



AWARENESS AND ACCEPTANCE OF EDIBLE INSECTS AMONG WORKERS IN SELECTED RESEARCH INSTITUTES IN OYO STATE, NIGERIA

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ABSTRACT

Insects are one of the commonest arthropods commonly found almost in every habitat worldwide. Many of them are consumed by man in different cultures as snacks for its high protein content. However, advent of civilization has limited the consumption of edible insects among people that grow up or work in towns and cities. This study was therefore carried out to ascertain institutional awareness of edible insects within Ibadan Metropolis. Random sampling technique was used to select one hundred and fifty respondents from four (4) research institutes. These are: Forestry Research Institute of Nigeria (FRIN), National Horticultural Research Institute (NIHORT), International Institute of Tropical Agriculture (IITA) and Cocoa Research Institute of Nigeria (CRIN) in Ibadan. Primary data were obtained through the administration of structured questionnaire. Data were analyzed using descriptive statistics and logistic regression. The study showed that 90.2%, 86.7%, 87.5% and 88.9% of the respondents were aware of edible insects from FRIN, NIHORT, IITA and CRIN, respectively. The result of the logistic regression showed that age, occupation, family size and level of education of the respondents influence the awareness of the importance and consumption of edible insects among the respondents. The finding also revealed that 60.8% of the respondents are willing to eat edible insects while 32.9% showed their unwillingness. From the results, 46.34 – 51.02% of the respondents are not aware of the many benefits provided by edible insects. The study concludes that the socioeconomic status of the household is an important determining factor in the awareness and consumption of edible insects. The study recommends an enhanced extension services that would adequately increase the awareness of the public on the nutritional benefits edible insects.

Keywords: Edible insects, Awareness, Institution, Ibadan, Willingness

Introduction:

Insects are the largest animal group on earth and constitute as much as 80% of the animal kingdom. Edible insects are traditionally consumed in many parts of world (DeFoliart 1997; Ramos-Elorduy 2009) and considered as an important source of food (Belluco *et al.*, 2013; Micek *et al.*, 2014; Shockley and Dossey, 2014). They contain high quality protein, fat, vitamins and minerals (Rumpold and Schlutter, 2013; Makkar *et al.*, 2014). They are healthy, nutritious alternatives to mainstream staples

such as chicken, pork, beef and even fish. The nutritional importance of edible insects and their huge availability have informed their consumption by more than two billion people on a daily basis (Premalatha *et al.*, 2011).

Entomophagy which is widely practiced compares favourably with nutrient and environmental aspects of conventional livestock rearing, and it has the potential to contribute substantially to reducing under nutrition among an expanding global population (Van Huis *et al.*, 2013). Edible



insects can be consumed in various ways either as raw, roasted, or are dried and added to other foods. They can be served alongside regional staples as the main source of protein in a complete meal. All major nutrients are important, but protein is one of the main nutrients required by humans, and protein deficiency leads to severe illness. Protein from animal sources may be especially valuable, as it contains essential amino acids that are not found in many plant proteins. However, protein from animal sources is not always affordable for a large share of the global population (Aiking, 2011). In 2016, the number of undernourished people in the world is estimated to have increased to 815 million although the food production has increased considerably in the past 50 years (Nisbett *et al.*, 2010; Luan *et al.*, 2013; FAO 2017).

In tropical countries insects are used as an important protein source, while westerners are reluctant to use insects as food. The negative attitude and bias against eating insects by westerners have brought serious setbacks to introducing this sustainable food source (Defoliart, 1999). Some other factors notably contributing to the acceptability and purchase decision of insects as food include insect phobia, feelings of disgust, knowledge level, and social demographic factors such as age, household size, household income and region (Liu *et al.*, 2019).

In addition to attitudinal factor militating against the acceptance of edible insects as food is the low level of awareness among some class of people. The culture of eating insects as food or local/indigenous snacks is common among old people in many communities in Nigeria. Civilization and migration of people from rural to urban centers has brought cultural knowledge erosion on the use of many of our local foods and snacks. This is common among the educated families and their children. Most of the edible insects such as

Macrotermes bellicosus (winged reproductive and queen castes of termites), *Zonocerus variegatus* (grasshopper), *Rhynchophorus phoenicis* (palm weevil), *Brachytrupes membranaceus* (Giant African cricket), *Anaphe venata* (African silkworm) and *Cirina forda* (Pallid emperor larva) are found in rural communities and consumed by rural dwellers (Alamu *et al.*, 2013). This study was carried out to document the level of awareness and acceptability of edible insects among workers in selected Research Institutes in Ibadan, Oyo State, Nigeria.

Methodology

Study Area

The study was carried out in four research institutes within Ibadan Metropolis which include Forestry Research Institute of Nigeria (FRIN), National Horticultural Research Institute (NIHORT), International Institute of Tropical Agriculture (IITA) and Cocoa Research Institute of Nigeria (CRIN). Ibadan is located on 3° 5' East of the Greenwich Meridian and Latitude 7° 23' north of the Equator (NPC, 2006).

Ibadan is located between longitude 70 20" and 70 40" East of the Greenwich meridian and between latitude 30 55" and 40 10" North of the equator. The city is in the equatorial rain forest belt and has a land area of between 445 and 455km². Ibadan metropolis is an important commercial centre and it comprises of people of different cultural and socio-economic backgrounds. The major types of livelihood activities in this area include farming, trading and government employment. Predominantly, food crops such as yam, maize, cowpea, okra, melon which reflect the dietary habits of the inhabitants are grown as is clearly seen in the type of meals taken by the people.

Data Collection and Analysis

One hundred (150) copies of structured questionnaire were administered to research



scientists from four randomly selected research institutes out of seven notable research institutes within Ibadan Metropolis, but only one hundred and forty (140) copies of filled questionnaires were valid. The data collected from the respondents include some important socioeconomic features and information on willingness and consumption of edible insects. The data were subjected to descriptive statistics and the result presented in form of frequency tables and percentages. Inferential statistics such as chi-square and logistic regression model were also used to identify the factors influencing the respondents' awareness of edible insects as well as their level of awareness. The explicit form of the function is specified as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \mu_i$$

Where,

Y=awareness of edible insects by respondents which is dichotomous (1 if the respondent is aware and 0 if otherwise)

β_1 = gender (dummy, male = 1, female = 0)

β_2 = age (years)

β_3 = occupation (dummy, public servant = 1, otherwise = 0)

β_4 = marital status (married= 1, otherwise, no = 0)

β_5 = education (years)

β_6 = household size (numbers)

β_0 = constant

$\beta_1 - \beta_6$ = Regression coefficients to be estimated

μ_i error term

Results and Discussion

Socioeconomic characteristics of the respondents

Table 1: Socioeconomic characteristics of respondents

Variable	Frequency	Percentage
Gender		
Male	80	57.00
Female	60	43.00
Age		

The result of the socioeconomic characteristics of the respondents presented in Table 1 showed that 57% was male while 43% were female. Gender is a factor that could influence consumption pattern. This result agreed with finding reported by Verbeke (2015), he noted that males had consumed edible insects more than females, which indicates that males have more adventurous taste orientation and females are more disgusted by edible insects. Majority of the respondents were within 20-39 years of age. The implication is that respondents in this age bracket are at child bearing stage, and this could make them to seek for alternative means of meeting their consumption need. Some studies have reported that the readiness to adopt insects as an alternative to meat is stronger in younger age groups (Scholer *et al.*, 2012; Caparros *et al.*, 2014).

Low income (₦50,000) may have been the reason some respondents (42.1%) had insect as alternative source of protein. Majority of the respondents (47.9%) earned a monthly salary of between ₦50, 000 - ₦100,000. About 50% of the respondents were married with a mean household size of 4 leaving them with the responsibility of taking care of the home thereby resorting to edible insects as an alternative to their regular protein. Most of the respondents (80.71%) had a tertiary education, indicating that respondents are well educated; and such level of education which could enhance their level of awareness and consumption pattern of edible insects.



Less than 20	8	5.71
20-29	62	44.29
30-39	42	30.00
40-49	21	15.00
50 and above	7	5.00
Monthly salary <50,000	59	42.14
50,000-75,000	33	23.57
76,000-100,000	34	24.29
101,000-125,000	10	7.14
126,000 – 150,000	2	1.43
151,000 and above	2	1.43
Marital status		
Single	65	46.43
Married	72	51.43
Divorced	1	0.71
Widow	2	1.43
Household size		
1-3	27	19.29
4-6	103	73.57
7-10	10	7.14
Primary education	6	4.29
Secondary	21	15.00
Tertiary	113	80.71
Total	140	100

Factors influencing awareness of edible insect

The result presented in Table 2 showed the factors influencing awareness of edible insect among the respondents. It was revealed that the estimated parameter obtained for age ($\beta = 0.049584$; $p < 0.10$) was positive and significant at 10% level of probability. This implied that the probability of being aware of edible insect is higher compared among older respondents. The coefficient obtained for education ($\beta = 0.078722$; $p < 0.05$) was positive and

significant at 5% level of probability. The implication is that the more education the respondents are, the more the probability of being aware of edible insect. Education could enhance access to different source of information.

Consumption of edible insect is an indigenous practice. However, level of education has a role to play especially in the spread of the nutritional importance of edible insect. Also, awareness of edible insect was influenced by size of household. This variable was positive and significant at



10% level of probability. This indicates that larger household are more are of edible insect. Large households tend to diversify consumption options to alternative sources in order to meet household demands. This

result was similar to the study conducted by Liu *et al.*, (2019) where, knowledge level and household size have a positive impact on consumer choices of edible insects.

Table 2: Logistic regression estimates of factors affecting the awareness of respondents on the consumption of edible insects

Variable	Coefficient	Std. Error	t-value
Gender	-0.47346	0.489255	-0.97
Age	0.049584*	0.027202	1.82
Occupation	-0.72684*	0.439793	-1.65
Marital Status	-0.37691	0.462752	-0.81
Household size	0.279726*	0.144292	1.94
Education	0.078722**	0.039728	1.98
Constant	-1.59275	1.365461	-1.17

* = P<0.10 **=P<0.05

Awareness of Edible Insect

Result in Table 3 showed the level of awareness on edible insects among the respondents in the study area. More than half (52.54%) of the respondents from FRIN, 48.98% from NIHORT, 52.83% from IITA and 53.66% from CRIN were aware that some insects, especially, termites, crickets, grasshoppers and some beetles are edible. The time of awareness of the respondents since their careers started in their respective institutes varies between 6 and 36 months (Table 4).

Some, however, indicated their awareness for more than 3 years. This is an indication that the knowledge of edible insects is not new to the respondents. The four Institutions are forestry and agriculturally oriented where the study of insects is key. Such institutions host specialists in the study of insects whose research activities have at one time or another addressed the role of beneficial insects in the nutrition and economy of people in the rural areas. Insects such as honeybees produce honey and other hive products that are useful as food and medicine.

Table 3: Awareness of respondents about edible insects

Institution	Responses			
	Yes	Percentage	No	Percentage
FRIN	31	52.54	28	47.46
NIHORT	24	48.98	25	51.02
IITA	28	52.83	25	47.17
CRIN	22	53.66	19	46.34

Table 4: Time of awareness

Institution	Time of awareness (Month)			
	6	12	24	36
FRIN	54	20	44	23
NIHORT	27	20	33	21
IITA	10	50	12	28
CRIN	9	10	11	27



TOTAL	100	100	100	100
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Medium of awareness of edible insect

A total of 29% and 17% of the respondents in FRIN and CRIN respectively knew about edible insects through the radio while 40% each of the respondents in IITA and FRIN got to know about edible insects through the prints media (Table 5). In addition, 50% of the respondents knew about edible insects through workshops in FRIN while only 14% had the knowledge of edible insects through workshops in CRIN. The percentage of the respondents in FRIN who got the awareness of edible through all the media, that is, radio, prints, television and workshops was more than what was observed in NIHORT and CRIN. This may be due to the nature of research activities in FRIN where the study of forests and forests products forms a major component of the research mandates.

The medium of awareness was not limited to radio in all institutions; others include prints, Television and workshops. All institutions got information about edible insects from prints media, except respondents from CRIN. On the average FRIN ranked the highest (37%) and CRIN the lowest (19%) of the total respondents that obtained information about edible

insects from either from radio, prints, television or workshops (Table 5). Workshops, radio, TV shows and prints media have been advocated for in the creation of awareness and promotion of edible insects and their products (Tang *et al.*, 2019). FRIN and IITA recorded the highest percentages of respondents that became knowledgeable of edible insects from different medium, except in workshops where IITA recorded the lowest. This may probably be due to the nature of research activities relating to forest and forests products, especially the Non-Timber Forest Products. This corroborates the report that the large majority of insects in developing countries are gathered from wild populations in nature, in farmlands or in forests (van Huis, 2015).

The effort of extension agents in dissemination of information on edible insects was 36% in FRIN, which is higher than in other research institutes. The results of the sensitization of respondents by extension on edible insects showed that extension agents are also stakeholders in the dissemination of information on edible insects.

Table 5: Medium of awareness

Institution	Medium of awareness			
	Radio	Print	TV	Workshop
FRIN	29	40	40	28
NIHORT	13	20	13	26
IITA	41	40	27	23
CRIN	17	0	20	25
TOTAL	100	100	100	100

Institutional knowledge of edible insects

Result in Table 6 showed the institutional knowledge about edible insects as a source of protein. In FRIN, 39% of the respondents had institutional knowledge of

edible insects as a source of protein while NIHORT, IITA and CRIN recorded 17%, 24% and CRIN, respectively. Existing studies clearly demonstrated that insects are a promising protein source for animal feeds and have the potential to meet increasing



global demands (Rumpold and Schluter, 2013). Reports from other studies (Ozimek *et al.*, 1985; Finke *et al.*, 1989) have shown that protein quality of insects is promising

regarding the availability and digestibility compared to casein and soy but varies and can be improved by the removal of the chitin.

Table 6: Knowledge of edible insects as source of protein

Institution	Response	
	Yes	No
FRIN	29	27
NIHORT	21	37
IITA	27	20
CRIN	23	16
TOTAL	100	100

Respondent’s decision with respect to consumption of edible insect

The willingness of respondents from different institutes to eat edible insects is shown in Table 7. The percentage of the respondents that were willing to eat edible insects was higher in FRIN (29%) when compared to NIHORT (19%), IITA (27%) and CRIN (25%). In line with the study of Kery *et al* (2018) on consumers’ willingness

to eat edible insects, he noted that consumers were more willing to eat insects when they are either mixed into a dish or unrecognizably incorporated into a product. Results that were similar was also obtained in another study, with consumers indicating that they would be most willing to try a biscuit made with insect flour (Conti *et al.*, 2018).

Table 7: Willingness to eat edible insects

Institution	Response	
	Yes	No
FRIN	29	35
NIHORT	19	26
IITA	27	23
CRIN	25	16
TOTAL	100	100

Workshop on edible insects will cause 32% of the respondents in FRIN to show their willingness to consume edible insects while 49% will still not be interested despite a workshop presentation (Table 8). With Workshop/Presentation 32% of the respondents in FRIN are willing to eat edible insects if there is a presentation or workshop on it, 49% are not willing to eat it even if a workshop or presentation is held on it. Of the total respondents in NIHORT 18% are willing to eat edible insects if there is a workshop\ Presentation on it while 27%

are not.28% of the total respondents are willing to eat edible insects if there is a workshop/ presentation on it while 12% of the respondents are not. Of the total respondents in CRIN, 22% are willing to eat it if there is a presentation/workshop on it while 12% are not willing to eat it even if there is a presentation/workshop on it.

This corroborates the earlier report that the provision of information plays a key role in decreasing the rejection of insects as food, both at a personal and social level (Mancini *et al.*, 2019).



Table 7: Willingness to eat edible insects with workshop/presentation

Institution	Response	
	Yes	No
FRIN	22	41
NIHORT	21	31
IITA	31	13
CRIN	25	13
TOTAL	99	98

Conclusion and Recommendation

This study showed that age, education and household size influenced the level of awareness of the respondents on edible insects. However, considerable proportions of the respondents are still unaware of the many benefits edible insects have to offer. This is evident from the results that not all who are aware of edible insects eat it and have the knowledge of their economic benefits. There is therefore the need to create awareness among both literate and non-literate through various media, such as newsprint, workshop presentations and also through sensitization by extension agents.

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