ISSN 2278-7763

THE POTENTIAL OF THE PEEL OF *SOLANIUM TUBEROSUM (*IRISH POTATOES) IN FEED FORMULATION

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ABSTRACT: The peels of *Solanium tuberosum* (Irish potatoes) obtained in Bauchi, Bauchi State, Nigeria were analyzed for their proximate and mineral compositions for possible incorporation in animal feed. The results revealed that the peels contained 29.11 ± 0.00 % moisture content, 6.69 ± 0.03 % ash content, 11.59 ± 0.76 % crude protein, 1.50 ± 0.04 % crude lipid, 10.17 ± 0.05 % crude fibre, 40.94 ± 0.88 % available carbohydrate and 212.03 ± 7.64 kcal/100 g metabolisable energy. The results of the mineral composition of sodium (460.00 ± 0.00 mg/100 g), copper (57.10 ± 0.01 mg/100g) and zinc (60.60 ± 0.04 mg/100 g) determined indicated that the peels investigated are good supplements for these elements in the formulation of goat feed. The results also indicated lower concentrations of the other mineral elements: magnesium (53.00 ± 0.00 mg/100 g), iron (2.00 ± 0.00 mg/100 g), calcium (115.00 ± 0.35 mg/100 g), potassium (70.00 ± 0.00 mg/100 g) and phosphorus (130.70 ± 0.04 mg/100 g) such that the levels determined are below the recommended dietary allowance (RDA) for goats and hence needs supplementation for these mineral elements in the preparation of goat feed.
Key words: *Solanium tuberosum,* mineral elements, proximate, peels and feed.

1 INTRODUCTION

Irish potato (*Solanium tuberosum*) is a perennial plant of the solananccae or nightshade family and is commonly grown for its starchy tuber. It is one of the world most widely grown tuber crop and the fourth largest crop in terms of fresh produce after rice, wheat and maize [1].

Irish potato (*Solanium tuberosum*) is efficient in converting land, labour, water and capital into highly nutritious food. This is because it has a shorter growing cycle of about 95 days than most other tuber crops in the tropics [2].

In developed countries, Irish potato is ranked first in energy production per hectare per day and is significantly above cassava and cereals. It is a lover of cool climate and therefore requires a cool growing season with a moderate and well distributed rainfall of about 800 mm during growing seasons with no prolonged dry weather [3]. A large amount of potato peels are discarded during processing for chips by many industries. These peels constitute a potential source of livestock feed ingredients [4].

Nigeria now has an alarming rate of population growth of both human and livestock, which include goats, poultry and sheep [5]. Food security for these millions of people and their domestic animals is of immense concern to the authorities as most staple food for human also serves as

ISSN 2278-7763

livestock feeds, thereby exalting serious competition between human and livestock for these scarce food items.

Human beings and animals require food to carry out essential functions, which include growth, development and reproduction. A balanced food must provide all the nutrients required for energy, body building, maintenance and regulation of body processes [6]. Plants are the ultimate source of food in nature, and of all the food crops of the tropical world, few are quite ubiquitous as root and tuber crops. Cereals are among the highest yielding crops and are second only to root crops in the energy yield, yet are becoming increasingly scarce, expensive and are less available for livestock feeding [7].

Consequently, since Irish potatoes are consumed by humans, thereby leaving large amount of the peels as refuse in homes, hotels and restaurants that constitute serious environmental problem, hence these when brought together can be a potential source of energy and minerals for livestock. The aim of the present study is to report the proximate and mineral compositions of the peels of *Solanium tuberosum* as this could serve as the basis for exploiting the peels in feed formulation.

2 MATERIALS AND METHODS

Analytical reagent (AnalaR) grade chemicals and distilled deionized water were used in this study. All the plastic and glass wares used were thoroughly washed with detergent solution, then with 20.00 % (v/v) trioxonitrate (V) acid, rinsed with tap water and finally with distilled deionized water. The apparatus were then allowed to dry [8].

2.1 Sampling and Sample Treatment

The peels of *Solanium tuberosum* were obtained from a restaurant in Bauchi, Bauchi State, Nigeria on 9th July, 2014, 15th July, 2014 and 21st July, 2014 respectively. The peel samples were air dried until a constant mass was obtained. All the weekly peel samples of *Solanium tuberosum* were then homogenized, ground to powder using a previously cleaned and dried ceramic pestle and mortar and then sieved through a 1.00 mm pore sized mesh. The powdered sample was then kept in airtight polyethylene bottles prior to analyses.

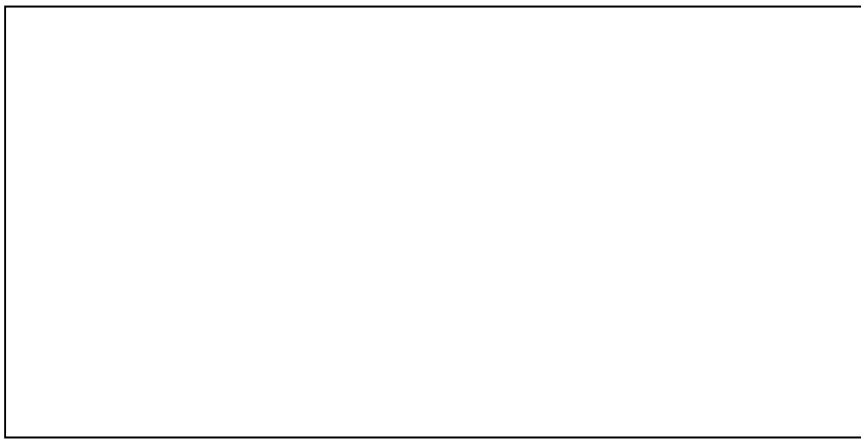
2.2 Analytical Technique

The crude lipid content was determined based on the method adopted by Ali, 2010 [11]. The moisture content, the ash content, the crude protein and fibre contents were all determined using AOAC, 1990 method [10]. The carbohydrate content was computed by difference. The energy content of the sample (kJ/100 g dry matter) was found based on the methods of Onwuka, 2005 and Hassan *et al*., 2007 respectively [11], [12].

The mineral analysis was carried out using the method described by Yahaya *et al.*, 2007 [5]. The concentrations of the metals (K, Na, Ca, Mg, Cu, Fe and Zn) were determined using Atomic Absorption Spectrophotometer Model 210. Phosphorus was determined by means of a Cecil UV-spectrophotometer model 91743 using standard colorimetric technique [13].

ISSN 2278-7763

3 RESULTS AND DISCUSSION



The results of the mean proximate analysis of the peels of *Solanium tuberosum* are shown in Table 1. A moisture content of 29.11 % was determined. This value was low compared to reported literature values of 75.60 % and 82.50 % for the peels of two different species of *Dioscorea alata* [5]. Low moisture content is a measure of stability and susceptibility of microbial contamination and is also useful for storage purposes [8]. The ash content of the peel (6.69 %) is a measure of the mineral content. This value is higher than 3.68 % reported for *B.eurycoma [15]*, but compares relatively well with 5.83 % in *Solanium tuberosum* peels [16]. Ash content is favourable in feed formulation since it is an essential mineral component necessary for blood coagulation and prevention of some blood related ailments. In addition, food material with a relatively higher percentage ash is quite encouraging because it is highly needed for substantial supply of calcium and magnesium needed for bone formation [17]. The crude protein (11.59 %) compares favourably well with the threshold level (10.00 %) required to meet the demand for the body maintenance of goats and sheep [12]. Protein is the material that makes up skin, muscle, wool and most of the body of animals necessary for making meat, milk and eggs [18]. The crude lipid content was found to be 1.50 %. This value is within the reported literature values of 1.86 % in *Dioscorea alata* peels [5] and 1.23 % in *Solanium tuberosum* peels [4]. The peels are

ISSN 2278-7763

therefore not economical for commercial exploitations. Fats are important to diet as they are a source of fat-soluble vitamins that promote absorption. Fats are also high energy nutrients and do not add to the bulk of the diet. The crude fibre of the peels of *Solanium tuberosum* determined was found to be 10.17 %. This value is higher than the reported literature value of 4.35 % in B.eurycoma [15]. The determined value (10.17 %) compares fairly well with the crude fibre content of 12.71 % found in *Moringa oleifera* seeds [8]. Fibre content is generally used as an index of value in poultry and feeding stock feeds [15]. High fibre content indicates low quality of feed material in compounding feed, but also helps digestion. The peels of *Solanium tuberosum* had an available carbohydrate composition of 40.94 %, which shows that it is a fairly good source of energy. This might be responsible for the energy value (212.03 kcal/100 g) of the peels obtained. The carbohydrate content in this present study compares favourably well with 39.20 % and 44.10 % all in *Dioscorea alata* peels [5]. Carbohydrates are important for the maintenance of plant and animal life and also provide raw materials for many industries [8].

The mineral content of *Solanium tuberosum* peels are shown in Table 2. The nutritional relevance of the peels based on the mineral composition is related to its contribution to the recommended dietary allowance (RDA) values. From Table 2, it can be seen that the peels of *Solanium tuberosum* can be regarded as good supplements for sodium, copper and zinc respectively in the feed formulation for goats, but relatively low in the other mineral elements determined (potassium, calcium, magnesium, iron and phosphorus). This therefore implies that the formulation of feed from the peels of *Solanium tuberosum* requires supplementation for the five elements that are below the RDA values for goats. The healthy functioning of the body organs of animals generally depend on mineral elements and too little of them can lead to deficiency disease(s) and too much of any can be toxic [19]. The low levels of some of the mineral elements could be due to soil types and the agronomic conditions of the farming sites [8].

4 CONCLUSION

This study shows that the peels of *Solanium tuberosum* obtained in Bauchi, Bauchi state, Nigeria can be used in feed formulation as the peels contain significant amount of carbohydrate, metabolisable energy, protein and some minerals useful for animal nutrition.

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