Original Research Article

COMPARING THE NUTRITIONAL COMPOSITION OF SOME EDIBLE INSECTS AND SOME ANIMAL MEATS IN NORTH-WESTHERN STATE OF NIGERIA

ABSTRACT

Five different edible insects from Kaduna, Kebbi, Niger, Sokoto and Zamfara States of North-Western Nigeria, namely; Red Locust *(Nomadacris setemfasciata),* Desert Locust *(Schistocerca gregaria),* Variegated Grasshopper *(Zonocerus wariegatus),* Termite *(Macrotermes bellicosus)* and Cricket *(Gryllotapha Africana),* were collected alongside with meats from camel *(Camellus dromedaries),* Cow (*Bos indicus),* Ram (*Ovis aries),* Chicken *(Gallus gallus),* and Fish (*Clariaslazera).* The insects were oven dried separately at 60^{O}c for 3-5hrs while the meats were dried at 60^{O}c for 48hrs. The dried contents of both the insects and the meats were grounded separately and each was subjected to proximate analysis. The results indicated the nutrient to have Carbohydrates ranging between 0.7g-12.1g in the insects and 0.4g-10.2g in the meats, Proteins ranging from 12.6g -57.3g in the insects and 18.1g – 70.4g in the meats, Fats, Fibre, Ash and Moisture having ranges between 5g-17.9g, 5g-20g, 4g -10g, 11.5g-53.6g, respectively in insects and 18.4g-70.4g Fats, 5g Fibre, 2.4g-10.4g Ash and 13.4g-59g moisture in the meats. Equally, the minerals showed varied in both the insects and the meats. Statistical comparison of the means of the results showed that the Carbohydrates, the Proteins and the Fibre do not differ significantly in both the insects and the meats. Similarly, Copper, Iron, Sodium, Calcium, Magnesium and Potassium do not differ significantly in the two groups. This suggested that insects as diet when taken in required amount can meet up with protein requirements of human body and can therefore supplement animal meats in our diets.

Key words: Edible insects, Animal meat and nutrient composition.

INTRODUCTION

Insects have been used as food by man ever since his creation when he converted many available resources in the universe into food (Richard, 1993). Insects are the cheapest source of animal protein, and their consumption has been encouraged due to the inability of low income people to afford fish or animal protein (Paul and Sudipta, 2011). Insects have been reported to be an important source of protein, vitamins, minerals and fats in many countries (Bailey, 1999 and Defoliart, 1975). Insects are also described by Michael (1978) as tasty, nutritional and high protein source.

UNDER PEER REVIEW

Ordinarily, insects are not only used as emergency food but are included as part of the diet throughout the year or when seasonally available (Banjo, *et al.,* 2006). Different types of insects are being eaten in different parts of the world, sometimes only the adults were eaten or larval stages or just some parts of the insect's body (Ene, 1963 and Gene, 1988).

In many parts of the world today, insects are considered as stable food possibly because they are good source of protein, easy to find, occupy a little space and have great nutritional value (Bailey, 1999). Food supplies in many African countries are inadequate in quantity and quality contributing to wide spread of malnutrition (Allotey, 2003). Therefore insects could be used in solving the problems of malnutrition in Africa.

In Nigeria, reports have shown that eating insects has contributed significantly to the reduction in protein deficiencies (Ashiru, 1988). Locusts, Grasshoppers, Termites, Beetles and Crickets are variously reported as being consumed by different communities, ranging from stable food sources to highly sought delicacies in different parts of Nigeria (Banjo, *et al.,* 2006). More than 1000 species of insects are safe to eat, some insects are distasteful or harmful and in some cases people can even develop allergies to insect's materials (Mpunchare *et al.,* 1975).

The present work compares proximate composition of five different edible insects with meats from five different animals commonly consumed in North – Western Nigeria.

MATERIALS AND METHODS

Insects for this study were collected from four Local Government Areas each, from Kaduna, Kebbi, Niger, Sokoto and Zamfara states of North-Western Nigeria located between longitude 10^{O}N and 15^{O}N and latitude 5^{O}E and 10^{O}E.

From initial survey of edible insects within the study area conducted at the onset of the study, the following insects were identified as the most preferred edible insects; Red Locust (*Nomadacris septemfasiata)* Deesertt locus*t (Schistocerca gregaria)* Verigated grasshopper *(Zenocerus variegates),* Termite reproductive forms *(Macrotermes bellicosus),* Brown Cricket (*Gryllotapha Africana)* and Beetle (*Melolantha spp.)*, out of which five were selected based on preference.

The selected insects were; Red Locust *(Nomadacris setemfasciata),* Desert Locust *(Schistocerca gregaria),* Variegated Grasshopper *(Zenacerus variegates),* Termite *reproductive formes*

UNDER PEER REVIEW

(Macrotermes bellicosus) and Brown Cricket *(Gryllotapha Africana).* These insects were then oven-dried for 3-5hrs at 60^{O}c and grounded separately and placed in separate petri-dishes.

100g of the materials obtained were subjected to proximate analysis separately according to official methods of analysis recommended by AOAC (2000). Moisture content, fibre, free nitrogen extract, fats and mineral salts were determined and crude protein was obtained using the Kjeldahl technique.

The results obtained were tasted for significances between the composition in the insect's body and the animal meats using paired t-test with SPSS 16.0 for Windows statistical package.

RESULTS

The mean nutrient composition of the insects and the meats were shown in Table 1. The highest amount of carbohydrates was observed among the insects with *S. gregaria* having 14.17g per 100g, followed by Z. variegatus with 11.13g while *G. Africana* had the lowest content of 1.17g per 100g. Generally, carbohydrates were observed to be in all the animal meats studied ranging between 1.73g on *G. gallus* and 6.73g on *O. Aries.* Crude protein was higher on meats from the animals than in the insect. The highest amount of the protein per 100g of the sample was observed in C. *dromedarius (*70.57g) followed by *G.gallus (65.77g).* Fats were higher among insects than the meats with *M. bellicosus* having the highest with 17.63g per 100g the *N. setemfasciata* (13.33g). Among animal's meat, the meat from *B. indicus with* 11.3g had the highest then *O. Aries* with 10g. The fibre content was almost the same in the animal meats but was relatively higher in the insects, particularly, in *S. gregaria* with 18.33g and *N. Septemfasciata* with 16.67g per 100g. *C. lazera* was observed to have the lowest values of the components except for moisture content where it ranked the highest with 58.07g per 100g. The ash was considerably low in all the organisms.

UNDER PEER REVIEW

TABLE1: NUTRIENT COMPOSITION OF SOME EDIBLE INSECTS AND SOME ANIMAL MEATS

(Each observation was based on three replicates)

Insects/Meat	Carbohydrates (g)	Crude Protein (g)	Fat (g)	Fibre (g)	Moisture (g)	Ash (g)
N. septemfasciata	9.23	18.80	13.33	16.67	36.97	5.00
S. gregaria	14.17	16.40	6.67	18.33	39.53	5.00
Z. variegates	11.13	25.13	6.67	11.67	42.07	5.00
M. bellicosus	6.27	12.93	17.63	6.67	51.63	5.00
G. Africana	1.17	57.07	13.30	5.00	11.77	10.00
C. dromedaries	3.90	70.57	8.33	5.00	14.50	2.70
B. indicus	5.87	62.30	11.33	5.00	16.00	5.00
O. Aries	6.73	61.47	10.00	5.00	16.90	5.00
G. Gallus	1.73	65.77	8.30	5.00	14.50	9.70
C. Lazar	6.10	18.87	8.33	5.00	58.07	8.40

Sample ranging between 3.00 as the lowest observed on C. lazar and the highest amount of 25. 75 mg in G. Africana. Phosphorus, sodium and potassium were considerably higher composition of mineral present in the entire samples while magnesium was variable among in all the samples

TABLE 2: MINERAL CONTENTS OF SOME EDIBLE INSECTS AND SOMEANIMALS MEATS

(Each Observation was based on three replicates)

Insects/Meat	Copper (mg)	Iron (mg)	Zinc (mg)	Phosp (mg)	Sodium (mg)	Calcium (mg)	Magnesium (mg)	Potassium (mg)
N. septemfasciata	1.17	9.00	0.34	80.43	271.70	30.80	65.00	1001.67
S. gregaria	0.67	4.92	0.41	92.80	163.00	17.07	32.58	490.27
Z. variegates	1.33	11.08	0.34	84.80	163.00	16.67	18.70	490.27
M. bellicosus	2.17	9.10	0.34	84.80	217.30	14.57	41.89	255.80
G. Africana	3.83	25.75	0.34	69.27	851.37	14.17	38.30	703.50
C. dromedaries	0.75	6.00	0.91	100.90	68.80	28.87	15.90	1278.80
B. indices	1.42	8.92	0.42	119.73	68.83	29.49	6.87	1278. 80
O. Aries	1.08	7.00	0.34	67.27	14.50	25.33	22.00	1236.10
G. Gallus	1.17	6.00	0.29	83.43	18.10	23.27	38.30	959.10
C. Lazar	0.92	3.00	0.26	71.13	32.60	17.87	29.47	383.60

Statistical comparison of the means was conducted and the results presented in table 3,

UNDER PEER REVIEW

It indicated that were no significant differences between the means of proximate composition of insects and the animals meats on carbohydrates, protein, fibre, copper, iron, sodium, calcium, magnesium and potassium while only fats, moisture, ash, zinc and phosphorus differ at 5% level of significance.

TABLE 3: COMPARSION BETWEENS MEANS OF PROXIMATE ANALYSIS OF SOME EDIBLE INSECTS AND ANIMAL MEATS

Nutrients/Minerals (Means±SE)	Edible Insects (Means±SE)	Animal Meats
Carbohydrates	8.39±1.40	4.87±0.74
Proteins	26.07±4.24	35.79±5.02
Fats	11.52±1.24*	9.26±0.56
Fibre	11.67±1.52	5.00±0.00
Moisture	36.39±3.55*	23.99±4.56*
Ash	6.00±0.55*	6.16±0.69*
Copper	1.83±0.30	1.07±0.09
Iron	11.97±1.98	6.18±0.52
Zinc	0.36±0.01*	0.44±0.13*
Phosphorus	82.42±2.06*	88.49±5.27*
Sodium	3.33E2±70.5	40.57±6.91
Calcium	18.65±1.67	24.97±1.29
Magnesium	39.30±4.22	22.51±3.10
Potassium	5.88ES±67.54	1.03E3±92.02

Values with asterisk (*) within the same row are significantly different at (P<0.05).

DISCUSSION AND CONCLUSION

The proximate analysis of the edible insects conducted showed that the insects have almost all the nutrients required by human body. The organic compound observed from the analysis of the insects bodies were proteins, fats, and carbohydrates in varying amounts. Similar observations were made by Omotoso (2006), who showed that the larvae of *Cirina forda* contained high levels of protein with ash, moisture, fats and carbohydrates. However, Omotoso (2006) indicated that fibre was not detected. Vandky (2000) reported that large grasshoppers have 14.2 percent of protein, 3.3 percent fats, and 2.2 percent carbohydrates while termites have 14.2 percent protein, 28 percent fats, 2.7 percent fibre and 44.5 percent moisture. The showed that fibre could be found in the nutrient content of insects despite the previous assertion by Omotoso (2006). However, Omotoso's finding could be related to the insect he worked with, being s Lepidopteran Larva. From the result, it was observed that meats from animals and insects both have nutritional

UNDER PEER REVIEW

values that varied in minor respects. It was also observed that some insects have higher moisture content and protein that are relatively similar to those found in animal meats. Insects therefore can be consumed to obtain the body nutritional requirement as can be obtained from animal meats. Therefore, where meat is not readily available or cannot be afforded, insect's diet can be supplemented.

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UNDER PEER REVIEW

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UNDER PEER REVIEW