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NUTRITIVE VALUE OF *Lepidoptara litoralia* (EDIBLE CATERPILLAR) FOUND IN JOS NIGERIA: IMPLICATION FOR FOOD SECURITY AND POVERTY ALLEVIATION

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ABSTRACT

Insects and caterpillars are traditionally important foods in many cultures in Nigeria. Their potential is seriously being considered in food security and poverty alleviation strategies. The nutrient composition of some commonly eaten insects especially in South-western Nigeria has been determined and reported. The nutritional and economic potentials of the abundant edible caterpillars in the Northern region particularly in Jos, Plateau State are yet to be ascertained and fully realised. *Lepidoptara litoralia*, a defoliator of *Isobelinia doka*, is commonly found and consumed by many indigenous ethnic groups in Jos Plateau State, Nigeria. The objective of the study was to evaluate the nutritional and economic potentials of *L. litoralia* as a strategy to mitigate food insecurity and alleviate poverty. The live caterpillars were hand-picked from bushes in the month of September, and processed under laboratory conditions according to local methods used by the indigenes. The processed sample was analysed for its proximate nutrient composition, amino acids and mineral profiles using standard procedures. Its commercial value was estimated through oral interviews with local women who trade the commodity with a view to popularize it as a strategy for food security and poverty alleviation among the local people. Analysis of the processed (ready-to-eat*) Lepidoptara litoralia* showed that they contained 59.8% crude protein, 17.0% fat, 20.2% Nitrogen Free Extract (NFE), 3.1% crude fibre, 4.3% ash and caloric value of 473.0kcal. Important mineral elements found in moderate quantities included sodium, chloride, iron, zinc, calcium and phosphorus. Magnesium and copper were found to be low. All the common amino acids with the exception of tryptophan were detected, and values ranged between 0.8g/100g protein and 12.5g/100g protein for histidine and glutamic acid, respectively. The estimated daily income from trading of the commodity by the indigenes was put at USD3 – 4/day or USD21 - 26/week. It was obvious that trading on processed *L. litoralia* can be a good source of additional income for families since no initial capital is invested. The nutrient composition of *Lepidoptara litoralia* was found to be comparable to those of conventional animal source foods such as beef and fish. It is concluded that consumption of the caterpillars could add variety and security to staple foods of the indigenous communities. When properly harnessed and large scale production and commercialization are explored, it can be a good source of livelihood for families thereby alleviating poverty.

Key words: Edible Caterpillars, Nutrition, Food Security

INTRODUCTION

Insects and caterpillars have played an important part in the history of human nutrition. Hundreds of species have been used as human foods in many countries of the world. In Africa, insects and caterpillars are popular foods in many cultures where they contribute significantly to protein, carbohydrate, vitamins and minerals as well as in traditional medicine [1].

In sub-Saharan Africa, the nutritional contributions of insects and caterpillars are not only appreciated, but their potentials are seriously being considered in food security and poverty alleviation strategies [2]. A re-focus on the basics of human nutrition starting from the periodic research on traditional foods and local biodiversity, has been advocated by the Deputy Director General, West African Health Organisation [3].

A number of researchers have given good accounts of the nutritional values and economic potentials of various insects and caterpillars [1, 2, 4, 5, 6, 7, 8]. Nigeria also has its own share of edible insects and caterpillars, most of which are gathered from bushes and farmlands by women and children, processed and eaten or sold in school premises and open markets. The nutrient composition of some of the commonly eaten insects in the South-western region of Nigeria, has been determined and reported [6]. There is however, paucity of such information from the North-central region particularly from Plateau State.

Lepidoptera is one of the nutrient-dense and abundant insect orders. Their larvae serve as food for many ethnic groups around the world and contribute a great amount of protein to indigenous diets and income in subsistence economies [8].The caterpillar *Lepidoptera litoralia,* is known in some indigenous languages as: makambari (Hausa), ayamberi (Afizere), yambari (Anaguta), inche (Rukuba), nyammeri (Buji). It is a defoliator of *Isobelinia doka*, a shrub found in Jos East, Jos North and Bassa Local Government Areas of Plateau State, Nigeria. They occur in large clusters on the leaves between the months of August and September. The matured caterpillars are gathered by women and children, processed and either eaten or sold in small packs in open markets. Because of the short period of availability, processed *L. litoralia* is considered a delicacy and can be stored for a longer period of time. There is, however, no information on the nutrient composition or any evaluation of its economic potential and contribution to livelihoods of the indigenous ethnic groups.

This study, therefore, sought to evaluate the nutritional value and economic potential of *L. litoralia*, in order to popularize it as a strategy to mitigate food insecurity and alleviate poverty among the indigenous ethnic groups in Plateau State, Nigeria.

MATERIALS AND METHODS

Collection, Identification and Processing of *L. litoralia*

Matured *L. litoralia* were hand- picked from the leaves of *Isobelinia doka* in bushes around Jos North Local Government Area of Plateau State, Nigeria in the month of September.

The taxonomical identification of both the plant and caterpillar was confirmed at the Federal College of Forestry Jos, Nigeria. Figure 1 below shows the live caterpillars feeding on the leaves of *Isobelinia doka*.

Figure1: Live *L. litoralia*

The caterpillars were processed according to procedures used by the local people but under laboratory conditions. The live caterpillars were boiled for three minutes in water to which a pinch of potash powder had been added, strained and sun-dried. Salt and other seasonings were added to taste and then roasted in an oven for about 5 minutes. The processed caterpillars were then kept in desiccators until required for analysis. Figure 2 below shows the processed caterpillars.

Figure2: Processed (Ready-to-eat*) L .litoralia*

Chemical Analysis

Proximate analysis (moisture, ash, crude fibre, crude protein, fat, NFE) were carried out according to the procedures described in the official methods of the Association of Official Analytical Chemists [9].

Mineral element profile was determined using a Hitachi 180-80 atomic absorption spectrophotometer, while sulphur, phosphorus and chloride were determined using Ion Chromatographic Analyzer (IC 100-25).

Amino acid analysis was carried out using the Technicon Analyzer (TSM-1).
All analyses were carried out in triplicates. Results are presented as mean ± SD.

Income Estimation

The estimated income from the processed *L.litoralia* was obtained from oral interviews with local women who trade the commodity on 23rd September, 2010 in Angwan Rukuba community in Jos North Local Government Area of Plateau State, Nigeria.

RESULTS

The results of moisture, ash, crude protein, crude fibre, crude fat, NFE and caloric value of *L. litoralia* are presented on Table 1. Protein content was found to be 59.8%,fat 17.0%,NFE 20.2,ash 4.3%,fibre 3.1%,moisture 5.5% and caloric value of 473.0kcal.

Table 2 shows the results of some mineral elements in *L. litoralia*. Elements found to be present in moderate concentrations are sodium (31.3mg/100g and chloride (29.0g/100g), followed by iron (19.5g/100g), zinc (15.1g/100g), calcium (12.0g/100g). The caterpillars were, however, low in magnesium (0.5g/100g) and copper (0.7g/100g).

Amino acid profile is shown in Table 3. All the common amino acids except tryptophan were detected in the processed caterpillars. Amino acids found in higher amounts were glutamic acid (12.5g/100g) and Aspartic acid (10.6g/100g). The essential amino acids methionine, lysine and cysteine were also present in moderate amounts (2.9, 6.9 and 7.5g/100g, respectively).

The estimated income realizable from trading the processed caterpillars usually sold in local packs of less than 1 US dollar is 3 - 4 US dollars per day. Depending on availability and patronage, an average of 21- 26 US dollars can be realized per week. Values with statistical expressions were means ± SD for three determinations.

DISCUSSION

In many African countries, caterpillars constitute an important part of the diets of many cultures and communities, where they are included as a planned part of the diet or snacks. The seasonal *L. litoralia* is usually short-lived (August/September), so it is considered a delicacy eaten as a single snack or added to other cooked foods in place of meat, fish or crayfish. However, the processed product can be stored for 2-3 months, which increases the period of availability for consumption and income generation.

The proximate composition of *L. litoralia* seen from the results of this study, closely agrees with the observations of other researchers. For instance, Afrol News [10] reported an average protein value of 63.5%, fat of 15.7% and energy value of 457Kcal for some caterpillar species. The high protein content of *L. litoralia* (59.8%) is particularly important for growing children. The amino acid profile further confirms the high quality of its protein in which all essential amino acids except tryptophan were present. These findings further confirm that caterpillars are indeed a good source of protein, fat and minerals. Their consumption by vulnerable children should be encouraged. Vantomme *et al.* [1] have reported that in some regions, flour made from caterpillars is mixed with staple foods to prepare pap to counter malnutrition in children. Information from the indigenes of Plateau State, Nigeria reveals that the processed caterpillars are added to other foods such as the local porridges. It is therefore believed that the consumption of *L. litoralia* caterpillar can to a large extent, supplement protein in predominantly cereal diets.

Malnutrition in developing countries is also a problem of calorie deficiency. According to DeFoliart [2], caterpillars rank high in fat content with little or no cholesterol, especially leaf eater ones, and fatty acid profile is similar to those of fish and poultry. Caterpillars have the advantage of converting plant materials that may not often be consumed by humans to a highly palatable food. Consumption of

caterpillars would, therefore, not pose any danger or risk of cardiovascular disease. Although the fatty acid profile and cholesterol content in *L. litoralia* are yet to be determined, their importance cannot be overemphasized. *L. litoralia* has fat content of 15.7%. It will, therefore, contribute significantly to caloric intake when consumed as a single or mixed diet.

Caterpillars have been found to be rich sources of vitamins and minerals. *L. litoralia* was found to contain some minerals, notably, sodium, iron, calcium, potassium, zinc, chloride, phosphorus, sulphur and magnesium. The high content of sodium and chloride observed could be attributed to addition of seasonings such as bouillon cubes, sodium chloride (NaCl), or table salt during processing. The high content of iron and zinc in *L. litoralia* caterpillar is of particular interest. Micronutrient deficiency (hidden hunger) is of great concern particularly among pregnant women and children in poor urban and rural dwellers, which often manifests as anaemia. Vitamin content of *L. litoralia* is yet to be ascertained. However, other researchers have reported that certain species of caterpillars are rich in different vitamins such as thiamine, riboflavin, pyridoxine, pantothenic acid and niacin, and that consumption of right quantities of the dried products can meet the daily human requirements for some vitamins [2, 4]. The leaf-eating *L. litoralia* could, therefore, contribute significantly to vitamin intake of consumers.

The collection of edible insects and caterpillars can generate income, especially for women as they require little capital input if gathered by hand. However, their nutritional and economic values are often neglected. It has been suggested that collection and commercialisation of this bio-diverse resource should be rediscovered and further encouraged given the benefits to food security, environment and human health [1, 10].

Findings from this study revealed that an average of 3 - 4 US dollars can be realised from sales of processed *L. litoralia* in a day depending on availability and patronage (21 – 26 US dollars per week or 75 – 104 US dollars per month).When compared to Nigerian minimum wage of about 112 US dollar (18,000 Nigerian Naira), it is believed that trading the caterpillar can be lucrative and valuable source of household livelihood in poor-resource settings. In fact, the possibility of large-scale production could be explored in order to make the commodity readily available and affordable.

CONCLUSION

In conclusion, results obtained from this study show the potential of *L. litoralia* as a good source of both macro and micro-nutrients which can be used to supplement other foods for human consumption. When in season, they are abundant, marketable and economically viable. The collection, commercialisation and sustained use of these reproducible biodiversity resources could mitigate malnutrition. The economic benefits and implication for food security are obvious.

Some Limitations of the Study

The following are some of the analyses that needed to be carried out : which shall form part of future work.

- Analysis of vitamin and fatty acid contents.
- Assessment of the digestibility of the processed caterpillars; and
- Domestication, large- scale production and commercialization of *L.litoralia*

Table 1: Proximate Nutrient Composition of *L.litoralia* (g/100g dm)

Moisture	5.5 ± 1.0
Ash	4.3 ± 1.4
Fibre	3.1 ± 0.3
Carbohydrate	20.2 ± 1.3
Protein	59.8 ± 2.2
Fat	17.0 ± 3.2
Energy(Kcal)	473.0 ± 4.6

Table 2: Mineral Element Content of *L.litoralia* (mg/100g dm)

Calcium	12.1 ± 0.1
Magnesium	0.5 ± 0.5
Potassium	8.2 ± 0.2
Sodium	31.3 ± 1.7
Iron	19.5 ± 1.4
Zinc	15.1 ± 0.3
Copper	0.7 ± 0.1
Manganese	5.1 ± 0.2
Sulphur	8.8 ± 1.1
Phosphorus	9.0 ± 2.0
Chloride	29.4 ± 2.7

Table 3: Amino Acid Profile of the Protein of *L.litoralia* (g/100g dm)

Phenylalanine	2.8
Alanine	4.2
Arginine	4.4
Glycine	9.1
Glutamic acid	12.5
Aspartic acid	10.6
Valine	3.8
Tryptophan	ND
Tyrosine	8.7
Threonine	2.4
Serine	5.5
Leucine	5.3
Isoleucine	3.7
Lysine	6.9
Cysteine	7.5
Histidine	0.8
Methionine	2.9

ND – Not Detected

Table 4: Estimated Income from Trading of Processed *L. litoralia*

Ave. life harvest	5kg
Ave. processed (ready-to-eat)	4kg
Ave. No. of local packs realizable/1kg	12-15
Ave. No. of packs/4kg	48-60
Ave. amount realizable/day @ < 1 US dollar/pack	3-4 US dollars
Ave amount realizable/week	21 – 26 US dollars

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