

## Entomophagy among Tertiary Institutions in Southwestern Nigeria

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**Abstract:** An entomophagical survey of insects among tertiary institutions in southwestern Nigeria was carried out to examine if insects are eaten among students in tertiary institutions. 1000 structured questionnaires were distributed out of which 925 was properly filled and returned. The age range between 16 and 36 and above. 60% of the students eat insect, of which 62% are males and 54.7% are females. The various insects eaten among students are *Zonocerus variegatus* (grasshopper) (Tata), *Brachytypes* sp (cricket), (Ire), *Rhynchophorus phoenicis* (larva), (Itun), *Macrotermes nigriense* (Queen termite)(Olu-ogan), *Apis mellifera* (Honey bee), (Oyin), *Anaphe* sp (silkworm), *Cirina forda* (Kanni), *Anapleptes trifaciata* (adult) (Peripe) and locust to mention a few. The most commonly eaten insects by students is winged termite of 58.05%. It is followed by *A. trifaciata* with 35.89% and *R. phoenicis* with 32.54%. In the meantime, 58.70% of the students eat insect because of its sweetness, protein content and its use as a food supplement. 34.81% of the students eat insect for strength and vigour. 39.46% of the students agree that eating of insects enhances food security and it is cost effective. 47.68% of the students believe that insects should be reared in large quantities. 47.24% of the students agree to the fact that governments should encourage the eating of insects.

**Key words:** Entomophagy · Tertiary · Institutions · Nigeria

### INTRODUCTION

Entomophagy can be defined as the use of insects as food by people. Insects have served as a food source for people for thousands of years. Insects are important element in human diet in different parts of the world; but they have long been a taboo in European civilizations [1].

At least 1,200 species of insects are eaten in various parts of the world. Many insects such as aphids, ants and grasshoppers are eaten as eggs or their adult form. Other insects are eaten while still in their wormlike larval stage [1]. Also, some insects are eaten raw, while others are fried or pickled (preserved in vinegar). Many people eat insects when other kinds of food are hard to find in the Australian food, for example Aboriginal people dig up and cook the caterpillars of witchetty moths, which survive droughts by living underground [1].

Compared to most other kinds of animal food, insects are a well-balanced source of nutrients. They are high in protein and contain much less fat than red meats, such as beef. A typical 100g serving of crickets (which might

contain around 180 adult crickets) supplies about 125 calories of energy, about the same as two slices of whole-wheat bread [1]. Insects are also a good source of vitamins and of minerals such as phosphorus and iron [1].

Insects have been a staple of almost every indigenous culture, not only because of their delicious flavor, but also because they provide a more complete protein than soya, meat or fish and have high concentrated sources of calcium, niacin, magnesium, potassium, the B-vitamins and many other nutrients [2].

The taste and texture of edible insects varies as other kinds of food. Grasshoppers are the most widely consumed. They have a nutty flavour when roasted and salted. Grasshoppers can also be ground up and used as flour. In Mexico, honeypot ants, so named because they fill their lower abdomens with sweet-tasting secretions from aphids, make a popular dessert. Winged termites are often fried in their own fat in Africa. Alternatively, termites may be spread out in the sun to dry. They remain preserved as a tasty treat for several months, once dry [1]. Some insects are used as

flavourings, as well as for food. The giant water bugs of Southeast Asia are the foremost among them. They have a highly prized minty taste. These animals are predatory and are either caught in nets or attracted to bright lights when they fly after dark. Maguey worms, in Mexico are used to flavour mescal, an alcoholic drink. The worms actually skipper butterfly caterpillars – have been a traditional ingredient of the drink since Aztec times. Ant pupae are used to flavour gin in Sweden [1].

A list of 71 species of insects that are consumed in Mexico was available [3], these were listed by order and family and giving the developmental stage(s) that are eaten and the geographical location (States) whereas they eaten. Variegated grasshopper *Zonocerus variegates* is commonly eaten in Akoko area of Ondo state, Nigeria [4], while the nutritional composition of fourteen edible insects eaten in southwestern Nigeria was recorded [5].

Eight additional lists of edible insects of the world by order and family, giving the country or continent were recorded. The listings include approximately 129 spp of Coleoptera (Beetles), 99 of Hymenoptera (Bees, ants, wasps), 48 of Lepidoptera (Butterflies and moths), 68 of Orthoptera (Grasshoppers, crickets, etc), 32 of Hemiptera (True bugs), 28 of Homoptera (Cicadas), leafhoppers, etc), 10 of Diptera (Flies, gnats), 17 of Isoptera (Termites) and 10 species in miscellaneous other orders bringing the total to approximately 441 species (for some of which only the identity of the genus is known).

In the next century, as the world heads for food shortages, insects can help meet humanity's growing nutritional needs also it was believed that edible insects can make an economic difference as well as nutritional difference in rural Mexico [2].

#### **The Current Work Was Carried out To:**

- Investigate if insects are eaten among students in tertiary institutions.
- Analyse through the use of primary data i.e questionnaires the various types of insects eaten among students in tertiary institutions.
- Know the reasons why some eat and other have apathy to it.
- Know if eating of insects enhances food security and its cost effectiveness (using chi-square).
- Investigate if insects should be reared in large quantities.
- Investigate if government should encourage the eating of insects using (chi-square).

#### **MATERIALS AND METHODS**

The study areas for this research are tertiary institutions in southwestern Nigeria. Ten (10) higher institutions were chosen randomly and also based on accessibility in South Western Nigeria. The schools were (1) Olabisi Onabanjo University, Ago-Iwoye (2) University of Lagos, Akoka (3) University of Ibadan (4) Obafemi Awolowo University, Ile Ife (5) Federal University of Technology, Akure (6) University of Agriculture, Abeokuta (7) The Polytechnic of Ibadan (8) Adekunle Ajasin Polytechnic, Owo (9) Lagos State Polytechnic, Isolo (10) Tai-Solarin University of education, Ijagun, Ijebu-Ode.

The reason for choosing tertiary institutions as the study area is to know if eating of insects is restricted to the un-educated or illiterate people or is also applicable to the literate people (students). The different schools in this research represent almost all the states in southwestern Nigeria. Therefore, the researched labour in these ten (10) schools will be used to generalize the subject matter of eating of insects among tertiary institutions students in southwestern, Nigeria.

The composition of the study would be predicted on the need to ensure that prospective respondents are those that are students or staff of tertiary institutions between the age of 16-65 in Southwestern Nigeria. In terms of orientation and experience, they were seen to have acquired a sufficient knowledge and experience which they can use to react to rational issues around them.

Probability method was the sampling technique used. This was because all the students in the tertiary institutions (Southwestern Nigeria) have equal and independent chance of being included in the sample. Stratified sampling method was the type of probability sampling method used. The students in tertiary institutions in southwestern Nigeria were been grouped into two definite characteristics, males and females, those that eat from these insects and those with apathy. From these groups or strata, the sample was chosen by applying random selection technique on each stratum.

A total of 1000 questionnaires were administered. The questionnaires were distributed among the ten (10) schools, 100 in each school. This large number of questionnaires was used so as to have enough information and also to be sure of our assumption because the higher the number of samples the less the error committed. About 925 of the 1000 questionnaires were recovered in which 620 were males and 305 were

females. The data collected has been compiled into meaningful categories with the use of tables; the analysis of the demographic characteristics of the respondents was also done with simple percentages. However, the set hypotheses were calculated with the use of chi-square ( $\chi^2$ ) method to test the significance of the hypotheses.

**RESULTS**

Table 1 Shows the socio-economic characteristics of the people interviewed (majorly students) on the usage of insect for nutritional and medicinal purposes. Most of the students interviewed fell within the age range of 21-25 (65.41%), 96.54% of them are single, about 67.03% are males and majority of them (78.27%) are Christian. Majorly, (89.84%) of them are undergraduates; their parent occupation varies with civil servants having about (50.81%) and business men/women (45.51%).

Table 2 shows the variability of edible insects eaten among the students. The most commonly eaten insects among the students are winged termite (*esunsun*) (*Macrotermes* sp), *Anapleptes trifaciata* (Ipe or Okoka) and Itun (*Rynchophorus phoenicis*) while locust, *Cirina forda* (kanni) and queen termite (*Macrotermes nigriense*) (olu-ogan) are the least consumed.

Table 3 shows that people eat insects for various reasons. These reasons include the strength/vigour it gives, immunity, longevity, its sweetness, protein content and its use as food supplement. The primary considerations are its sweetness, protein content and its use as food supplement. (58.70%).

Table 4 shows the processing methods of the insect before consumption. These methods are boiling, frying, roasting and smoking. Many students prefer the frying and roasting method.(57.84 and 57.30%, respectively). Only very few people use the smoking method.

Table 1: The socio-economic characteristics of the students interviewed

Characteristics	F(N=925)	%
<b>AGE</b>		
16 – 20	195	21.08
21 – 25	605	65.41
26 – 30	98	10.59
31 – 35	20	2.16
36 and above	7	0.76
<b>MARITAL STATUS</b>		
Single	893	96.54
Married	32	3.46
Divorced	-	-
Separated	-	-
Widow	-	-
<b>SEX</b>		
Male	620	67.03
Female	305	32.97
<b>RELIGION</b>		
Christianity	724	78.27
Islam	201	21.73
Traditional	-	-
<b>EDUCATION</b>		
Primary Education	-	-
Secondary Education	-	-
Vocational	-	-
Undergraduate	831	89.84
O.N.D	32	3.46
N.C.E.	15	1.62
H.N.D.	42	4.54
M.Sc/Ph.D.	5	0.54
<b>PARENT OCCUPATION</b>		
Trading	10	1.08
Civil Servant	470	50.81
Farmer	12	1.30
Business	421	45.51
Contractor	7	0.76
Others	5	0.54

Table 2: Variability/ species of edible insects consumed by tertiary instructions students

Insects	Local Names	(n =925)	%
<i>Anapleptes trifaciata</i> (Larva)	Ipe, Okoka	332	35.89
<i>Macrotermes</i> sp (Winged termite)	Esunsun	537	58.05
<i>Zonocerus variegatus</i> (Grasshopper)	Tata	160	17.30
<i>Brachytypes</i> sp. (Cricket)	Ire	175	18.92
<i>Rynchophorus phoenicis</i> (Larva)	Itun	301	32.54
<i>Macrotermes nigriense</i> (Queen termite)	Olu-Ogan	10	1.08
<i>Apis mellifera</i> (Honey bee)	Oyin	8	0.86
<i>Anaphe</i> sp. (Silkworm)	N/A	18	1.95
<i>Cirina forda</i>	Kanni	7	0.76
<i>Anapleptes trifaciata</i> (Adult)	Ogidima	42	4.54
<i>Rynchophorus phoenicis</i> (Adult)	peripe	15	1.62
Locust	Elega	4	0.43

Table 3: Reasons for eating insect

Reasons for eating insects	F(n=925)	%
Longevity	41	4.43
Strength/vigour	322	34.81
Immunity	120	12.97
Others specify (sweetness, supplement, protein)	543	58.70

Table 4: Methods/ Techniques of Insects preparation before Consumption

Processing Methods	(n=925)	%
Boiling	312	33.73
Frying	535	57.84
Roasting	530	57.30
Others (smoking)	15	1.62

Table 5: Preservation/Storage techniques of edible insects

Storage/Preservation Methods	(n=925)	%
Salting/sun drying	340	36.76
Frying	535	57.84
Roasting	530	57.30
Smoking	15	1.62
Refrigeration	210	22.70

Table 6: Insect for Treating Ailments and Allied Problems

Insects	Types of ailments and ailed problems
<i>Macrotermes</i> sp. (Esunsun)	Curing diabetes, hypertension, Asthma, Stroke, Poor vision, cholesterol and malaria. It is used to increase libido and also to appease god for protection.
<i>Apis mellifera</i> (bee)	For curing sore, cough, ear pulse. It is also used to cure high blood pressure.
<i>Zonocerus variegatus</i> (grasshopper)	For curing HIV, Gonorrhea in Edo State also, used to cure Pneumonia, Ulcer and headache.
<i>Brachytypes</i> sp. (cricket)	For curing disease in the dry season, poor vision, upper respiratory tract infection, skin smoothening, stomach ache, feverish condition and malaria. It can also be used to cure dwarfism.
Locust	For curing infertility;
<i>Musca domestica</i> (maggot in 'ogiri')	Stomachache treatment and wound dressing.
<i>Rhynchophorus</i> sp(adult) 'Peripe'	Used to cure whitlow
<i>Anapleptes trifaciata</i> (larva)	Used for spiritual attack (atagba)
<i>(Rhynchophorus phoenicis)</i> (larva)	Used to stop addict drunkard
Beetle	Hunch back

Table 5 shows the preservation/storage method of the insects. These include salting/sun drying, frying, roasting, smoking and refrigeration. The most common storage/preservation method are frying (57.84%) and roasting (57.30%). This is followed by salting/sun drying and refrigeration. Only few people preserve them by smoking.

Table 6 shows the insects that are used traditionally for treatment of ailment. These insects are *Macrotermes* sp. (Termites), *Apis mellifera* (Bee), *Zonocerus variegatus* (Grasshopper) *Brachytypes* sp. (Cricket), Locust, caterpillar, maggot of *Musca domestica*, larva and adult of

*Rhynchophorus* sp (Itun and peripe), larva and adult of *Anapleptes* sp (Okoka and ogidima). In Edo State, grasshopper is used to cure HIV and gonorrhoea. In Ondo state, peripe is used to cure whitlow and (Okoka) is used to cure (Atagba) spiritual attack.

In Abeokuta, *Rhynchophorus phoenicis* (itun) is used to stop drunkard from drinking.

Table 7 shows the cultural perspectives/taboo associated with the use of insects among all the insects, termites and *Rhynchophorus* sp (larva) (itun) are the ones that have taboos attached to them. Some believe that termites should not be eaten by men in the night in

Table 7: Cultural Perspectives/taboo associated to the use of insect

Insects	Cultural Perspectives/taboo
Termites( <i>Macrotermes sp</i> )	Men should not eat it in the night. There is a species of this insect that is not edible and if eaten accidentally, can cause deafness. A pregnant woman must not eat it. Also water must be taken after eating termite to appease the god of insects.
<i>Rhynchophorus phoenicis</i>	In the use of "itun" to stop an addict drunkard, the mother of such drunkard must be alive otherwise, it will not be effective.

Table 8: Summary of the statement of the questionnaire A = Agree, SA = Strongly agree, U = Undecided, D = Disagree, SD = Strongly disagree

S/No	Statement of the questionnaire	A	SA	U	D	SD
1.	Eating of insect is a taboo	75	21	198	351	280
2.	Insect is very useful in the household	318	74	173	248	112
3.	Insects should be reared in large quantities	267	174	255	116	113
4.	Eating of insects reduces high cost of animal protein	200	119	280	230	96
5.	Eating of insect is no longer fashionable	338	92	220	203	72
6.	Government should encourage the eating of insects	230	101	277	208	109
7.	Edible insects are gradually going into extinction	257	59	341	193	75
8.	Insects are beneficial to the human race	436	189	155	79	66
9.	Eating of insect has side effects	193	94	309	208	121
10.	Eating of insect is economical/cost effective	281	145	221	199	79
11.	Sale of insect enhances food security	239	65	357	156	108

Ogun State while others in Ekiti State believe it should not be eaten by pregnant women. Some from Ogun and Ondo State also believe that if the wrong species/unripened termite is consumed, it will cause deafness. In Abeokuta, it is believed that before "itun" can be used to stop drunkard from drinking, the mother must be alive and otherwise it will be non-effective.

Table 8 shows the summary of the various statement of the questionnaire. 37.95% of the students could not decide if eating of insect is a taboo, but 30.27% of them disagree to the fact that eating of insects is a taboo. 42.38% of the students agree that insect is very useful in the household. 34.48% of the students agree that eating of insects reduces high cost of animal protein. 47.68% of the students agree that insects should be reared in large quantities. 45.73% of the students disagree that eating of insects is no longer fashionable. 47.24% of the students agree that government should encourage the eating of insects. 32.65% of the students disagree that edible insects are gradually going into extinction, while 34.16% of the students agree to the fact. 67.59% of the students agree that insects are beneficial to the human race. 35.57% of the students disagree that eating of insects has side effect. 46.05% of the students agree that eating of insects is economical/cost effective while 32.86% of the students agree that the sale of insects enhances food security.

## DISCUSSION

Edible insects are consumed mostly due to historical their sweetness or delicacy, reasons, nutritional composition (vitamins and proteins) or as a supplement for meat. These findings have clearly revealed that insects

are not only eaten by local people i.e. people in rural places, but are also eaten and cherished by the civilized people i.e. students of higher institutions.

Result of this findings showed that 60% of the students in tertiary institution eat insects, 62% of them are males and 54% females eat insects. However, of all the edible insects winged termites called "esunsun" in Yoruba land and 'Iba' in Abeokuta are the most commonly eaten (58.05%). They are eaten in almost all the dialectic groups in the region. Insects used as food are mostly those which can be collected in large numbers [6]. Many of the students said that winged termites are collected after rainfall by trapping them in basin of water placed around a strong source of light. The trapped insects are processed by either frying or roasting (57.84 and 57.30%, respectively). Many of the students prefer the frying and roasting method of preservation (57.84 and 57.30%, respectively). The fried or roasted termites can be stored for weeks. The next insect in order of consumption is *Anapleptes trifaciata* (35.89%). It is called "ipe" by the Ijebus and Epes, "ogongo" by the Abeokutas, "okoka" by the Ikales and Ilajes in Ondo State and "Nnung ukot" by the Ikot-Ekpene in Akwa-Ibom. It is followed by *Rhynchophorus phoenicis* called "itun" by the Yorubas (32.54%). These edible beetles are picked up around fruit trees and where palm wine is been trapped. Their larvae are found in the fluff around the leaf bases of palm tress and inside decaying tree trunks in the forests. All the students agreed that the source of these insects is from the wild and are collected for consumption by majority youth, farmers and hunters. Majority of the students got this insect from the market. From the findings, the students gave a cost estimate of these edible beetles.

4-5 insects per stick of *A. trifaciata* are sold for N40 in Okitipupa, 3 insects per stick are sold for N20 in Ikorodu and Ijebu-Ode. Palm trees under stress for any reason and fallen palms serve as breeding sites for *R. phoenicis* (itun) and can support hundreds of larvae [4]. Collected larvae of *A. trifaciata* and *R. phoenicis* are washed and fried. Some people prefer them roasted. Condiments like onion, pepper and a little salt are added. Most of the students interviewed believe that these insects are very delicious, but many prefer *R. phoenicis* to *A. trifaciata* because of its taste and softness.

According to the result of these findings, the least consumed insects are locust, *Cirina forda* (Kanni, in Yoruba), *Apis mellifera* (honey bee) and *M. nigriense* (Queen termite). Grasshoppers and crickets are eaten though rather infrequently and largely by young children [7], who can take the trouble of digging it out of its abode in the soil is *Brachytypes membranaceus* Drury. The cricket is termed "ire" in Yoruba. These insects live in tunnels that are easily detected [4]. They turn a golden colour when roasted. "The variegated grasshopper, *Zonocerus variegatus*, which has a large dry season population in Southern Nigeria (i.e. from November to April) is reported to be roasted by eaters in Akoko area of Ondo State" [7]. This is also proved by the result of this research. It is termed "tata" by the Yorubas. They are eaten fried or roasted.

"kanni", the larvae of *Cirina forda* is perhaps the most important and widely marketed edible insect in Kwara State [4]. The larvae are starved for a day or two to eliminate the gut contents, then boiled for two hours, then sun-dried on mats. From the research, only a few of the students eat "kanni", probably because majority of them are not from Kwara State. Most of the edible insects are seasonal. Some are found during dry season i.e. grasshoppers, cricket etc. Some are also found during the wet (rainy season; termites others are believed to occur at any season i.e. *A. trifaciata* (ipe), *R. phoenicis* (itun) etc. Some of the insects are measured/weighed for sale in tin, congo, basket or other means. The price of various insects varies, "itun" is sold for N50 in Okitipupa i.e. 3 pieces per stick.

From the result of the socio-economic characteristics of the students interviewed, it was observed that parental occupation has nothing to do with the eating of insects by students. 50.81% of the parents are civil servants and 45.51% are businessmen and women. Parents that are farmers are 1.30%. Result of this finding also reveals that students eat insects because of many benefits attached to it. 4.43% eat for longevity, 34.81% eat insects for strength/vigour, 12.97% eat insects for immunity while

58.70% eat insects for its sweetness, protein content and as a supplement for meat. From the research hypotheses, almost all the hypotheses were true.

Also 178 of the students disagree and 94 of the students strongly disagree while 289 of the students were undecided. If there is more enlightenment on entomophagy, the students believe that it will enhance food security and also promote economic income level

If insects such as *Macrotermes* sp can cure diabetes, hypertension, poor vision to mention a few, there is no reason why such insect should not be encouraged to be eaten by people. From the research work, it was discovered that *Zonocerus variegatus* can be used to cure HIV and gonorrhoea in Edo State. By virtue of this finding, more light can be thrown into this issue to see how this (use of grasshopper) can be achieved.

Conclusion, Entomophagy (i.e. eating of insects) among students of tertiary institutions is no more a nightmare but a reality. The studies revealed that eating of insect is not a taboo and not archaic. The eating of insect should be encouraged because of the nutritional value and it will bring about food security

## REFERENCES

1. Anonymous, 2005. Entomophagy, <http://encarta.msn.com/encyclopedia/701702408/Entomophagy.html>.
2. Ramos-Elorduy J., 1998. Creepy Crawl Cuisine. The Gourmet Guide to edible Insects, pp: 150.
3. Eldorduy de Conconi, J.R., 1982. Insects as a source of Protein in the future. Balderas 95, Primer Piso, Mexico, pp: 144.
4. Fasoranti, J.O. and D.O. Ajiboye, 1993. Some Edible Insects of Kwara State, Nigeria Amer. Entomologist, 39(2): 113-116.
5. Banjo, A.D., O.A. Lawaland and E.A. Songonuga, 2006. The nutritional value of fourteen species of edible insects in Southwestern Nigeria. African J. Biotechnol., 5(3): 298-301
6. Ene, J.C., 1963. Insects and Man in West Africa. University of Ibadan, pp: 58.
7. De Foliart, G.R., 2002. The human Use of Insects as a Food Resource: A Bibliographic Account in Progress. Chapter 20: Food Insects Newsletter, 1(1): 23-25.
8. De Foliart, G.R., M.D. Finke and M.L. Sunde, 1982. Potential Value of the Mormon Cricket (Orthoptera): Tettigoniidae) harvested as a high protein feed for poultry. J. Econ. Entomol., 75: 848-852.
9. Dunkel, F.V., 1997. Food Insect Festivals of North America., 10, Issue #3.