ASSESSMENT OF KNOWLEDGE ON FUNCTIONAL VALUES OF EDIBLE INSECTS IN PERI URBAN COMMUNITIES OF IJEBU ODE LOCAL GOVERNMENT AREA, OGUN STATE NIGERIA

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ABSTRACT
This study examined the knowledge on functional value of edible insect in per urban communities of Ijebu Ode Local Government Area (LGA) in Ogun State. Sixty residents were selected through purposive sampling from 11 communities in the LGA. Primary data collected through administered questionnaire. Both descriptive and inferential statistics were used for data analysis. Descriptive statistics such as simple percentage and frequency count were used. Hypothesis was tested using Pearson Product Moment Correlation (PPMC). The results revealed that about half (48.3%) of the respondents were between 31-40 years. A larger percentage was male (61.7%) and Christian (61.7%). Majority (68%) was married and 63.3% possess tertiary education. About one third of the respondents (33.3%) were civil servants and 28.3% earn between ₦41,000-₦60,000. Cricket, termite, palm weevil, yam beetle, caterpillar, silkworm, and locust respectively were the identified indigenous species of insects being consumed by the people. Also, more of the respondents eat crickets followed by locust and then termites. The results further revealed respondents' knowledge of functional values of edible insects' consumption and constraints to edible insects' consumption. The results of the Pearson Product Moment Correlation revealed that there is no significant relationship between respondent's socio-economic characteristics' and their edible insect consumption at p < 0.05. This study concludes that residents of peri urban communities have good knowledge of functional values of edible insects. It is therefore recommended that there should be more awareness on consumption of edible insects since it is nutritious so that people can benefit from the numerous nutrients of these edible insects.

Key words: functional value, edible insect, Ijebu Ode, pearson product moment correlation

INTRODUCTION

Insects constitute as much as 80% of the animal kingdom. They present an important seasonal source of proteins and are a common part of the menu of a substantial part of human population. Entomophagy is the term used to describe the process of eating insects as a food source. Insects and other related invertebrates serve as a food source for people for tens of thousands of years, all over the planet (Adeoye *et al*., 2014). Hundreds of insect species have been used as human food, some of the more important groups include grasshopper, caterpillars, beetle grubs and sometimes adults, winged termites (some of which are very large in the tropics), bee, wasp, and ant brood (larvae and pupae) as well as winged ants, cicadas and a variety of aquatic insects.

In general, insects are a high source of protein, vitamins, minerals and low in fats. A number of insect or their products were used as food in some parts of Nigeria and to a large extent eaten as tit-bits exclusively by children. The most commonly consumed insects according to FAO (2013) include 31% beetles (*Coleoptera*); 18% caterpillars (*Lepidoptera*), 14% bees, wasps and ants (*Hymenoptera*); 13% grasshoppers, locusts and crickets (*Orthoptera*); 10% cicadas, leafhoppers, plant-hoppers, scale insects and true bugs (*Hemiptera*); 3% termites (*Isoptera*); dragonflies (*Odonata)*; 2% flies (*Diptera*); and others (5%). Insects are often consumed whole but can also be processed into granular or paste forms (Ekpo, 2011).

Most humans in developed countries regard the consumption of insects with some revulsion, and where exceptions occur, insects are generally considered as food more for their novelty than their nutrients, for example, embedded in chocolates or ice cream (Johnson, 2010), or as a means of survival when wilderness adventures go wrong. In many developing countries and among various cultures scattered throughout the world, insects remain a vital and preferred food and an essential source of protein, fat, minerals and vitamins (Durst and Shono, 2010).

Recently, consumption of insects by humans is traditionally practiced in many countries around the world. Over 2000 insect species are edible and has a high nutritional value. Among these species are beetles, caterpillars, bees, ants and flies and other species (Jongema, 2017). Considering the growing population in the world and the increasing demand for production of traditional beef and chicken meat, edible insects should be seriously considered as a source of animal protein (Dreon and Paoletti, 2009). This is especially important as the nutritional value of insects is comparable to commonly eaten meats. Insects are gaining more and more attention worldwide due to many ways of their exploitation (Cerritos, 2011; Fontaneto et al., 2011; Mariod, 2011; Premalatha et al., 2011; Chae et al., 2012; FAO, 2012). Many articles deal with insects in relation to developing countries, harvesting insects in nature and solving the problem of famine (De Foliart, 1992; Ramos-Elorduy et al., 2011).

Insects are classified as one of the most successful groups of animals on earth constituting about 76% of all known species of animals; found in nearly all environments; and widely distributed across aquatic ecosystems, farmlands and forests. Ironically, they have also been rated as the most under-utilized and under-exploited creature on earth by mankind in the time past (Van Huis, 2013). Although there are more than one million described species of insects, scholars have identified over 1,900 species that have reportedly been used as food (FAO, 2013). Generally, the taste and nutritional value of edible insect vary with the species of the insect, the metamorphic stage of the insect, the habitat and its diet (Agbidye et al., 2009).

Studies that focus on edible insect consumption can be beneficial in shifting food systems from large animals. In spite of the seemingly nutritional, economic, environment, and health benefits of insects however, empirical research evidence documenting consumption pattern in Nigeria remains relatively few and that of Ogun State appears almost nonexistence. This study aimed to provide empirical evidence on forest insect as source of traditional food in human diet. Therefore, this study examined the knowledge of peri-urban community residents on functional value of edible insect. The specific objectives are to:

(i) describe the socio-economic characteristics of the respondents;
(ii) determine the type of edible insects' consumed;
(iii) ascertain the respondents' level of knowledge on the functional value of edible insects' consumption; and
(iv) identify constraints to edible insects' consumption among respondents.

Hypothesis of the Study
$H0_1$: There is no significant relationship between socio-economic characteristics of respondents and edible insect consumption in the study area.

MATERIALS AND METHODS
The research was carried out in peri-urban communities of Ijebu-Ode Local Government Area (LGA) and its environs in Ogun State. Ijebu-Ode LGA is located at longitude $3.18°$ E and latitude $6.47°$ N. Ijebu-Ode region covers an area of about 72 km² and the second largest urban centre in Ogun State in terms of population and infrastructural facilities, being next only to Abeokuta the state capital. Since the last two decades, the town has proved to be a rapidly growing and expanding urban centre. Ijebu-Ode has a tropical wet and dry climate characterized by heavy annual rainfall, high temperature and relative humidity. The town is characterized by modern economics and administrative headquarters (Solaja et al., 2017).

Primary data were collected through administration of structured questionnaires to residents in areas surrounding the administrative headquarter of the LGA to serve as peri urban centres. Due to the nature of the study, purposive sampling method was used to select communities from which sixty (60) respondents were randomly drawn for the study. The respondents were selected across these communities; Ogbogbo (8), Odoyanta (8), Iperin (5), Ala (4), Imowo (4), Igbeba (4), Molipa (5), Ilupeju (4), Isowe (4), Atan (4), Irewon (5) and Eruwon (5) communities. Data collected were analyzed using percentage and frequency count. The formulated hypothesis was tested using Pearson Product Moment Correlation Analysis (PPMC). The PPMC was used to analyze the relationship between edible insect consumption and socio-economic characteristics.

Pearson Product Moment Correlation Analysis
The Pearson correlation coefficient is known as the sample correlation coefficient *(r)*, product-moment correlation coefficient, or coefficient of correlation (Neter et al., 1990). It was introduced by Galton in 1877 (Galton, 1887; Galton, 1888) and developed later by Pearson (Pearson, 1896). It measures the linear relationship between two random variables. The pearson product-moment correlation coefficient (Pearson correlation or Pearson's correlation) – is a measure of the strength and direction of association that exists between two continuous variables. The Pearson correlation generates a coefficient called the Pearson correlation coefficient, denoted as *r*–fora perfect positive linear relationship. A value of 0 (zero) indicates no relationship between two variables.

The test statistics is given below:

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - (\sum y)^2]}}$$

where N is number of pairs of scores, $\sum xy$ is sum of the products of paired scores, $\sum x$ is sum of x scores, $\sum y$ is sum of y scores, $\sum x^2$ is sum of squared x scores, and $\sum y^2$ is sum of squared y scores.

RESULTS AND DISCUSSION

Table 1 shows the socio-economic distribution of the respondents. It shows that 23.3% of the respondents were less or equal to 30 years of age, 48.3% of the respondents were between the ages of 31-40 years, 20.0% of the respondents were between the ages of 41-50 years while the remaining 8.4% of the respondents were between the ages of 51-60 years. This implies that majority (71.6%) of the respondents were 40 years and below of age. The peri urban residents are youth. Therefore, their opinion on edible insect consumption cannot be said to be that of the elderly. About 61.7%of the respondents are males while the remaining 38.3%of the respondents are females. This indicates that majority of the respondents are males. Majority (61.7%) of the respondents practice Christianity as their religion, 31.7% practice Islam while the remaining 6.7% of the respondents practice other types of religion. The two prominent religion practiced in the nation are found in the study area so the result cannot be religiously biased. The singles constitute about one third (31.7%) of the sampled respondents while the remaining two third of the respondents (68.3%) are married. The residents are mainly from family setting so their insect consumption and views can be taken as representative of household views especially with the male who are household decision makers constituting the majority (61.7%). Only a minority (1.7%) of the respondents have no formal education, 3.3% of the respondents have primary education, 26.7% of the respondents have secondary education – while the remaining 5.0% of the respondents have other types of education. The majority (63.3%) of the respondents have tertiary education. So the respondents' opinion cannot be those of illiterates or uneducated. A large percentage (33.3%) of the respondents were civil servants, followed by (26.7%) farmers, 16.7% were traders, 10.0% were students while 13.3% of the respondents have other type of occupation. Since majority of the respondents here are not farmers, the edible insect consumption cannot be adjudged to be due to their occupation or environment. Most of the respondents had monthly income of below ₦81,000; only 18.3% of them earn above this amount.

Table 2 shows the types of insect eaten by the respondents. Majority (66.7%) of the respondents eats crickets, termite (51.7%) and weevil (46.7%). Those eaten sparingly are beetle (21.7%) caterpillar (16.7%) and silkworm (10.0%). Locust is however moderately eaten (35.0%). The result shows that crickets, termites and weevil are the commonly eaten insect. This finding is in line with the study of Meludu and Onoja (2018) which submitted that cricket, termite, palm weevil, yam beetle, caterpillar, silkworm, and locust respectively were the identified indigenous species of insects being consume.

Table 1: Socio-economic characteristics of the respondents

Socio-economic characteristics	Frequency	Percent
Age		
Less or equal to 30	14	23.3
31-40 years	29	48.3
41-50 years	12	20.0
51-60 years	5	8.4
Sex		
Male	37	61.7
Female	23	38.3
Religion		
Christianity	37	61.7
Islam	19	31.7
Others	4	6.6
Marital Status		
Single	19	31.7
Married	41	68.3
Educational Status		
No formal education	1	1.7
Primary education	2	3.3
Secondary education	16	26.7
Tertiary education	38	63.3
Others	3	5.0
Main occupation		
Civil Service	20	33.3
Farming	16	26.7
Trading	10	16.7
Schooling	6	10.0
Others	8	13.3
Monthly income		
Less or equal to 20,000	14	23.3
21,000-40,000	16	26.7
41,000-60,000	17	28.3
61,000-80,000	2	3.4
Greater or equal to 81,000	11	18.3
Total	60	100.0

Source: Field Survey, 2018

Table 2: Type of insects eaten

Insect	Frequency	Percentage*
Cricket	40	66.7
Termite	31	51.7
Weevil	28	46.7
Beetle	13	21.7
Caterpillar	10	16.7
Silkworm	6	10.0
Locust	21	35.0

*multiple responses
Source: Field Survey, 2018

Table 3 shows respondents' knowledge on functional values of edible insects. Majority of the respondents agree that edible insects contain mineral e.g. calcium (58.3%), do not contain fats (63.3%), is a healthy source of food for humans (88.3%) and edible insects and its products can be used in place of meats (80.0%). They further disagree with the fact that edible insects do not contain protein (68.3%) lack phosphorus which aids bones and teeth formation (58.3%) and reduce palatability of food (73.3%). In essence, edible insect contain protein, phosphorus and thus not hamper the palatability of food. Also, the result shows that edible insects do add taste to food when fried (81.7%) and is low in cholesterol content (85.0%). There was however no clear opinion as to whether insect can be eaten raw or not. Some (50%) agreed edible insect can be eaten raw while some others (50%) believed it can't be eaten raw. It is therefore safe to conclude that insects can be eaten raw or cooked. The findings gain support from the submission of Kinyuru *et al.* (2009) and Van Huis (2013). These studies found out that edible insects are rich in essential nutrients, but their nutritional value varies greatly depending on the species, stage of life, habitat, and diet of the insect. They also submit that nutritional composition of edible insects is also affected by the preparation and processing methods applied before consumption.

Constraints associated with edible insects' consumption are reported in Table 4. Poor supply and seasonality (83.3%) were the major constraints militating against the consumption of edible insects in the study area. These findings uphold the submission of Alamu *et al.* (2013) which reported the influence of season in availability of common edible insects consumed in Nigeria. Other constraints include unattractive sizes (68.3%), cultural beliefs (58.3%) and irritating physical structure (51.7%).

Table 4: Constraints to edible insects' consumption

Constraints	Freq-uency	Percent-age*
Cultural beliefs	35	58.3
Poor supply edible insects	50	83.3
Unattractive sizes of edible insects	41	68.3
Seasonality nature of edible insects	50	83.3
Insects has irritating physical structure	31	51.7
Unpleasant odour of edible insects	16	26.7
Edible insects contain poison	10	16.7

*multiple responses
Source: Field Survey, 2018

Test of Hypothesis

Pearson Product Moment Correlation (PPMC) analysis was employed to test the hypothesis of this study, to show the relationship between edible insect consumption and socio-economic characteristics of the respondents. The result of the test of hypothesis, presented in Table 5, shows that there is no significant relationship between the socio-economic characteristics of the respondents and edible insect consumption in the study area as age, sex, religion, educational level, main occupation and monthly income do not have any significant relationship with edible insect consumption. Correlation coefficient for age (0.174), sex (0.007), religion (0.048), educational level (0.023), main occupation (–0.074) and monthly income (0.156) were not statistically significant at 5% ($p < 0.05$). This is against the findings of Fadairo *et al.* (2015) and Meludu and Onoja (2018) where education and main occupation were significant factors influencing level of edible insects' consumption. This study shows that there is a significant relationship between the respondent's marital status ($r = 0.26$; $p = 0.045$) and edible insect consumption. This indicates that marriage and consequently household number may contribute to consumption of edible insect.

Table 3: Knowledge on functional values of edible insect consumption

Statements	Yes	No
Edible insects contain minerals, e.g., calcium	8.3	1.7
Edible insects do not contain fats	63.3	36.7
Edible insects is a healthy source of food for humans	88.3	11.7
Edible insect and its products can be used in place of meats	80.0	20.0
Edible insects do not contain protein	31.7	68.3
Edible insects do add taste to food when fried	81.7	18.3
Edible insect is lower in cholesterol content	85.0	15.0
Insects lack phosphorus which aids bones and teeth formation	41.7	58.3
Edible insects reduce palatability of food	26.7	73.3
Edible insects can be eaten raw	50.0	50.0

Source: Field Survey, 2018

Table 5: Pearson product moment correlation analysis showing relationship between edible insect consumption and socio economic characteristics

Variable	r-value
Age	0.174
Sex	0.007
Religion	0.048
Marital status	0.260*
Educational level	0.023
Main occupation	–0.074
Monthly income	0.156

*Significant at 5%
Source: Field Survey, 2018

CONCLUSION

The study concludes that insects' consumption is a common practice and that peri urban dwellers are aware of the functional values of edible insects' consumption. Also, socioeconomic characteristics do not have influence edible insect consumption. It is therefore recommended that there should be more awareness on consumption of edible insects since it is nutritious so that people can benefit from the numerous nutrients of these edible insects.

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