Bajopas Volume 11 Number 1 June, 2018

http://dx.doi.org/10.4314/bajopas.v11i1.7

Bayero Journal of Pure and Applied Sciences, 11(1): 37 - 40
Received: June, 2016
Accepted: December, 2017
ISSN 2006 – 6996

A PROXIMATE, MINERAL COMPOSITION AND ANTI-NUTRITIONAL FACTORS OF THE AERIAL PARTS OF *Lablab purpureus* (L.) SWEET

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ABSTRACT
This study evaluates the nutritional and anti-nutritional potentials of the aerial part of Lablab purpureus as it relates to its use in Animal nutrition. The preliminary phytochemical test of the plant revealed the presence of bioactive secondary metabolites; glycosides, saponins, flavonoids, tannins, steroids, alkaloids, coumarins, phenols, carbohydrates and terpenoids in the crude extract. Results from the study revealed significant mineral composition in Lablab purpureus. Atomic Absorption Spectroscopic (AAS) technique was employed in the elemental analysis. Substantial amounts of Ca, Na, K and Mg were found, while Cu, Fe, P, Mn and Zn were present in trace amounts. Proximate analysis revealed the ash and fat contents to be 5.6 % and 4.2 % respectively. The protein level, total Carbohydrate and Fibre contents were determined to be 25.4 %, 46.93 % and 7.5 % respectively. The presence of anti-nutritional secondary metabolites; tannins, saponins, oxalates, phytates, cyanogenic glycosides and free phenolics were quantitatively determined to be 0.50 %, 3.8 %, 0.70 %, 2.2 %, 1.2 % and 2.1 % respectively. The results of the phytochemical constituents, proximate composition, anti-nutritional factors and mineral composition of the aerial part of Lablab purpureus in this study demonstrates high nutrients content with potentials to meet the nutritional requirements in monogastric diets.
Key words: Anti-nutritional composition, Lablab Purpureus, Mineral composition, Proximate analysis.

INTRODUCTION

Lablab purpureus known as beans in English 'wake' in Hausa and 'ewa' in Yoruba belongs to the Fabaceae family and is cultivated in many countries of the world including west tropical Africa, and Nigeria in particular. It is a legume that thrives very well in Northern Nigeria. It is drought resistant and is usually sown after the normal cropping season, thereby acting as a buffer crop for ruminant feeding during the dry season (Adu *et al*., 1992). *Lablab purpureus* is a common plant cultivated for its edible beans, though it is reported to have certain medicinal properties (Handa *et al*., 1989; Adeleke *et al*., 2012).

One common cause for the high cost of raising animals in the developing countries is the high cost of feeding ingredients, and poor feeding strategies (Shaahu *et al*., 2012). It is apparent that the demand for animals' diet in developing countries like Nigeria is on the rise. This is pertinently stabilized by the increase in the production of the minor legumes, many of which have low preference or are unsuitable for human consumption, and thus, reducing the over dependence on conventional feed stuff (Shaahu *et al*., 2012). Therefore, the need for increase in animals' production in such countries like Nigeria must require the exploitation of the non-conventional feed ingredients. One such legume that could be exploited to serve as an alternative source of nutrients in monogastric diets is the leaves of *Lablab purpureus* (Cameron, 1988).

It is against this background that this study aimed at evaluating the nutritional value of the aerial part of *Lablab purpureus*. The objectives are therefore to determine its phytochemical constituents, proximate composition, anti-nutritional factors and mineral composition.

MATERIALS AND METHODS

Plant Material Collection and Identification

Aerial parts of *Lablab purpureus* (*L.*) sweet (*Subsp. bengalensis*) were collected during September 2016 from Kargi district, of Kaduna state, and taxonomically identified at the Herbarium, Ahmadu Bello University Zaria (Adebisi and Bosch, 2004).

Preparation of Methanolic Extract of Aerial Parts

Aerial parts were washed thoroughly with distilled water to remove dust and other particulate matter, cut into small pieces, air-dried in the shade, and 150g of dried and powdered aerial parts were extracted with methanol (Trease and Evans, 1996).

Preliminary Phytochemical Screening

Portion of the methanol extract was subjected to preliminary phytochemical screening using standard procedures (Sofowora, 1993; Trease and Evans, 1996; Silva *et al*., 1998).

Proximate Analysis

Moisture, ash, proteins, fat and crude fibre contents were determined according to standard procedures outlined in Williams (1984). Total carbohydrate was calculated by difference according to Williams (1984) procedure.

Mineral Analysis

The sample was ashed and the residue dissolved in hydrochloric acid and quantitatively transferred into a volumetric flask. The volume was made up to 50 ml using distilled deionised water. The concentrations of the mineral elements (Ca, Na, K, P, Cu, Fe, Mg, Mn and Zn) were determined using Atomic Absorption Spectrophotometer (Alpha 9 Model, Buck Scientific Ltd USA) according to the method outlined by Williams (1984).

Anti-Nutritional Analysis

Total tannins were determined colorimetrically as described in AOAC (1990). The method described by Day and Underwood (1986) was adopted for the determination of oxalates and phytates. Gravimetric method of AOAC (1990) was employed to quantitatively determine saponins.

RESULTS AND DISCUSSION

Preliminary Phytochemical Screening

The phytochemical screening of the aerial part of the plant *Lablab purpureus* revealed the presence of carbohydrate, glycosides, alkaloids, saponins, steroids, terpenoids, coumarins, phenols, flavonoids, and tannins (Table 1).

Table 1: Phytochemical Constituents of Crude Methanol Extract of the aerial Part of *Lablab purpureus*

Phytochemicals	Tests	Inference
Glycosides	Modified Bontrager's	+
Tannins	Lead acetate Ferric Chloride	+
Saponins	Frothing	+
Anthraquinones	Bontrager's	–
Flavonoids	NaOH	+
Steroids/Triterpenes	Lieberman-Burchard	+
Alkaloids	Dragendoff's	+
	Wagner's	+
	Picric acid	
Coumarins		+
Phenols		+
Carbohydrates	Molisch's	+
Terpenoids		+

Key: + = Present – = Absent

The presence of glycosides, saponins, flavonoids, tannins, steroids, alkaloids, coumarins, phenols, carbohydrates and terpenoids in the plant materials called for immense research, since bioactive chemical compounds (secondary metabolites) are of various pharmacological importance.

Several reports have provided evidence for the pharmacological effects of plant phytochemicals. Tannins are reported to have anthelmintic effects (Molan *et al*., 2000) and useful in the treatment of inflamed or ulcerated tissues and they also have remarkable activities in the cancer prevention and anticancer activity (Akinpelu *et al*., 2009). Flavonoids, phenols and saponins have been reported to exhibit their actions through effects on membrane permeability, anti oxidative action and anti inflammatory effects (Olayinka and Okoh, 2010). Many triterpene saponins and their aglycones have varied uses including anti-inflammatory, antipyretic, fibrinolytic, analgesic, anti-ulcerogenic, anti-oedema and antimicrobial effects (Hostettmann and Martson, 1995; Soetan *et al*., 2006; Ndukwe *et al*., 2007). Alkaloids are haemolytically active, toxic to micro-organisms and are widely used as therapeutic agents in the management of cancer. Glycosides are reported to inhibit tumour growth and also protect against gastrointestinal infections (Adeshina *et al*., 2010). Terpenoids have been reported to be active against bacteria, fungi, protozoa and viruses (Maiyo *et al*., 2010). El-Mahmood *et al*. (2008) linked antimicrobial properties of plants to bioactive secondary metabolites (saponins, tannins, alkaloids, flavonoids, phenols, glycosides and diterpenes).

Proximate Composition

Data on the dry matter, ash, fat, protein, fibre and carbohydrate constituents in the aerial part of the plant (*Lablab purpureus*) sample are shown in Table 2. The dry matter was determined to be about 88.2%.

Table 2: Proximate Composition (%) of the Aerial Part of *Lablab purpureus*

Constituents	Relative amount
Dry Matter (%)	88.20±0.40
Moisture Content (%)	11.80±0.20
Ash Content (%)	5.60±0.10
Crude Fat (%)	4.20±0.30
Crude Protein (%)	25.40±0.20
Crude Fibre (%)	7.50±0.20
Ethyl Ether (%)	5.87±0.4
Total Carbohydrate (%)	46.93±0.30

Data are mean of triplicate determinations ± standard deviation

The ash and fat contents were 5.6 % and 4.2 % respectively. The Moisture content was determined to be 11.8 %, which agree with data reported previously by Al-Snafi (2017). The protein level, total Carbohydrate and Fibre contents were determined to be 25.4 %, 46.93 % and 7.5 % respectively. These results are comparable with those reported by Shaahu *et al*. (2012).

Minerals Composition

Nine (9) minerals were found, which include calcium, sodium, potassium, copper, iron, phosphorus, magnesium, manganese and zinc. These minerals are regarded as the most significant elements of a valuable food (Murphy *et al.,*1999).

Table 3: Minerals Composition (mg/100g) of the Aerial Part of *Lablab purpureus*

Minerals	Concentration (mg/100g)
Ca	36.5±0.020
Na	71.6±0.008
K	112.6±0.012
Cu	1.4±0.002
Fe	155.3±0.003
P	386.6±0.007
Mg	156.8±0.020
Mn	20.5±0.008
Zn	30.4±0.004

Data are mean of triplicate determinations ± standard deviation

Table 3, shows that the aerial part of *Lablab purpureus* has high content of the following essential minerals; Iron (Fe), Phosphorus (P), Potassium (K) and Magnesium (Mg), with the following concentrations; 155.3 mg/100g, 386.6 mg/100g, 112.6 mg/100g and 156.8 mg/100g, respectively. While relative amount of Sodium Na, about 71.6 mg/100g; Calcium (Ca), about 36.5 mg/100g and Zinc (Zn), about 30.4 mg/100g were also found to be present in the sample, Manganese (Mn), and Copper (Cu) recorded the least with the following concentrations; 20.5 mg/100g and 1.4 mg/100g respectively. This implies that the aerial part of *Lablab purpureus* could be a good dietary mineral supplement for animals. This agrees with the study of Al-Snafi (2017), in his review reported that *Lablab purpureus* is rich in some micronutrients with considerable variation depending on the variety.

Anti-Nutritional Composition

The anti-nutritional composition of the aerial part of *Lablab purpureus* is presented in table 4. Six (6) factors which include tannins, saponins, oxalates, phytates, cyanogenic glycosides and free phenolics were quantitatively determined.

Table 4: Anti-nutritional Composition (mg/g) of the Aerial Part of *Lablab purpureus*

Constituents	Composition (mg/g)
Tannins	0.50±0.02
Saponins	3.80±0.01
Oxalates	0.71±0.02
Phytates	2.20±0.01
Cyanogenic glycosides	1.20±0.03
Free phenolics	2.10±0.02

Data are mean of triplicate determinations ± standard deviation

The concentrations of tannins, saponins, oxalates, phytates, cyanogenic glycosides and free phenolics in the aerial part of *Lablab purpureus* are 0.50 %, 3.8 %, 0.70 %, 2.2 %, 1.2 % and 2.1 % respectively. Saponins had the highest percentage composition while oxalate had the least. High composition of oxalate in human diet can increase the risk of renal calcium absorption and has been implicated as a source of kidney stones (Chai and Liebman, 2004). In addition, Chai and Liebman (2004) reported that higher value of tannins in feeds interferes with protein absorption and digestive enzymes. From the results obtained in this study, the concentrations of oxalates, tannins and phytates in the aerial part of *Lablab purpureus* are low to cause any health risk in both human and animals.

CONCLUSIONS

Finally, the results of the phytochemical constituents, proximate composition, anti-nutritional factors and mineral composition of the aerial part of *Lablab purpureus* in this study demonstrate that it contains high nutrients with potentials to meet the nutritional requirements in monogastric diets. It can also be used as a dietary supplement to correct some nutritional deficiencies. According to the International Feed Industry Federation standard, the low concentrations of anti-nutritional factors also suggest that the aerial part of *Lablab purpureus* is a good source of food for both human and animals (I.F.I.F., 2017).

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