



EFFECT OF NYPA FRUTICAN (WURMB) ASH ON THE GROWTH AND YIELD OF SPINACH (BASELLA ALBA L.)

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ABSTRACT

This research was carried out at the Centre for Ecological Studies, Abuja campus, University of Port-Harcourt, Rivers State. The study was conducted to determine the effect of *Nypa fruticarpa* ash on the growth and yield of Spinach (*Basella alba*). Five Vines of 10-12(cm) in length were planted in a nursery bag of 7kg well drained Sandy loamy soil. Different concentrations of the extracted ash; control (0g), 20grams, 30 grams and 50grams were applied to the soil before planting. A total of 4 treatments with 3 replicates each were laid in a completely randomized design. The following growth parameters; plant height, number of leaves, leaf length, leaf width, fresh and dry weight and percentage growth rate were used in ascertaining the effects of *Nypa fruticarpa* ash on the growth of *Basella alba*. The result showed that the growth and yield of *Basella alba* were not significantly ($p = 0.05$) affected by the ash concentration in the soil. 20grams of ash had the highest yield in terms of the number of leaves, fresh weight and Dry weight in comparison with other treatments. 50 grams concentration had the highest yield in terms of Vine length and leaf length in comparison with other treatments. The *Nypa fruticarpa* ash of concentrations 20,30 and 50 grams had stimulating effect on the growth and yield of *Basella alba*.

KEYWORDS: Growth And Yield, *Nypa Fructicarpa* Ash, Spinach, *Basella Alba*

1. INTRODUCTION

The spinach (*Basella alba*) is a green leafy vegetable. It is a popular class of edible leaves and it is highly recognized around the world (Pandy *et al.*, 1993). It is highly cultivated in the western and southern part of Nigeria. Spinach is a low maintenance broadleaf annual crop that will grow with minimal effort and resources. The under exploited leafy vegetable is easy to cultivate and grows in most climates and soils (Yarger, 2007). Spinach is an annual plant for the production of its leaf and biennial for the production of seed. The breeding methods of cross-fertilization of vegetable can be applied to the cultivation of spinach. To improve the population of spinach, methods like recurrent selection, Progeny testing and mass selection are suitable for the development of new variation (Pandy and Kallo, 1993). *Basella alba* can be cultivated in spring and autumn. The nutritional value of fresh spinach, with 91% moisture content, has between 0.4% and 0.6% of lipid content, 2.9% protein content and a good number of essential Amino acid are contained in this vegetable, with an exemption to sulfurous amino acid (methionine) and tryptophan. It also has a low percentage of carbohydrate (2% - 10%) and a high fiber content of (2.2%).

The health benefit associated with the consumption of spinach (*Basella alba*) are stupendous inexhaustible. Some of those health benefits include; hypoglycemic activity, ant obesity effects, anticancer properties, neuronal protection, lipid-lowering properties and cardiovascular properties (Murica *et al.*, 2020). Opioid peptide called rubiscolones have also been found in spinach. The folic acid was first purified from spinach. To have a good amount of folate in spinach, it is better to steam than to boil it. The amount of folate in spinach can be halved, if the spinach is boiled for 4 minutes (Bender and Bender, 2005). The freshly harvested spinach is attributed with high antioxidant properties because of the humongous amount of flavonoid compound, chlorophylls', ferulic acid, cafeic acid, etc. which is mostly found in leaves (Murica and Tome, 2020). With the numerous health benefits attributed to this plant Spinach, it is imperative to carry out thorough research and develop ways and method of increasing its productivity. The fertilizer of the soil in Nigeria has bottleneck in the agricultural sector due to the indiscriminate activities of man. With this major issue, farmers are faced with the challenges looking for alternative source of nutrient to boost productivity of their farm produce. The Ash that will be used in this research is an organic fertilizer obtained from plant Biomass, *Nypa fruticarpa* which undergoes 4 different stages to extract the ash. The *Nypa Fruticarpa* also known as *Nypa palm*, are major threat to the mangroves and coastal system in the Niger delta. These palm are foreign species that were introduced to the Niger delta region. Over the years, these plant have acclimatized to the coastal environment and have developed



superior root system. These plants are known for their tough buoyant seeds that aid wide dispersal. These quantities have made them to have an edge over mangrove.

These palms change the pedology, hydrology and landscape architecture of the coastal environment once they are established. In essence these pose a major threat to the mangrove and entire coastal system, which benefit from the ecosystem services provided by the mangroves. Research has established that the mangrove may disappear completely in the next 50 years from the Niger delta region if the encroachment of this palm continues unabated. However, this problem can be averted by the palms through mechanical, physical or chemical means (Numbere, 2018).

These plant have economic importance in furniture industry, craft industries and under the agricultural sector, they can be used in feeding pigs during the dry season. They can be used in the production of biofuels such as Bioethanol, charcoal briquette, etc. In order to curb the acclimatization of these plants in the coastal region and avoid further threats to the mangrove region. A large amount of this fruit can be used in the production of biofuels.

The aim of the study is to evaluate the growth of spinach (*Basella alba*) using *Nypa frutican* as fertilizer.

2.0 MATERIALS AND METHODS

2.1 THE STUDY SITE

The experiment and research work was carried out at the Ecological research Centre of the University of Port-Harcourt, Abuja Park, Port- Harcourt, Rivers State.

2.2 SOURCES OF MATERIALS

The vine of *Basella Alba* were sourced from ADP farm, School to land Rumuodomaya, Port-Harcourt, Rivers State. The loamy soil used were sourced from the Department of Agriculture farm site, University of Port-Harcourt. The *Nypa frutican* were sourced from Eagle Island, Agip, Port-Harcourt, Rivers State.

2.3 METHODS OF ASH EXTRACTION

2.3.1 DRY WEIGHT AND FRESH WEIGHT OF *Nypa frutican*

The weight of *Nypa frutican* were measured using a digital weighing scale.

The fresh weight of 3 *Nypa frutican* = 233.0 grams

The Dry weight of 3 *Nypa frutican* = 77.1 grams

The moisture content in *Nypa frutican* = 155.9 grams

Moisture Content = Fresh Weight (FW) – Dry Weight (DW)

2.3.2 CARBONIZATION OF *Nypa Frutican*

The *Nypa frutican* were placed in 20 liters' metal bucket. The *Nypa frutican* were completely carbonized for 3 hours. The carbonization of the *Nypa frutican* were carried out twice and it produced 300 grams of Ash. During the carbonization, the biomass turned black due to the absence of oxygen. The carbonization were done under high temperature and pressure.

2.3.3 CRUSHING OF *Nypa frutican*

The crushing of the *Nypa frutican* were done manually using a pestle. It was thoroughly crushed into powdered form.

2.3.4 COMPACTION OF *Nypa frutican*

The *Nypa frutican* were compacted using cassava starch. The cassava starch was prepared with hot water. A little amount of cold water were used in mixing the starch. The hot water were poured to the starch and stirred until it becomes thick. This method is similar in the preparation of the conventional cereal pudding (Akamu). A bowl of 5 and half diameter and 2 and half inches deep were used in the preparation of the starch. A compacting cylindrical shaped metal were used with a rod for pounding. A little quantity of starch were added to the *Nypa frutican* and mixed, it was placed in the cylindrical shaped metal and a rod were used in compacting it. After compacting, it is kept, to dry for 2-3 days under the sun. But the drying process can be facilitated using an oven.

2.3.5 ASH PRODUCTION

The dried, briquette biomass used in the preparation of food like bole, roasted corn, or in drying meat or fish and the Ash is obtained at the end of the Day.



Plate 1: Freshly Harvested *Nypa frutican*



Plate 2: Dried *Nypa frutican*



Plate 3: Carbonization of *Nypa frutican*



Plate 4: *Manihot esculenta* starch used as binder



Plate 5: Briquetted *Nypa frutican*



Plate 6: Burning of briquetted *Nypa frutican*

2.4 CLEARING OF STUDY SITE

The study site, which is an open field was cleared using a shovel.

2.5 CULTURAL PRACTICES

Weeding were done by hand picking in the nursery bag when necessary and shovels and hoes were used to weed the field around the nursery bag.

2.6 APPLICATION OF TREATMENT AND PLANTING

7kg of soil were used in carrying out this study. Eight poly bags were filled with loamy soil and were arranged in 3 replicates. A vine of 10cm in length were added to each bag.

2.7 METHOD OF ASH APPLICATION

A concentration of 20, 30, and 50 grams of ash were added to the soil and mixed thoroughly before planting.

2.8 FRESH WEIGHT AND DRY WEIGHT OF SPINACH AFTER PLANTING

The fresh weight and Dry weight of spinach were measured with a digital weighing balance to determine the dry weight.

2.9 GROWTH PARAMETERS

2.9.1 VINE LENGTH (cm)

The plant length were measured from the base of the plant to the Apex using a meter rule. The vine length were measured weekly in centimeters.

2.9.2 LEAF LENGTH (cm)

The leaf length were measured from the base of the leaf to the Apex. And it was measured weekly in centimeters.



2.9.3 LEAF WIDTH (cm)

This was measured from one side of the leaf to the other using a meter rule. The widest part of the leaf was measured.

2.9.4 NUMBER OF LEAVES

The number of leaves were counted visually on a weekly basis.

2.10 STATISTICAL ANALYSIS

The data collected for the different parameters was subjected to one way analysis of variance (one-way ANOVA) using Microsoft Excel 2013.

RESULTS AND DISCUSSION

3.0 PHYSICOCHEMICAL ANALYSIS

3.1 SOIL ANALYSIS

The physicochemical properties of the soil used in conducting this experiment are presented in the table below. The result showed that the soil used was slightly acidic (5.56), high in organic matter (sand 79.4), (silt 13.4), (clay 7.2) and low in nitrogen (0.0604). Available phosphorus and potassium were also high.

Table 1: SOIL PROPERTIES

PROPERTIES	DATA
pH	5.56
Phosphorus	19.260
Nitrogen	0.0604
Organic matter	(sand 79.4) (Silt 3.4), (Clay 7.2)
Potassium	0.130

Table 2: Percentage germination of Vine

	Concentration			
	Control	20g of Ash	30g of Ash	50g of Ash
Total number of vines planted	15	15	15	15
Total number of Germinated Vines	10	10	10	9
% germination rate	66.66%	66.66%	66.66%	60%

n = Total Number of Germinated Vines

N = Total Number of Vines planted

$$\% \text{ germination rate} = \frac{n}{N} \times 100$$

3.2 MORPHOLOGICAL CHARACTERS

3.1.3 LEAF LENGTH

There was increase in the leaf length of *Basella alba* in all the treatments. The varying leaf length concentration are shown in Figure 3.1. The highest leaf length in week 7 was 50gram of (8.61cm) and the lowest was in the control (2.50cm).

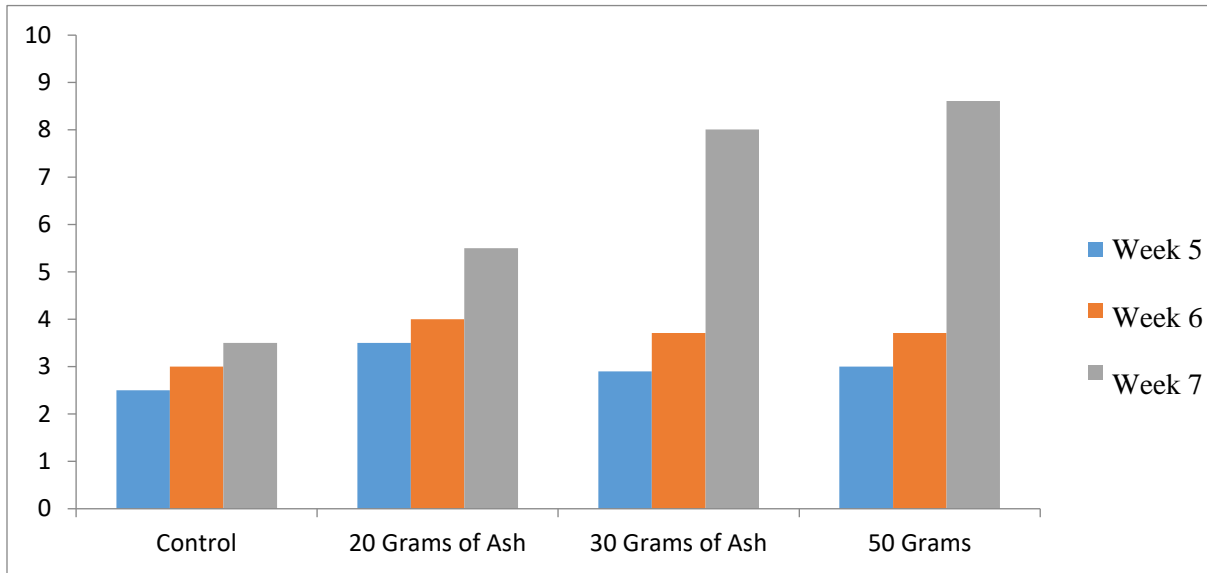


Figure 1: Leaf length of *Basella alba* in varying concentration

3.1.4 LEAF WIDTH

There was increase in the leaf width of *Basella alba* in all the treatments. The varying leaf width concentrations are shown in Figure 2. The highest was in the 50grams concentration of ash (5.51)cm in week 7. The lowest was in the control (1.01) cm.

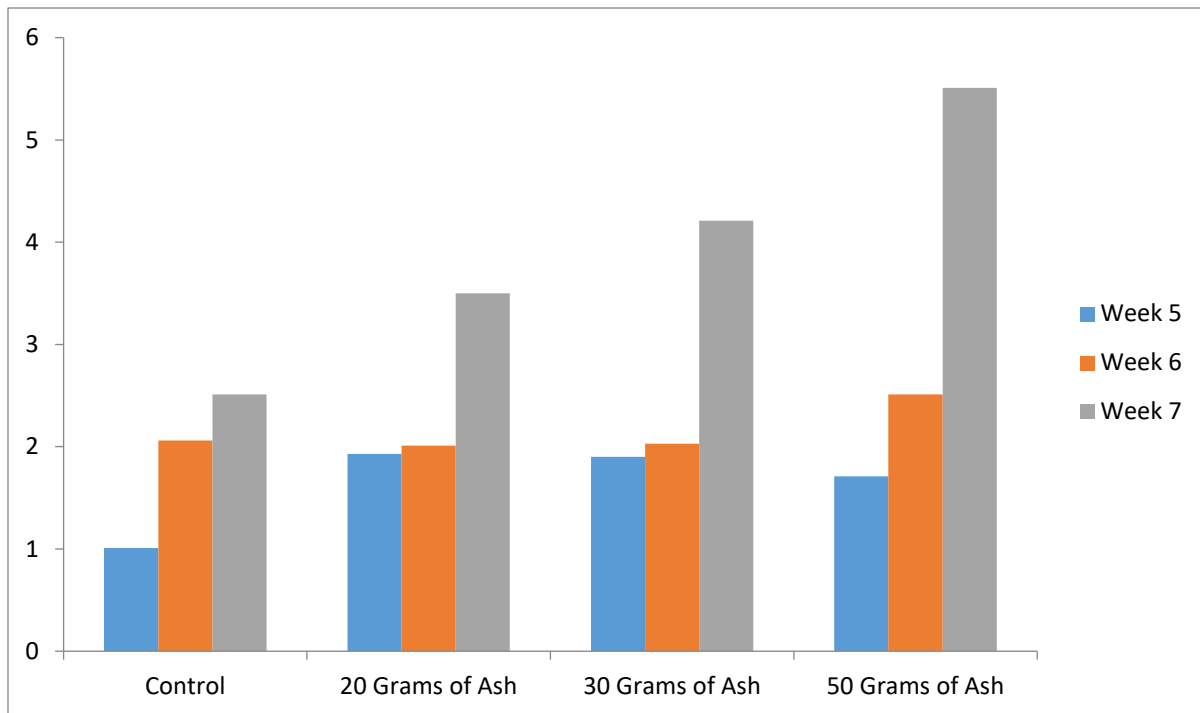


Figure 2: Leaf width of *Basella alba* in varying concentration

3.1.5 VINE LENGTH

In *B. alba* there was increase in the vine length in all treatments used. The varying concentrations are shown in Table 2. The plant treated with 50grams of ash had the highest plant vine length (24.00cm) and control had the least plant vine length (13.00)cm. The highest plant vine length was in week 7



Table 2: Vine length (cm) of *Basella alba* in varying concentration

Duration (weeks)	Control	20 grams of ash	30 grams of Ash	50 grams of Ash
5	13.00 ± 6.123	13.50 ± 10.012	13.50 ± 7.312	13.00 ± 7.512
6	15.60 ± 6.512	15.61 ± 10.315	15.00 ± 8.023	13.40 ± 7.713
7	16.00 ± 7.512	20.00 ± 11.012	20.10 ± 9.210	24.00 ± 11.012

DISCUSSION

According to Fern (2014), the required pH for the growth of spinach is 5.5-7.0. And spinach can tolerate soil pH in the range of 4.3 to 7.5. The soil pH used for the cultivation of *Basella alba* in this research was 5.56. The soil was slightly acidic and it yielded good results.

The soil required for the cultivation of spinach is a moisturized soil. Constant water application should be avoided to prevent the soil from being soggy (Annotti, 2022).

According to Annotti (2022), a nitrogenous based fertilizer is highly recommended for the growth of spinach. The fertilizer used for this project work was *Nypa frutican* ash, which has a chemical composition of mainly carbon, calcium, magnesium, nitrogen, potassium and phosphorus. And it yielded good results from the statistical analysis given. It is ecologically important to appropriately dispose ash (Fay, 2021).

The significant influence of the ash concentration of the growth and yield of *Basella alba* reveals that the fertilizer can be used as soil amendment to promote the yield of crops. Vine length of plant height, T4 (50g of ash) had the highest number of leaves in week 7. Number of leaves T2 (20g of ash) recorded the highest number of leaves from week 5 to week 7. Leaf length T4 (50g of ash) had the highest leaf length in week 7. Leaf width T4 (50g of ash) had the highest number in week 7. At the end of the experiment, the fresh and dry weight of each treatment were obtained. T2 (20g of ash) had the highest weight while the control T1 had the least. T2 (20g of ash) had the highest amount of moisture content after subtracting the fresh weight from the dry weight.

Basella alba is an underutilized green leafy vegetables, therefore it is expedient that we explore the potential of *B. alba* as a functional food or as an ingredient in various processed food (Oberoi and Azeez, 2021) I strongly affirm Oberoi statement that *B. alba* is an underutilized plant. This project work has not only provided an alternative fertilizer for the growth *B. alba*, but has also created awareness and sensitized individuals on the Nutritional benefits of *B. alba*.

CONCLUSION

Application of fertilizer to a soil, most especially organic fertilizer is an effective means of increasing soil fertility, soil texture and soil structure. From this study, the ash nutrient gave a positive outcome on the growth and yield of *B. alba*. The organic fertilizer ash does not only boost the growth of the plant but enhances its taste.

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