Characterization and Consumption of Edible Insects among Households in Oji River Local Government Area, Enugu State, Nigeria

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KEYWORDS

Characterization
Consumption
Edible Insects
Households
Nigeria

ABSTRACT

This research was on characterization and consumption of edible insects among households in Oji River local government area of Enugu State, Nigeria. Purposive sampling technique was used to select one hundred and twenty (120) respondents used for the study. Data were collected with structured questionnaire and interview schedule. Data were analyzed using descriptive statistics while the hypothesis was tested using simple regression analysis at 5% level of significance. The results revealed that males especially middle aged were more involved in the consumption of edible insects. Large family size of the respondents could be their reason for consuming edible insects to supplement their protein intake. Majority of respondents have basic education hence are well informed of the nutritional value of insects. Majority of the respondents were civil servants and spent between ₦10,000 - ₦20,000 per month on consumption of edible insects. Majority (100%) of the respondents enjoyed eating winged termite, cricket, larva of a species of butterfly (Wiwi or Nwigu) and honey from bee. The hypothesis showed that socio-economic characteristics did not significantly affect the level of consumption of the insects. It was recommended that farming/rearing and harvesting of edible insects should be part of the farming systems in the study area and that more awareness campaigns created.

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INTRODUCTION

Entomophagy is the human consumption of insects as food (Adeoyo Job, Abiodun and Dare, 2014). It is indigenous to Nigeria and most other African nations. The consumption of edible insects seems to be on a steady increase in recent time especially in the study area despite the fact that real insect farming is seemingly unpopular in most part of the country (Ezeano, 2020). According to Van Huis (2016) insects are among the most diverse groups of animals on the planet. There are more than 1 million described species, which is more than half of all known living organisms.Insects are class of animals within the arthropod group that have a chitinous exoskeleton, a three-part body (head, thorax and abdomen), three pairs of jointed legs, compound eyes and two antennae. The utilization and consumption of edible insects is continuously growing as people are increasingly interested in the new resource. According to Ebenebe and Okpoko (2017) traditional dishes are prepared with edible insects but in all of these dishes, edible insect inclusion is optional.

In Achi, Oji River local government area of Enugu State, edible insects are delicacies meant for the bourgeoisie, youths and titled men. It is included in traditional dishes like Tapioca (Abacha) and traditional soups during festivals like traditional marriages, funeral ceremonies, coronations, *ofala* and traditional feasts. Fried locusts and other edible insects are imported into Achi from Maiduguri and other northern states for their ceremonies.

The protein content of insects depends on the metamorphosis stage; adults usually have higher protein content than instars source proteins. Blasquez, Moreno and Camacho (2012) edible insects are richer in proteins (60%) compared to beans (23.5%), Lentils (23.5%) and Soybean (41.1%). It is only fish (81%) that surpasses edible insects in protein content.

According to Ezeano (2020) with decline in bush meats as a food source in Nigeria due to deforestation and diseases associated with wild life consumption, edible insects could play a more important role in food security The supply of most edible insects is scarce and occurs mainly during the rainy season (Ebenebe, Amobi, Udegbala and Ufele, 2017). In spite of the seemingly nutritional, economic, environment and health benefits of edible insect, empirical research evidence documenting edible insect farming and consumption pattern in Nigeria remains relatively few (Ebenebe *et al*. 2017) and (Meludu and Onoja, 2018).

The problem is that there is a serious shortage of animal protein in the diet of most Nigerians and edible insect consumption can be an alternative source which this research is intended to fill.

According to Ebenebe and Okpoko (2015) the shortage of animal protein in the diet of Nigerians and other developing countries necessitates a search for alternative animal protein source to augment the conventional meat proteins in meeting the animal protein needs of the populace. Thus this research is an attempt to bridge the gap between animal nutrient deficit and human population growth rate as well as managing the health risk associated with meat consumption. Therefore, insect consumption as an alternative source of nutrients has been recommended to form integral aspect of the nation's traditional farming system and consumption.

Objectives

The main objective of this study was the characterization and the consumption of edible insects among households in Oji River local government area of Enugu State. Nigeria. Specially, the study described the socio-economic characteristics of the respondents, identified and characterized the major edible insects predominant in the area, determined the level of consumption of edible insects in the study area.

Research Hypothesis

The hypothesis stated that Socio-economic characteristics do not significantly affect the level of consumption of the insects in the study Area and was tested at 0.05 level of significance

This study has provided the populace with information on the characteristics of edible insects and it serves as a resource material to other researchers who might be interested in studying edible insects in their respective locations.

METHODOLOGY

Research Design

A survey research design was adopted for the study which sampled individual units of a population and questionnaire was used to elicit data from the respondents in the study area.

Area of the Study

This research was carried out in Oji River Local Government Areas of Enugu State, Nigeria. Oji River is located at Latitude 06˚16N and Longitude 07˚16E with Altitude of 140m above sea level. The mean annual rainfall is 2000mm, while the annual temperature ranged between 26.8˚C and 32.5˚C; the average Relative Humidity is 84%. Oji-River is bounded to the south by Anambra state. The people of the study area are mainly farmers and the area is well suited for natural breeding of edible insects. The major towns in Oji-River are: Achi Agu, Achi Uno, Inyi, Awlaw, Akpugoeze and Ugwuoba.

Population of the study

All the households involved in harvesting, and consumption of edible insects formed population for the study and is therefore infinite.

Sampling Procedure and Sample Size

Stage 1: Oji-River local government area was purposively selected for this study because it is naturally endowed with the ecology, soil type and vegetation that support the natural breeding and rearing of these edible insects.

Stage 2: Four (4) towns where these edible insects breed naturally were purposively selected; Achi-Uno, Achi-Agu, Awlaw and Inyi;

Stage 3: One hundred and twenty (120) respondents that are popularly involved in harvesting, and consumption of these edible insects were purposively selected in this order Achi-Agu (30) ,Achi-Uno (30) ,Awlaw (30), and Inyi (30) giving a total sample size of 120 respondents.

The instruments used for data collection were structured questionnaire for literate respondents and interview schedule for illiterate respondents The instruments were validated by a Statistician and an Extensionist from Enugu State University of Science and

Technology. Their corrections were used to produce the final draft. Responses with numerical values were subjected to reliability test using Kuder Richardson (KR21) which gave a value of 0.86 (86%) ,indicating high level of reliability.

Method of Data collection

The researcher trained two Research Assistants that helped in data collection. The structured questionnaire was given to literate respondents who filled them on the spot while the interview schedule was used by the Researchers to elicit information from the illiterate respondents by asking them questions and filling in the responses into the questionnaire.

Data Analysis

Data collected from the respondents were analyzed using percentage, frequency and mean scores.

Objectives 1,2,3 and 4 were achieved by use of mean, percentage and frequency counts, while hypothesis 1 was tested by use of simple regression analysis at 5% level of significance. The null hypothesis was accepted if the p- value is greater than 0.05 and rejected if otherwise

RESULTS AND DISCUSION

Socio-economic characteristics of respondents.

Table 1 shows the socio- economic characteristics of the edible insect consumers in the study area.

Table 1: Socio-economic characteristics of the respondents

	Frequency	**Percentages**	**Mean**	**Standard deviation**
Sex				
Male	64	53.33		
Female	56	46.67		
Age				
Less than 15	3	2.50	34.3	0.1
15-25	50	41.67		
26-40	24	20.00		
41-60	35	29.17		
Above 60	8	6.67		
Marital Status				
Single	71	59.17		
Married	45	37.50		
Divorced	0	0.00		
Widow	4	3.33		
Household size				
1 – 4	43	35.83	5.7	0.2
5-8	56	46.67		
9-12	21	17.50		
Above 12	0	0.00		
Educational Attainment				
No formal education	8	6.67		
Primary education	11	9.17		
Secondary education	56	46.67		
NCE/B.Sc.	40	33.33		
M.Sc. and above	5	4.17		
	120	100.00		
Income spent on edible insect	43	35.83		₦14047.387
Less than ₦10,000/month				
₦10,000-₦20,000/month	43	35.83		
₦21,000- ₦30,000/month	13	10.83		
₦31,000-₦40,000/month	16	13.33		

₦41,000-₦50,000/month	5	4.17		
Occupation				
Full-time farmer	21	17.50		
Civil/ public servant	64	53.33		
Part-time farmer	21	17.50		
Edible insect harvester	14	11.67		
Membership of social organization				
1 -2	72	60.00	2.8	0.01
3-4	24	20.00		
5-6	13	10.83		
above 6	11	9.17		
Total	**120**	**100.0**		

Sex: Table 1 shows that the males constitute the majority (53.33%) while the female (46.67%) constitute the minority. The implication of this finding is that males are more involved in the consumption of edible insects in the study area.

Age: Table 1 shows that the majority (41.67%) of the respondents are between the ages of 15-25, 20.00% of them are between the ages of 26 to 40, This implies that youths constitute the majority of the people that consume insects in the study area followed by middle aged people. This finding agrees with apriori expectation that youths in the study area enjoy eating edible insects

Marital Status of the Respondents: Table 1 shows that the majority (59.17%) of the respondents are single, 37.50% of them are married. This confirms the apriori expectation that youths constitute the majority of the insect consumers. This is probably because they have enough energy required in the harvesting of these insects.

Household size of the Respondents: Table 1 shows that the majority (46.67%) of the respondents have between 5 – 8 members in their family, The respondents have large family size with mean of 6 which is common in the study area. Probably they consume a lot of insects to complement or supplement their feeding.

Educational Background of the Respondents: Table 1 shows that majority (46.67%) of the respondents attained secondary education level,while, 33.33% have acquired their NCE/B.Sc. certificates,. The implication is that the respondents are well informed and knows the nutritional value in the consumption of insects.

Monthly Income of Respondents spent on Edible Insects consumption: Table 1 shows that majority (35.83%) of the respondents spent between ₦10,000-₦20,000 every month, on consumption of edible insects. This is really a lucrative business in the study area and no wonder youths are mainly involved in the enterprise.

Occupation of the Respondents: Table 1 shows that the majority (53.33%) of the respondents are civil/public servants, while 11.67% of the respondents harvest edible insects. The implication is that the respondents probably used the enterprise to augment their poor salaries.

Number of Social Organization the Respondents belonged to: Table 1 shows that the majority (60.00%) of the respondents are members of 1 to 2 social organizations, 20.0% of the respondents belonged to 3 to 4 organizations. The implication is that the respondents are well exposed and have high interaction which informed the knowledge of the nutritional value of the insect.

Table 2 shows that majority (100%) of the respondents correctly characterized the following insects cricket, winged termite, soldier termite *,omuru ,ikpuru,* grasshopper, *egu* and *wiwi* or *nwigu* describing their features and habitats.This agreed with insect characterization of Ezeano, (2020)

Table:2 Characterization of some edible insects.

Insects	Features	Habitat	%
Black aphids (Okpo)	Has two thorns on the head	lives in Agidi local cowpea, Ichakiri	80.5
Praying mantis(Nkori)	has slimmy cylindrical body with long antennae	Green schrubs	60.5
Cricket (Abuzu)	Adults has wings while the nymph has small wings	grass land areas mostly seen around April, May, June and July), burrows and lives inside the soil, the adult male and female fly in the night during mating season and are called Ebio	100.0
Winged termite (Aku)	Has slimmy white wing	Seen normally in the night under light around May/June). Lives in the termitarium or termitary (Mkpu)	100.0
Soldier termite (Akika)	with red big head	Termitary	100.0
Queen termite (white larva),	Rounded fatty white body	Lives in the termitarium or termitary (Mkpu)	100.0
Buru ishikwuo ukwo (leafy crops Akidi)	has no head but cylindrical structure	Found in local cowpea (Akidi)	50.5
Okochi (Agbada)	has protruding eyes	mainly found in Agba tree during dry season.and dry banana leaves	60.0
Shi-shishi brown Shi-shishi green		Dry banana leaves Green banana leaves	45.0
Omuru; beetle found around January to march	with shiny green body	Oka, Okpokoro, ububo,utompuma,cashew	100.0
Ikpuru; beetle found around January to march	with brown body	Oka, Okpokoro, ububo,utompuma,cashew	100.0
Zenocerous variagatis(Otuwom); green grasshopper (bitter leaf, cassava), Grasshopper; brown (Elephant grass), Gbaratu,(Brown), Ji-ji-ji, Locust; (Igurube),	Thorney hind leg with double wings	Bitterleaf, Cassava leaf, Elephant grass, All grasses	100.0
Okpanka;	Has smooth body	Okpokoro ,oka ububo,utompuma	50.0
Ogwogorogwo	with thorns	Oka,ububo utumpuma ,cashew, akpaka	60.0
Upanata	with hairy body	Alulu, Okpokoro oka, ububo,utompuma	70.5
Egu–	Red and Black with thorns	Umbrella tree, Ukpaka, Oka, Ukwa	100.0
Wiwi or Nwigu;	bluish black	Ukwa, Akpaka, Oka ububo,utompuma	100.0
Ikpuruala	Larva with big jaw	lives inside the soil under oka,ububo,utompuma okpokoro	60.5
Mgbaba	with hairy body	,found in Oka, ububo,cashew, utompuma	50.0
Rhinozerus beetle	black with thug like elephant	found in oil palm tree	50.0
Raffia palm larva; pupa with small wing, Raffia palm caterpillar; larva,	Whitish body	Found in raffia palms	55.0

Raffia palm beetle	Has thick wing	found in raffia palm trees.	60.0
Onumanya, oil palm- greenish	Has thick wing	found sucking fresh palm wine	60.5
Kpukpakpa	with big head and claws	found in grassland areas	50.0
Mgbangba	black ant with fatty big belly	seen during the onset of rain (lives inside the soil and flies like winged termite)	65.0
Mbe	winged termite	end of rainy season around October lives inside the soil	80.0
Mkpoma	winged termite	onset of rainy season March /April lives inside soil	
Nwamiri			85.0
		lives inside the soil found around june/july	
	winged termite		75.0
Giant black scorpion	Has jointed black body with tail.	found in grass land area	30.0
Okukoro with rough wing	Green with long legs	seen on green hedges Ukpodu, Aboshi	60.0
Ohuha with smooth wing	Has smooth slimmy body	green hedges	65.5
Aboke- greenish	Has greenish body	found in all schrubs	50,0
Ami or Apia	slimmy with pointed body	found in grass land areas.	75.0
Yam beetle (Ebe)	Has dark hard wing	lives inside the soil in yam farms	60.0
Date Palm larva	Has whitish soft fatty body	lives in date palms	35.5

Table 3 revealed that the following insects are consumed at high level; Cricket ($\bar{X}$ = 3.09), Wiwi ($\bar{X}$ = 3.46), Omuru and Ikpuru (beetle) ($\bar{X}$ = 3.27), Winged termite ($\bar{X}$ = 3.96). Grasshopper ($\bar{X}$=3.42),and honey from bee ($\bar{X}$=3.72).The rest have low level of consumption. This indicates that the insects highly consumed are the ones readily available and accessible in the area. This observation is in agreement with the report by Van Huis *et al*. (2013) that most commonly consumed edible insects are beetles, grasshoppers, locusts and crickets, cicadas, leafhoppers, plant hoppers, scale insects and true bugs, termites, dragonflies.

Table 3: The respondents' level of consumption of some edible insects

Insects	VHL	HL	MH	LL	VLL	Mean	Remark
Cricket	24	24	35	13	24	3.09	**
Wiwi	48	13	21	22	16	3.46	**
Omuru$ Ikpuru	37	22	24	10	27	3.27	**
Winged termite	49	34	22	13	2	3.96	**
Grasshopper	10	22	16	32	40	3.42	**
Caterpillars	5	8	35	27	45	2.18	*
Locust	5	30	35	27	23	2.73	*
Honey Bee	23	20	32	30	35	3.72	**
Praying mantis	19	11	10	32	48	2.34	*
Date palm larva	0	3	19	11	87	1.48	*

** High consumption *low consumption

Test of hypothesis

From Table 4, the following regression equation was generated**.** Level of consumption (Y) = 7.576 - 1.019X1 - 0.283X2 + 0.148X3 - 0.665X4- 0.457X5 +0.120X6 -0.589X7 + 0.518X8+ µ .Where, Y =level of consumption of the insects, X_1 =Sex, X_2 =Age of respondent (years), X_3 = Marital status of respondent, X_4 = Household size(number), X_5 = Educational Attainment, X_6 = Income from sale of edible insect(₦), X_7 = Occupation of respondent, X_8 = Membership of social organization, µ =Error term.The coefficients result in table 7 indicates significant positive correlation linking membership of social organization to level of consumption of insects. The table indicates that there is a significant negative correlation linking sex, age, household size, educational attainment and occupation to level of consumption of insects. Finally, the table indicates that there is a positive non-significant correlating marital status and income spent on edible insect consumption in the area. This finding is in agreement with Ezeano (2020) that consumption of edible insects in Oji River is widespread and is not based on status.

Table 4: Level of consumption of the insects and socio-economic characteristics of respondents in the study area.

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	7.576	.173		43.684	.000
Sex	-1.019	.145	-.356	-7.019	.000
Age	-.283	.107	-.205	-2.654	.009
Marital status	.148	.130	.070	1.144	.255
Household size	-.665	.181	-.329	-3.668	.000
Educational Attainment	-.457	.096	-.290	-4.772	.000
Income spent on consumption of edible insect	.120	.161	.098	.749	.455
Occupation	-.589	.127	-.361	-4.626	.000
Membership of social organization	.518	.105	.359	4.922	.000

Summary

This research analyzed the characteristics and the consumption of edible insects among households in Oji River local government area of Enugu State. The study revealed that middle aged males are more involved in the consumption of edible insects in the study area. Majority of respondents have basic education hence are well informed of the nutritional value in the consumption of insects. The majority of the respondents are civil servants who spent ₦10,000 - ₦20,000 per month on consumption of edible insects. Majority of the respondents enjoy eating termite, cricket, wiwi, Omuru/Ikpuru (beetle), grasshopper, and honeybee. The result of the hypothesis showed that socio-economic characteristics do not significantly affect the level of consumption of insects in the study area. This implies that the level of edible insect consumption is not dependent on the socio-economic characteristics hence anybody can consume it because it is affordable when compared with other sources of animal protein.

CONCLUSION AND RECOMMENDATIONS

This study revealed that males are more involved in the consumption of edible insects in the study area and that middle aged constitute majority of the consumers

Based on the findings of this study, the following recommendations were made:

Mass rearing of edible insects would be the most appropriate solution for its availability all year round hence more studies should be conducted on the development of techniques for mass rearing of edible insect species and more campaigns on nutritive value

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