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Entomophagy and Commercially Available Insects among the Sumi Nagas in Dimapur District of Nagaland, Northeast India

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ABSTRACT

Given the myriad diversity of insect species in Nagaland; it has been a source of nutrition and livelihood for the Nagas. Entomophagy is a notable practice prevalent among the Sumi Nagas of Nagaland. The present study was undertaken with the aim of identifying, listing the edible insects which are consumed by the Sumi Nagas and are commercially available in Dimapur; with evaluation of their nutritional composition. Including but not limited to, eleven species of insects belonging to different order and family were identified. Variant mode of consumption-fried, roasted, smoked, steamed with local herbs, spices, chutney, were reported. The study underlines the potential of extensive research on edible insects and its nutritional value, and additionally, the need for documentation of traditional rearing and its sustainable use.

Introduction

The term Entomophagy refers to the consumption of insects as diet. The consumption of insects as food is prevalent in several indigenous communities and plays a significant role as part of their nutrition. There are about 751,000 known species of insects worldwide, which is about three-fourths of all species of animals (Majumder *et al.,* 2015).

Insects are appreciated as food compared to conventional meat sources; edible insects contain satisfactorily more energy and protein content, good amino acid and fatty acid profiles and high contents of a variety of micronutrients and vitamins (Rumpold and Schluter, 2013). A large number of insects are low in cholesterol and fat (Srivastava *et al.,* 2009), they are herbivores and have clean eating habits which makes them cleaner than chickens, pigs, and several other conventional protein source. Most often than not, insects consumed are harvested from the wild, or come from the wild and are gathered for food, hence, they are mostly free from pesticide and other chemical contaminant which abound in places where conventional sources of protein are found (Durst and Shono, 2010).

Entomophagy has, therefore, been advocated worldwide as a source to combat future food security mainly because of its abundance, high nutrient composition, high feed conversion efficiency, digestibility and ease with which they can be bred (Seni, 2017 and Alexander *et al.,* 2017).

Furthermore, as a food source, edible insects can help to uplift the nutritional status of residents of poor developing countries and at the same time serve as a complimentary food or food ingredient for developed countries (Sogari *et al.,* 2017).

Besides the significance as food, edible insects have an impact on livelihood and social conditions of rural population as gathering and farming of insects could be carried out with minimal output of technical or capital resources which also gives the poorest members of the society a possibility to generate income (Das, 2019). The nutritional importance of edible insects and their availability has attracted their consumption by more than 2 billion people on a daily basis (Das, 2019 and Mitsuhashi, 2016) and hence the part played by insects in human nutrition cannot be underestimated (Sirithon and Pornpisanu, 2011). According to Das (2019), the North Eastern states of India recorded the highest insect consumption in India (Sirithon and Pornpisanu, 2011). With no exception to Nagaland, the Sumi Nagas have been practising entomophagy since we know of them. They share a consecrated accord with their environment and are interdependent for existence. Some of the insects consumed by the Sumi Nagas and are commercially available in the markets are- silkworm, grasshopper, flying termite, cricket, cicada, stink bug, palm weevil, water beetle, bee and hornet, the details of which will be discussed further in this paper.

Materials and Methods

Study area

The study was conducted in Dimapur District of Nagaland, with special reference to the weekly local markets in the district.

Survey

The study was conducted from September 2017 to September 2018 through in-depth interviews using self-administered questionnaires and schedules. In addition, only the vendors belonging to the Sumi Naga were engaged in the study.

Collection and Identification

The insects were collected from the local markets and their local names were identified from the vendors as well as from Sumi elders in the community. They were preserved following standard methods (Sirithon and Pornpisanu, 2011) and submitted to Zoological Survey of India (ZSI), Shillong for identification. The scientific and common names were obtained from the taxonomic literature, photographs and literature review.

Determination of nutrient content

Nutrient contents were analysed in the ZSI, Shillong and the protein estimation of the specimens were done by following the methodology of Das *et al.,* (2019) and Lowry *et al.,* (1951). Carbohydrate estimation was done by Van Handel method (1985); total lipid was extracted from the whole insect as per the method of Das *et al.,* (2019) and Folch *et al.,* (1957).

Results and Discussion

Diversity of Species

11species of insects belonging to 7 order and 10family were identified. Out of these, 2 species belong to order Hymenoptera, 2 belong to Orthoptera, 2 belonging to Hemiptera, another 2 belong to Coleoptera and 1 each to Lepidoptera, Cicadoidea and Blattodea.

As surveyed in the study and mentioned in the table, the stage of consumption differed for each insect, i.e., some were consumed during the stage of larva, pupa, nymph and adult. In addition, the mode of consumption also varied-steamed with different spices and herbs, fried, roasted, smoked and grinded.

Table.1 Diversity of edible insects

Sl No	Scientific Name	Local Name	Common Name	Order	Family	Availability	Stage of Consumption	Mode of Consumption
1	*Philosomiaricini*	Eri nnga	Silkworm	Lepidoptera	Saturniidae	April-October	Pupa/larva	Steamed with bamboo shoot, ginger, garlic and other spices; Fried
2	*Heiroglyphus banian*	Tuluqhu	Rice grasshopper	Orthoptera	Acrididae	June-October	Adult	Fried/Smoked/ Roasted
3	*Meloimorpha cincticornis*	Awusho	Cricket	Orthoptera	Gryllidae	August-November	Nymph/ Adult	Fried/Smoked/ Roasted
4	*Dundubiaintemerata*	Ghoi	Cicada	Cicadoidea	Cicadoidea	August-November	Adult	Fried/Roasted
5	*Coridius chinensis dallas*	Akhanu	Stink bug	Hemiptera	Dinidonidae	May-July	Adult	Chutney
6	*Rhynchophorus Herbst*	Akhulo	Palm weevil	Coleoptera Linnaeus	Curcurlionidae	October-November	Larva	Steamed/Fried/ Roasted/Smoked
7	*Cybisterlimbatus*	Befu	Water beetle	Coleoptera	Dytiscidae	July-November	Adult	Fried/Roasted/ Smoked
8	*Vespa tropicatropica*	Akizu	Great banded hornet	Hymenoptera	Vespidae	May-November	All stages	Steamed/Fried/ Smoked/ Roasted
9	*Apis indica*	Akhi	Honey bee	Hymenoptera	Apidae	May-November	Larva	Steamed/Fried/ Smoked/ Roasted
10	*Isoptera*	Ahlu	Flying/winged termite	Blattodea	Rhinotermitidae	May-August	Larva	Fried/ Smoked/ Roasted
11	*Lethocerus americanus*	Amasa	Giant water bug	Hemiptera	Belostomatidae	April-August	Adult	Steamed/Fried/ Smoked/Roasted

Table.2 Nutritional value of the collected insects per 100gm

Sl No	Common Name	Protein (%)	Carbohydrates (%)	Fat (%)	Moisture Content (%)
1	Silkworm	11.1	2.5	5.5	48.1
2	Rice grasshopper	13.6	2.1	3.2	15.6
3	Cricket	14.4	5.0	5.5	35.05
4	Cicada	18.1	4.5	8.9	29.3
5	Stink bug	9.8	1.9	1.1	17.2
6	Palm weevil	17.7	3.9	7.3	63.7
7	Giant water bug	20.1	3.2	8.4	61.2
8	Great banded hornet	17.2	3.7	6.7	57.5
9	Honey bee	15.9	3.3	6.3	48.9
10	Flying/winged termite	14.2	0.2	1.4	24.2
11	Water beetle	9.2	1.5	2.1	29.6

Fig.1 Pupae of Eri silkworm

Fig.2 Larva of Eri silkworm

Fig.3 Larvae of Eri silkworm

Fig.4 Giant water bug

Fig.5 Water beetle

Fig.6 Bee larvae in comb

Fig.7 Bee larvae

Fig.8 Great banded hornet with larvae

Fig.9 Dried Stink bug

Fig.10 Stink bug

Nutritional Value

The proximate composition of the identified insects is shown in table 2. The result of the analysis is recorded on fresh weight basis. The protein value was above 9%, the highest belonging to giant water bug (20.1%). The carbohydrate content was the highest at 5.0% belonging to cricket; and the fat content was highest in cicada (8.9%). The results fall in line with a study by Das (2019), indicating that the protein content was higher than the carbohydrates and fat contents, thus, highlighting the nutritional value of the insects as alternative source of protein.

Incognizant of insects' nutritional composition and benefits, it is consumed as regular food, based on their availability and not only during food shortage. The Sumi Nagas'autodidactic knowledge on the seasonal availability of diverse species, stages of consumption and insect parts is creditable.

However, surfeit on consumption could perturb the equilibrium of insects' life cycle; a concern for over utilization. Thence, awareness on over exploitation and unsustainable harvesting methods are essential to maintain and protect the biodiversity. Furthermore, the process of rearing and harvesting needs further exploration and documentation.

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