African Journal of Pharmaceutical Research & Development

Vol. 13 No.2; pp. 127-132 (2021)

PROXIMATE COMPOSITION, MINERAL CONTENT AND ANTINUTRITIONAL FACTORS OF LEAVES OF *Senna occidentalis* (Linn)

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ABSTRACT

Senna occidentalis belong to the family *Fabaceae* and it's widely known in Nigeria for its medicinal usage for treatment of fevers, coughs, headache, haemorrhage, renal calculi. The aim of this research is to determine the compositions of proximate, mineral and antinutritional content of the leave of *S. occidentalis*. The proximate, mineral and antinutritional composition where determined using standard procedures. The results revealed that the value of the proximate ranged between 8.67±0.18 to 46.38±0.83 %. The mineral analyses showed that phosphorus have the highest value (4121.03±0.43 mg/100g) while lead was the least (0.00±0.01 mg/100g). These indicate that the leaves of *S. occidentalis* are good source of mineral. The results of antinutritional factors are 20.99±0.04 mg/100g, 0.67±0.09 mg/100g, 0.34±0.13 mg/100g, 0.81±0.04 mg/100g, 66.70±0.18 mg/100g and 2.11±0.14 mg/100g for saponin, tannin, phytate, oxalate, flavonoid and alkaloid respectively. These were found to be within acceptable levels for human and animal consumption. It can be concluded that the leaves of *S. occidentalis* might be a good source of nourishment if properly utilized.

KEYWORDS: ***Senna occidentalis*; Proximate; Antinutritional; Mineral composition.**

INTRODUCTION

Medicinal plants are seen as complementary therapeutics due to presence of active ingredients has showed improve management of ill-health conditions [1]. Some of these medicinal plants, however, offer potential for cost effective management of antimicrobial activities [2], hypertriglyceridemia [1] antihypertensive and antidiabetic activities. These medicinal plants contain phytochemicals that provide health benefits to humans, and are distributed in different parts of the plant such as seeds, leaves, stem, roots, flowers and fruits. In addition, phytochemical protect the plants from diseases and damages, and also contribute to the plants colour, aroma and flavour [3]. They include flavonoids, alkaloids, triterpenes, glycosides, saponins, tannins, carbohydrate, essential oils, and other complex chemical substances of different composition are reported to have impacts on the curative properties of medicinal plants [4].

Phytochemicals are also referred to as phytonutrients, and are extremely valuable for good health and proper wellbeing [5]. Certain levels of anti-nutritional factors such trypsin inhibitors, saponins, phytates, oxalates, alkaloids, tannins, flavonoids and lectins found in plant materials are reported to interfere with assimilation of phytonutrients like proteins and minerals to reduce digestion and cause adverse health effect such as mineral deficiencies and micronutrient malnutrition [6].

Plant materials have been reported to contain six components of proximate such as moisture, crude protein, ether extract, crude ash, crude fiber and nitrogen free extracts. These components determine the properties of the plants and are expressed as the percentage composition [5, 7]. Several micro- and macro-elements such as calcium, magnesium, potassium, sodium, phosphorus, iron, manganese, copper, zinc and lead present in plants are

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responsible for the cure of different diseases, and these elements are present in all plant samples [7].
Senna occidentalis is a very leafy plant and grows annually that can reach up to 2 metres tall. The plant is cultivated for medicinal use and has disagreeable odour when crushed [8]. The leaf is used for the treatment of fevers, coughs, headache, haemorrhage, renal calculi [9, 10].
This study was aimed at carrying out the proximate composition, mineral content and antinutritional factors of leaves of *S. occidentalis*.

MATERIALS AND METHODS

Plant Material

The plant materials *Senna accidentalis* was collected from the wild in Maimalari district of Yusufari, Yobe State - Nigeria in January, 2020. It was identified by Mallam Bashir, Biology Department, Federal University Gashua, Yobe State. The sample was deposited at the herbarium for reference purpose after assignment of Voucher Number V/N: 00127. The leaves were air dried for 21 days under room temperature and then crush to powder.

Proximate Analysis

Proximate analysis was carried out as described by [5] for the standard determination of six components such as moisture content, total ash, lipids, protein, crude fibre and carbohydrate. The sample (5 g) was dried at 103°C for four hours using electrical dryer and cooled in desiccator; percentage of weight difference was considered as moisture content. Certain weigh of the sample was ignited at 550°C until all carbon is removed; ash was taken and was considered as ash content. Protein content was estimated from the nitrogen content of the plant material. Determination of crude fibre involved extracting the plant material with petroleum ether and evaporates; the residue was the crude fat.

Mineral Analysis

Analysis of mineral composition was determined as used by [11]. A known weigh of the plant material was heated until no smoke was emitted to obtain ash. Then it was cool in a desiccator. Hydrochloric acid (0.1 ml) was added to the ash sample to make a solution and filtered. The resulting filtrated was subjected to atomic absorption spectrophotometer (AAS) for the analysis of calcium, magnesium, iron, manganese, copper, zinc and lead while phosphorus was determined by vanadomolybdate colorimetric method, sodium and potassium were measured using flame photometer.

Antinutritional Factors

Antinutritional analysis was determined as described by [5] for the evaluation of saponin, flavonoid and alkaloid in the plant material as double extraction gravimetric method was used for evaluation of saponin and alkaloid content. Determination of contents of phytate, tannin and oxalate were described as used by [12].

Statistical analysis

Collected data were analysed for their central tendencies (mean), and expressed in mean ± standard deviation of the observations.

RESULTS

Proximate composition result of leaves of *S. occidentalis* is presented in Table 1. Composition of carbohydrate (46.38±0.83 %) had highest percentage while the least percentage composition is moisture content. Analysis of Mineral content of leaves of *S. occidentalis* revealed the content of phosphorus (4121.03±0.43 mg/100g) to be the highest concentration among calcium, magnesium, potassium, sodium, iron, manganese, copper, zinc and lead with concentration as presented in Table 2. The antinutritional content result of leaves of *S. occidentalis* is showed in Table 3. The flavonoid content was 66.70±0.18 mg/100g and represented the highest concentration while phytate concentration was 0.34±0.13 mg/100g representing the least concentration among saponin, tannin, oxalate and alkaloid concentration.

DISCUSSION

Proximate analysis of a plant material/food sample is the nutritional composition of that sample and helps in estimating the nutritive value of the sample. The result of proximate analysis of this study is presented in Table 1 and it revealed that the leaves of *Senna occidentalis* contains essential nutrients, energy sources for good human and animal health because of the percentage contents of protein (19.13±0.20 %), carbohydrate (46.38±0.83 %) and crude fibre (22.38±0.17 %) and it's within the acceptable limit. These results are similar with [13] for evaluation of protein (14.88 %), carbohydrate (55.68 %) and crude fibre (15.85 %) contents in seeds of *Senna Singueana* and [14] for evaluation of protein (15.84 ± 1.43%), carbohydrate (13.13 ± 0.94%) and crude fibre (48.29 ± 2.67%) contents in leaves of *Alafia barteri*. Samples rich in fibre have been reported to lower risk of constipation and diabetes, decrease

Figure 1: *Senna occidentalis* showing stems, leaves and fruits.

Table 1: Proximate composition of leaves of *Senna occidentalis*

Parameters	Composition %
Moisture Content	8.67±0.18
Total Ash	11.71±0.43
Lipids	14.10±0.30
Protein	19.13±0.20
Crude Fibre	22.38±0.17
Carbohydrate	46.38±0.83

Data are measured in triplicate and reported as mean ± standard deviation.

Table 2: Mineral content of leaves of *Senna occidentalis*

Minerals	Composition mg/100g
Calcium (Ca)	158.02±0.28
Magnesium (Mg)	463.72±0.23
Potassium (K)	1399.98±0.29
Sodium (Na)	65.03±0.42
Phosphorus (P)	4121.03±0.43
Iron (Fe)	52.23±0.34
Manganese (Mn)	4.55±0.31
Copper (Cu)	2.31±0.08
Zinc (Zn)	4.66±0.38
Lead (Pb)	0.00±0.01

Data are measured in triplicate and reported as mean ± standard deviation.

Table 3: Anti-nutritional composition of leaves of *Senna occidentalis*

Components	Composition mg/100g
Saponin	20.99±0.04
Tannin	0.67±0.09
Phytate	0.34±0.13
Oxalate	0.81±0.04
Flavonoid	66.70±0.18
Alkaloid	2.11±0.14

Data are measured in triplicate and reported as mean ± standard deviation.

cholesterol level and reduce risk of hypertension [14]. This study also revealed the crude lipid level to be (14.10±0.30%) and it is lower than crude lipid content (23.70%) in fruit pulp of *Vitex doniana* reported by [15]. Sample having lower level of lipid content have been reported to lower the serum cholesterol level in human and animal [14].

The moisture content is (8.67±0.18%) and correspond with moisture content (8.76 ± 0.59%) in leaves of *Alafia barteri* [14] but slightly higher than moisture content (6.56%) in seed of *Raphia taedigera* reported by [16]. Low value of moisture content indicates less chances of microbial degradation during storage because excess moisture can result in the breakdown of important constituents by enzymatic activity and as a result may encourage the growth of yeast and fungi during storage [17]. The ash content (11.71±0.43%) is a clear indication that the leaves of *S. occidentalis* contain mineral elements in reasonable amount. This value is slightly higher than ash content (6.75%) in leaves of *Alafia barteri* reported by [14].

The result of the mineral analysis is presented in Table 2 and revealed that the leaves of *S. occidentalis* is a good source of calcium (158.02±0.28 mg/100g), magnesium (463.72±0.23 mf/100g), potassium (1399.98±0.29 mg/100g), sodium (65.03±0.42 mg/100g), phosphorus (4121.03±0.43 mg/100g), iron (52.23±0.34 mg/100g), manganese (4.55±0.31 mg/100g), copper (2.31±0.08 mg/100g), zinc (4.66±0.38 mg/100g) and lead (0.00±0.01 mg/100g). The values obtained for calcium and magnesium were higher than [18] for calcium (44.2 ± 0.9 mg/100g) and magnesium (78.7 ± 0.8 mg/100g) in *Opuntia ficus-indica*. Calcium has been reported to assist in maintaining skeletal integrity while intestinal absorption occurs in presence of magnesium [14].

Manganese plays an important role in plant chlorophyll production and it is essential for growth, vertebral development in animal. Deficiency of manganese can lead to dwarfism [19]. Iron is reported to be helpful in prevention many diseases, e.g. anaemia [14]. The result of manganese (74.80 ± 2.84 mg/100g) and iron (46.20 ± 4.11 mg/100g) reported by [14] in leaves of *Alafia barteri* were higher when compared to the result of this research. The result of zinc, potassium and copper concentration as 1.14±0.00 mg/100g, 258.64 ± 15.89 mg/100g and 0.37 ± 0.06 mg/100g reported by [20] in Kilombero, a rice variety, were lower when compared to the result of this research. Likewise, the sodium value (2.90 ± 0.04 mg/100g) reported by [14] in leaves of *Alafia barteri* is lower than that obtained in this study. The differences might be to different plant families. Zinc is distributed widely in plant and animal tissues, its primary roles appear to be in cell replication and gene expression [21]. Potassium plays a vital role in kidney maintenance and normal cell function including neurotransmission, muscle contraction, and maintaining acid-base balance [22]. Copper is not produce in the body but rather obtained in food and it plays roles in maturation of the nervous, also growth and development of the body [23].

The concentrations of antinutrients were found to be within acceptable levels for human and animal consumption. However, traditional processing techniques can be used to reduce the levels of antinutrients for safe consumption. The amount of alkaloids and saponin concentration obtained in this study is higher than the alkaloids (0.53±0.00 mg/100g) and saponin (0.68±0.00 mg/100g) reported by [5] in Leaves of *Corchorus oliterius*. Saponins have been reported to reduce risk of heart diseases and also possess properties such as anticarcinogenic, hypocholesterolemic and immunostimulatory. Alkaloids are toxic at value above 20 mg/100g and when consumed in large amount, they act on the nervous system and disrupt electrochemical transmission [5].

Flavonoids (368.42±26.95 mg/100g) and tannins (96.16±8.39 mg/100g) reported by [14] are higher than flavonoids (66.70±0.18 mg/100g) and tannins (0.67±0.09 mg/100g) recorded in this study. Flavonoids are known to exhibit anti-inflammatory, antimalarial and antioxidant activities and give plant nutritional advantage while tannins interfere with protein digestion in human by inhibiting digestive enzymes and increasing fecal nitrogen. Oxalate in plant materials/foods is reported to hinder the absorption of calcium, a divalent mineral [5]. The oxalate concentration (0.81±0.04 mg/100g) reported in this study is lower than oxalate (241.96±0.02 mf/100g) reported by [5] in leaves *Corchorus oliterius*.

CONCLUSION

The proximate and mineral analysis of leave of *Senna occidentalis* have shown that it might be a good source of nourishment if properly utilized. The antinutritional factors were found to be within acceptable levels for human and animal consumption. The carbohydrate can help supply the energy need of the cell when consumed. The mineral content of the leaf suggests that the plant can contribute significantly to the nutrient requirements of man owing to the high concentrations of phosphorous and iron as it may help build strong

bones and teeth; and may help to ameliorate anaemia due to significant amount of Fe.

ACKNOWLEDGEMENTS

The authors are grateful to Mallam Bashir Garba of Biological Department, Federal University Gashua for identifying and authenticating the plant. We are also grateful to Abubakar M. Shehu of Institute for Agricultural Research, Ahmadu Bello University Zaria for his valuable technical assistance.

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