Bayero Journal of Pure and Applied Sciences, 2(2): 188 - 190
Received: July, 2009
Accepted: November, 2009

PROXIMATE AND ELEMENTAL COMPOSITION OF WHITE GRUBS

[1] Alhassan, A. J. [1]M .S. Sule, [1]J. A. Hsassan. [1]B. A. Baba. A. Aliyu and [2]M. D. Aliyu
[1]Department of Biochemistry, Bayero University, P M.B. 3011, Kano, Nigeria.
[2]Jigawa Research Institute, Kazaure, P. M. B. 5015, Kazaure, jigawa, Nigeria.
*Correspondence author: ajalhassan@yahoo.com

ABSTRACT
This study determined the proximate and mineral element composition of whole white grubs using standard methods of analysis. Proximate analysis showed on percentage dry matter basis: 65.86 ± 1.23% (protein, lipids, carbohydrates and ash) and (moisture content) 34.01 ± 1.00%. The lipid and protein contents showed the highest mean ± standard deviation percentage of 29.67 ± 1.34% and 12.75 ± 3.65% respectively. Mineral contents of white grub in terms of relative concentration was found to be in the order of K > Mg > Na > Ca > Mn > Zn > Fe > Cu. These elements in white grubs are appreciable to meet nutritional requirements. Therefore, consumption of white grubs is advised.

Keywords: White grubs, Proximate Analysis, Essential element, Nutrient

INTRODUCTION

Science of nutrition is concerned with various useful ingredients or nutrients of which food are composed, and the nutrient intake in amount sufficient for the physiological needs of virtually all healthy persons in a population as recommended by national and international organizations (Donald, 1981). The quality of life, therefore, depends on the nourishment provided by nutrients to the body. Dietary habit differs from one community to another based on their customs and, in general, is influenced by many factors, including religion, tradition, economic status, education, climate, family, age, culture, agriculture, medicine, etc (Joshi, 2002). Carbohydrates, proteins, fats, water, minerals and vitamins are the six major chemical components of food. Each nutrient performs specific functions that nourish the body and are required in right amount and must be eaten regularly (Donald, 1981, Berge, *et al.,* 2002). It is time for nutritional science to venture into research areas that focus on the exploration and maximum exploitation of both common and unpopular food sources. This has been necessitated by the possible health hazard associated with consumable products of genetic engineering, global food crises due to direct result of rapid and alarming population expansion, aggravated further by devastating effect of drought and war, and the attendant large number of displaced population commonly among the developing countries.

Beetle, is of order coleoptera, class; *insecta* and phylum; *Arthropoda*. Beetles have more than 350,000 known species and rank as the largest order in the animal kingdom. Within the limitations imposed by their biting mouthparts, the beetles have invaded all available habitats - including the sea - and exploited all possible food sources (Kendall, 2005). White grubs are the larvae of May beetles also called June beetles, found in the genus *Phyllophaga,* of which there are over 100 different species. The *Phyllophaga* larvae and other larvae of the family scorabaeidae are often referred to as "White Grubs" including larvae of the Japanese beetle (*Popillia Japonica)*, Annual white grubs (*Cyclocephala* spp) and the green june beetle (*Cotinis nitida linnaeus*). *Phyllophaga spp* and related insects are distributed through out the United States and Canada (Kendall, 2005, Eileen, 2006). In Africa, the species is widely distributed and is commonly found in Nigeria, Niger Republic, Uganda, etc. However the distribution of individual species usually is more restricted.

In Nigeria, White grubs among Hausa – Fulani is called ''Gwazarma or Dole – dole'', '' Eruru among Ibos and they got it from palm trees and moist refuge dum, ''Okahio'' among Beni people of Edo state, ''Ivungur'' among the Tiv of Benue State, ''Kibwo – kurhew'' among Bettle people of Cross River State. White grubs whole or extract is used in the treatment of jaundice, fever, and general body weakness, and as food by various communities. Fats from white grubs may be extracted for processing other foods, and could be used as bait for fishing. From the foregoing discussion, white grubs like any other foods may contain one or more nutrients necessary for body system.

Therefore this study is to evaluate the level of protein, lipids, carbohydrates, ash and some mineral elements in white grub.

MATERIAL AND METHODS

Sample collection

White grubs found in public wastes of Court Road, Tarauni Local Government Kano State were collected in the month of July and August, 2008.

Sample Preparation

Whole white grubs cleaned of dirt were sun dried for at least four days, before pulverized to powder and kept in plastic container.

The moisture, crude fat, crude protein, ash and carbohydrate levels were determined by the method described AOAC, (1984). The mineral element Na, K, and Ca were determine by Flame photometry AOAC, (1999), while, Mg, Zn, Fe, Cu and Mn were determine by atomic absorption spectroscopy (AAS) (John and Van, 1980). Each parameter was determined five (5) times and result reported as mean ± SD.

RESULTS AND DISCUSSION

The proximate composition of white grubs is presented in Table 1. The crude fat content of white grubs was found to be 29.67 ± 1.34% which is comparable to that reported in nematodes by De forliart (1999), who reported that nematodes are rich in fats ranging from 10 to 30%. High level of fats in white grubs suggests that could be a rich source of dietary fats. The high fat content in white grubs is not surprising in view of the fact that animals such as pig and duck that feeds on waste matter normally accumulate fats. Dietary fat provides body with energy, polyunsaturated fatty acid (PUFA), fats soluble vitamins. The protein content was found to be 12.75 ± 3.65% which may be adequate for nutrition needs. Dietary protein provides body with amino acids for indigenous protein synthesis. Generally, proteins function in the growth and maintenance of the body, regulation of body processes, etc. The carbohydrates content was found to be 6.29 ± 2.69% which may certain nutritional requirements. Dietary carbohydrate is primary source of energy to the body, it spares fats and proteins in the body.

Table 1: The Proximate Composition of White Grubs

Parameters%	Moisture	Dry Matter	Lipids	Proteins	Carbohydrates	Ash
	34.01 ± 1.00	65.85 ± 1.23	29.67± 1.34	12.75 ± 3.65	6.29 ± 2.69	17.15 ± 3.15

Values are mean ± standard deviation

Table 2: Elemental Composition of White Grubs

Minerals mg/100g	Na	K	Ca	Mg	Fe	Zn	Cu	Mn
	10.6 ± 1.02	30.2 ± 2.01	5.2 ± 1.02	15.9 ± 1.23	0.40 ± 0.01	0.68 ± 0.02	0.20 ± 0.01	0.86 ± 2.02

Values are mean ± standard deviation

The ash content, which is a measure of mineral matter, was found to be 17.15± 3.15%. This is not surprising considering the habitat and feeding habit of white grubs, where it naturally biodegrade organic waste for nutrient needs.

Table 2 summarises the elemental composition of white grubs, which are within acceptable level. Sodium in addition to neutralizing acid and activating body fluid and organs is an important component for muscle and nerve functions as well as for the proper functioning of the liver, pancreas, and gall bladder. Sodium ion (Na^+) is the major cations in extracellular fluid (ECF), where as K and Mg, are the main cations in intracellular fluid (ICF). Calcium is the fifth most common element in the body, 99% of it is present in the skeleton in the form of hydroxyapatite (Ca_{10} $[PO_4]_6[OH]_2$). Of the total plasma Ca 50% is free, 40% protein bound (80:20% albumin: globulin) and 10% is complexed (HCO^-_3, lactate, phosphate, and citrate). Intracellular Ca functions in muscle contraction, hormone secretion, glycogen metabolism and cell division, and the extracellular Ca provides ions for the maintenance of intracellular Ca, bone mineralization, blood coagulation, and plasma membrane potential (Mc Donald *et al.,* 1995). Iron is an important transition element with several vital functions in the body; as a carrier of oxygen to the tissues from lungs (hemoglobin), storage of oxygen in the muscle tissue (myoglobin), as component of electron carrier in plant, animal and bacteria (cytochromes), electron transfer in plants and bacteria (ferridoxins), as an integral part of important enzyme reactions: the oxidation of aldehydes (aldehydes oxidase), the decomposition of hydrogen peroxide (catalase and peroxidase), in the aerobic oxidation of carbohydrates (succinate dehydrogenate), in nitrogen fixing bacteria (nitrogenase) (Lee, 1991). Zinc (Zn) has an important biological role in enzyme systems, there are over twenty (20) Zn containing enzymes (Lee, 1991; Harrison and deMora, 1996; Halberge *et al.,* 1993). The metal plays an important role in biological structure for example in β – cells of pancreas, where it appears to stabilize insulin structure, and in retina in position of choroids region of eye. Zinc requiring enzymes occur in each of the six categories designated by International Union of Biochemistry (IUB) commission (Reily, 1980). Copper is essential to life, Very little copper exists in free ionic state in body fluid or tissue but it nearly all complexes as metalloproteins or as enzymes. These include various oxidases and blue proteins such as amino acid oxidases, cytochrome oxidases, hydroxylases, and ceruloplasmin (Lee, 1991, Harrison and de Mora, 1996).

Conclusion

From the result obtained it could be seen that white grub contains high amount of fat, protein, and some mineral elements, it could therefore be nutritionally important for normal growth and development.

REFERENCE

Adedire, C. O. and Aiyesanmi, A. F. (1999). Proximate and mineral composition of the adult and immature grasshopper. *Bioscience Research*, 11 (2): 121 – 126.

AOAC, (1984) *Methods of analysis*, Association of Analytical Chemists. Washington DC.

AOAC, (1999) *Methods of analysis*,6th ed. Association of Analytical Chemists. Washington DC.

Defoliart, G.R (1999) insect fatty acids: similar to those of poultry and fish in their degree of unsaturation, but higher in polyunsaturates. *Food insects Newslet.* 4 (1): 1 – 4.

Donald, S. M. (1981). *Nutrition and its disorders.* 3rd eds. Longman Group publishers, New York. P 190.

Halberge, L. , SandestrÖm B and Aggett, P.J. (1993). Iron, zinc and other trace elements. In: Garrow J. S., James, W. P. T. and Ralph, A. (eds.) *Human Nutrition and Dietetics* 9th eds. Churchill Livingstone. Edinburgh. Pp 175 – 207.

Harrison R.H. and de Mora,S. J. (1996). *Introductory Chemistry for Environmental Sciences*. 2nd ed. Cambridge University press. Pp50 – 238.

John C. and Van,L. (1980).Atomic Absorption Spectrometer. In: *Analytical Atomic Absorption Spectroscopy*. Academic Press, Inc. Orlando, Florida. Pp 11- 293.

Joshi A. S. (2002). *Nutrition and Dietetics*: 2nd ed., Tala Mc Grew – Hill, New Delhi. Pp 3- 68.

Kendall D. (2005) *Insect Taxonomy - Agroecology - Biometrics - Expert Witness*. *Adaptations and Dynamics.* : Fuxter Verlag, *Stuttgart,* P. 551.

Lee, J. D. (1996). An introduction to transition elements I: *Concise inorganic chemistry, 4th eds.* Chapman and Hall. London. Pp 654 – 881.

Mc Donald, R. A. E., Geenhalgh, J. F. D. and Morgan, C. A. (1995). Minerals In: *Animal Nutrition*. 5th ed. Pearson Education Limited, Essex U. K. Pp. 122 - 127

Reily, C. (1980). *Metal concentration of food*. Applied science publisher ltd. London. Pp 25 – 196.

Vidyasagar, P. S. P.V., Hagi, M., Abuzuhairah, R. A., Al Mohana, O. E., Al – Saihali, A. (2000). Impact of red palm weevil Adult population and infested level in dead palm Gardens of Saudia 76: Pp347 – 355.