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## Entomophagy practiced among the Tiwa community of Morigaon district, Assam

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### Abstract

Edible insects are important dietary components which are consumed as food in many developing countries. Insects are quality food items that can provide substantial amount of nutrients essential for maintenance of health and protection from age related diseases. The ethnic people of India consume different insects as food. Practice of entomophagy is quite common among the ethnic individuals of North East India especially among the tribes of Nagaland, Manipur, Arunachal Pradesh and Assam and to a lesser degree by the tribes of Mizoram and Meghalaya. The tiwa are an ethnic community of Assam. Certain species of edible insects are found abundantly in Tiwa villages. The present study was conducted to record the status of entomophagy in tiwa community of Morigaon district, enlist the diversity of edible insects and determine their nutritional value. It was found that 15 species of insects belonging to 6 orders such as Hemiptera, Coleoptera, Orthoptera, Hymenoptera, Odonata and Isoptera of class insecta are consumed by the Tiwa people. People use these insects as their regular diet or during special occasions. Nutritional value of the insects consumed was also determined and it was found that they were rich in nutrients especially in proteins, suggesting their use as good nutritional supplements of balanced diet.

**Keywords:** Entomophagy, insects, tiwa community, nutrients

### Introduction

Insects are the major animal group on Earth. They hold an enormous biodiversity and constitute a huge amount of biomass. As such their potential as an alternate food source holds great possibility particularly in poor communities of Africa and Asia<sup>[1]</sup>. Consumption of insects may therefore supplement dietary requirement of these people and may also prevent the development of diseases among them due to the medicinal value of the insect's products<sup>[2]</sup>. Accordingly a tradition of using insects as food has developed through the ages in these countries leading to the evolution of the term "ENTOMOPHAGY" in entomological literature. Entomophagy literally means the consumption of insects as food. Entomophagy is practiced in many countries around the world but predominantly in parts of Asia, Africa and America. Many insect species are edible including ants, grasshopper, bees, wasps, crickets etc<sup>[3]</sup>. They are enormous sources of protein, carbohydrates, fats, minerals and vitamins<sup>[4-7]</sup>. According to the "2004 United Nations Food and Agricultural Organization" (FAO) report, caterpillars of many species are rich in potassium, calcium, magnesium, zinc, iron as well as B-vitamins<sup>[8]</sup>. Edible insects are natural renewable resource that provides food to diverse ethnic groups in many different countries like Japan, Kenya, Mexico, Latin America, China, India etc. In the Northeastern region of India, the tribal communities of Assam, Manipur and Nagaland use late instar larvae and pupa of silkworms mostly the *Philosomia ricini* (Eri silk worm) and *Bombyx mori* (Mulberry silkworm) as well as other insects like giant water beetle, diving beetle, grasshopper, cricket, larvae of honey bee and wasps etc as food. In lower Assam, the silkworm larvae and pupa along with the aquatic insect *Lithocercus indicus* have a high market demand among the Tiwa, Rabha, Bodo and Garo communities. Edible insects such as *Doroglus obesus*, *Apis indica*, *Vespa orientalis*, *Hydrochara sickseckeri*, *Heiroglyphus bannian*, *Neoconocephalus palustris*, *Philosomia ricini*, *Antheraea assama* and *Bombyx mori* are consumed by different ethnic groups in Assam<sup>[9]</sup>.

The Tiwa are an ethnic and linguistic community, early settlers of Assam in the Northeastern part of India. The Tiwa villages of the Morigaon district have a natural economy and use certain species of insects as food. The indigenous people collect edible insects for consumption thereby sharing it among their families and selling the surplus on certain occasions. Certain species of edible insects are found abundantly in Tiwa villages which

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contain many useful nutrients, including proteins and carbohydrates and if popularized may contribute as an alternative source of nutrients solving the problem of malnutrition to a certain extent. The traditional knowledge of entomophagy among the Tiwas is rich but confined because it is only orally passed through generations. So, it is imperative and an urgent task to document the traditional wisdom of these people. The entomological knowledge among this tribe ranges from edible to medicinal use. In the Morigaon district where half of the Tiwa community resides, socio cultural and economic limitations often obstruct the use of more common protein sources such as pork, beef, poultry, milk and eggs. On the other hand, edible insects are easily accessible and consumed by the rural people and thus could possibly serve as an imperative source of protein. The current study was therefore carried out to report the edible insects consumed by the Tiwa community in Morigaon district of Assam.

## 2. Materials and Methods

**2.1 Study area:** The present study was conducted in the Morigaon district of Assam. The district has different tribes and among them, population of Tiwa community is highest. Survey was conducted in 2 villages namely, Oujari nad Manipur inhabited by Tiwa tribe during December, 2016 to May, 2017.

**2.2 Survey:** At first, the people were asked about the type of insects they use as food. After that regular survey was done in the morning and evening hours as they went for fishing at that time. Gathering techniques of other terrestrial insects used by

local people in the villages were observed. Cooking and eating style of these insects were also observed during the study period.

**2.3 Collection and Identification:** During the study period the insects identified as edible were collected from fresh water bodies, paddy fields, vegetable gardens and grasslands of different Tiwa villages with the help of local fisherman and other people. Insects were then placed in ice box and carried to the Department of Zoology, B. Borooah College. Local names were gathered from the villagers where as English and Scientific names were obtained from the taxonomic literature and photographs. Nutrient contents were analyzed in the laboratory of Zoology department and also in the Bio Tech Hub of the same college.

**2.4 Determination of nutrient content:** Protein estimation of the collected insects was done by following the methodology of Lowry *et al* <sup>[10]</sup>. Carbohydrate estimation was done by Van Handel <sup>[11]</sup> method. Total lipid was extracted from the whole insect as per the method of Folch *et al* <sup>[12]</sup>.

## 3. Results

**3.1: Diversity of species:** During the survey it was found that 15 species of insects belonging to 6 orders and 14 families were consumed by the Tiwa people in Morigaon district. Out of these, three species belong to order Hemiptera, two to Coleoptera, four to Orthoptera, three to Hymenoptera and one each to Odonata, Lepidoptera and Isoptera (Table 1). The people consumed these insects as a delicacy.

**Table 1:** Name of the edible insects found in Tiwa village along with their order, family, English name, Local name and their consumption stage

Sl. No.	Scientific name	Order	Family	English name	Local name	Consumption stage
1.	<i>Lethocerus indicus</i>	Hemiptera	Belostomatidae	Giant water bug	Dagla bori	Adult
2.	<i>Dytiscus marginalis</i>	Coleoptera	Dytiscidae	Diving beetle	Khoi puk	Adult
3.	<i>Laccotrephes ruber</i>	Hemiptera	Nepidae	Nepa	Pani puk	Adult
4.	<i>Anaciaeschna donaldi</i>	Odonata	Aeshnidae	Dragonfly	Hata puk	Nymph
5.	<i>Batocera horsefieldi</i>	Coleoptera	Buprestidae	Wood borer	Kath puk	Larva`
6.	<i>Mantis inornate</i>	Orthoptera	Mantidae	Praying mantis	Gagini	Adult
7.	<i>Chondracris rosea</i>	Orthoptera	Acrididae	Short horned grasshopper	Kakoti faring	Adult
8.	<i>Eupreponotus inflatus</i>	Orthoptera	Acrididae	Short horned grasshopper	Tel faring	Adult
9.	<i>Gryllotalpa africana</i>	Orthoptera	Gryllotalpidae	Mole cricket	Uisiringa	Adult
10.	<i>Apis indica</i>	Hymenoptera	Apidae	Honey bee	Mou	Larva
11.	<i>Formica indica</i>	Hymenoptera	Formicidae	Red ant	Amroli porua	Larva
12.	<i>Pompilidae</i>	Hymenoptera	Pompilidae	Wasp	Borol	Larva
13.	<i>Macrotermes natalensis</i>	Isoptera	Termitidae	Termite	Ui puka	Adult
14.	<i>Philosamia recini</i>	Lepidoptera	Saturniidae	Eri silk worm	Eri puka	Pupa
15.	<i>Pelocoris femoratus</i>	Hemiptera	Naucoridae	Creeping water bug	Pani puk	Adult

**3.2 Nutritional value:** The proximate composition of listed insect has been shown in table 2 which is graphically

represented in Fig-1. The result of the analysis is recorded on fresh weight basis.

**Table 2:** Nutritional value of some edible insects per 100 gm

S. N.	Insects Name	Moisture Content (%)	Protein (%)	Carbohydrate (%)	FAT (%)
1.	Giant water bug	61.07	19.8	3.1	8.3
2.	Diving beetle	40.4	14.2	0.6	1.8
3.	Red ant	16.6	13.9	2.9	3.5
4.	Eri pupa	47.9	9.6	2.3	5.6
5.	Grasshopper	42.85	18.2	3.9	6.1
6.	Cricket	32.2	12.9	5.1	5.5
7.	Termite	25.1	14.2	0.2	1.4

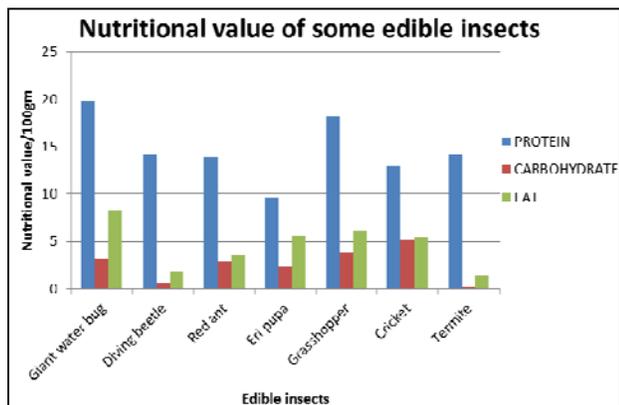


Fig 1: Nutritional value of different edible insects per 100 gm

Although almost all the species showed protein content above 10%, the highest amount of protein was recorded in Giant water bug (19.8%). Carbohydrate content was highest in cricket (5.1%) and lipid in Giant water bug (8.3%). The results indicate that the protein content is more than carbohydrate and fat which highlights the nutritional value of the insects as an alternative food source.

#### 4. Discussion

The proximate analysis of the insects used as food by the Tiwa community in Morigaon district exhibited rich source of many essential nutrients viz, protein, fat and carbohydrate. The protein content was found to be comparable with that of meat and fish source and therefore can be considered as a cheap and readily available alternative to counter protein malnutrition among the poor. The carbohydrate content of these insects lies within the range of 1-5% of wet weight which conforms to the results obtained by Xiaoming *et al.*<sup>[13]</sup> working on certain aquatic edible insects in China. The high fat contents of the insects under study holds promise as an easy source of oil in diets. This may be one of the reasons why insects are preferred food among many communities. However high level of fats in food may be undesirable from a nutritionists point of view. So detailed studies on the oils in edible insects, such as sterol content and saturated and non-saturated fatty acids are a topic for future research<sup>[14]</sup>.

Nevertheless our study has revealed that the wild edible insects consumed by the Tiwa people of the Morigaon district have the potential to be quality food items that can provide a substantial amount of nutrients essential for maintenance of health and protection from age related diseases<sup>[15]</sup>. Its consumption can help in alleviating the problem of malnutrition among low socio-economic groups. The rich diversity and large population of insects if properly exploited, holds great nutritive as well as developmental potential<sup>[14]</sup>. Works such as our's may hopefully contribute in this regard and play an important role in popularizing entomophagy among the common populace.

#### 5. Conclusion

The present study conducted in Morigaon district provides an overview of the different edible insects consumed by the Tiwa community along with their nutrient composition. It was found that the wild varieties of insects consumed were rich in protein, carbohydrate and fat content and if properly exploited could thus serve as alternative source of high quality nutrient diet.

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