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Proximate and Phytochemical Analysis of *Cochlospermum planchonii* Rhizome

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Abstract*: The study was designed to evaluate the proximate composition and phytochemical constituents of Cochlospermum planchonii. Sample of the plant was harvested from the surroundings of the Federal University of Agriculture, Makurdi, Nigeria. The harvested plant sample was peeled and separated in tiny strands which were allowed to dry under the shade for a period of 6-8 days. After drying, it was pulverized into coarse powder and used for the determination of proximate composition and phytochemistry. The result of proximate analysis revealed high amounts of nitrogen free extract (58.6 %), crude fibre (26.7 % and inorganic matter (8.0 %). Similarly, phytochemical screening revealed rich contents of secondary plant metabolites with tannins, alkaloids, flavonoids and saponins in very high amounts. It was therefore, concluded that, the rich secondary plant metabolites justifies the use of this plant in the management of both human and animal disease conditions.*
Keywords: *Proximate analysis, rhizome, tannins, phytochemical constituents*

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I. Introduction

Medicinal plants are essential in the treatment of many diseases by peasant rural communities in developing countries (Prajapati and Prajapati, 2002). Each species of medicinal plant is endowed with primary (nutrients) and secondary (phytochemicals) metabolites which play vital physiological and biochemical roles in life processes (Dingman, 2002). *Cochlospermum planchonii* is widely distributed in the tropical regions from Senegal eastward to Chad (Kone *et al*., 2002). It occurs from sea level up to 1700 m altitude in savannah and forest-savannah mosaic and in fallows, sometimes in hedges. It is a common weed of cultivation, reproducing naturally from seeds and rhizomes (Burkill. 1985). The stem bark yields a fibre used in northern Sierra Leone and in north central Nigeria for making string and rope. In Burkina Faso, the fibre is used for binding mats. The floss of the fruit can be used for stuffing (Nikiema, 2005). The rootstock is a source of a yellow dye which is useful in Sudan and Nigeria (Abbiw, 1990). The Hausa people of northern Nigeria add indigo to obtain green shades (Akobundu and Agyakwa, 1998). In the Republic of Benin a reddish powder obtained from the rootstock is used as a colouring agent for sauces and soups. In Burkina Faso, the flowers are eaten. *Cochlospermum planchonii* is one of the plants preferred by cattle in grazing land in Burkina Faso (Nikiema, 2005).

In traditional medicine in northern Sierra Leone a decoction of the rootstock is drunk for the treatment of gonorrhoea. In Mali the rootstock enters into diuretic preparations and several preparations of the rootstock are prescribed against jaundice. A tea of the leaves with a few peppercorns is drunk against gastrointestinal problems. In the Republic of Benin, a decoction of the leaves is taken orally against diarrhoea and as antiemetic. Traditional healers among the Igede of North Central Nigeria use the plant to treat against Acquired Immune Deficiency Syndrome (AIDS) (Igoli *et al*., 2005). The rhizomes are also used in the treatment of stomach disorders, typhoid fever and urinary tract infections (Togotla *et al.*, 2008; Yakubu *et al*., 2010; Nafiu *et al*., 2011; Isah *et al*., 2013). In ethno-veterinary practice, the rhizomes are used for the treatment of gastrointestinal helminths by cattle rearers, while small ruminant producers use it in the treatment of diarrhoea (personal communication).

The phytochemical constituents of *C. planchonii* were earlier reported to include saponins, alkaloids, phenolics, carbohydrates, flavonoids, glycosides, cardiac glycosides, triterpenes, tannins and steroids (Nafiu *et al*., 2011; Isah *et al*., 2013). It has also been reported to contain elements like Sodium (Na), Potassium (K), magnesium (mg), Iron (Fe), Calcium (Ca), Copper (Cu) and Selenium (Se). This study was therefore, designed

to determine the proximate composition as well as the phytochemical constituents of *Cochlospermum planchonii* in the study area.

II. Materials and Methods

Location of the study

The study was conducted at the Veterinary Teaching Hospital Complex, College of Veterinary Medicine, Federal University of Agriculture, Makurdi, Benue State. Makurdi is located within the Guinea Savanna Zone on longitudes 7^o 47' E and latitudes 6^o 25' N, with an undulating topography of 1,500m to 3,000m.

Plant collection and processing

Rhizomes of *Cochlospermum planchonii* were collected within the premises of the Federal University of Agriculture, Makurdi in the month of February, 2017. The rhizomes were peeled and carefully separated into small strands which were allowed to dry under shade for 6 - 8 days.

Proximate analysis

Sample of pulverised *Cochlospermum planchonii* was oven dried at 60^0C until a constant weight was obtained for proximate analysis according to the procedure of AOAC (2000). The crude protein of the sample was determined using micro-Kjeldahl method (Pearson, 1976), while the nitrogen free extract (carbohydrate) was determined by the formula below (James, 1995)

Total carbohydrate = 100-[%crude protein+ %crude fat+ %crude fibre+ %crude total ash].

Phytochemical screening

Phytochemical analyses of Cochlospermum planchonii constituents was determined by standard procedures (Sofowora, 1993; Trease and Evans, 2002)

Carbohydrate- Molisch's test

Few drops of Molisch's reagent were added to each of the portion dissolved in distilled water, this was then followed by addition of 1 ml of conc. H_2SO_4 by the side of the test tube. The mixture was then allowed to stand for two minutes and then diluted with 5 ml of distilled water. Formation of a red or dull violet colour at the interphase of the two layers was a positive test (Sofowora, 1993)

Glycosides - Fehling's test

About 0.5 g each portion was dissolved in distilled water and filtered. The filtrate was heated with 5 ml of equal volumes of Fehling's solution A and B. Formation of a red precipitate of cuprous oxide was an indication of the presence of reducing sugars (Sofowora, 1993).

Cardiac glycosides – Kella-Killiani test

Small portion of extract was dissolved in glacial acetic acid containing traces of 5% ferric chloride. The test tube was held at an angle of 45o and conc. H2SO4 (1 ml) was added down the side. A purple colour at the interfaces indicated cardiac glycoside (Sofowora, 1993).

Frothing test - Saponins

One gram of each portion was boiled with 5 ml of distilled water, filtered. To the filtrate, about 3 ml of distilled water was further added and shaken vigorously for about 5 minutes. Frothing which persisted on warming was taken as an evidence for the presence of saponins (Sofowora, 1993).

Triterpenes and steroids - Liebermann-Burchard Test

To the solution of extract (2 ml) was added acetic anhydride (2 ml) followed by conc. H2SO4 (1 ml) was added downside the tube and the color change was recorded immediately and later. Red, pink or purple color indicates the presence of triterpenes while blue or blue-green indicates steroids (Sofowora, 1993).

Tannins - Ferric chloride

About 0.5 g each portion was stirred with about 10 ml of distilled water and then filtered. Few drops of 1% ferric chloride solution were added to 2 ml of the filtrate occurrence of a blue-black, green or blue-green precipitate indicates the presence of tannins (Trease and Evans, 2002).

Flavonoids - Sodium hydroxide test

Few quantity of the each portion was dissolved in water and filtered; to this 2 ml of the 10% aqueous sodium hydroxide was later added to produce a yellow colouration. A change in colour from yellow to colourless on addition of dilute hydrochloric acid was an indication for the presence of flavonoids (Trease and Evans, 2002).

Alkaloids - Dragendoff's test

Few quantity of the each portion was stirred with 5 ml of 1% aqueous HCl on water bath and then filtered. Of the filtrate, 1 ml was taken individually into 2 test tubes. To the first portion, few drops of Dragendorff's reagent were added; occurrence of orange-red precipitate was taken as positive. To the second 1 ml, Mayer's reagent was added and appearance of buff-coloured precipitate will be an indication for the presence of alkaloids (Sofowora, 1993).

Anthraquinones - Borntrager's test

About 0.2 g of each portion to be tested was shaken with 10 ml of benzene and then filtered. Five millilitres of the 10% ammonia solution was then added to the filtrate and thereafter the shaken. Appearance of a pink, red or violet colour in the ammoniacal (lower) phase was taken as the presence of free anthraquinones (Sofowora, 1993).

III. Results

Proximate composition of C. planchonii rhizomes

The result of proximate analysis of *Cochlospermum planchonii* is presented in Table 1. The result showed that the plant contains high amount of carbohydrate (58.6 %) and crude fibre (26.7 %). It also contains 4.03 % crude protein and high amount of inorganic matter (8.0 %).

Qualitative and quantitative phytochemistry of *C. planchonii* rhizomes

The result of the preliminary phytochemical screening is presented in Table 2. The result revealed the presence of several important phytochemical constituents. Samples were collected in the months of January (representing the dry season), April (representing the onset of rainy season in the study area) and June (representing the rainy season proper). The values as presented in Figure 1 decreased in the phytochemical constituents from dry season to rainy season. The only exception was that of phenolic compounds where the value increased from 1.60 % in January to 2.0 % in April, then declined from 2.0 to 1.30 in June.

Table 1: Proximate composition of *Cochlospermum planchonii* rhizome

Chemical constituents	% composition
Dry matter	92.3
Crude protein	4.03
Ether extract	2.7
Crude fibre	26.7
Ash	8.0
Nitrogen free extract	58.6
Metabolizable energy	1.07 KJ/KG DM

Table 2: Phytochemical screening of *Cochlospermum planchonii*

Constituent	**Test**	**Reaction**
Carbohydrate	Molisch	+
Glycosides	Fehling's	+
Cardiac glycosides	Kella-Killiani	+
Saponins	Frothing	+
Triterpenes	Liebermann-Bucchard	+
Tannins	Ferric chloride	+
Flavonoids	Sodium hydroxide	+
Alkaloids	Dragendoff's	+
Anthraquinones	Borntrager's	+
Steroids	Liebermann-Bucchard	-

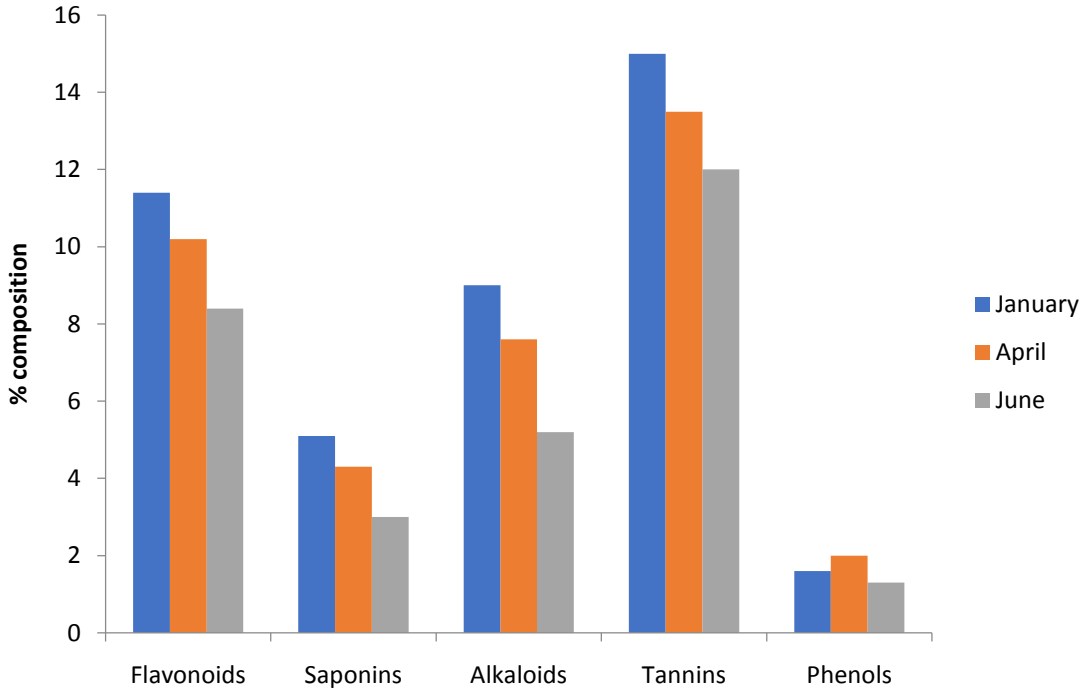

Fig 1. Quantitative phytochemistry of *Cochlospermum planchonii*

IV. Discussion

The crude protein content of *C. planchonii* obtained in this study was low, but the value was however, higher than the 2.1 % recorded by Ayuba *et al.* (2011) from the root of *Datura innoxia*. High crude fibre and ash were recorded in this study and this was in consonance with the report of Ilodibia *et al*. (2014) who reported values of 30 % and 4.9 % for crude fibre and ash respectively from the root of *Dracaena arborea*. The NFE obtained in this study was higher than the values reported by earlier researchers (Ayuba et al., 2011). The phytochemical constituents of *C. planchonii* roots in this study were comparable to those reported by Nafiu *et al*. (2011). However, the quantitative analyses of the different constituents were higher in this study than reported by Nafiu *et al*. (2011). The results showed that the highest phytochemical component was tannins, followed by flavonoids, alkaloids, saponins and phenolics whereas Nafiu *et a*l. (2011) reported saponins as the highest component followed by phenolics, alkaloids, tannins and flavonoids. The differences observed in the present study may be due to the age and/or season of collection of the plants (Ben Salem *et al*., 2005), location where the sample was taken (Makkar and Becker, 1998) and possibly the mode of plant processing and storage before analysis. The phytochemical constituents from samples collected in January were highest and decreased as the rainy season progressed and this agrees with the report of Ben Salem *et al*. (2005).

The presence of these phytochemical constituents has justified the importance of this plant in ethno-medical and ethno-veterinary practices. Tannins and saponins have been reported to be responsible for the haemostatic activity due to their ability to arrest bleeding blood vessels by precipitating proteins for vascular plugs (Okoli *et al*., 2007). In addition, tannins have astringent properties, hasten wound healing and inflamed mucous membranes (Igboko, 1983). Tannin-rich plants have been widely reported to have effect on internal nematodes in ruminants (Molan *et al*., 1999; Min *et al*., 2003; Hoste *et al*., 2006; Knox *et al*., 2006; Kommura *et al*., 2012). Flavonoids are said to be antioxidants and free radical scavengers which prevent oxidative cell damage and has also been reported to possess anticancer activity and the ability to inhibit tumour growth (Salah *et al*., 1995; Okwu and Okwu, 2004). Thus, the acclaimed anti-inflammatory and wound healing uses of *Cochlospermum planchonii* rhizome extract may be attributed to their content of tannins and flavonoids. Phenolic compounds have antimicrobial properties and have been used extensively as disinfectants (Okwu, 2001). Alkaloids in their pure or synthetic forms are used as the basic medicinal agent because of their analgesic, anti-spasmodic and anti-bacterial properties where they show marked physiologic effect when administered to animals (Stray, 1998; Njoku and Ahamefuna, 2007). This may justify the use of *C. planchonii* rhizome extract in the treatment of pain, malaria and enteric fever in traditional medicine.

V. Conclusion

The study has revealed that Cochlospermum planchonii is a rich source of plant primary metabolite (carbohydrate) as well as a rich source of useful secondary metabolites such as tannins, flavonoids, alkaloids and saponins. The presence of these secondary metabolites has justified its extensive use in etno-medical and ethno-veterinary practices.

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