EFFECT OF DIFFERENT PLANT BIOMASS AS SOIL AMENDMENT ON GROWTH PARAMETERS AND YIELD OF MAIZE

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Abstract
Soil fertility degradation remains the major biophysical cause of declining per capita crop production especially on small holder farms. Appropriate soil fertility regimes are therefore, critical for improved crop productivity. Plant biomass is the weight of living plant material contained above and/or below a unit of ground surface area at a given point in time. It includes both the above and belowground tissues of plants, for example, leaves, twigs, branches, boles, as well as roots of trees and rhizomes of grasses Incorporation of plant biomass into the soil for plant use has effects on the growth parameters of plants. This study evaluated the short term effect of plant biomass on the growth parameters of maize plant. The plant biomasses used were: Banana leaf, Guinea grass and Siam weed (Chromoleana). These are common plants most people take as waste unwanted plant. The parameters characterized were plant height, leaf area and stem girth. Records of the leaf breadth, leaf length, plant height and stem girth were taking. The leaf area was gotten by multiplying the leaf length and the leaf breadth of each plant together with the corrective factor of 0.75 as suggested by Saxena and Signh (1965) and Tollenaar (1992).The average leaf area recorded were 373.33 cm^2, 402.40 cm^2, 388.21 cm^2 and 394.19 cm^2 for Control, Siam weed, Guinea grass, and Banana leaf respectively for the 6^{th} week which was the first record. The average plant heights recorded were 122.56 cm, 125.22 cm, 125.00cm and 112.78 cm for Control, Siam weed, Guinea grass, and Banana leaf respectively. It was noticed that there was no significant difference among the means recorded for the plant height at $P<0.05$. The average stem girths recorded were 6.61 cm, 6.76 cm 6.83 cm and 6.67 cm for Control, Siam weed, Guinea grass, and Banana leaf respectively. The average maize yield recorded were 2.42 ton/ha, 3.21 ton/ha, 2.86 ton/ha, and 3.14 ton/ha for Control, Siam weed, Guinea grass, and Banana leaf respectively. Plot amended with the plant biomass had better performance on the growth parameter of maize. At the 6^{th} week, plot amended with Siam Weed (Chromoleana) had the highest Leaf Area and Plant Height while at the 12^{th} week (maturity period) plot amended with Guinea Grass had the highest Leaf Area and Plant Height, this may be as a result of the mineralization rates. Plot amended with Siam Weed (Chromoleana) had the highest yield while the Control plot had the lowest yield; this was as a result of the advantageous effect of the Plant biomass on the soil. In conclusion, Plant biomass amends soil fertility and improves growth parameters of plants (maize) and the yield.

Keywords: Banana leaf, Guinea grass, Siam weeds.

Introduction
The greatest challenge of agriculture is to optimize land use in environmentally and economically sustainable ways especially for small-scale family farming (Lamonica; Barroso, 2006). Soil fertility decline is increasingly viewed as a critical problem affecting agricultural productivity and environmental welfare in sub-Saharan Africa (SSA) (Bationo et al., 2004). Studies indicate the decline is as a result of combination of high rates of erosion,

leaching, removal of crop residues, continuous cultivation of the land without adequate fertilization or fallowing (Sanchez and Jama, 2002). This is aggravated by the inherent poor fertility in most tropical soils (Okalebo et al., 2003). Throughout the 1990's interest in soil quality and understanding its importance has come to the forefront of environmental sustainability. Over $25 billion is spent in the United States annually for soil care and improvement (Wallace Terry, 1998).

Plant Biomass includes both the above and belowground tissues of plants, for example, leaves, twigs, branches, boles, as well as roots of trees and rhizomes of grasses. Plant biomass considered for this study is Guinea Grass (*Panicium maximus*), Banana Leaf (*Musa acuminate*) and Siam weed (*Chromolaena odorata*). Siam weed (*Chromolaena odorata*) Chromolaena odorata is a member of the family Asteraceae. The plant has been shown to enhance the buildup of organic matter in fallow system in tropical soil (Agbim, 1987; Obatolu and Agboola, 1993). Chromolaena odorata (a weed in the family Asteraceae) was known to enhance the buildup of organic matter in fallow system in tropical soil. Chromolaena helps in controlling spear grass as well as improving the fertility of the soil and reducing the fallow period of land (Ojeniyi 2007). As fallow species, Chromolaena provides large quantities of nutrient rich humus, which improves the soil structure and nutrient content. The study is significant in the sense that the result of the project will provide information on how to improve soil fertility at low cost and to reduce cost of production using plant biomass.

The results of the project will provide information on the growth parameters of maize planted on soil amended with Guinea Grass; Banana Leaf and Siam Weed separately.

Statement of the problem

Chemical fertilizers cause damages to soil; it reduces the soil fertility The nutrient requirements of the crop are met from soil reserves until these reserves cannot meet crop demands, which result to reduction in plant growth and yield. Soil fertility decline and high production cost of food is a big issue in agriculture today due to increase in population which requires increase in food production. In this case there is need to improve the soil with organic fertilizers that is cheap and available like Guinea grass, Siam weed, and Banana leaf which were sometimes counted as weeds. This will reduce the cost of production that may arise due to purchase of inorganic fertilizer, as plant biomass are free natural resources costing little or nothing.

Objectives of study

The purpose of this project is to study the effect of different plant biomass on growth parameters of Maize.

The specific objectives are:

1. To determine the effect of Guinea Grass (*Panicium maximus*) on plant height, leaf area and stem girth of maize.
2. To determine the effect of Banana Leaf (*Musa acuminate*) on plant height, leaf area and stem girth of maize.

3. To determine the effect of Siam weed (*Chromolaena odorata*) on plant height, leaf area and stem girth of maize.
4. To compare the effect of the three plants used.

Research Questions

Based on the purpose of this study, the following research questions were raised

- What is the effect of Guinea Grass (*Panicium maximus*) on the growth parameters of maize and groundnut?
- What is the effect of Banana Leaf (*Musa acuminate*) on the growth parameters of maize and groundnut?
- What is the effect of Siam weed (*Chromolaena odorata*) on the growth parameters of maize and groundnut?
- Are there differences on parameters due to effects of the biomasses used?

Materials and Methods

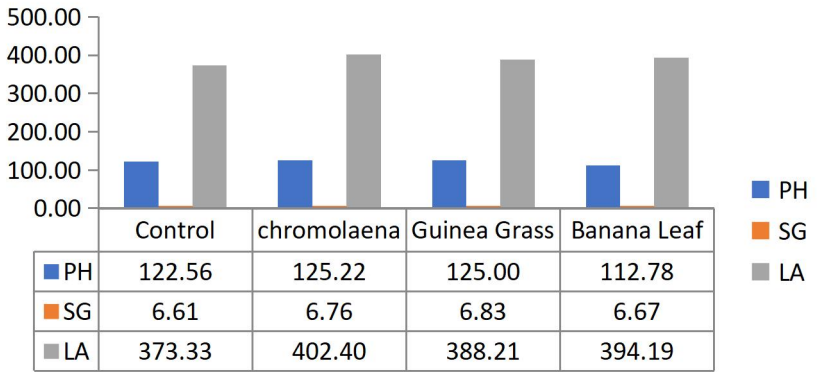
Description of experimental location

This experiment was carried out at Federal College of Education (Technical) Akoka, Lagos. The area lies approximately between latitude 6.583°N and longitude of 3.750°N and 2 metres above the sea level. It is located in coaster region of Nigeria with annual rainfall over 2,000mm. The annual temperature range is 22°C and 38°C with relative humidity above 85%.

Analytical Technique

The land was tilled and thirty-two beds of 3m x 4m and 1m spacing each were made for planting. Biomass (Chromolena leaf, Banana leaf, Guinea grass) were added to each bed at the rate of 10 tons/ha. The biomass was left for two weeks to decompose after which maize was planted. Records of maize growth parameters (plant height, leaf length, leaf breadth, stem girth, leaf number) for 6th, 9th and 12th week and yield were taken. The leaf area was gotten by multiplying the leaf length and the leaf breadth of each plant together with the corrective factor of 0.75 as suggested by Saxena and Signh (1965) and Tollenaar (1992). ANOVA was used for the data analysis and represented with graphs..

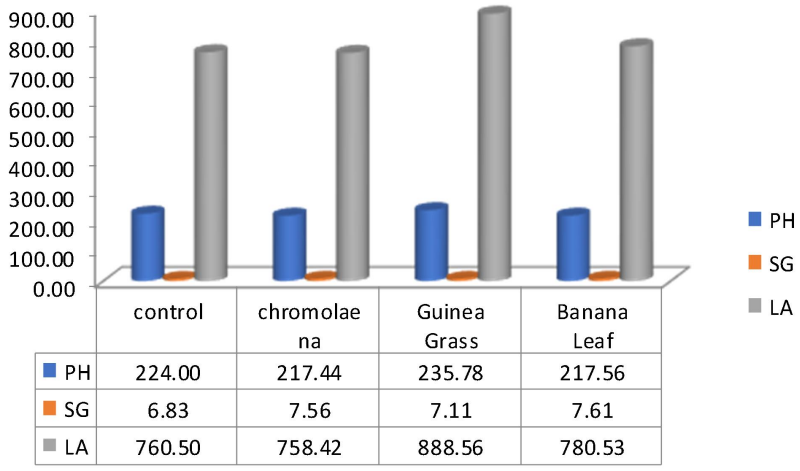
Result and Discussion



	Control	chromolaena	Guinea Grass	Banana Leaf
PH	122.56	125.22	125.00	112.78
SG	6.61	6.76	6.83	6.67
LA	373.33	402.40	388.21	394.19

Figure1: Effects of treatments on Plant Height, Stem Girth and Leaf Area for 6th week.

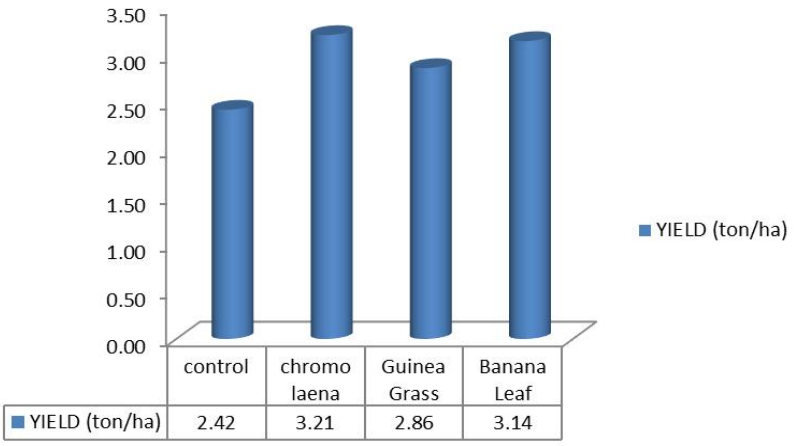
PH –Plant Height SG—Stem Girth LA—Leaf Area



	control	chromolaena	Guinea Grass	Banana Leaf
PH	224.00	217.44	235.78	217.56
SG	6.83	7.56	7.11	7.61
LA	760.50	758.42	888.56	780.53

Figure3: Effects of treatments on Plants Height, Stem Girth and Leaf Area for 12th week.

PH –Plant Height SG—Stem Girth LA—Leaf Area



	control	chromo laena	Guinea Grass	Banana Leaf
YIELD (ton/ha)	2.42	3.21	2.86	3.14

Figure 4: Effects of treatments on Maize Yield

The average leaf area recorded were 373.33 cm^2, 402.40 cm^2, 388.21 cm^2 and 394.19 cm^2 for Control, Siam weed, Guinea grass, and Banana leaf respectively for the 6th week which was the first record. The average plant heights recorded were 122.56 cm, 125.22 cm, 125.00cm and 112.78 cm for Control, Siam weed, Guinea grass, and Banana leaf respectively. It was noticed that there was no significant difference among the means recorded for the plant height at $P<0.05$. The average stem girths recorded were as follows 6.61 cm, 6.76 cm 6.83 cm and 6.67 cm for Control, Siam weed, Guinea grass, and Banana leaf respectively. Plot amended with the plant biomass had better performance on the growth parameter of maize. At the 6th week plot amended with Siam Weed (Chromoleana) had the highest Leaf Area and Plant Height while at the 12th

week (maturity period) plot amended with Guinea Grass had the highest Leaf Area and Plant Height, this may be as the result of the mineralization rates. The average maize yield recorded were 2.42 ton/ha, 3.21 ton/ha, 2.86 ton/ha, and 3.14 ton/ha for Control, Siam weed, Guinea grass, and Banana leaf respectively. Plot amended with Siam Weed (Chromoleana) had the highest yield while the Control plot had the lowest yield; this was as a result of the advantageous effect of the Plant biomass on the soil. In conclusion, Plant biomass amends soil fertility and improves growth parameters and yield of maize. .

Conclusion and Recommendation

The experiment shows that there was no significant difference among the plant growth parameters but significant difference among the plant biomass .The purpose of this project is to study the effect of different plant biomass on growth parameters of Maize.

Exists at $P<0.05$, likewise there was significant difference among the yield. Plot amended with Siam Weed (Chromoleana) had highest yield showing that Siam Weed (Chromoleana) has high rate of mineralization within the soil. All the Plant biomass added to the soil improves both the Plant Parameters and the Yield of Maize.

Based on the foregoing, Siam weed, Guinea grass, and Banana leaf are recommended for maize production. These are counted as waste but they are good source of manure to the soil to improve the soil fertility. It is therefore recommended that they can be used as soil amendment for maize production especially for small scale farmers.

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