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Original Research

Nutritional and anti-nutritional composition of *Lantana camara* leaf

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ABSTRACT

Objectives: The nutritional and anti-nutritional contents of *Lantana camara* leaf were investigated. Levels of nutrients like the crude protein, crude fat, crude fibre, ash, mineral and anti-nutrients like phytate, tannins and oxalate were determined. **Methods:** The nutritional and anti-nutritional contents of *L. camara* leaf were investigated using standard methods. **Results:** The results of the proximate analysis showed that the crude protein content was the highest among other components with the value of 24.84±0.51 (%) while the crude fat gives the least value which is 2.99±0.01 (%). Other components are moisture content, 10.15±0.57 (%), crude fibre, 16.41±0.58 (%) and ash, 10.77±0.43 (%). The mineral analysis has potassium with the highest concentration of 1.05±0.03 ppm while phosphorus was the least with 0.07±0.01 ppm. Other minerals are calcium (0.54±0.01 ppm), manganese (0.99±0.02 ppm), sulphur (0.73±0.03 ppm), iron (0.84±0.01 ppm), magnesium (0.43±0.03 ppm) and copper (0.53±0.01 ppm). Zinc was not detected. The anti-nutrients detected include phytate, 41.06 mg/100g, tannins, 3.35 mg/100g and oxalate, 280.75 mg/100g. **Conclusion:** It is considered that *L. camara* could be a very good source of protein and minerals in animal diets, if well processed, to reduce or eliminate the anti-nutritional factors.

KEY WORDS: *Lantana camara*, nutrients, antinutrients, proximate analysis, protein-rich leaf

INTRODUCTION

The search for protein-rich leaf is an ongoing process. This is because protein is limiting in the world nutrients today, especially in Africa where people can really afford the animal protein, which of course is superior to plant protein. Even the plant proteins are becoming more expensive because of the competition between man and his animals for these protein sources [1]. Therefore, there is the need to continually search for protein source, especially among the lesser known plants, among which is *L. camara*.

Lantana camara L. (Verbanaceae), commonly known as wild or red sage is the most widespread species of this genus and regarded both as a notorious weed and a popular ornamental garden plant [2]. However, it is listed as one of the important medicinal plants of the world [3]. *L. camara* contains lantadenes, the pentacyclic triterpenes which is reported to possess a number of useful biological activities. Several previous reports have described antifungal [4,5], anti-proliferative [6,7] and antimicrobial activities of *L. camara* [6,8-10] including termicidal activity reported recently by Verma and Verma [11] Moreover, the hydroalcoholic extracts of the leaves have shown an effect on fertility, general reproductive performance, and teratology in rats [12]. *L. camara* whole plant and plant parts such as leaves, flowers, and essential oils have been thoroughly studied for their chemical compositions, previously and currently [13-17]. All these studies have revealed the presence of terpenoids, steroids, and alkaloids as major chemical constituents in *L. camara* [13-16]. However, sesquiterpenes with mainly ß-caryophyllene, zingiberene, humulene, arcurcumene, gemacrene-D and bisabolene were reported as major leaf and flower essential oil constituents [18-22]. Chemical composition of the whole plant and plant parts and essential oils are reported to be influenced by genetic, geographical, and seasonal factors as well as the developmental stages of the concerned plant, its parts/tissues. However, information on the nutritional values and the anti-nutritional content of the *L. camara* leaf is still very scanty in literature.

MATERIALS AND METHODS

Sources of Materials

The leaves of *L. camara* were obtained from the main campus of the University of Jos, Nigeria and authenticated at the Herbarium of the Department of Botany, University of Jos, Nigeria, where a voucher specimen was deposited at the Herbarium of the Institute. The sodium hydroxide, sodium sulphate, cupric sulphate, 5-hydrate, petroleum ether (60 – 80oC), chloroform, methanol, ethanol used were all products of BDH Chemicals Ltd., Poole, England. All other reagents used were of analytical grade and prepared in the Biochemistry laboratory, University of Jos, Nigeria, in glass apparatus using distilled water.

Processing of Materials

The leaves were washed, air dried and pulverized to powder form using a blender. The pulverized leaf was subsequently used for analyses.

Proximate Analysis

The moisture content, crude protein, ether extract, crude fibre and ash contents of the *L. camara* leaf were determined as described by AOAC [23].

Mineral Determination

The determination of the levels of inorganic minerals of the pulverized *L. camara* leaf was carried out by acid digestion using nitric acid and perchloric acid mixture (HNO: HClO, 5:1 w/v). The total amounts of K, P, Mn, Ca, S, Cu, Mg, Fe, and Zn in the digested samples were determined by atomic absorption spectrophotometry [24].

Anti-nutrient Determination

The determination of the phytate, tannin and oxalate contents of the pulverised L. carama leaf were carried out using the methods of Wheeler and Ferrel [25], Josyln [26] and Iwuoha and Kalu [27] respectively.

RESULTS

The results of proximate analysis of L. camera leaf are shown on table 1. The leaf has high content of crude protein (24.84%), crude fibre (16.41%), ash (10.77%) and moisture (10.15%) while crude fat (2.99%) is present in small amount. Table 2 shows the results of mineral analysis of *L. camara* leaf. The results revealed that the leaf contained Phosphorus (0.07±0.01 ppm), Calcium (0.54±0.01 ppm) Manganese (0.99±0.02 ppm) Sulphur (0.73±0.03 ppm) Potassium (1.05±0.02 ppm) Iron (0.84±0.01 ppm) Magnesium (0.43±0.03 ppm) Copper (0.53±0.01 ppm). Zinc was not detected. The anti-nutrient composition of *L. camara* is shown in table 3. The result revealed that the leaf contained phytate (41.06 mg/100g), tannins (3.35 mg/100g) and oxalate (280.75 mg/100g) as anti-nutrients.

Table 1. Proximate composition of *Lantana camara* leaf

Proximate indices	Composition (%)
Moisture	10.15±0.57
Crude protein	24.84±0.51
Crude fibre	16.41±0.58
Crude fats	2.99±0.01
Ash	10.77±0.43

Values are expressed as Mean ± SEM (n = 3).

Table 2. Mineral composition of *lantana camara* leaf

Minerals	Composition (ppm)
Phosphorus	0.07±0.01
Calcium	0.54±0.01
Manganese	0.99±0.02
Sulphur	0.73±0.03
Potassium	1.05±0.02
Iron	0.84±0.01
Zinc	Nd
Magnesium	0.43±0.03
Copper	0.53±0.01

Values are expressed as Mean ± SEM (n = 3).
Nd: not detected

Table 3. Anti-nutrient content of *lantana camara* leaf

Anti-nutrients	Composition (mg/100g)
Phytate	41.06±0.15
Tannins	3.35±0.05
Oxalate	280.75±1.06

Values are expressed as Mean ± SEM (n = 3).

DISCUSSION

Animal feed, today, is becoming costly due to the limitation posed by protein source. This is because the conventional soybeans and groundnut are over-competed for man and his animals [1]. Therefore, this study shows a high level of protein in the leaf of *L. camara* and it could be used as a source of protein in animal diets. The level of protein in the leaf of *L. camara* compare favourably well with some proteinous plants such as cowpeas (25%) [28], pigeon pea (20.4%) [29], lima bean, bambara groundnut (23 – 26%) [30-32].

Other proximate compositions of the leaf are crude fibre (16.41%), ash (10.77%), crude fat (2.99%) and moisture (10.15%). Crude fiber content will help to maintain the motility of food through the gut and may be broken down by some bacteria in the gut to provide energy. The ash content is a reflection of the mineral contents preserved in the leaf; the crude fat will help provide energy while the moisture content will reflect shelf-life of the plant.

Minerals which are either macro minerals or micro minerals are essential for the normal growth and maintenance of the body. The mineral analysis of *L. camara* leaf shows the presence of phosphorus, calcium, manganese, sulphur, potassium, iron, magnesium and copper. The significance of these elements cannot be over emphasized. For instance, calcium act as a second messenger of hormones e.g. glucagon; phosphorus is involved in the formation of phosphoproteins, e.g. casein; sulphur in the form of sulphates are important in detoxification mechanism; magnesium is involved in enzymatic reaction in the body such as Krebs cycle, glycolysis etc.; copper is involved in scavenging free radicals; iron is important in the formation of haemoglobin; Manganese is also involved in carbohydrate, amino acid and cholesterol metabolism; zinc serves as a cofactor for dehydrogenases. Therefore, the leaf could also be a good source of the minerals above.

However, the existence of the anti-nutrients which are known to have various deleterious effects, ranging from reduction in feed intake, reduction in bioavailability of minerals to causing death of animals [33-37], is an indication of the limitation of the use of the leaf as protein source in animal diets. Hence, for *L. camara* to be used as a source of protein and minerals in animal diets, it may therefore be necessary that the plant be subjected to processing techniques. This will either reduce or eliminate its anti-nutritional factors.

CONCLUSION

It can be concluded that *L. camara* leaf is rich in nutrients such as protein which can be used as a source of protein for animal diets with extended shelf-life

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