



## PROXIMATE COMPOSITION AND ELEMENTAL ANALYSIS IN *BORRERIA STACHYDEA* AND *CASSIA ABSUS* Linn

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### ABSTRACT

This study assesses the proximate and elemental compositions of two medicinal plants viz; *Borreria stachydea* ((Dc) Hutch & Dalziel) and *Cassia absus* Linn belonging to Rubiaceae and Leguminosae families, respectively. The proximate analysis of the two plant materials (whole) showed moisture content of 8.67 % and 6.67 % and ash content of 8.5 % and 8.0 % in *Borreria stachydea* and *Cassia absus* respectively. The crude protein was 8.08 % and 9.81 %, crude fibre 7.11 % and 3.17 %, crude fat 2.15 % and 2.11 %, and Nitrogen Free Extract (NFE) 65.59 % and 70.36 % in *Borreria stachydea* and *Cassia absus* methanolic extracts respectively. The petroleum spirit extracts of *Borreria stachydea* and *Cassia absus* showed crude protein of 5.63 % and 4.88 %, crude fibre 0.11 % and 2.65 %, crude fat 3.13 % and 1.94 % and NFE 89.27 % and 88.39 % in the two plants respectively. Using AAS, the plants extracts were analyzed for metals with the following results obtained; Average elemental concentrations for *Borreria stachydea* were 0.4272, 0.42625, 0.0193, 0.0003, 0.1425 and 0.0008 mg/Kg for Ca, Mg, Zn, Pb, Cr, and Cd respectively, while those for *Cassia absus* were 0.5093, 0.6423, 0.0320, 0.0010, 0.1616 and 0.0028 mg/Kg for Ca, Mg, Zn, Pb, Cr, and Cd respectively. These results show a significant amount of crude protein and fibre, making the plants possible food sources. However, the presence of small amounts of some heavy metals such as Pb, Cr and Cd means that caution should be exercised in consuming the plants.

**Keywords:** *Borreria stachydea*, *Cassia absus*, essential elements, proximate composition

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### INTRODUCTION

Plants have occupied very important position in human life for a very long time. They provide food, medicine, fibre and fodder for domestic animals. So many plants of promising nutritive values, which could nourish the ever increasing human population, remain underutilized due to lack of awareness and technologies for their utilization. Plant minerals are very important ingredients for normal metabolic activities of body tissues. They are constituents of bones, teeth, blood, muscles, hair and nerve cells. Vitamins cannot be properly assimilated without the correct balance of minerals [1].

*Borreria stachydea* [(Dc) Hutch & Dalziel] is an erect hairy and weedy herb, about 1ft in height with mauve flowers. It belongs to the phylum magnoliophyta and class Manoliopsida and is a member of the Rubiaceae family. It is found in Nigeria, Ghana, Sudan, Malaysia, India and several other nations of the world. A poultice of the whole plant is used to heal leg ulcer, wounds and urinary tract infections; it has been found to be highly anti-oxidative in nature. *Borreria* is a relatively large genus of herbs or half-shrubby plants. This genus consists of about 100 species distributed trough out the tropics [2]. *Borreria stachydea* is popularly known and called “alkamar tururuwa” in the Hausa language of northern Nigeria, while the Fulani call it “fairare”. The plant is used in northern Nigeria medicinally

for urinary troubles, gonorrhoea, etc and for women in childbirth, or to regulate the menses [3].

*Cassia absus* Linn belongs to the plant family Leguminosae and sub-family Caesalpinodeae. The plant is a useful medicinal plant which is regarded as a blood tonic, bitter astringent for the bowels and applied locally to heal ulcers [3]. It is also useful in the disease of the eyes such as purulent conjunctivitis and ophthalmia [4]. All the species of *Cassia* have bright yellow flowers of characteristics shape. *Cassia absus* Linn is popularly known as “fidili” in Hausa and “jasmeejaz” in English. The plant is found in tropical Asia, Australia, Africa and throughout India. Its leaves are hot, bitter and acrid, and astringent to the bowels. Its seeds possess diuretic and stimulant properties and are used in the treatment of ringworms, ophthalmia and skin affections [5].

### MATERIALS AND METHODS

#### Collection, identification and preparation of plants materials

The plants were collected from Ajide forest of Okpokwu Local government Area of Benue State Nigeria in March 2015. The two plants were identified and authenticated at the Herbarium Unit of the Department of Biological Sciences, Ahmadu Bello University, Zaria, Nigeria by Mallam Namadi. Voucher specimen numbers were assigned to the plants:- *Borreria stachydea* - 2756 and *Cassia absus* - 3106. The fresh plants leaves were washed

thoroughly and carefully with distilled water and air dried for five days. The dried plant materials were pulverized mechanically using wooden mortar and pestle.

### Extraction of plants materials

Of the two powdered plant materials, 100 g each were carefully weighed and loaded into a Soxhlet extractor. Each powdered plant material was separately extracted with methanol and petroleum ether for 72 hr. The extracts were concentrated in-vacuo at 40°C using rotary evaporator, followed by air drying.

### Proximate analysis

The proximate compositions of the plants samples were determined by adopting the official method of analysis by AOAC, 1990 [6]. The total Nitrogen Free Extract contents in the extracts were determined as total Kjeldahl nitrogen by microkjeldhal method. The crude proteins were obtained according to the AOAC, 1990 procedure [6]. The moisture and ash were determined from the plant materials using weight difference method [7, 8]. Crude fibre was estimated from the extracts by loss in weight on ignition of dried residue following digestion of fat free samples. Crude fat was determined by extracting the samples with petroleum ether in a soxhlet extractor. All the proximate values were reported in percentages [9].

### Mineral elements composition determination

The mineral compositions were determined by the aqua regia method of digesting the samples in a mixture of nitric acid and hydrochloric acid (1:3). Ca, Mg, Zn, Pb, Cr and Cd were determined using the Varian AA240 FS Model Atomic Absorption spectrophotometer adopting standard method [10].

## RESULTS

The proximate analysis of the crude sample of *Borreria stachydea* showed moisture of (8.67%) and ash content of (8.5 %). Results for the *Borreria stachydea* methanolic and petroleum extracts are given in Table 1. The results showed that it contained; crude protein (8.08%), crude fibre (7.11 %), crude fat (2.15%), Nitrogen Free Extract (65.59%). Crude protein has the highest value while crude fat has the least. The petroleum spirit extract of *Borreria stachydea*, Table 1, showed that it contains crude protein (5.63%), crude fibre (0.11%), crude fat (3.13%) and free nitrogen (89.27%). The crude protein and crude fibre contents are higher in the methanolic extract of *Borreria stachydea* while the crude fat and free nitrogen are higher in the petroleum spirit extract of *Borreria stachydea*. The proximate analysis of crude extract of *Cassia absus* showed ash content (8.0%), moisture (6.67%). The *Cassia absus* methanolic and petroleum extract is given in Table 1. The result showed crude protein (9.81%) and (4.88%), crude fibre (3.7%) and (2.65%), crude fat (2.11%) and (1.94%),

Nitrogen Free Extract (70.36%) and (88.39%) for the *Cassia absus* methanolic and petroleum spirit extract respectively. The components have the highest percentage in the methanolic extract of *Cassia absus* compared to the petroleum spirit extract of *Cassia absus*. The result of mineral analysis is given in Table 2 for *Borreria Stachydea* methanolic and petroleum spirit extract respectively, while Table 3 shows results for the minerals analysis of *Cassia absus* methanolic and petroleum spirit extracts respectively.

## DISCUSSION

The result from proximate analysis showed that *Borreria stachydea* methanolic extract has the highest crude fibre content of 7.11% compared with *Cassia absus* plant (Table 1). Nutritionally, this is of beneficial effect since it had been reported that food fibre aids absorption of trace elements in the gut [11] and reduce absorption of cholesterol [12]. Crude fibre is very essential for the digestion of food materials in the food canal of animals, and thus reduces the risk of some cancers [13]. *Cassia absus* methanolic extract showed higher crude protein content. Nutritionally *Cassia absus* is beneficial as protein as it contains amino acids utilized by the cells of the body to synthesize all the numerous proteins required for the function of the cell and also to provide energy [14].

*Borreria stachydea* petroleum spirit extract also showed moderate percentage composition of fat, total ash, and moisture contents. The total fat content in *Borreria stachydea* if further analyzed may contain fatty acids as well as vitamins. The plant can be considered as a poor source of lipids as it contain 3.13 % and 2.15 % of crude fat as compared to reported values of (8.3-27.0%) in some vegetables consumed in West Africa [15]. The percentage of moisture content varies from 6.67 % in *Cassia absus* to 8.67 % *Borreria stachydea*. The moderate moisture content provides for an activity of water soluble enzyme and co enzyme needed for metabolic activities of these leafy vegetables [16]. *Borreria stachydea* and *Cassia absus* have relatively similar values of ash contents of 8.5 % and 8.0 % respectively. This confirms that there are minerals in the two plants.

Mineral elements such as Calcium, Zinc, and Magnesium were determined in the two plants. The mean concentration of calcium is in the order of 0.6102 and 0.4458 mg/kg in *Cassia absus* and *Borreria stachydea* methanolic extracts respectively (Tables 2 and 3). Calcium is good for growth and maintenance of bones, teeth and muscles [17]. Therefore these plants could provide veritable sources of calcium. Other mineral elements detected at reasonable concentrations in Table 2 and 3 are magnesium and zinc. The concentration of these metals found in the plants is advantageous since certain inorganic mineral elements (potassium, zinc, calcium etc) play

important roles in the maintenance of normal glucose tolerance and in the release of insulin from beta cells of islets of Langerhans [18].

Chromium was observed to be higher than the WHO recommended limit of 0.05 mg/L. However, lead and

cadmium were relatively of low concentrations. Therefore consuming these plants may be harmful since it has been reported that some of these minerals like lead, chromium and cadmium are highly toxic even at low concentration [19, 20].

Table 1: Proximate analysis of *Borreria Stachydea* and *Cassia absus*

Components	<i>Borreria stachydea</i> methanolic extract	<i>Cassia absus</i> methanolic extract	<i>Borreria stachydea</i> petroleum sprit extract	<i>Cassia absus</i> petroleum sprit extract
Crude protein value (%)	8.08	9.81	5.63	4.88
Crude fibre value (%)	7.11	3.17	0.11	2.65
Crude fat value (%)	2.15	2.11	3.13	1.94
Nitrogen Free Extract value (%)	65.59	70.36	89.27	88.39

Table 2: Elemental constituents of *Borreria stachydea*

Element	Methanolic extract (mg/kg)	Petroleum Sprit extract (mg/kg)
Ca	0.4458±0.0014	0.4086±0.0595
Mg	0.3677±0.0015	0.4848±0.0009
Zn	0.0199±0.0012	0.0186±0.0007
Pb	0.0000±0.0003	-0.0005±0.0006
Cr	0.1613±0.0011	0.1236±0.0018
Cd	0.0004±0.0003	0.0012 ±0.0004

Table 3: Elemental constituents of *Cassia absus*

Element	Methanolic extract (mg/kg)	Petroleum Sprit extract (mg/kg)
Ca	0.6102±0.0023	0.4083±0.0003
Mg	0.8769±0.001	0.4076±0.0003
Zn	0.0389±0.0015	0.0251±0.0004
Pb	0.0019±0.0005	-0.0001±0.0006
Cr	0.0023±0.0008	0.3209±0.0019
Cd	0.0042±0.0017	0.0013 ±0.0005

## CONCLUSION

This work has shown that the plants examined are good sources of fibre, which implies that they can decrease high cholesterol levels in the body. But care has to be taken to avoid the excessive use of the plants as medicinal therapies because they contain low concentration of some heavy metals such as lead and chromium. Long and excessive usage may lead to their bio-accumulation of such metals, which may eventually become toxic to the human body.

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