# Phytochemical and Proximate Analysis of African Oil Bean (*Pentaclethra macrophylla* Benth) Seed

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**Abstract-**
Medicinal plant research is a highly diversified topic of interest owing to applications of their phytoconstituents in drug discovery, human dietary intake, corrosion inhibition, material science research among others. The study revealed the phytochemical composition and proximate determination of *Pentaclethra macrophylla* benth (African oil bean) seed. The dried seeds of *Pentaclethra macrophylla* benth were pulverized into fine powder and a portion of it was extracted with n-hexane. The result of the phytochemical screening of the extract from *Pentaclethra macrophylla* showed that the oil seeds contained terpenoids, cardiac glycosides and saponin while steroids, alkaloids, flavonoids, tannins, phlabotannins and anthraquinones were not detected. Proximate analysis indicated low moisture content (1.895 %), while other parameter determined include ash (2.033%), crude fibre (17.227%), acid value (8.182), iodine value (101.235), peroxide value (20.06), and free fatty acid (4.091). This extract is a candidate with potential for further study regarding unveiling of their mechanical properties for technological advances.

**Key words:** Phytochemistry, proximate analysis, secondary metabolite, fatty acid

## 1. Introduction

Plants and their seeds as food are highly important to aid or provide good health to everybody. There are certain physiological actions on human body that produce certain chemical substances from plant which make it medicinal [1]. Completely hydrolyzed and its amino acid composition measured and compared with that of egg and milk protein as standard. The amount of essential amino acid and its digestibility gives the nutritional value of protein [2]. When protein is produced within a country, it should be produced near the places where it is needed most. This suggestion has been given with the aim for solving the world food problem. The proximate compositions of some plant seeds reveal their nutritional values, that is, their importance in human diet, but the seed coat polyphenolics can reduce the nutritional values [3]. One of the wonderful set of compounds produced by plants are phytochemicals. There are specific of types of cancer that can be prevented by taken diet like vegetables, fruits, beans (grams) etc.

The specific benefit in the listed diets above are carrying out by researchers to detect compound responsible for the purpose. The scientific findings from their researches have yet supported the

fact that taking phytochemicals supplements can yield the same result as consuming these diets: vegetables, grams, fruits and beans from where they are taken from [4]. Various health conditions could be corrected by engaging medicinal plant, some of which are treatments of cancer, heart disease, high blood pressure, diabetes. In addition, production of probable carcinogens i.e. cancer-causing substances, may be prevented by help of certain compounds knows as phytochemicals by stopping the reaction of carcinogens on their target tissues or organs and may also stop development or growth of cancer on cells [5].

Consumption of more fruit, vegetables and other foods obtained from plants that possess special compounds known as phytochemicals, have been suggested by most experts or scientists to reduce or prevent people from risk of cancer. Example of phytochemicals is tannin which is a good anti-oxidants, but it reduces the digestibility of legume protein [4,5]. Direct intake of high quantity of this compound might led to side effect because of its unwanted interaction with some drug biomolecules and this could be dangerous [4]. The nutritional composition comprises of crude protein, moisture content, crude fibre, ash content, total carbohydrates, vitamins, crude fat, and minerals [5]. The proteins are low in sulfur-containing amino acids. Some rare amino acids including dicarboxylic acids have been found in oil beans seeds [6].

The oil bean seeds commonly referred to as Ugba in Easter Nigeria, are a good source of edible oil. The oil has a pleasant aroma and bunt taste possibly due to the presence of alkaloid. Oakenful and Sidhu, 1989 reported in their findings that the unfermented seed oil of *Pentaclethra macrophylla* possessed fatty acid content which varied from 2.7 to 4.8%. Its oil bean is excellent source of essential mineral elements such as phosphorus and calcium [6]; and it contains vitamins such as thiamin, riboflavin and niacin [7]. Stachylose, galatose, fructose are the major sugars in oil bean seeds, saponin makes up 2.1% also in oil bean. Saponin yields oleanolic acid, glucose, arabinose and rhamnose on hydrolysis [8,9]. Thus, the aim of this present study is to investigate the phytochemical constituents and proximate analysis of the seed oil *Pentaclethra macrophylla* in order to establish it nutraceutical potential for sustainable devilment.

## 2. Methodology

### 2.1 Sample collection and preparation

*Pentaclethra macrophylla* benth (African Oil bean) fruits were collected in the premises of Covenant University using stratified random sampling technique. The seeds obtained from their pods were shade dried, and obtained a constant weight. The dried seeds were pulverized into fine powder using a mechanical blender. The powder seeds were kept away from light and dust before extraction, and were well stored to prevent microbial contamination.

Preparation of extract

About 200 g of the powdered seeds of *Pentaclethra macrophylla* benth (African Oil Bean) was extracted with 1 litre of hexane. The Soxhlet extractor was used for the extraction while removal of n-hexane solvent was achieved using a rotary evaporator and the extracted was kept in the refrigerator prior to use.

Proximate composition

The powdered seeds were used for the determination of the moisture, crude fibre, ash and mineral contents using standard methods [10].

Phytochemical analysis
The oil was extracted from the seed using Soxhlet extraction with n-hexane and was screened for phytochemical contents according to standard method [11].

## 3. Result and discussions

In the continuous quest for research into oil seed of bioactive plant [10], we herein reported the phytochemical screening and proximate analytical determination of the oilseed of *Pentaclethra macrophylla*. The result of the phytochemical screening is as shown in Table 1. Having extracted the oil with standard method, the phytochemical analysis showed that the oil seeds contained terpenoids, cardiac glycosides and saponin while steroids, alkaloids, flavonoids, tannins, phlabotannins and anthraquinones were not detected. It was because some of these undetected constituents might be present in micro-quantity.

Phytochemical screening unveiled that seed oil of this plant contained terpenoids, Cardiac glycosides and saponin while steroids, alkaloids, flavonoids, tannins, phlabotannins and anthraquinones were not detected. This is in agreement with the report of [12] which showed that alkaloids and terpenes are widely distributed in the genus "*citrullus"*. Phytochemicals possessed pharmacological potential which include antioxidant properties, antimicrobial efficiency and effective modulation of detoxifying enzymes and hormonal activities, as well as stimulation of the immune system [13]. The presence of terpenoid shows that there are isoprene units as monomeric constituent of the seed oil and could be useful in the development of techniques for sustainable pest control and abiotic stress protection [14].

**Table 1:** Result of phytochemical screening of oil extract of *Pentaclethra macrophylla.*

| **Phytochemicals** | **Test Inference** |
|---|---|
| Steroids | - |
| Terpenoids | + |
| Cardiac glycosides | + |
| Saponins | + |
| Alkaloids | - |
| Flavonoids | - |
| Tannins | - |
| Phlabotannins | - |
| Volatile organics | + |
| Anthraquinones | + |

The result of physicochemical and proximate analysis of the seed oil of *Pentaclethra macrophylla* is as shown in Table 2. The moisture and ash content are 1.895% and 2.033% respectively. The low moisture and ash contents showed that the oil sample may contained more of the organic components and so less liable to spoilage by microbial contamination if properly stored. Moisture content is a major quality factor in the preservation of some food products and it affects food stability [15]. The relatively low moisture content is an indication that oil made

from these seeds may have high shelf-life especially when properly packaged. The crude fibre and peroxide values are 17.227% and 20 meq, / kg $O_2$ respectively. The high level of crude fibre in the seeds is probably the reason why many individuals tend to spit them out due to the discomfort produced during chewing. However, this component provides the bulk component which is responsible for the proper peristaltic action in the intestinal tract thereby aiding digestion, contrary to public opinion of the seeds being a source of constipation and indigestion. The high P.V. is an indication of occurrence of rancidity which is ether oxidative or hydrolytic in nature. This is because the peroxide value was not determined immediately after sample treatment. The iodine value (I.V.) was 101.235 g $I_2$ of /100 g of oil which was noted to be higher than that of *Moringa oleifera* (65.90 g $I_2$ of /100 g) but fell within values documented for olive, cotton, groundnut, and sunflower oils which ranged from 86 to 145 g $I_2$ of /100 g. This high I.V. for the seed oil of *Pentaclethra macrophylla* implied that the oil is of high nutritional value but low oxidative stability [16, 17].

**Table 2:** Physicochemical and proximate analysis of the seed oil of *Pentaclethra macrophylla*

| **Parameter** | **Test inference** |
|---|---|
| Acid value | 8.182 |
| Free fatty acid | 4.091 |
| Iodine value | 101.235 |
| Ash content | 2.0326 %, |
| Crude fibre | 17.2274 % |
| Peroxide value | 20.06 |
| Moisture content | 1.895% |

## 4. Conclusion

The seed oil of *Pentaclethra macrophylla* benth popularly known as African bean are valuable fatty acid ester essential human growth and development due to presence of salient phytochemicals acting as secondary metabolite in the body system. Phytochemistry showed that the oil seeds contained terpenoids, cardiac glycosides and saponin, while proximate analysis and physicochemical parameter determination confirmed the presence of low moisture content (1.895 %), ash (2.0326 %), crude fibre (17.2274 %), acid value (8.182), iodine value (101.235), peroxide value (20.06), and free fatty acid (4.091). This seed oil can be further examined for mechanical properties in order to unveil its other application for sustainable development.

## 5. Recommendation

Due to high nutritional component the proximate analysis, but low quality due to high peroxide value, it is recommended that the P.V. of the freshly prepared seed oil of *Pentaclethra macrophylla* benth should be carried out to identify the required parameter for oil quality improvement.

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