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Proximate and Mineral Analyses of White Grubs (*Phyllophyga specie*)

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ABSTRACT

White grubs (*Phyllophyga specie*) were obtained from Tambuwal local government area in Sokoto state Nigeria. The powdered sample of head and the body were used for the proximate composition showed that the value of ash and protein content was higher in the body 30.33±0.76% and 26.34±0.32% than in the head 21,17±1.04% and 25.23±0.81% respectively, while the lipid, carbohydrate, moisture and fibre content were 18.33±1.26%, 22.78±1.54%, 8.20±1.26% and 4.33±0.81% respectively, were higher in the head compared to the body with 17.67±0.03% for Lipid, 16.76±2.46% for Carbohydrate, 6.67±1.26% for Moisture, 3.00±1.00% for Fibre. Minerals analysis revealed slight high values for sodium in the head (486.67±5.77mg/100g) compared with the body (485.00±8.66mg/100g). Similarly high values was recorded for potassium but much higher in the body (406.67±5.77mg/100g) compared with 388.33±7.64mg/100g in the head. Magnesium content in the body (0.17±0.00mg/100g) appeared higher than (0.14±0.01mg/100g) in the body. The analysis revealed that consumption of white grubs is useful diet supplements recommended for families.

Keywords: Body, Head, Mineral, Proximate Analysis, White Grubs

INTRODUCTION

Insects are the most successful group of animal containing about 76% of known species of animals. Insects affect man either as destroyer of man's valuable materials and crops or as sources of his nutrients. It was reported that (chitin an important component of insects) can significantly reduce serum cholesterol, and serve as haemostatic agent for tissue repair and for accelerating heeling of wound and burns. (Adesina, 2012).

Insects according to Van (2003), are eaten as a delicacy in many part of the world, particularly in the tropics. In contrast, most of the western world tends to see human entomology as an aberration. They are very reluctant to even consider insects' consumption, often associated with primitive or barbaric attitudes, this may be the reason that such traditional foods may have received very little attention in assistance programmers on food security.

In Asia, West and Central Africa in particular, insects are used as emergency food to strive against starvation and as normal diet throughout the year or in seasons of occurrence (Banjo *et al*., 2006). In Nigeria edible insects are important sources of high protein to both rural and many city dwellers in. Among the most important orders of insects consumed in Nigeria include Coleopteran, Hymenoptera, Isopteran, Lepidoptera, Odonata, Orthoptera and they are highly priced (Fasoranti and Ajiboye, 1993). Notable examples of these are the palm weevil, *Rhynchophorus phoenicis*, termites, *Macrotermes nigeriense* (queen, king and reproductives), *Cirina forda*, and variegated grasshopper, *Zonocerus variegatus* (Adedire and Aiyesanmi, 1999).

In Nigeria, white grubs among hausa – Fulani is called ''Gwazarma or Dole Dole'', ''Eruru'' among Ibos, ''Okahio'' among benin people of Edo state, ''Ivungur'' among Tiv of benue state, ''kibwo-kirhew'' among people of Cross River State. Fat obtained from white grubs may be extracted for processing other foods, and could be used as bait for fishing. From the foregoing discussion, white grubs may contain one or more nutrients necessary for body system (Alhassan *et al*., 2009).

Olowu *et al*., (2012) conducted a research on asessment of proximate and mineral status of rhinoceros beetle larva (Oryctes rhinoceros linnaeus), on his research the proximate composition (the Moisture, Ash, Protein, Fibre, Fat and total carbohydrate) was analysed using standard method recommended by Association of Official Analytical Chemist AOAC (1999). Alhassan *et al*., (2009) carried out a research on Determinetion of Proximate and Elemental Composition of White grubs, the Moisture content, Ash, Crude protein, Crude Fibre, Lipid and Total carbohydrate were analysed using a method described by AOAC (1984), and mineral composites were determined by flame photometry, AOAC (1999), and Ethylene Diamine Tetraacetate (EDTA) titrimetry method. Omotoso (2005), uses the method recommended by AOAC (1990) to determine the proximate composition while the

mineral composition were determined by the method reported by Oshodi (1992).

Banjo *et al*., (2006) determined the nutritional value of fifteen species of edible insects in Southwestern Nigeria, adopted a method recommended by AOAC (1975) on determination of Moisture content, Ash, Fibre, Free nitrogen extract, and Mineral salt. While the Crude protein were analysed using kjeildahl technique. Afiukwa *et al*., (2013) on the evaluation of Proximate and Mineral content of termites (trinervitermis germinatus) uses a standard method described by Onwuka (2005) and AOAC (1999) on proximate composition (Moisture, Ash, Crude fat Crude Fibre, and crude protein profile) of the fresh, fried and wing samples.

METHODOLOGY

Ten (10) samples of white grubs larvae used for this research were obtained from Sanyinna, Tambuwal local government area in Sokoto state. The white grubs were killed by asphyxiation in a refrigerator for four hr and oven dried at 65ºC for 24 hr and ground to fine powder using ceramic mortar and pestle after separating the sample into head and body, then stored inside clean containers until required for analysis. The samples were treated using method describe by Akullo *et al*. (2018).

The proximate analysis was carried out using the method recommended by Association of Official Analytical Chemists (AOAC, 2005; AOAC 2000). For mineral content determination the ash sample was dissolved in 10% HCl and made up with distilled water to 100ml marks in a standard flask. Mineral such as calcium and magnesium were determined by Ethylene Diamine Tetraacetic Acid (EDTA) AOAC, (2000) titrimetric method. While sodium and potassium were determined by flame photometry.

RESULT AND DISCUSSION

The results of proximate analysis in the head and body of white grubs are as shown In Table 1. The moisture content of the sample showed that the head possesses higher moisture content (8.20% ± 1.26) than the body (6.67%±1.26) which are almost similar to the value (7.72%) for termite reported by Afiukwa *et al*., (2013) but less than 64.01% reported for white grubs by Alhassan *et al*., (2009), also 20.2% was reported for Cirina forda by Banjo *et al*., (2006) which may be due to environmental factor, geographical location and climate condition among others. Adesina (2012), reported respective values of (1.01%) and (1.16%) for yam beetle and palm weevil which appear lower than the value obtained from this analysis.

The ash content was higher in the body (30.33±0.76%) than the head (21.17%±1.04). Both values were higher than the values (12.92%), (8.70%±0.1) for Oryctes rhinoceros larva and Cinira forda larva reported by Olowu *et al*., (2012), Osasuna and Olaofe (2010) respectively. However, the values are lower than (42.25±0.01%) for land crab reported by Omotoso (2005). The ash determines the mineral composition of the sample, this shows that it could be particularly useful for lactating, pregnant women and children.

Lipid is essential in the diet because it increases the portability of food by absorbing and retaining their flavours (Aiyesanmi and Oguntokun 1996). It is also vital in the structural and biological functioning of cells and helps in the transport of nutritionally essential fat-soluble vitamins. The values obtained in both the body (17.87%±0.03) and head (18.33%±1.26) were in agreement with the values (18.39%), (18.60%) for rhinoceros beetle larva and Africano silkworm respectively reported by Banjo *et al*., (2006). but less than the value (30.50±1.20%), for dung beetle reported by Paiko *et al*., (2012) and greater than the value (16.12%±1.10) for cirina forda reported by Paiko *et al*. (2014).

Table 1: Proximate Composition (%) of white grubs larvae (*phyllophyga spp)*

Parameters	Composition (%)	
	Sample A (Body)	Sample B (Head)
Moisture	6.67±1.26	8.20±1.26
Ash	30.33±0.76	21.17±1.04
Lipid	17.67±0.03	18.33±1.26
Fibre	3.00±1.00	4.33 ± 1.04
Protein	26.34±0.32	25.23 ±0.81
CHO	16.76±2.46	22.78 ±1.54

Values are mean ± standard deviation of three measurements

The physiological role of fibre in the body is to maintain an internal distention for proper peristaltic movement of the intestinal track. (Odour *et al*., 2008) A diet very low in fibre could therefore lead to constipation which might bring discomfort in the body system with running stool (Groff *et al*, 1999). Diet with high fibre content have been used for weight control and fat reduction as it gives a sense of satiety even when small food is eaten (Ekop, 2004). The result or crude fibre in both the body (3.00%±1.00) and head(4.33%±1.04) can favourably be compare with that for yam beetle (3.0%) as reported by Adesina (2012) and scrab beetle (3.40%) by Banjo *et al*, (2006). the result are

however lower than (11.58%) reported for grasshopper (arphia fallax) determined by Ramos-Elorduy *et al*, (2012).

The result shows that the body of White grubs possesses more protein content (26.34% ± 0.32) than the head (25.23% ± 0.81). Both values are higher than the value reported for larva (20.79% ± 2.22) and pupae (21.50% ± 2.91) stage of silkworm by Omotoso, (2014). Almost similar value were found for scrab beetle (oryctes boas) (26.00%), caterpillar (anaphe vanate) (25.70%) as reported by Banjo *et al*, (2006). But lower than the values for yam beetle (38.10%) and palm weevil (50.01%) Adesina (2012).

A human adult needs about 400-500g of carbohydrate intake as starch. (NRC, 1980). The amount of carbohydrate obtained from this insect in the body (16.76% ± 2.46) and head (22.78% ± 1.34) were higher than (5.10%) for cricket as documented by Dunkel (1996). But less than (27.70±0.50%), reported for Oryctes. rhinoceros by Onyeike *et al*, (2005). Similar values were reported for emperor moth larvae (*Bulnea alcinoe*) (22.16 ± 1.09) by Dauda *et al*. (2014).

The Mineral Composition of white grubs is shown in Table. 2 Sodium has the highest values of 486.67 ± 5.77mg/100g and 485±8.66mg/100g in head and body respectively. Followed by Potassium 406.67 ± 5.77mg/100g for the body and (338.67 ± 2.89mg/100g) for the head. Magnesium recorded (406.67 ± 5.77mg/100g) for the body and head (335.33 ± 7.64mg/100g) magnesium is required in the body due to its role in the regulation of muscular contraction, blood pressure, insulin metabolism, cardiac excitability, vasomotor tone, nerve transmission and neuromuscular conduction (Uwe *et al*., 2015), while Calcium recorded the lowest value of (0.04 ± 0.00mg/100g) for both the body and head. Sodium is higher in the head than the body both values can be compared with the value (440,00mg/100g) reported by Ife and Emeruwa (2011). But higher than the value (10.6 ± 1.02) reported for white grubs by Alhassan *et al*. 2009.

This variation could be due to differences in geographical area or place of collection. Considering the importance of sodium in the metabolism, world health organisation (WHO) has recommended a daily dietary allowance of 2400mg of sodium per day (WHO, 2012). The values obtained for Potassium in the body is greater than head and both values are less than (2130.00mg/100g) reported for Cirina forda by Akinnawo and Ketiku, (2000). Higher value was (92.50 ± 1.20mg/100g) reported for dung beetle by Paiko *et al*., (2012). Magnesium is more concentrated in the body than the head. Similar value (0.17 ± 0.03mg/100g) was reported for Oryctes rhinoceros by Olowu *et al*., (2012). Which is higher than (0.09mg/100g) reported for cytacanthacris aeruginosus by Banjo *et al*., (2006). But less than (19.53 ± 210mg/100g) reported for emperor moth by Dauda *et al*., (2014). Calcium recorded the least value of (0.04 ± 0.00mg/100g) this value is greater than (0.03 ± 0.00mg/100g) obtained from rhinoceros beetle larvae by Olowu *et al*., (2012) and less than (27.00 ± 0.90mg/100g) reported for emperor Moth by Dauda *et al*., (2014). Calcium is an essential mineral for bone development.

Table 2: Elemental Composition of white grubs larvae in (mg/100g).

Parameters	Composition(mg/100g)	
	Sample A (body)	Sample B (Head)
Na	485.00±8.66	486.67±5.77
K	406.67±5.77	338.33±7.64
Mg	406.67±5.77	338.33±7.64
Ca	0.04±0.00	0.04±0.00

Values are mean ± standard deviation of three measurements

CONCLUSION.

In this study proximate composition was carry out using method recommended by AOAC and the mineral elements were determined using flame photometre and EDTA. The result obtained from this research reveal that the larva of white grubs beetle is a good source of protein and minerals. This shows that consumption of this larva is recommended for low income earners.

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