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Processing, Uses and Constraints to Edible Insect Consumption in Ekiti State, Nigeria

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ABSTRACT*: Insects have played an important role in the history of human nutrition, especially as important sources of high protein. This study investigates the processing, uses and constraints to edible insect consumption in Ekiti State. The study area was stratified based on ecological zones into; tropical rainforest and derived savanna. Four local government areas were selected from each ecological zone, and two villages were selected from each LGA. Structured questionnaires were administered to twenty (20) respondents in each of the eight selected villages. Field observations revealed that the majority of the respondents were female (65%), with (48%) of them above 30 years and (41%) of the respondents were farmers. The result revealed that six (6) insects were consumed by the respondents in the study area, with Marcrotermes nigeriensis (31%) being the most consumed insect, followed by Rhynchophorus phoenicis (22%), Cirina forda (20%), while Gryllotalpa africana (6%) was the least consumed insect. The result on the functional values of edible insects revealed that (32%) of the respondents stated that edible insects are rich in protein, while (25%) consume insects as meat for a cheaper alternative source of protein. Another (18%) stated that edible insects are medicinal. The result shows that the commonly used processing method by the respondents is roasting (44%). Lack of knowledge of the nutritional values and seasonal availability were the major challenges against the consumption of edible insects in the study area. The study recommends creating public awareness about the health and nutritional benefits of these edible insects, alongside adopting improved processing and preservation techniques.*

KEYWORDS: edible insect, processing, uses, constraints, Ekiti state.

INTRODUCTION

Insects are categorized as one of the most successful group of animals on earth constituting about 76% of all known species of animals. They have also been rated as the most under-utilized and

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under-exploited creatures on earth by mankind in the time past. According to Van (2013), insects are eaten as a delicacy in many parts of the world, particularly in the tropics. In developing countries and among various cultures dispersed worldwide, they remain an important and preferred food serving as a source of protein, fat, minerals, and vitamins (Durst and Shono, 2010). The most commonly consumed insects according to FAO (2013), include beetles (Coleoptera) caterpillars (Lepidoptera) bees, wasps and ants (Hymenoptera), grasshoppers, locusts and crickets (Orthoptera), cicadas, leafhoppers, plant-hoppers, scale insects and true bugs (Hemiptera), termites (Isoptera), dragonflies (Odonata) flies (Diptera). The adverse effects of malnutrition in developing countries cannot be over-emphasized, most especially in rural communities and among people with low incomes due to insufficient availability and high cost of animal protein sources. Malnutrition problems are attributed to mere ignorance of edible insects around them; some forest edible insects are high in proteins and can be consumed as an alternative cheap source of protein, which could reduce the level of malnutrition in most developing countries if given adequate sensitization and research attention.

As long as protein-energy malnutrition in developing countries prevails in developing countries, the search for low-cost, nutritious and easy-to-prepare locally available complementary foods will continue (Solomon *et al.*, 2008). Protein deficiency has been a serious cause of illness and death in many developing countries where protein foods are in short supply and thus not within the reach of low-income households (Ojiako *et al*., 2010). The insufficient availability of common animal protein sources, and the high cost of the few available plant protein sources, should, as a matter of urgency, prompt intense research into the possible exploitation of the nutrient potentials of insects. Edible insects can be a good source of not only protein but also vitamins, minerals and fats. Consumption of edible insects should be encouraged; they can be reared for their high nutritional qualities and sold to the populace that regards them as delicacies. However, this study is designed to investigate the processing, uses, and constraints of edible insect consumption in Ekiti State.

METHODOLOGY

Study area

The study was carried out in Ekiti State, Southwest Nigeria. The state covers about 7,500 km^2 of land mass located between Longitude $4°5^1$ and $5°45^1$ East and Latitudes $7°\ 15^1$ and $8°\ 5^1$ North of the Equator with a population of 3,592,200 (NPC, 2022). The state enjoys a tropical climate with two distinct seasons: the wet season between April to October and the dry season between November to March. Temperature ranges between 21°C and 28°C, with little variation throughout the year. The mean annual precipitation in the southern part of the state is about 1,700 mm, and in the northern part is hardly over 1,500 mm (Adebayo, 1993). There are two ecological zones in Ekiti State: the tropical rainforest and the derived savannah

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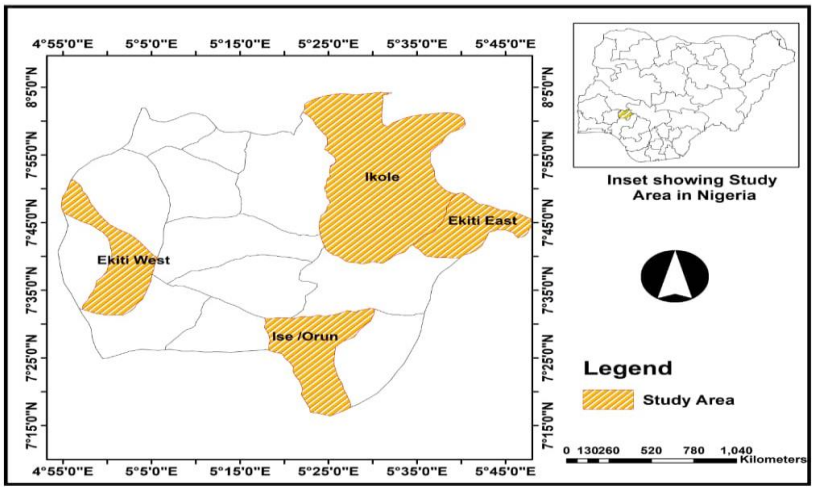

Figure 1: Map showing the study area

Sampling techniques, data collection and analysis

The study area was stratified based on ecological zones; tropical rainforest and derived savanna. Four local government areas were selected from each ecological zone and eight villages were selected from each LGA. (Table 1). Questionnaires were administered to twenty (20) respondents in each of the selected villages using the snowball sampling techniques. Data collected from the study were analyzed using descriptive statistics of frequency tables and percentages.

Table 1: Distribution of Respondents in the study area

Ecological zones	Local government area	Community	No of respondents
Derived Savanna	Ekiti East	Omuo Ekiti	20
		Ilasha Ekiti	20
	Ikole	Ikole Ekiti	20
		Ayebode Ekiti	20
Tropical rain forest	Ise Orun	Erinwa Ekiti	20
		Orun Ekiti	20
	Ekiti west	Aramoko Ekiti	20
		Erinjiyan Ekiti	20
Total	**4**	**8**	**160**

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RESULTS

Socio-economic characteristics of respondents

Table 2 shows that the majority of the respondents are Female (56%), with 48% of them above 30 years old. The results further revealed that 28% of the respondents were married, while 31% had primary education. The major occupation of the respondents in the study area is farming (41%).

Table 2: Socio-economic characteristics of respondents

Variables	Frequency	Percentages (%)
Age		
20-30	35	22
31-40	41	26
41-50	38	24
Above 50	46	28
Gender		
Male	70	44
Female	90	56
Marital status		
Single	44	28
Married	80	50
Divorced	16	10
Widowed	20	12
Occupation		
Farming	66	41
Trading	37	23
Artisan	16	10
Civil servant	41	26
Educational background		
Primary	50	31
Secondary	24	15
Tertiary	50	31
Non-formal	36	23
Total	**160**	**100**

Common edible insects consumed in the study area.

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Table 3 shows that six (6) insects are consumed by the respondents in the study area, with *Macrotermes nigeriensis* (31%) as the highest consumed insect, followed by *Rhynchophorus phoenicis* (22%), *Cirina* (20%), while *Gryllotalpa africana* (6%) was the least consumed insects.

Table 3: Common edible insects consumed in the study area

Scientific name	Common name	Frequency	Percentage (%)
Oryctes boas	Scarab beetle	18	11
Zonocerus variegatus	Grasshopper	15	10
Rhynchophorus phoenicis	Palm weevil	35	22
Cirina forda	Pallid emperor	32	20
Gryllotalpa Africana	Cricket	10	6
Marcrotermes nigeriensis	Winged termite	50	31
Total	**6**	**160**	**100**

Seasonal availability of edible insects in the study area

Figure 2 indicates how the edible insects are available. The result showed that 44% of the respondents stated that the insects are mostly available in the rainy season, (18.5%) are available in the dry season, while 37.5 % said the insects are available all year round.

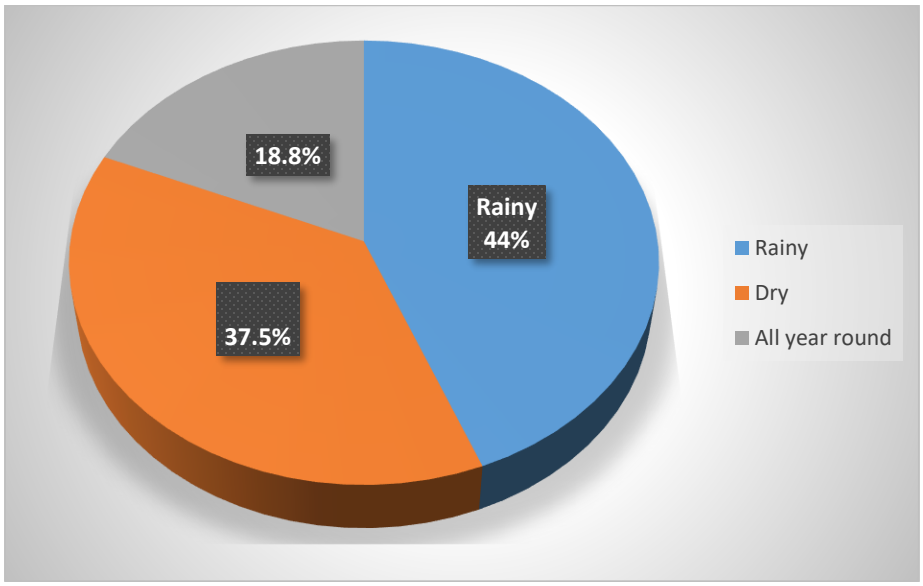

Figure 2: Seasonal availability of edible insects in the study area

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Functional values of edible insect

Figure 3 presents the functional values of edible insects in the study area. Quite a large number of the respondents (32%) stated that edible insects are consumed as sources of protein, 25% take them as an alternative to meat, while 6% used them for medicinal purposes.

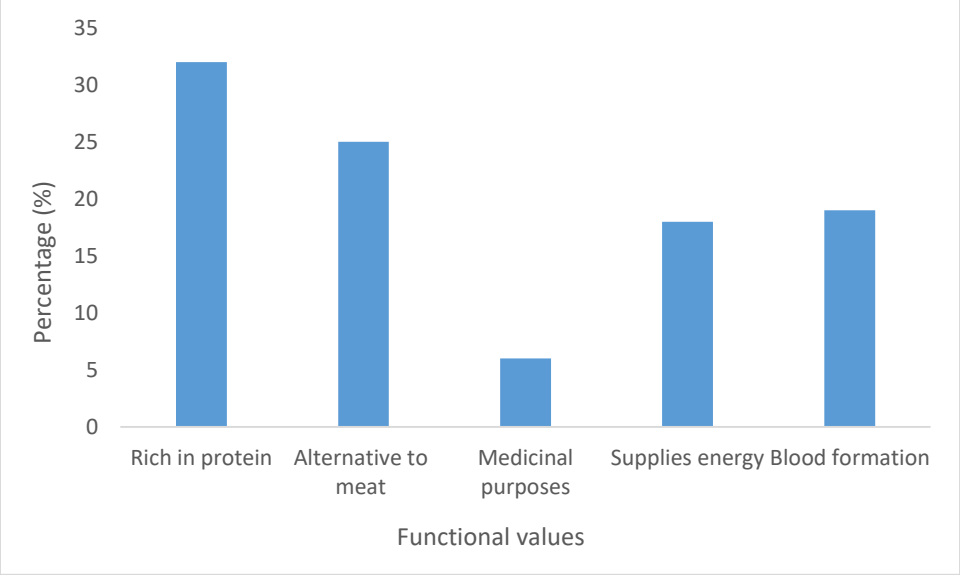

Figure 3: Functional values of edible insects by the respondents

Processing methods adopted by the respondents

Table 4 revealed the methods of processing insects by respondents in the study area. The result shows that the most commonly used method by the respondents is roasting (44%), followed by frying (25%), sun drying (18%), while cooking accounted for 13%.

Table 4: Distribution of respondents by methods of processing

Processing Method	Frequency	Percentage (%)
Cooking	21	13
Frying	40	25

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Roasting	70	44
Sun drying	29	18

Respondents' perception on the acceptability of edible insect consumption in the study area

Table 5 shows the perception of respondents on the acceptability of edible insect consumption in the study area. The result shows that 45% of the respondents thought that edible insect farming is not lucrative, 17.5% said edible insects are consumed by poor people and 15% opined that some insects are poisonous and less satisfying. The result also revealed that 6.25% of the respondents said the appearance of most insects looks scary.

Table 5 Respondents' perception on the acceptability of edible insect

Perception on the acceptability of edible insect	**Frequency**	**Percentage**
Edible insects are consumed by the poor people in the society.	28	17.5
Edible insect farming is not lucrative.	72	45
The appearance of most insects are scary	10	6.25
Less satisfaction is derived from edible insects when consumed	25	15
Some edible insects are poisonous	25	15
Total	**160**	**100**

Constraints to edible insects consumption in the study area

Figure 4 presents the problems faced by respondents against the consumption of edible insects. The result shows that inadequate nutritional knowledge accounted for 25% of the problems faced

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by the respondents, followed by seasonal availability (21%), Unpleasant odour of edible insects (20%), lack of storage facilities (19%) while fear and discomfort accounted for 15%.

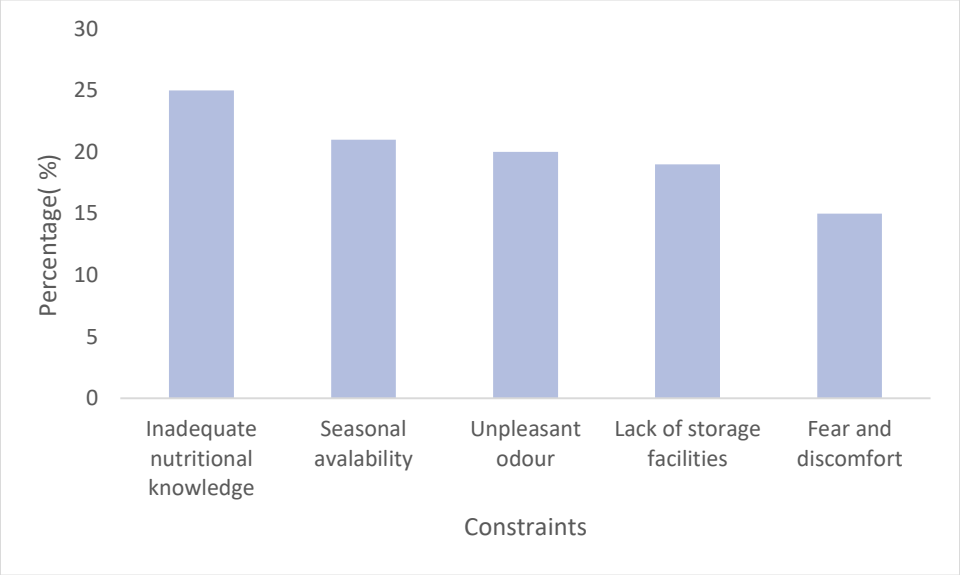

Figure: 4 Constraints against the consumption of edible insects

DISCUSSION

The observed higher percentage of female involvement in edible insect collection and consumption in the study might be due to the fact that women are more involved in the collection and marketing of non-timbre products in the study area. This assertion corroborates the findings of Olujobi and Abdusalam (2020), who reported that women were more involved in edible insects than men in the study area. The involvement of a higher number of married and fairly aged people in the collection and consumption of edible insects in the study area attests to the fact that people within this age bracket were still very agile and still physically capable of hunting insects and may need to continue working to support themselves and their families. This assertion has been similarly reported by Olujobi and Adejuyigbe (2020), who stated that the majority of rural households involved in non-timber forest product harvesting and collection are above 50 years of age. Though the majority of those involved were farmers, some civil servants and business people were also involved in the trade. Over 60% of those involved have had their primary and tertiary education. This shows that the collection of insects is not only a business for the poor and uneducated but also for those who are highly esteemed in society. This assertion agrees with the findings of Alobi

et al., (2022), who stated that the majority of those involved in insect collection and marketing were farmers, with a higher percentage of people with tertiary education.

The result revealed that six insect species were commonly eaten in the study area; these insects cut across the following orders: coleoptera, isoptera, orthoptera, and lepidoptera. Ifie and Emeruwa, 2011; Ekpo and Onigbinde, 2005, have also reported the edible insects consumed in Nigeria. The study revealed *Macrotermes nigeriensis* as the most-consumed insect (Table 3), while *Gryllotalpa africana* was the least-consumed insect by respondents in the study area.

The study further revealed the seasonal availability of edible insects; the result showed that insects were mostly available during the wet season, which agrees with the findings of Okeke *et al*., (2019), who reported that winged termites are enjoyed in all parts of Nigeria, especially because of their availability at the onset of the rainy season. The result revealed the level of knowledge of respondents on the functional values of edible insects; the highest result was for the statement "edible insects are rich in protein," followed by edible insects serve as an alternative to meat. The majority of the respondents had little knowledge of the medicinal values of edible insects. However, this calls for heavy public education and awareness of the health and nutritional benefits of edible insects. The study revealed that the major method of processing was roasting, followed by frying (Table 4). This corroborates the finding of Adeoye *et al*., (2014), who reported roasting as the preferred method of processing. The result on respondents' perception on the acceptability of edible insect consumption revealed that the most outstanding reason why a lot of people may not practice entomophagy is because they believe insects are consumed by poor people (Table 5). This assertion has been similarly reported by Meludu and Onaja, (2018) who stated that insects are meant for poor people who cannot afford meat. The majority of the respondents believed that insects are meant for those who cannot afford meat. This finding corroborates the reports of Ebenebe *et al.,* (2015) that insect-eating was greatly associated with the poor and illiterates in the rural communities.

The major constraints to edible insect consumption by respondents include; inadequate nutritional knowledge, which ranked highest among other problems, followed by seasonal availability, unpleasant odour of edible insects, lack of storage facilities and fear and discomfort. This finding corroborates the submission of Babarinde *et al.,* (2024), who reported ignorance of nutritional values as one of the challenges faced by respondents on edible insect consumption. Alamu *et al.,* (2013) also reported seasonal availability as a challenge of edible insects consumed in Nigeria.

CONCLUSION

This study has shown that edible insects are rich sources of protein; the study further revealed that the respondents had little knowledge of the nutritional and medicinal values of edible insects.

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However, this study concludes that heavy public education and awareness should be made on the health and nutritional benefits of edible insects. Findings from this study have revealed that the act of entomophagy has declined over the years. Consequent to the above findings, awareness should be created to positively change the perception of people towards edible insect consumption and fully harness several benefits of insect consumption.

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