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# Qualitative & Quantitative Phytochemical Screening and Proximate Composition of *Bombax buonopozense* (Red Silk Cotton Tree) Stem-Back

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## ABSTRACT

Qualitative & quantitative phytochemical screening and proximate composition of *Bombax buonopozense* stem was investigated. Nine phytochemicals viz: - alkaloid, carbohydrate, phenols, flavonoids, saponins, tannins, protein, terpenoids, and oxalates were observed. Steroids and glycosides were below detectable limits. Quantitative phytochemical analysis indicated that alkaloid, flavonoid, phenols, tannins and saponins had values of 0.68 g, 0.09 g, 2.35 g, 1.41 g and 1.15 g respectively. The proximate analysis gave high percentage moisture content (55.30%). Carbohydrate and protein were of low values (1.04 % and 6.0% respectively). Ash content was found to be 15.30%, fiber (16.80%) all analyses were per 100g of crude sample.

Keywords: phytochemical screening, proximate composition, *Bombax buonopozense*, quantitative / qualitative analysis, stem-back

## INTRODUCTION

Screening of phytochemicals is a valuable step in the detection of the bioactive principles present in medicinal plants and subsequently may lead to the discovery and development of drugs (Yadav *et al.,* 2014). Harbone, 1973 and Okwu, 2004 considered phytochemicals as compounds formed during the plants normal metabolic processes and these chemicals are often referred to as secondary metabolites. Phytochemicals working together with nutrients found in fruits, vegetables and nuts help slow the aging process (Bassey & Khan, 2015) and reduce the risk of many diseases such as cancer, heart disease, stroke, cataracts, osteoporosis and urinary tract infections (Iroka *et al.,*2014).

Medicinal plants besides being therapeutic agents are also a reliable source of secondary metabolites for a wide variety of chemical constituents which could be developed and use for the treatment of precise/ selective ailments (Yadav *et al.,* 2014). These plants are the reservoirs of potentially useful chemical compounds which could serve as new leads and clues for modern drug design (Vijyalakshmi *et al.,* 2012). Medicinal use of plants range from the administration of the plant roots, barks, stems, leaves, flowers, seeds, to whole plants extracts (Inyang *et al.,* 2008). Onwuka, 2005 defines proximate composition as the determination of the major components of food, which includes: moisture, lipids (fats), ash, proteins, fiber and carbohydrates.

## *Bombax buonopozense*

*Bombax buonopozense* is of the family *Malvaceae* formerly *Bombacaceae* and is commonly known as Gold coast Bombax or red flowered silk cotton tree (Beentje*et al.,* 2001). It is known by the following local names: *Akpe (Igbo), Ponpola (Yoruba), Kurya(Hausa), Ukim (Efik) and Ido Undu (Ijaw)*. It is native primarily to West Africa where it is found in rainforests of Sierra Leone in the North West, East Gabon and some parts of Nigeria (Beentje *et al.,* 2001). It is a large tree and often reaches heights of 40 meters (130 feet) and up to 3 meters trunk diameter. The bark of younger trees is covered with spine but sheds the spine with age to some degree and large deep pink to red flowers emerge while the tree is leafless (GRIN, 2007). According to Beentje *et al.,* 2001 and Germplasm Resources Information Network, 2007; many parts of this plant are utilized for medicinal and traditional purposes.

Medicinal plants contain compounds that are potential drugs candidates and could rightly be recommended for further examinations. The active principles/ secondary metabolites differ from plant to plant due to their biodiversity and produce definite physiological actions on the human body (Edeoga *et al.,*2006) the rationale for phytochemical screening and proximate analyses of plants being done constantly even

on those secondary metabolites already known (Temitope *et al.,*2012).This work therefore is aimed at screening the stem back of *B. buonopozense* for the presence of secondary metabolites and its proximate composition.

# MATERIALS AND METHODS

## (Sample Collection, Preparation and Analysis)

The fresh stem of *Bombax buonopozense* was collected from an open farmland in Hildi Village of Hong Local Government Area of Adamawa State, Nigeria in November, and 2015.The plant was cited from existing collections deposited at the Herbarium in Ibadan, an international herbarium listedin Holmgren *et al.,* 1990. *Bombax buonopozense* P.Beauv, has Forestry Herbarium Index Number FHI108415 and a specimen of the plant is deposited in the herbarium there. The sample was rinsed in water to remove dust and was dried under shade after which it was then pulverized into fine powder using laboratory mortar and pestle. The pulverized crude sample was then analyzed for:

## Qualitative Phytochemical Screening

Standard analytical procedures as described by Harbone, 1973; Trease and Evans, 1989; Sofowora, 1993 and Aluko *et al.,* 2000 were adopted for the identification of the constituents

## Quantitative Phytochemical Screening

Analysis was carried out on the powdered sample using standard analytical procedures as described by Harbone, 1973; Bolim*et al.,* 1994; Ubadoni*et al.,* 2001.for the quantities of the constituents.

## Proximate Composition

Ash, carbohydrate, crude fiber, fat, moisture and protein contents were analyzed for. (AOAC, 2000).

# RESULTS AND DISCUSSION

The results of each analyte (**Table 1**) are calculated averages of three (3) analytical values. Statistical values were obtained using IBM-SPSS software version 22, 2015 edition and are presented as mean ± SD.

Table 1: proximate (%) composition of *B.buonopozense* stem-back

| Constituents | Values (%) |
|---|---|
| Ash | 15.30± 0.005 |
| Carbohydrate | 1.04± 0.000 |
| Crude fiber | 16.80±0.005 |
| Fat | 10.00±0.000 |
| Moisture | 55.30±0.005 |
| Protein | 6.00±0.000 |

Values are mean ± SD

The carbohydrate value was obtained via difference i.e.
100 – (Values of ash + crude fiber + protein + fat + Moisture content).
The above values are expressed as % by weight.

The crude protein value was found to be 6.0%. A value comparable to the value of *Moringa oleifera* 8.65% (Adeyemi*et al.,* 2012), *Ceiba pentandra* 9.74% (Olujubi, 2015) and 4.70% for *Jautrop acurcas* as documented by Atamgba *et al.,* 2015.

The fat value was 10.00±0.000 % which is higher than that reported for *Costus afer*stem (Bush cane) 2.48% (Uwemedimo, 2012). This is analogous to the value (9.6%) acknowledged by Adeyemi *et al.,* 2012, for *Moringa oleifera*. but lower than that documented for *Jatropha curcas*stem (16.70%) Atamgba *et al.,* 2015,
The ash content which is a measure of the non-volatile inorganic constituents remaining after ashing was found to be 15.30% which is comparable to *Costusafer* (Bush cane)as documented by Uwemedimo *et al.,* 2012 with a value of 14.21% and 11.83% for *J. curcas*stem and 18.62% for water leaf respectively.

The carbohydrate content and crude fiber of the sample were found to be 1.04% and 16.80 %. The bush cane stem is documented to have carbohydrate and crude fiber contents of 20.14% and 14.02% respectively (Uwemedimo *et al.,* 2012). Atamgba *et al.,* 2015; reported 50.53% (crude fiber)and 12.23 % (carbohydrate) for *J. curcas* stem and (Iroka *et al.,* 2014) reported 19.75% (crude fiber) and 31.85 % (carbohydrate) for *Ceiba pentandra stem.*

Table 2: Summary of qualitative phytochemical screening of *B. buonopozense* stem-back

| Phytochemical components | Test | Observation | Inference |
|---|---|---|---|
| Alkaloid | Wagner's | Reddish precipitate | + |
| Carbohydrate | Benedict's | Orange red precipitate | + |
| Phenols | Ferric chloride | Bluish black colour | + |
| Flavonoids | Alkaline reagent | Yellow precipitate | + |
| Saponins | Froth | 1cm layer of form | + |
| Tannins | Galatin | White precipitate | + |
| Protein | Xanthoproteic | Yellow colour | + |
| Steroids | Steroid's | Violet colour | - |
| Glycosides | Legals' | Blood red colour | - |
| Terpenoids | Salkowski | Reddish brown colour | + |
| Oxalates | Ethanoic | Red precipitate | + |

**+ = present, - = below detection limit.**

**Table 2** above gives a tabular presentation of the phytochemicals present or below detection limit in the plant sample.

These phytochemicals / secondary metabolites are known to have antimicrobial activities which are a property of most medicinal plants (Bassey and Khan, 2015).

Alkaloids are said to be pharmacologically active and are known to exhibit marked physiological activities (Okwu, 2004). Their actions are felt in the autonomic nervous system, blood vessels, promotion of diuresis, respiratory system, gastrointestinal tract, uterus, malignant diseases and malaria (Trease and Evans, 1996). However, pure isolated plant alkaloids and their synthetic derivatives are used as basic medicinal agents for analgesics, antispasmodic and bacterial effects (Stray, 1998).

Plants containing carbohydrates, glycosides and proteins are known to exert a beneficial action on the immune system by increasing body strength, and hence are valuable as dietary supplements (Yadav *et al.,* 2014). Glycosides also have a vast therapeutic efficacy as they are found in almost every medicinal plant (Yadav *et al.,* 2014).

The presence of flavonoids in the stem-back indicates the medicinal value of the plant (*B.buonopozense*). Hence, flavonoids are antioxidants and free radical scavengers which prevent oxidation; they have strong anticancer activity and also protect the cell against all stage of carcinogenesis (Salah *et al.,* 1995; Okwu, 2004). In addition, flavonoids in the intestinal tract lower the risk of heart disease (Okwu, 2004). Flavonoids and flavones are widely distributed secondary metabolites with antioxidant and antiradical properties (Nakayoma and Yamada, 1995). This suggests that taking foods rich in flavonoids help to reduce the risk of heart diseases, and this is of great importance in pharmacology, medicine and human nutrition. In addition, flavonoids are phenolic in nature, and they act as cytoplasmic poisons which have been reported to inhibit the activity of enzymes (Dathak and Iwu, 1991). The antioxidant properties of flavonoids may be responsible for the ability of

some selected plants, such as *Fucusvirosa*to treat several diseases like arthritis, anaemia and others.

Tannins have amazing stringent properties. They are known to hasten the healing of wounds, and inflamed mucous membranes. They are well known for their antimicrobialproperties; therefore, this suggests that they may be useful in the treatment of venereal diseases and also help to regenerate the skin (Okwu, 2004).

These secondary metabolites contribute significantly towards the biological activities of medicinal plants such as hypoglycemic, anti-diabetic, antioxidant, antimicrobial, anti-inflammatory, anti-carcinogenic, anti-malarial, anti-cholinergic, anti-leprosy activities (Negi*et al.,* 2011).

Table 3: Summary of Quantitative phytochemical screening of *B. buonopozense*stem-back

| Components | Values (g/100g) |
|---|---|
| Alkaloids | 0.68±0.028 |
| Flavonoids | 0.09±0.000 |
| Phenols | 2.35±0.015 |
| Tannins | 1.41±0.000 |
| Saponins | 1.15±0.023 |

Values are mean ± SD

The above statistical results were calculated as triplicate values and expressed as mean ± SD using IBM-SPSS software version 22, 2015 edition and expressed as g/100 g of sample.

The alkaloids value obtained in the stem was **0.68±0.028 g/100g** of the sample. This value is lower compared to that of*Manihotesculentus* 7.02g/100 and *Ceibapatandora* 3.79g/100g(Okeke, 2009). Alkaloids are known to exhibit marked physiological activity when administered to animals (Okwu, 2003). Pure isolated plant alkaloids and their synthetic derivatives are used as basic medicinal agents for analgesics, anti-

spasmodic and bacterial effects (Stray, 1998). However, excessive intake of alkaloid tends to disrupt the normal functioning of the central nervous system.

Flavonoids value obtained in the stem was **0.09±0.000 g/100g,** this value is comparable to that documented by (Eyong etal., 2011) for *Manihotesculentus* with a value 0.51g/100g and lower than that documented by (Okeke, 2009) for *Ceibapatandra* with value of 1.14g/100g. The presence of flavonoids in the plant,indicates a medicinal value hence, flavonoids are antioxidants and free radical scavengers which prevents oxidation and in the intestine lower the risk of heart diseases (Okwu, 2003).

The tannin value obtained was **1.41±0.000g/100g.** This value is higher than the value reported for *Ceiba pentandra*0.83 g/100g as documented by (Okeke, 2009). Tannins present in plant have been found to possess astringent properties which hasten the healing of wounds and inflamed mucus membranes(Okwu, 2003).

Saponin value was found to be**1.15±0.023 g/100g.** This value is lower than the value of *Manihote sculentum* and *Ceiba pentandra* documented by (Eyong et al., 2011) and (Okeke, 2009) with values of 13.21 and 2.43 respectively. Saponins are used in the manufacture of shampoos, insecticides,various drugs preparation and in the synthesis of steroidal hormones (Dubrousky, 2005).However, excessive consumption of Saponins could be dangerous as they cause heamolysis of blood and are known to cause cattle poisoning (Kar, 2007).

The phenol value was found to be **2.35±0.015 g/100g.** This value is higher than that documented by (Okeke, 2009) with the value 0.08 for *Ceiba pentandra*. Phenols present in the plants shows that it can be used to make disinfectant and antiseptics that are used in mouth wash surface cleansing Dettol and other disinfectants.

The presence and quantities of these phytochemicals in the plant sample may have complementary and overlapping mechanisms of action in the body such as anti-oxidant effects, modulation of detoxification enzymes, stimulation of metabolism, anti-bacterial and anti-viral effects. And the values obtained from the quantitative phytochemical screening of the plant shows that these values are comparable to other plant samples as earlier indicated and as such *B. buonopozense* stem can be utilized for several medicinal purposes.

## CONCLUSION

From the analysis carried out on the sample; it was deduced that the sample contains phytochemicals, thus making it suitable for industrial purposes like in pharmaceutical and cosmetic industries. Therefore, the stem-back extract of *B. buonopozense* can be used to uncover bioactive natural products that may serve as lead for the development of new pharmaceutical agents to address unmet therapeutic needs. Such screening of various natural organic compounds and identification of active agents is of paramount importance since medicinal plants have become a house whole name with majority of humanity depending on them for their existence. This is because they are comparably of fewer side effects, are cost effective and for their nearness to the inhabitants. Thus, plants are either consumed as food (the leaves, twigs, flowers, roots and stems) as well as for ethno medicinal purposes.

## RECOMMENDATION

There is need for further studies on the plants parts in order to isolate, identify, characterize, and elucidate the structure(s) responsible for the activity.

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