International Journal of Research (IJR) Vol-1, Issue-11 December 2014 **ISSN 2348-6848**

The Effect of Forest Litters *(Gmelina Arborea)* on the Growth of *Celosia Argentea*.

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ABSTRACT:
The effect of forest litters (Gmelina arborea) on the growth of celosia argentea was carried out at the Federal College of Forestry, located within Government Reserved Area (GRA), Jericho, Ibadan, (7^o23N and 3^o51E) with an annual rainfall of about 1,300mm-1,500mm and average relative humidity of about 80-85% (FRIN Meteorological Station, 2006). The collected top soil was air dried and sieved and it was filled in to the 5kg polythene pot. The Celosia argentea seeds were planted directly into the polythene pot two days after the collection of the soil. The Experimental Design used for the experiment was Completely Randomized Design (CRD) and replicated five times. Forest leaf litters (Gmelina arborea) collected from the plantation was air dried after which it was grounded into fine particles.Four levels (5g, 10g, 15g, and 20g) of forest (Gmelina arborea) leaf litters were separately added to the top soil in the polythene pot two weeks after planting of Celosia argentea, while top soil only serves as control. The following growth parameters were assessed during the experiment weekly plant height (cm), stem diameter (mm), number of leaves, fresh harvest weight and dry harvest weight (g). Fresh and dry weight plant-1 was significantly influenced by the addition of different level forest tree leaf litters. The highest values in fresh harvest weight per plant were obtained from the 10g application level treatment of 89.00g and which is significantly different from the control treatment of 0g application level. The lowest values of most of the parameters were obtained from control treatment, the performance of Gmelina leaf litters with respect to growth of Celosia suggested that leaf litters can be used as an alternative of chemical fertilizer in the profitable production of leafy vegetables like Celosia.

Keywords:
Leaf litter; *Celosia argentea*; Forest soil; growth; application level

INTRODUCTION.

Forest litter is an organic layer of dead plant and animal parts undergoing different stages of decomposition processes on top of the soil. In forests with year's long life cycle, litter is a major source of nutrients systematically enriching the soil (Wardle *et al.*, 1999).

Celosia argentea is one of the important leafy vegetable in south-western, Nigeria. It is a vegetable of high economic value particularly in the dry season, as it provides a source of living for most rural vegetable farmers. (Akinlasoye *et al*.,2008). The leaves and succulent stem are consumed as vegetable because it constitutes a cheap and rich nutrient source for the low income earners, and the seeds could also be

processed into food items, supplement and additives.

This leafy vegetable is an essential component of people's diet in Nigeria and other parts of West Africa. The leaves and young shoots of both forms are used in soups and stews. The leaves contain high levels of calcium, phosphorus and iron. This plant is an important source of proteins, calories, vitamins and minerals (Leung *et al.*, 1968) that enrich the diet the people of West Africa but unfortunately the production of this popular vegetable is very low according to our demand.

A major problem facing the production of celosia in Africa is the poor soil condition as a result of continuous cultivation. So the production of these vegetables should be increased to meet up our increasing demand. To alleviate this problem the use of forest litter to act as organic manure like especially poultry droppings and ruminant dung is common with farmers in Nigeria for the production of this vegetable. Organic manure helps to improve the physical condition of the soil and provides adequate amount of necessary nutrients for soil productivity, in addition to being a major contributor of plant nutrients (Adeyeye, 2009).

The objective of the study is to determine the effect of forest litters *(Gmelina arborea)* on the growth of *Celosia argentea*.

MATERIALS AND METHOD

EXPERIMENTAL SITE

The experiment was carried out at the Federal College of Forestry, located within Government Reserved Area (GRA), Jericho, Ibadan, (7^{o}23N and 3^{o}51E) with an annual rainfall of about 1,300mm-1,500mm and average relative humidity of about 80-85% (FRIN Meteorological Station, 2006).

METHODOLOGY

The collected top soil was air dried and sieved. The sieved soil was filled in the 5 kg polythene pot and later wet adequately before planting and seeds were collected from Institute of Agricultural Research and Technology (IAR&T) Moor Plantation Apata, forest leaf litters (*Gmelina arborea*) collected from College of Forestry plantation was air dried after which it was grounded into fine particles powder using grinding machine. Four levels (5g, 10g, 15g, and 20g) of forest (*Gmelina arborea*) leaf litters were separately added to the top soil in the polythene pot two weeks after planting of *Celosia argentea*, while topsoil only serves as control.

The Experimental Design used for the experiment was Completely Randomized Design (CRD) and replicated five times, the following growth parameters were assessed during the experiment weekly stem height (cm), stem diameter (mm), number of leaves, fresh harvest weight and dry harvest weight (g).

DATA ANALYSIS

Data collected was analyzed using Analysis of Variance (ANOVA) and the means were separated using Duncan's Multiple Range Test (DMRT) at 5% level of probability.

RESULTS AND DISCUSSION

TABLE 4.1: SOIL ANALYSIS

Sample	Soil
Exchange Na (cmol/kg)	0.36
Exchange K (cmol/kg)	0.38
Exchange Ca (cmol/kg)	1.21
Average P (mg/kg)	1.53
pH	6.31
%N	0.24
% Organic C	2.44

Source: FederalCollege of Agriculture, Moor Plantation, 2012.

The table above shows the result for the analysis of soil sample in the experimental site. It shows the composition and structure of the soil which consist of nutrients both at large and small quantity and its pH level. The result indicates that the soil contains 0.36cmol/kg of sodium (Na) exchange, 0.38cmol/kg of potassium (K) exchange, 1.21cmol/kg of Phosphorus (P) exchange, 0.24% of Nitrogen (N), 2.44% of Organic Carbon (C), and 6.31% of pH. From the table, it shows that the highest amount of nutrients present in the soil is organic Carbon at 2.44% and the lowest amount of nutrient in the soil is Nitrogen at 0.24%. The pH level of the soil is closer to its neutral level which is the balanced level of a soil, this proves that the soil is good enough for planting and it contains the necessary nutrients a plant needs for its growth.

TABLE 4.2: CHEMICAL ANALYSIS OF *Gmelina arborea* LITTER USED

Parameters	*Gmelina arborea*
Total Organic Carbon%	51.20
Total Nitrogen%	1.98
Mg^{++} (mg/100g)	80.00
P as $P0_4^-$ (mg/100g)	217.50
Ca^{++} (mg/100g)	395.00
K^+ (mg/100g)	110.00

Source: Kappa Biotechnology Laboratories, 2012.

The table above shows the result for the chemical analysis of the forest (*Gmelina arborea*) litter used for the experiment. It shows the chemical

composition of the litter which consist of nutrients both at large and small quantity. The result indicates that the litter contains 51.20% of total Organic Carbon (Ca), 1.98% of total Nitrogen (N), 80.00mg/100g of Magnesium (Mg^{++}), 395.00mg/100g of Calcium (Ca^{++}), and 110.00mg/100g of Potassium (K^{+}). From the table, it shows that the highest amount of nutrients present in the litter is Calcium at 395.00mg/100g and the lowest amount of nutrient in the litter is Nitrogen at 1.98%. The result proves that the litter is good enough for planting and it contains the necessary nutrients a plant needs for its growth.

TABLE 4.3: PLANT HEIGHT (cm) OF *C. argentea* AS INFLUENCED BY *Gmelina arborea* LITTER USED

Treatment	Week 1	Week 2	Week 3	Week 4	Week 5
T_O (Control)	18.92b	21.10b	28.90e	43.00c	49.20c
T_1 (5g)	19.50b	21.10b	30.88d	43.40c	52.50bc
T_2 (10g)	25.70a	28.10a	39.40a	56.20a	66.20a
T_3 (15g)	20.10b	22.50b	33.60c	47.00b	57.40b
T_4 (20g)	25.00a	27.58a	35.26b	50.40b	57.30b
LSD 5%	3.83	2.02	1.08	3.21	6.94

**Means with different alphabet differ significantly at 5% level of probability.*

TABLE 4.4: PLANT NUMBER OF LEAVES OF *C. argentea* AS INFLUENCED BY *Gmelina arborea* LITTER USED

Treatment	Week 1	Week 2	Week 3	Week 4	Week 5
T_O (Control)	18.50c	20.70b	23.75c	26.75d	30.75d
T_1 (5g)	19.50b	20.75b	25.25b	30.25c	34.25c
T_2 (10g)	20.50a	22.75a	27.75a	33.75a	43.75a
T_3 (15g)	18.75c	20.75b	26.00b	32.25b	37.50b
T_4 (20g)	19.00bc	21.75ab	26.00b	29.50c	37.50b
LSD 5%	0.70	1.10	0.90	1.54	2.38

**Means with different alphabet differ significantly at 5% level of probability.*

TABLE 4.5: PLANT DIAMETER (cm) OF *C. argentea* AS INFLUENCED BY *Gmelina arborea* LITTER USED

Treatment	Week 1	Week 2	Week 3	Week 4	Week 5
T_O (Control)	2.18b	2.45b	3.10c	3.37b	3.16c
T_1 (5g)	2.43b	2.60ab	3.38b	3.60ab	3.75b
T_2 (10g)	3.03a	3.25a	3.60a	4.05a	4.18a
T_3 (15g)	2.38ab	2.90ab	3.53a	3.93ab	4.08ab
T_4 (20g)	2.28b	2.63ab	3.30b	3.53ab	3.65b
LSD 5%	0.67	0.64	0.20	0.66	0.42

**Means with different alphabet differ significantly at 5% level of probability.*

TABLE 4.6: PLANT WEIGHT (g) OF *C. argentea* AS INFLUENCED BY *Gmelina arborea* LITTER USED

Treatment	Fresh Harvest Weight (g)	Dry Harvest Weight (g)
T_O (Control)	58.60c	44.33e
T_1 (5g)	68.00c	54.64cd
T_2 (10g)	89.00a	68.77a
T_3 (15g)	65.20c	51.00de
T_4 (20g)	78.00b	60.40bc
LSD 5%	10.1030	7.56

**Means with different alphabet differ significantly at 5% level of probability.*

Litter fall is a major functional part of any ecosystem as it plays a vital role in regulating nutrient cycling and organic matter content. A substantial amount of organic matter returns to the forest floor through litter fall. Leaves constitute about 70-90% of the total litter fall in various forest ecosystems. Litter, thus, exerts a great influence on physical and morphological characteristics of plant. Studies have been carried out on litter fall dynamics and nutrients in various types of forest ecosystems with little information on the biotic disturbance factors on litter fall and nutrient dynamics in *Gmelina* forests.

There were significant difference in the effect of application of *G. arborea* leaf litter on the plant height, number of leaves produced, stem diameter and plant yield weight (fresh and dry harvest) of *C. argentea*. From the result recorded in the experiment it was generally observed that there was progressive increase of the parameters taken weekly. T_2 (10g of *Gmelina*) showed the highest mean of plant height, number of leaves produced and

plant stem diameter at 5 weeks after application with the mean values of 66.20cm, 43.75 leaves and 4.18mm respectively . These suggest that the nutrient of the leaf litter has the required nutrients and the release to boost the growth of Celosia to be better than that of control treatment. Weight is an important characteristic of any plant upon which the economic value of such plant depends on. for the plant yield weight, T_2 (10g of *Gmelina*) also produced the best significant effect which is significantly different from the control with the mean values 89.00g (fresh harvest) and 68.77g (dry harvest).

The result of this experimental work shows that, *Gmelina arborea* litters at 10g with topsoil had positive effect on the growth and yield of *Celosia argentea.*

RECOMMENDATION

Based on the result of this project, *Gmelina arborea* litter at 10g with topsoil can therefore be recommended for the cultivation and production of *Celosia argentea.* More research work should be carried out on the effects of different forest litters as organic fertilizer on different plants.

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