Proximate Composition, Mineral Elements and Anti-Nutritional Factors of *Anisopus mannii* N.E.Br. (Asclepiadaceae)

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Abstract: Biochemical studies with a view to assess the nutritional potentials of *Anisopus mannii* were carried out by evaluating the proximate composition, mineral elements and anti-nutritional content of the plant. The results showed that the total oxalates, free cyanides, tannins and total cyanides were found to be present at 0.70±0.5, 6.50±0.41, 10.55±0.01 and 12.41±7.19%, respectively. However, concentration of phytate was very low (0.017±0.00%). Proximate compositions of the plant showed a rich source of crude protein (8.40±0.17%), fats (8.67±0.63%), carbohydrates (72.57±0.68%) and total ash (10.36±0.22%). The plant was also found to contain the following essential minerals: potassium (1700 mg/100 g), calcium (1280 mg/100 g), iron (156 mg/100 g), vanadium (102 mg/100 g), chromium (53.90 mg/100 g), zinc (0.874 mg/100 g), copper (1.43 mg/100 g) and manganese (36.60 mg/100 g). The results of this research indicated that *Anisopus mannii* has nutritional qualities that could provide the users with additional nutrients for enhanced curative process of ill health.

Key words: Proximate analysis, trace elements, anti-nutritional factors, *Anisopus mannii*

INTRODUCTION

Plants have played significant roles in maintaining the health and promoting the quality of human life for thousands of years. The majority of the earth's inhabitants in the developing world rely on traditional medicine for their primary health care needs and a major part of this therapy involves the use of plants, plant extracts or their active principles (Craig, 2001). In Northern Nigeria many indigenous plants are widely consumed as food or home remedies especially in the treatment or management of common diseases such as digestive problems, headache, cough and cold, diabetes and pile. *Anisopus mannii* (Asclepiadaceae) is a glabrous twining shrub with leaves petiole, elliptic, ovate and shortly cuspidate at apex up to 15 cm or more long and 12 cm broad and the stem twining to a height of 3.7-4.6 cm (Hutchinson and Dalziel, 1963). The plant is known as kashe zaki (Hausa) meaning destroying sweetness. It is a familiar herb in the traditional medicinal preparations across Northern Nigeria, where a decoction of the whole plant is used as remedy for diabetes mellitus, diarrhea and pile.

However, very little information exist on the inorganic elements constituents of the plant and the role they may play in traditional medicine. It is an established fact that there is a relationship between chelation of metals and some chemotherapeutic agents. The role of inorganic elements in animal and plant metabolism has long been established, but the effect and influences of these elements on administration of medicinal plants has received relatively little attention (Saiki *et al*., 1990; Xio and

Qin, 1990; Dim *et al*., 2004). This study was designed to evaluate the proximate compositions, mineral elements and anti-nutritional factors of *Anisopus mannii* with a view to assess the nutritional potentials of the plant in relation to its uses.

MATERIALS AND METHODS

Plant Material

Whole plant of *Anisopus mannii* was collected in February 2006 at Samaru along Giwa road, Zaria. The plant was taxonomically authenticated and specimen (Voucher No. 217) of the sample deposited at the Herbarium, Department of Biological Sciences, Ahmadu Bello University, Zaria, Nigeria. The sample was washed with double distilled water; air dried, (except for moisture content) ground to powder (using mortar and pestle) and made to pass through 1.00 m mesh sieve size (for XRF analysis).

Proximate and Anti-Nutritional Analysis

The proximate compositions and toxic anti-nutritional factors of the sample (crude protein, crude fat, moisture content, crude fibre, ash content, soluble carbohydrate, total carbohydrate, phytates, tannins, free cyanides, soluble oxalates and total oxalates) were determined according to the standard methods as recommended by the Association of Official Analytical Chemists (AOAC, 1990).

Mineral Elements Determination

The mineral element determination was carried out using Energy Dispersive X-ray Fluorescence analysis (ED-XRF). Pellets of the powdered sample were prepared by taking about 0.500 g and pressed at about 10 tonnes with a hydraulic press. Measurements were then taken using annular 25 m Ci^{109} Cd as the exciting source that emits Ag-K X-rays (22.1 KeV) in which case all elements with lower excitation were detected. The quantitative analysis of the samples was carried out using Emission-Transmission (E-T) method. It consist of SILENA model 12170 Lithium drifted selenium Se (Li) detector with a resolution of 170 for 5.90 kev line coupled to a computer controlled Analog Digital Converter (ADC) card. The system utilizes the MAESTRO software for spectral acquisition, peak location, energy assignment, elemental identification, smoothening, background subtraction and normalization as well as the AXIL software for quantification of the acquired spectra (Bernasconi *et al*., 1996).

Statistical Analysis

All determinations were replicated three times and results were reported as Mean±SD.

RESULTS

The results from the proximate analysis of *A. mannii* showed that crude fibre was higher with 89.64±0.22% followed by total carbohydrate content 72.57±0.68%. The crude protein content was 8.40±0.17%; moisture content was 8.41±0.02%, soluble carbohydrates 7.94±0.15% whereas total fat and ash content were 8.67±0.63 and 10.36±0.22%, respectively (Table 1). The toxic anti nutritional components of the plant showed that total cyanide content was higher (12.41±7.19%) followed by tannins (10.55±0.01%), free cyanide (6.50±0.41%), total oxalates (0.79±0.5%) and soluble oxalates (0.34±0.16%); with phytate content (0.017±0.00%) being the least (Table 2). The mineral analysis indicates that the concentration of macro minerals; potassium (1700 mg/100 g) and

Table 1: Proximate composition of *Anisopus mannii*

Parameters	Concentration (g/100 g)
Moisture	8.41±0.02
Ash	10.36±0.22
Crude fiber	89.64±0.22
Crude protein	8.40±0.17
Fat	8.67±0.63
Soluble carbohydrate	7.94±0.15
Total carbohydrate	72.57±0.68

Table 2: Antinutritional composition of *Anisopus mannii*

Parameters	Concentration (g/100 g)
Phytates	0.017±0.000
Tannins	10.550±0.010
Free cyanide	6.500±0.410
Total cyanide	12.410±7.190
Soluble oxalate	0.340±0.160
Total oxalate	0.790±0.500

Table 3: Mineral element composition of *Anisopus mannii*

Mineral elements	Concentration (mg/100 g)
K	1700.00
Ca	1280.00
V	102.00
Cr	53.90
Mn	36.60
Fe	156.00
Cu	14.30
Zn	8.74
Pb	17.60

calcium (1280 mg/100 g) were the highest. Other minerals detected in reasonable amounts were iron (156 mg/100 g), vanadium (102 mg/100 g), chromium (53.90 mg/100 g) and manganese (36.60 mg/100 g). The concentrations of zinc, copper and lead were the least (Table 3).

DISCUSSION

The results of proximate analysis showed a high content of crude fibre and total carbohydrate (Table 1). Food fibres have been reported to aid absorption of trace elements in the gut (Kelsey, 1981) and reduce absorption of cholesterol (Leveille and Sauberlich, 1966). The amount or composition of crude protein (8.40±0.17%) and ash content (10.36±0.22%) compared favourably with and in most cases surpassed those reported for most medicinal plants (Abolaji *et al*., 2007; Odoemena and Ekpo, 2005) This is indicative of the potential benefit of *Anisopus mannii* as proteins are essential for the synthesis of body tissues and regulatory substances such as enzymes and hormones (Vaughan and Judd, 2003). The moisture content analyzed was low (8.41±0.02%) compared to that of a medicinal plant *Nypa fructican* as reported by Odoemena and Ekpo (2005), in which the moisture content for leaf (50.19±0.33%), stem (63.51±0.54%) and root (29.19±0.94%) were obtained. High moisture content promotes susceptibility to microbial growth and enzyme activity (Adejumo and Awosanya, 2005).

The nutritional importance of a given food or vegetable depends on the nutrients or anti-nutritional constituents (Aletor and Omodara, 1994). The values for oxalate and phytate determined for *A. mannii* (Table 2) were quite lower than 18.09±2.29 mg/100 g (oxalates) and 96.40±0.20 mg/100 g (phytates) as reported for *Caesalpina pulcherrima* (Pride of Barbados) (Prohp *et al*., 2006). The total cyanide content determined was also lower than 21.60±1.43 mg/100 g reported for leaf of *Nypa fructicans* (Odoemena and Ekpo, 2005). High concentrations of anti-nutrients

such as phytate and oxalates have been known to exert substantial effects on mineral bioavailability in foods (Weaver and Kannan, 2002). Oxalate salts are poorly soluble at intestinal pH and oxalic acid is known to decrease Ca absorption in monogastric animals (Allen, 1982). These anti-nutrients form complexes with nutritionally important minerals such as Ca^{2+}, Mg^{2+}, Cu^{2+}, Fe^{2+}, Mn^{2+}, Co^{2+} and Zn^{2+} thereby preventing efficient absorption by the body systems (Aletor and Omodara, 1994).

The results of nutritionally valuable minerals showed that *Anisopus mannii* was rich in potassium (1700 mg/100 g) and calcium (1280 mg/100 g). These concentrations are higher than those obtained from the leaves of *Boerhavia diffusa* (potassium 0.91±0.07 mg/100 g and calcium 174.09±2.73 mg/100 g) and *Commelina nudiflora* (potassium 0.78±0.08 mg/100 g and calcium 240.00±4.14 mg/100 g) as reported by Ujowundu *et al*. (2008). The biological roles for K and Ca are essential for disease prevention and control and may, therefore, contribute to some of the traditional medicinal influences of the plant. Iron, manganese and zinc, present in the plant at 156 , 36.60 and 8.74 mg/100 g concentrations, respectively, are three essential elements in enzyme metabolism. The importance of iron in maintaining good health has been recognized (Vaughan and Judd, 2003). Manganese is an important modulator of cells functions and play a vital role in the control of diabetes (Korc, 1988). This is one of the illness for which *A. mannii* is traditionally used to remedy.

The concentration of lead (17.60 mg/100 g) in *A. mannii* is quite higher when compared to concentration of 2.71±0.14 mg kg^{-1} obtained for *Caesalpina pulcherrima* (Pride of Barbados) as reported by Prohp *et al*. (2006). This should be of concern in traditional medicinal therapy because of lead toxicity even at low concentration. However, using the proximate analysis, the mineral content and toxic anti-nutritional factors as approximate indices of nutritional quality, it showed that the plant *Anisopus mannii* hold tremendous promise in providing the protein and mineral supply that could enhance the curative process of ill health. These findings provide biochemical as well as trace metals profiles which are important in understanding the pharmacological and/or toxicological actions of the medicinal plant. Further studies will concentrate on the use of extracts of *A. mannii* on laboratory animals in order to determine their metabolic effects.

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