

## Proximate Analysis of *Phyllanthus Fraternus* (Euphorbiaceae) Leaf and Stem

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### Abstract

The study aimed to determine the proximate analysis of *phyllanthus fraternus* leaf and stem. The plant materials were collected, air dried and crude preparation was made. Proximate analysis was carried out to determine moisture content, ash content, fat content, crude fiber, crude protein and carbohydrates content. Proximate results showed moisture content (11.8%), Ash (40%), Fat content (10%), crude fiber (36.7%), crude protein (0.88%) and Carbohydrate content (1.5). *phyllanthus fraternus* showed its importance both as a vegetable and as a medicinal plant because of the presence of numerous secondary metabolites.

**Key words:** *Phyllanthus fraternus*; Proximate analysis; Medicinal plant; Extract and Secondary Metabolites

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### INTRODUCTION

Proximate analysis refers to the determination of the major constituents of feed and it is used to assess if a feed is within its normal compositional parameters or somehow adulterated. This method portioned nutrients in feed into six (6) components: water, ash, crude protein, ether extracts, crude fiber and nitrogen free extract

(NFE). *Phyllanthus fraternus* is a weed and a medicinal herb widely distributed in most tropical and subtropical countries. The plant belongs to euphorbiaceae family. In India, it is known as “Bhumyamlaki” in Ayurvede and is widely used in traditional herbal medicine for treatment of various diseases like hepatitis, infection, fever, asthma etc. (Rakesh et al, 2016).

Products from natural sources are gradually replacing synthetic drugs all over the world due to that synthetic drugs with time, tends to exhibit adverse effects on the users, unlike drugs produced using medicinal plants which are said to be less toxic and safer than synthetic drugs (Egbon et al, .2017). *Phyllanthus fraternus* is an annual herb commonly called Meche da goyo (Hausa) and Gulf plant (English). It's flowering and fruiting time is from April to August. It is found distributed in tropical and subtropical regions of the world. It is also distributed in some states in Nigeria, including Taraba State and Adamawa State but medicinal properties of the plant is not well known. *Phyllanthus fraternus* herb is bitter in taste and reported to possess diuretic, hypertensive, hypoglycemic effects, antihyperlipemic, antihepatotoxic and antioxidant activity (Nadro and Elkanah, 2016). The plant is employed for numerous other conditions such as colic, diabetes, dysentery, fever, pain, tumours, vaginitis, gonorrhoea and dyspepsia. The plant was observed to show some intrinsic antimalarial activity by its chemo suppressive and even curative ability compared to that of chloroquine which is the standard drug (Matur et al., 2009).

Traditionally in India, *phyllanthus fraternus* is used as mild laxative to expel worms and intestinal gas. The plant extracts are used for treating many biliary and bacterial infections such as cystitis, prostatitis, viral infections, flu, tuberculosis, liver diseases, anaemia and viral diseases (Bharti et al., 2014). The antibacterial property of *phyllanthus fraternus* has been reported by Chanda (2011). The aqueous extracts of the plant show antioxidant

property and has protective effects against bromobenzene induced mitochondrial dysfunction (Gopi and Setty, 2010). Also, the extracts can reduce the toxicity of drugs such as cisplatin therefore can be used to raise the therapeutic potential of anticancer drugs (Kumari and setty, 2012). Ethanolic extracts of the herb has antioxidant and anticoagulant property in experimental models (Koffuor and Amoateng, 2011). According to Chanda et al, (2011), the flavonoids present in the herb show hypoglycemic effects in rats. This plant mainly contains phyllanthin, phyllantidine, hypophyllanthin, niranthin, nirtetralin (Singh et al, .2011). Kidney is important excretory organ of the body, playing a dominant role in homeostasis. Cyclophosphamide (CPA), a widely used therapeutic drug, induces inflammation of urinary bladder renal damage, thereby limiting the therapeutic used of the drug. *Phyllanthus fraternus* is a potent medicinal herb used to treat various human diseases including renal disorder. The plant is ancient Indian traditional phytomedicine used for treatment of renal disorder (Sangita et al., 2014).

Several medicinal plants have been used as dietary adjunct and in the treatment of numerous diseases without proper knowledge of their function and toxicity. The nutritional and antinutritional benefits of plants provide a better support for human wellbeing. According to the World Health Organization, about 80% of the world's population living in developing countries relies essentially on plants for primary Health care, so herbal medicine associated pharmacology and pharmaceutical products are required to update frequently (Sandeep and Veeru,2014., Egbon *et al.*, 2017).

Research carried out in last few decades has validated several such claims of use of traditional medicinal plants. But without the proper knowledge of efficacy and safety of these traditional medicines sometimes it would be harmful. Common weed plant like *phyllanthus fraternus* L. of euphorbiaceae family is used as traditional therapeutics due its vast medicinal values. The plant is a good source of vitamin C and used as antiscorbutic in the treatment of scurvy. The plant is widely utilized against jaundice, alcohol-induced liver damage, kidney stones, hypertension, genitor-urinary tract infections, and abdominal pains. It was also set up to be helpful in carminative, cooling and overcoming thirst, bronchitis, asthma, leprosy, anaemia, venereal diseases, anuria, biliousness and hiccups. *Phyllanthus fraternus* is reported to possess antidiabetic, antiviral, anti-inflammatory, analgesic, antioxidants and anti-coagulant. The aerial part has been claimed as anti-diarrhoeal profile in an ancient literature (sandeep and Veeru, 2014, Biradar *et al.*, 2010).

Despite tremendous progress in human medicines, infectious diseases caused by microorganisms are still major threats to public health. According to world health organization, medicinal plants are best sources to obtain a

variety of newer herbal drugs. The used of plant extracts and phytochemicals, both with known antimicrobial properties can be of great significance in therapeutical treatments. Plant's secondary metabolites were found to be sources of various phytochemicals that could be used directly or indirectly as intermediates for the production of pharmaceuticals. In recent years, there has been a resurgence of interest in the discovery of new compounds from plants with the aim of finding novel treatment against various diseases. Many medicinal plants that reported to have the potentials for medicinal purpose were investigated for their useful active compound (Kavit and Jain, 2016).

Phytochemicals investigations on root extracts of *phyllanthus fraternus* have revealed the presence of active constituents like alkaloids, Tannins, terpenoids, glycosides and steroids. Flavonoids, saponins, and phlobatanins were absent. Phytochemical results of the aerial parts of the plants with different solvent (petroleum ether, chloroform, aqueous, and methanol extracts) indicate the presence of proteins in all the extracts and absence of steroids in all the extracts (Kavit and Jain, 2016. Biradar *et al.*, 2010).

*Phyllanthus fraternus* Webster, a pan tropical weed originated from western India, is distributed throughout india as a weed in cultivated and wasteland. It is a monoecious slender erect glabrous annual herb up to 80cm, stems, angular, branching from the base. Leaves sessile, distichous, overlapping, elliptic-oblong, obtus or rounded at apex and base, glaucous beneath, flowers, axillary, minute, greenish yellow. Male flower with six sepals, styles minute. Fruits a capsule, trilobite-subglobose, seeds trigonous. It's flowering and fruiting time is from April to October. This weed is found everywhere in grassy fields, gardens and wastelands.

*Phyllanthus fraternus* and *phyllanthus amarus* are closely related species, latter having narrower leaves, five perianths in both male and female flowers, some axile with both male and female flowers. In *phyllanthus fraternus*, the leaves are broader, perianth six in both male and female flowers and male towards base and female towards the top. Its ethnobotanical uses are well known. It used as hepatoprotective agent in one or the other way. Its fresh leaves are used in jaundice and many liver problems by many locals. Extracts of whole plant with roots are also taken to cure digestive problems (Biradar *et al.*, 2010, Singh *et al.*, 2011). *Phyllanthus fraternus* is widely used as a medicinal plant in different forms and its phytochemical constituents has been determined. It is therefore appropriate to also determine the proximate composition of the plant. The aim is to determine the proximate composition of the stem and leaf of *phyllanthus fraternus* and to present an overview of the existing studies on the pharmacological importance of *phyllanthus fraternus*.

## MATERIALS AND METHODS

### Collection of plant materials

The plant used for this study was collected in May 2020 from a bush around Modibbo Adama University of Technology in Girie Local Government Area of Adamawa State of Nigeria. The plant was carefully selected to avoid the inclusion of other unwanted plant and was then transported down to Jalingo.

### Crude dry preparation

After removing the roots, the stems and leaves were then air dried in the Biochemistry Laboratory for Fourteen days. The air dried plant materials were then pounded in a mortar using a pestle. It was then sieved to obtain a fine powder and stored for further analytical purpose.

### Proximate analysis:

#### Moisture content determination (MC)

Moisture content was determined by the Association of Official Analytical Chemists (AOAC) method (2000). 3grams of well mixed samples were weighed accurately using a sensitive balance in a clean dry crucible previously weighed and then placed in an oven at 100°C. The crucible was transferred to a desiccator and allowed to cool and then weighed. The weighing continues until a constant weight was achieved.

$$MC (\%) = \frac{\text{weight of sample} - \text{weight of dry sample}}{\text{Weight of sample}} \times 100$$

**Ash content determination:** Ash is the inorganic residues obtained by burning of the organic matter of feedstuff at 400-600°C in a muffle furnace for three (3) to four (4) hours. Ash content of the sample was determined according to the method of AOAC (2000). 2grams of the sample was placed in a clean crucibles previously weighed, and then the crucible with its content ignited in a muffle furnace at 400°C for 3hours until light gray ash was obtained. The crucible removed from the furnace to a desiccator to cool and then weighed. Ash content was calculated as follows.

$$\text{Ash content} = \frac{\text{Weight of Ash}}{\text{Weight of sample}}$$

#### Fat content determination

The fat content was determined according to the method of AOAC (2000) using soxhlet extractor apparatus. An empty cleaned and dry extraction round bottom flask was weighed ( $W_1$ ). 2grams of plant sample was placed in a clean muslin cloth and tied and placed inside the extractor ( $W_2$ ). Extraction was carried out for four (4) hours with petroleum ether. The heat was regulated to obtain at least 10 siphoning per hour. The residual ether was dried by evaporation. The flask was placed in oven at 100°C to

dry completely and cooled in desiccators before it was weighed ( $W_3$ ). It was calculated as shown below;

$$FC = \frac{W_2 - W_1 \times 100}{W_3}$$

FC= fat content

$W_1$  = weight of extraction flask

$W_2$  = weight of extraction flask with fat

$W_3$  = weight of sample.

#### Crude fiber determination

Crude fiber is primarily measured to comprehend indigestible parts in feeds and is consisted mainly of a part of lignin, pentosan, chitin etc in addition to cellulose. These compounds are collectively called fiber. Crude fiber was determined according to AOAC (2000). 3grams of sample was boiled sequentially with dilute acid and then with dilute alkali, and the sequentially washed with ethanol and diethyl ether, and the residue is subtracted by its ash, and the result is define as crude fiber.

#### Protein determination (by direct method i.e. Kjeldahl

$$\%CF = \frac{\text{dry weight of residue before ashing} - \text{weight of residue after ashing} \times 100}{\text{Weight of sample}}$$

Weight of sample

#### method)

Three steps are involved in this method.

**Digestion** - 0.5grams of the plant sample was weight and placed in a digestible flask (500ml), heated with con.  $H_2SO_4$  to give ammonium sulphate solution as the end product.

**Distillation** – the digested sample was then transferred to a distillation unit and 15ml of 40% NaOH was added. The ammonia was received in a 500ml beaker containing 10ml boric acid with 3drops of methyl red as indicator. The distillation continued until the volume reached 60ml.

**Titration** – The content of the flask was titrated against 0.2M HCl. Titration readings recorded. Crude protein was calculated as follows:

Where T = titration reading,

$$\text{Crude protein}\% = \frac{(T-B) \times N \times 14 \times 100 \times 6.25}{\text{Weight of sample} \times 1000}$$

Weight of sample × 1000.

B = Blank titration reading,

N= Normality of HCl,

1000 = to convert to milligram (Brader, 2017).

#### Determination of Carbohydrates.

Carbohydrates were determined by differences. The sum of moisture, fat, protein and ash contents was subtracted from 100 to obtain the total carbohydrate by difference (Brader, 2017). This is also known as the nitrogen free extract (NFE), which represents soluble carbohydrates and other digestible and easily utilized non- nitrogenous substances in feed.

Carbohydrates = 100 – (ash% + Moisture% + Crude protein% + Oil% + Fiber %).

## RESULTS

Results of proximate analysis of *phyllanthus fraternus* leaf and stem.

$$\text{Moisture content (\%)} = \frac{(37.4-35.5) - (37.2 - 35.5) \times 100}{37.2-35.5} \quad \text{MC (\%)} = 11.8$$

$$\text{Ash Content (\%)} = 28.7-27.9/2.0 \times 100 = 40//$$

$$\text{Fat Content (\%)} = 348.7-348.5 \times 100/2.0 = 10//$$

$$\text{Crude Fiber (\%)} = 29.9-28.8 \times 100/3.0 = 36.7//$$

$$\text{Crude Protein (\%)} = 0.5 \times 0.1 \times 14 \times 100 \times 6.25/0.5 \times 1000 = 0.88//$$

$$\text{Carbohydrates Content} = 100 - (11.76+40+10+36.7+0.88) = 1.5//$$

## DISCUSSION

The proximate analysis showed moisture content of 11.8% which showed that the dry plant has minimal chance for microbial attack, which is lower than that reported by Egbon *et al.*, (2017) for *phyllanthus amarus* with a moisture content of 37.4%. The total ash value of 40% is higher than that in *phyllanthus amarus* with ash value of 9.0% (Egbon *et al.*, 2017), suggest that the amount of inorganic substances in the leaf and stem of *phyllanthus fraternus* is high, portraying the plant as a good source of dietary inorganic salts. Crude proteins of 0.88% indicate that the plant is a poor source of Nitrogen. Fat content of 10% suggest that the fats in the plant parts is moderate. Crude fiber of 36.7% indicate high amount of indigestible parts which consist mainly of lignin, pentosan, chitin and others in addition to cellulose.

## CONCLUSION

The of secondary metabolites and other constituents account for the local medicinal uses of *phyllanthus fraternus*. The used of medicinal plants is on the increase worldwide as a result of their low sight effects. Studies carried out on *phyllanthus fraternus* showed its importance both as a vegetable and as medicinal plants because of the presence of numerous secondary metabolites.

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