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Consumer perception and attitude towards grasshopper as an alternative source of protein in Katsina state Nigeria

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Abstract

The study was conducted to assess consumer perception and attitude towards grasshopper as an alternative source of protein in Katsina State Nigeria. A pilot study was conducted using fifty questionnaires covering the three senatorial zones to ensure clarity and ease of understanding of the questionnaire by the respondents. All lapses observed were addressed before the production of the final questionnaire. The Cronbach's alpha based on standardized items used for the pilot testing was found to be 0.887. A random sampling procedure was used to select a total of 600 respondents from the three senatorial zones in the state. Data were collected with the aid of questionnaires to obtain information on consumer's perception on grasshopper consumption in relation to economy, nutrition, health and environmental factors. The data obtained was analyzed using descriptive and inferential statistics. Findings show 87.9 % of the respondents consume grasshopper, they also consider it a suitable diet for humans (72.2%) with no substantial risk to human health (66.9%). The study concludes that insect consumption is a common practice in Katsina State and therefore recommends public awareness creation and public education on the health and nutritional benefits of grasshoppers and other edible insects to mankind and the establishment of insect farming training centres across the state. It was also recommended that the concentrations of heavy metals and other possible contaminants that can be obtained from the environment should be regularly assessed in order to ensure that they are within the acceptable limits.

Keywords: Grasshopper; Consumption; Protein; Food; Perception

1. Introduction

Global demand for increased food supply, especially animal protein has been linked to the human population increase which was projected to reach over 9 billion by 2050 (FAO, 2013; Grafton *et al*., 2015; Park and Yun, 2018). This increase in population coupled with an increasing demand for animal protein has necessitated the need to rethink our food habits, particularly those related to meat consumption, as such Insects as food and feed emerge as an especially relevant issue in the twenty-first century due to the rising cost of animal protein, food and feed insecurity, environmental pressures, population growth , problems associated with red meat consumption and increasing demand for protein among the middle classes. However, our land and energy resources are too limited to produce enough food to meet the growing demand. In order to fulfil this demand, alternatives food sources have to be found (Fred, 2013). One of these alternatives is entomophagy, which is the consumption of insects as food (*Steggerda, 2015*). Insects are a good alternative because they contain protein, good fats and are high in calcium, iron and zinc (van Huis, 2012). Insect farming is more sustainable and environmentally friendly than other protein sources because, insects have a high food conversion rate which means that they need relatively less food to produce the same amount of protein, than for example cattle. Moreover, insects emit considerably fewer greenhouse gases than most livestock (Van Huis, 2012, Akhtar and Isman 2018)

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Entomophagy is the practice of eating insects - including arachnids (tarantulas) and myriapods (centipedes). The word "entomophagy" derives from the Greek term éntomos, or éntomon, meaning, "insect(s)," literally meaning "cut in two," referring to an insect's segmented body, and phăgein, "to eat." Combined, the two terms mean, "insect eating."

As of 2019, Nigeria's per capita daily protein intake (45.4 g) was lower than both the minimum per capita daily protein intake (53.8 g) recommended by the Food and Agriculture Organization (FAO) and the average daily intake (64 g) around the world, indicating that the nation is suffering from a protein deficiency (Metu *et al*., 2016; Akerele *et al*., 2017; Protein Challenge, 2020).

The survey further points out that Nigeria ranks below the bar in the global food security index with a protein per capita – daily intake lower than the worldwide standard. This is a major burden that requires continuous interventions to combat and reduce the nutrition crisis in Nigeria.

Ebenebe *et al*., (2017) stress the need to harness the potentials of cheap, environmentally friendly animal protein sources like edible insect to augment the deficit. Furthermore, Ebenebe *et al*., (2017) cited British Ecological Society (BES, 2013) reporting that edible insect has a potential solution to the problem of our ever increasing demand for food. The report also elicited the benefits of entomophagy in relation to social, health and environmental realities.

Entomophagy is heavily influenced by cultural and religious practices. Insects are commonly consumed as a food source in many regions of the world. However, some people view entomophagy with disgust and associate eating insects with primitive behavior. This attitude has resulted in the neglect of insects in agricultural research as it is only recently that entomophagy started to capture public attention worldwide (FAO, 2013).

Globally, grasshoppers, locusts and crickets (Orthoptera) account for 13 percent of the most common insects consumed even though caterpillars (Lepidoptera), are the most popular insect consumed in sub-Saharan Africa (FAO, 2013), Shortage of animal protein in human diets is more severe in Africa and other developing nations of the world and is currently linked to high rate of infant and maternal mortality (UNICEF Nigeria, 2015). Insects have been eaten by humans for tens of thousands of years, and they still retain an important place as a traditional food in many parts of the world. Acceptance may lag in some Western nations, but it is widely estimated that insects are currently regularly consumed by about two billion people, around a quarter of the world's population (Josh, Flore and Frøst, 2017). FAO (2013) cited Kellert, (1993) saying "It is safe to say that, by and large, negative perceptions surrounding insects are fully entrenched in Western societies".

Insects are a highly nutritious and healthy food source with high fat, protein, vitamin, fibre and mineral content. The nutritional value of edible insects is highly variable because of the wide range of edible insect species. Even within the same group of species, nutritional value may differ depending on the metamorphic stage of the insect, the habitat in which it lives, and its diet. For example, the composition of unsaturated omega-3 and six fatty acids in meal worms is comparable with that in fish (and higher than in cattle and pigs), and the protein, vitamin and mineral content of meal worms is similar to that in fish and meat (FAO, 2013, Akhtar and Isman, 2018, Guiné, Correia, Coelho and Costa, 2021). Many authors have documented nutritional and other health benefits of edible insects (Banjo *et al.*, 2006; Braide *et al.*, 2010; Ebenebe *et al.*, 2007; Edijala *et al.*, 2009; Ekpo and Onigbinde, 2004; Nzikou *et al.*, 2010). Protein content range from 21 to 65% (crude protein) which compares favourably with what obtains in meat and fish (Braide *et al.*, 2010; Ebenebe *et al.*, 2007; Edijala *et al.*, 2009; Ekpo and Onigbinde, 2004; Womeni *et al.*, 2012).

2. Material and methods

The survey was carried out in the three senatorial zones of Katsina State. Three local governments were selected in each zone. All the local government areas involved are agrarian regions.

2.1. Questionnaire

The questionnaire prepared in English language was adapted from questionnaires of previous studies. Prior to data collection, a pilot study was conducted using fifty questionnaires covering the three senatorial zones to ensure clarity and ease of understanding of the questionnaire by the respondents. All lapses observed were addressed before the production of the final questionnaire. The first part of the questionnaire covered the Socio-demographic information of the respondent, such as gender, age and education level. The other parts focused on the respondents' personal views, economic, nutritional, health and environmental issues relating to consumption of grasshopper and other edible insects.

2.2. Reliability of the Instrument

Cronbach's alpha score was run to determine internal consistency of the research instrument. The Cronbach's alpha based on standardized items used for the pilot testing was found to be 0.887.

2.3. Survey method

The study was conducted using 10 enumerators (research assistants) who were given training on the questions and administration of questionnaires before the pilot testing. The questionnaires were validated by a team of experts from the National Bureau of Statistics, Katsina office. A total of 600 respondents were randomly selected for the study. The respondents therefore included adults, teenagers, children, rural dwellers, urban dwellers, rich class, average income, low income, edible insect traders, local farmers, large-scale farmers, self-employed and civil servants. Information was collected using well-structured questionnaire/oral interviews. In situations where the respondent is not literate enough, structured oral interview was used with the questions asked exactly the same way they were written in the questionnaire and responses recorded by the interviewer. Apart from the biodata, other questions aimed at eliciting information from respondents on the subject matter were based on open-ended design. The questionnaires were administered using one-on-one method to ensure high rate of return. Information obtained were analyzed by coding them into perspectives held by the respondents' acceptance and the factors that influenced their acceptance.

2.4. Data analysis

Data collected on personal details of respondents were organized and then analyzed using descriptive statistics in SPSS V-16 software while information they provided on the set objectives were grouped according to the perspective they held.

3. Results and discussion

Bio-Data of the respondents

Table 1 Distribution of respondents' Bio-Data

Gender	**Percentage (%)**
Male	68.6
Female	31.4
Age (Years)	
M(18-34)	63.6
F(18-34)	26.4
M(Other)	6.2
F(Other)	3.8
Educational Level of the Respondents	
Primary	4.48
Secondary	33.76
Higher Institution	57.28
Non Formal	4.48

Source: Field Survey, 2023, SPSS V.16

Results of the study reveals that the majority of the respondents (57.28%) bagged higher degrees, both sexes (male = 69.8% and female = 30.2%) were fairly represented in the study. Majority of the respondents were male between the ages of 18-34 (63.6%) (Table 1).

Table 2 Distribution of respondent's acceptance and the factors that influenced their acceptance of Grasshopper consumption

Statement	**Percentage response**	**decision**
Do you eat Grasshopper?	87.9	accepted
Do you consider Grasshopper as exotic food?	67.7	accepted
Grasshoppers are not suitable for human consumption.	25.1	rejected
Do you consider grasshopper as a protein source?	87.8	accepted
Grasshoppers are more sustainable alternative to other sources of animal protein.	82.7	accepted
Grasshopper provide protein foods at cheap prices	86.4	accepted
Grasshoppers have poor nutritional value	33.4	rejected
Edible insects possess unique nutritive properties	84.7	accepted
Grasshoppers are a good source of energy	72.9	accepted
Insects have high protein content	78.6	accepted
Grasshopper proteins are of poor quality compared with other animal species	67.4	accepted
Grasshopper contain bioactive compounds beneficial to human health	87.7	accepted
Grasshopper provide essential amino acids, group B vitamins and contain dietary fibre necessary for humans	92.1	accepted
Grasshopper contain minerals of nutritional interest, such as calcium, iron and magnesium	76.8	accepted
Consumption of edible insects could help mitigate hunger	71.9	accepted
Insects are used by some people in traditional medicine	88.8	accepted
Grasshopper consumption is associated with taboos and food neophobic.	49.1	rejected
Eating grasshopper poses no substantial risk to human health	70.2	accepted
Grasshopper collected from the wild may be contaminated with pesticide residues	83.3	accepted
Insect and insect-based foods are often infected by pathogens and parasites	74.3	accepted
The consumption of Grasshopper and derived foods depends on availability	93.1	accepted
Consumption of Grasshopper is seasonal or if available may be all year round	80.5	accepted
Personalities/influencers can encourage people to consume insects	84.7	accepted
The market for edible insects is expected to decline in the future	32.9	rejected
Insect consumption is independent of marketing campaigns	67.6	accepted
Grasshoppers difficult to find on sale in street markets	34.0	rejected
Edible insects easy to find on sale in supermarkets	42.0	rejected
Production of chicken protein requires much less water than insect protein	88.3	accepted
Loss of biodiversity is lower with insect production compared to other animal food production	76.8	accepted
Insects are used as a means of pest control for some cultivated crops	86.5	accepted

Source: Field Survey, 2023, SPSS V.1

Analysis of the responses in table 2 above showed that 87.9% of the respondents indicated that they consume grasshopper and 72.2% consider it a suitable diet for humans although 67.7% consider grasshopper an exotic food. Majority of the respondents acknowledged that they consume grasshopper to supply body with protein (87.8%) and

energy (72.9%). The finding of this study corresponds with that of Mutungi *et al*., (2019) who reported that edible insects play an important role in the food culture of Africa. Additionally, (Mbabazi, 2011) assert that grasshoppers are considered as a source of energy and protein in Uganda.

The response to the question about whether insect-based dishes would be treated as delicacies was negative (42.6%), hence decreasing the possibility of offering them in restaurants or special occasion.

On the economy, 82.7 % of the respondents indicated that grasshoppers are sustainable alternative protein source, 86.4% are of the view that they are cheap protein sources. 67.6 % indicated that insect consumption is independent of market campaigns. Only 34.0% indicated that it is difficult to find grasshoppers in the street market, and 42% indicated that grasshoppers can be found in supermarkets.

Most respondents acknowledged that personalities and campaign may influence more people to consider insect based dishes and they believe that the market for edible insects is expected to improve in the future (table 2). On reason for grasshopper consumption some respondents indicate that they consume grasshopper just for health reason as they believe that edible insects possess unique nutritive properties such as provision of essential amino acids, group B vitamins and dietary fibre necessary for humans (table 2). Raheem *et al.,* (2018) also found that some cultures associate insect consumption with various health benefits beyond nutrition.

Allergic reaction, food safety issues and fear of toxicity, may deter consumer to enjoy the obvious nutritional value of edible insect, however most of the respondents believed that eating grasshopper poses no substantial risk to human health (70.2%) despite their believe that insect and insect-based foods are often infected by pathogens and parasites, (74.3%). Contamination with pesticides and infection by pathogens and parasites can be a threat to consumption of grasshopper and other edible insects. This can result from the methods of collection, preservation and preparation. There is therefore the need for regular monitoring of the concentration of heavy metals and other likely contaminants in order to ensure safety in their consumption. Responses indicated that environmental issues such as loss of biodiversity, the need for large amounts of water and space is likely to be less with grasshopper rearing when compared to other animal protein sources (Table 2).

4. Conclusion

It can be concluded from the findings of this study that the consumption of grasshopper is widely accepted within the study area. The consumers are also aware that it has some nutritive properties but there is still need for public enlightenment on the health and nutritional benefits of edible insects to mankind. This will be more effective after thorough researches so that the campaign is supported by facts and figures. There is also the need for regular studies on the levels of heavy metals and other contaminants in grasshopper and other edible insects so as to ensure safety in their consumption and timely intervention if need be. Responses have also shown a promising benefit from the economic point of view as establishment of insect farming centers will help in boosting the citizens financially in addition to providing cheap protein thereby improving health and nutrition.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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