, lower number of leaves encountered from the soil treatment was with application of *Parkia* leaf litter or poultry manure and soil alone from the study. Lower number of leaves encountered from soil treatments with single nutrient source application had lower performance which could be associated with insufficient nutrient availability from the soil.

Table 5 – Effect of rates of *Parkia* leaf litter and poultry manure on mean value of number of leaves of maize plant during 2017 and 2018 rainy seasons at Afaka

| | | number of leaves at | | | |
|---|---|---|---|---|---|
| Treatment | Rates | 3 | 6 | 9 | 12 (WAP)[1] |
| PLL[2]+ PM[3] | 1:1[4] | 5.92[5] | 9.08a | 11.58a | 11.66bc |
| PLL + PM | 2:1 | 6.25 | 8.75abc | 11.25ab | 12.50ab |
| PLL + PM | 3:1 | 5.42 | 9.00ab | 10.67abc | 11.75bc |
| PLL + PM | 4:1 | 6.33 | 9.17a | 10.75abc | 13.00a |
| Soil + LL | -:1 | 5.50 | 8.50bc | 10.25bc | 11.42bc |
| Soil +PM | -:1 | 5.38 | 8.33c | 9.67c | 11.07c |
| Soil alone | - | 5.42 | 8.08c | 10.25bc | 10.67c |
| SE±[5] | | 0.21 | 0.11 | 0.22 | 0.24 |

*[1]week after planting [2]parkia leaf litter [3]poultry manure [4]1:1 1 kg/m$^2$ [5]mean followed by similar letters are not significantly different at p >0.05 using Duncan Multiple Range Test (DMRT).*

Yield components of maize plant on influence of rates of *Parkia* leaf litter and poultry manure obtained at harvest during 2017 and 2018 rainy seasons are indicated in Table 6. The yield component of cob length (cm), cob weight (kg/m$^2$), 100- seed weight (g) and grain yield (t/ha) were all significant. Both cob length and cob weight produced comparable significantly higher values at different ratio of 1:1, 2:1, 3:1 and 4:1 with combination of *Parkia biglobosa* leaf litter + poultry manure (1kg/m² each) compared to the least values obtained with soil + leaf litter (1kg/m²) and soil alone. The significant 100-seed weight resulted in higher mean value of 1466.70g of 4:1 and was comparable to mean value of 1166.70g obtained with 3:1. The least value of 416.70 was observed with 100-seed weight of soil + poultry manure and soil alone. During the experimental periods of 2017 and 2018 rainy seasons, treatment applications of 3:1 and 4:1 had higher grain yield of 5.85 and 5.69 (t/ha) respectively compared to all other treatments application. The least grain yield was obtained

with soil + poultry manure alone. The better vegetative growth performance observed during the study on number of leaves, leaf area, plant height and shoot girth played significant role in the yield component that gave higher values of cob weight, cob length, number of seed, 100-seed weight and yield of maize. This was probably due to nutrient sources of leaf litter and poultry manure that improved on the soil that had low nutrient content. It has been reported (Oyebamiji *et al.,*2016) that fertility level of savannah soils are low, inorganic fertilizers has been in used in most cases. However, the need of organic source is presently being considered due to the role play by improvement of physical characteristic. The addition of *Parkia* leaf litter and poultry manure was able to ameliorate the nutrient content of the soil thereby producing higher yield components observed in the study. The better growth performance also produced higher yield with combination of *Parkia* leaf litter and poultry manure at 4;1 and 3;1 ratio respectively than other nutrients application.

Table 6 – Effect of rates of Parkia leaf litter and poultry manure on mean value of yield and yield components of maize plant during 2017 and 2018 rainy seasons at Afaka

| | | Yield and Yield Components at harvest | | | | |
|---|---|---|---|---|---|---|
| Treatment | Rates | Cob length (cm) | Number of Seed/cob | Cob weight Kg/m | 100 Seed Grain yield (t/ha) weight(g) | |
| PLL + PM | 1:1 | 17.67a | 369.67ab | 1.26a | 950.00bc 3.67bc | |
| PLL + PM | 2:1 | 16.75a | 370.25ab | 1.24a | 833.30bc 2.96c | |
| PLL + PM | 3:1 | 18.58a | 470.50a | 1.67a | 1166.70ab | 5.85a |
| PLL + PM | 4:1 | 17.83a | 488.17a | 1.44a | 1466.70a 5.96a | |
| Soil + LL | -:1 | 12.92b | 259.83bc | 0.63b | 566.70c | 3.67b |
| Soil +PM | -:1 | 12.92b | 210.23c | 0.46b | 416.70c | 1.91d |
| Soil alone | - | 11.67b | 200.58c | 0.51b | 500.00c | 2.68c |
| SE± | | 0.59 | 27.03 | 00.96 | 104.07 | 1.16 |

*Note: Cob weight/plant, number of seed/cob, cob weight, 100-seed weight, grain yield, mean followed by similar letters are not significantly different at p >0.05 using Duncan Multiple Range Test (DMRT).*

## DISCUSSION OF RESULTS

The soil used for the study was sandy loam with a $P^H$ of 6.40 which makes it slightly acidic. This could allow uptake of various nutrient elements. The result obtained from Table 1 with low level, of soil nitrogen was enhanced by total nitrogen present in the other nutrient samples of *Parkia* leaf litter and poultry manure, and all other nutrient elements could cause increase in fertility status that will be beneficial for maize crop uptake.

*Parkia biglobosa* leaf litter enable decomposition by mic-organisms that led to addition of organic matter to the soil. This could enhance vital activity in the soil. In this study, incorporation of *Parkia biglobosa* leaf litter and poultry manure increased the organic matter (13.39% and 6.69%) and organic carbon of (7.75% and 3.87%) respectively. The enrichment of the soil organic matter increased the fertility level there by the in higher rates of combination of *Parkia biglobosa* leaf litter and Poultry manure could led to significant higher number of leaves, plant height, shoot girth and leaf area obtained during the sampling periods.

The findings corroborate with Chude *et al.* (2012), who reported that higher nutrient availability could lead to better crop growth and performance. The result also agrees with observation of Odeyemi, (2010) and Oyebamiji *et al*. (2016), who also observed better growth and performance of maize.

The result of the study indicated that higher yield of maize obtained was influenced by the higher rates of application of *Parkia* leaf litter and poultry manure at ratio of 4:1 that produced improved cob weight, cob length, number of seed/cob, 100-seed weight and grain yield at harvest compare to all other treatments with low nutrient applications. Furthermore, the ability of the nutrient combination of 4t/ha *Parkia* leaf litter and poultry manure of 1t/ha could improve the soil chemical properties. Poultry manure has been used as soil amendment to sustain adequate crop yield in maize (Boateng *et al.,* 2006). Therefore, presence of poultry manure as organic manure could have been beneficial to maize producers.

## CONCLUSION

In conclusion, the results showed that treatments combination of *Parkia biglobosa* leaf litter and Poultry manure at ratio 4:1 performed better with respect to the selected growth parameters namely shoot girth, plant height, leaf area and number of leaves p and also produced higher maize yield. The study therefore recommends that incorporation of tree leaf litter and poultry manure into farm land should be encouraged among the farmers in Afaka environs to ameliorate the soil for improved growth rate in maize plant rate which in turn will enhance bumper harvest of maize for farmers

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