

# Utilization of Edible Insects as Food in Northeast India

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**Abstract:** Consumption of edible insects by human being is called as Entomophagy. Insects are traditional food in many parts of the Northeast India. In Northeast India, entomophagy was practiced on a large scale by tribal communities. Entomophagy is not only supporting the nutritional security but also protect the family livelihood of tribal communities during difficult periods of the year. So, edible insects are the good source of supplement food item that could meet the people's present and future need. In India, a total of 255 species of edible insects are recorded so far and it is mostly practiced in North Eastern State of India. Study of entomophagy in Northeast India is explored the uncharted natural resources of the region and medicinal, traditional beliefs of tribal people. This paper reviews most common edible insects consumed by peoples in Northeast India.

Key words: Entomophagy, Northeast India, Food, Edible insects, Tribal communities

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Northeast India is one of the primary biodiversity hotspots in India, where a huge percentage of its flora and fauna uncharted. It comprises of seven sister states namely Arunachal Pradesh, Assam, Meghalaya, Manipur, Nagaland, Tripura and Sikkim. The Northeast India is native to many traditionally living indigenous tribes and communities who are in continual touch with nature. The use of edible insects as food is common among ethnic people of Northeast India. The food processed and prepared traditionally by its people is connected to their socio-culture life and health. In Northeast India insects have been using in varied ways such as for edible, medicinal, industrial, cultural purposes. It was observed that various insects used by tribal people as a food it plays a vital role in retaining the nutritive value of food and cause significant impact on health.

Insects are actually rendering to humans priceless services as pollinators, as predators of crop and storage pests, as source of raw materials and as food. Entomophagy is derived from Greek word “*entomon*” means Insect and “*phagein*” means to Eat. The word Entomophagy literally means consumption of insects as food by native human population (Bodenheimer, 1951). Some of the important insects consumed by tribal people include grasshoppers, beetle grubs, termites, bees, ant, wasps, cicadas and a variety of aquatic insects. But it varies with regard to local population and ethnic group (Johnson, 2010). A scientific study revealed that almost 255 insect species are used as food by different tribes of India. Among the edible species of insects, consumption of coleopteran insects was highest constituting about (34%) followed by Orthoptera (24%), Hemiptera (17%),

Hymanoptera (10%), Odonata (8%), Lepidoptera (4%), Isoptera (2%) and the least was Ephemeroptera (1%) (Chakravorty et al., 2014). Edible insects are chosen by members of various tribes according to their traditional beliefs, taste, regional and seasonal availability of the insects. Depending on the species, only certain, but sometimes all, developmental stages are consumed. Preparation of the edible insects for consumption involves mainly drying, roasting and boiling. Sometimes spices are added to enhance the taste. This review focuses on Entomophagy practiced in different tribes of Northeast India.



Fig. 1. Bihu festival in Assam

## Why Entomophagy?

### Health

- Edible insects are healthy and nutritious
- Rich in protein, fat, vitamins and minerals.
- Insects are also used in therapeutic purposes.

### Environmental

- Insects emit less greenhouse gases (GHGs) and ammonia than most livestock.
- Require small area of land for rearing and not necessarily a land-based activity.
- Insects can be fed on organic waste streams.
- Require less water for survival than conventional livestock.

- As they are cold blooded, they have high feed conversion efficiency.

### Livelihoods (economic and social factors)

- Insect harvesting/ rearing is a low-tech, low-capital investment option that offers entry even to the poorest

sections of society, such as women and the landless.

- Insects are easily available in the wild and can be collected directly.
- Processed insects (fried, steam, curry, chutney *etc.*) can be sold in the market as street food which directly provides income.
- Insect rearing can be low-tech or very sophisticated, depending on the level of investment.

### Entomophagy Culture in Northeast India

Tribes of Arunachal Pradesh consume many number of insect species compared to other parts of the Northeast India. They mostly choose highest number of insects from the order Orthoptera. Tribe communities of Arunachal Pradesh used nearly 158 species of insects for cooking. The preference of edible insects varies depends upon the different tribe communities and regions. *Nyishi* of East Kameng and *Galo* of West tribal communities of Arunachal Pradesh consume 102 number of species of insects. *Galo* tribes use most of insects from Odonata and Orthoptera and *Nishi* tribes consume more insects from Coloeoptera and Hemiptera.

Six tribes of eastern Arunachal Pradesh namely Nocte, Wangcho, Singpho, Tangsa, Deori and Chakma using 51 insect species for edible purposes (Chakravorty et al., 2014).

In Assam (in Moridhal Panchayat of Dhemaji district), 16 terrestrial edible insect species are eaten belonging to 6 orders. These six orders include Lepidoptera (3 species), Orthoptera (5 species), Hymenoptera (5 species), Isoptera (1 species), Blattodea (1 species) and Hemiptera (only 1 species) (Dutta et al., 2016). In Morigaon district, 15 species of insects belonging to 6 orders and 14 families were consumed by the Tiwa people. Out of these, three species belong to the order Hemiptera, two species from Coleoptera, four species from Orthoptera, three species from Hymenoptera and one species each from Odonata, Lepidoptera and Isoptera (Rahman et al., 2018). The Entomophagy among the *Bodos* of Udalguri district recorded from 23 species of edible insects belonging to Orders Hemiptera, Coleoptera, Hymenoptera, Orthoptera, Lepidoptera, Isoptera and Odonata were recorded. The Giant water bug (*Lethocerus indicus*) and Eri silk worm larvae (*Samia cynthia ricini*) were most preferred edible insect species in their community (Hazarika, 2018).

In Manipur, 46 species of edible insects are reported. The ethnic groups of Manipur prefer to consume highest number of Hemipteran insects. Five different tribes of Manipur namely, *Meitei*, *Tarao*,



Fig. 2. Insects used as food A. Red ant egg, B. Silkworm larvae, C. Silkworm pupa, D. Crickets

*Tangkhul*, *Chothe* and *Thadou* tribes consume the highest number of insect species (28–30) as compared to other communities in Manipur. On the other hand, the Lepidopteran insects are not

preferable as food by the *Meitei* community (Shantibala et al., 2012). Aquatic beetles are also popular in Manipur and other parts of Northeast India.

In Nagaland, 82 insect species belonging to 28 families and 9 orders are consumed as food by the tribal communities. The list includes 8 species of Odonata, 17 species of Orthoptera, 2 species of Mantodea, 1 species of Isoptera, 19 species of Hemiptera, 9 species of Coleoptera, 20 species of Hymenoptera, 5 species of Lepidoptera and 1 species of Diptera (Lobeno Mozhui, 2017). Edible insects considered delicacies comprise different kinds of bees, beetles, bugs, cicadas, crickets, grasshoppers, locusts, wasps and various larval forms of insects.

In Meghalaya, termites are mostly used as edible insect and to a lesser extent by the tribes of Mizoram and Tripura. Comparatively this practice is much lower among the ethnic people of other parts of Northeast India. The option of insects as food by tribes depends upon the availability of insect, palatability, nutritional value, customs and tradition.

## **Preparation of Insects in North East India**

Edible insects are prepared in the forms of curry, roasted, fried, raw and chutney. Depending upon the type of insects and form of the consumption, these are prepared with or without other ingredients like spices and oil. Hard bodied insects are eaten in roasted or fried form whereas soft bodied insects are eaten as curry or raw. The method of preparation is mostly traditional and is handed down from generation to generation. Odonates are eaten in nymph stage only but Lepidoptera are eaten in both larval and pupal stages. In Hymenoptera insects, eggs are also eaten along with other stages (Shantibala et al., 2012).

## **Nutritive and Medicative Feature of Insects**

**‘Medicine Is Food and Food Is Medicine’** likewise edible insects are natural inexhaustible resource of food with nutritional, economic, medicinal and ecological benefits to the rural people. Insect food have high protein content with digestibility as well as some minerals, vitamins, fats and carbohydrates make the insects as excellent food. Insects are the cheapest source of protein compared to animal meat and fish (De Foliart, 1992). The composition of unsaturated omega-3 and six fatty acids in mealworms is comparable with that in fish (higher than in cattle and pigs) and the protein, vitamin and mineral content of mealworms is similar to that in fish and meat. Insects have high feed conversion ratios (FCRs) and emit low levels of greenhouse gases. Insects can be used instead of fish meal and fish oil in animal diet. Insects are of a higher calorific value than meats, maize, soybeans, lentils, or other legumes. Recent data show that of the

insects, it had 50% caloric value higher than soybeans, 87% higher than corn, 70% higher than fish, lentils and beans and 95% scored higher values than wheat and rye. Caterpillars contain proteins to the extent of 50-60g/ 100g dry weight, the palm weevil grubs contain 23-36g, Orthopterans contain 41-91g, ants contain 7-25g and termites and storage are necessary in order to avoid contamination and to ensure safety levels.

## **Beliefs in Ancient Food Culture**

In Assam tribes of Mishings and Ahom community use red ants (*Oecophylla Smargdina*) as a food at the time of Assamese festival Bohagi Bihu in the month of April. Tribes of Mishings people believe that red ant keep the health safe from infection of disease.

The formic acid of these insects is being used in connection with scabies, malaria, tooth aches, stomach disorders and blood pressure anomalies. In Ahom Community its compulsory to eat red ants (*Myrmica rubra*) during Bohag Bihu festival (Doley and Kalita, 2012).

Some peoples of Northeast India trust to use Muga silkworm (*Antherea assama*) to cure constant itching and soreness of the throat. They also used the pupae and larvae of Eri silkworm (*Samia cynthia ricini*) for curing “Dudmur” or infection of mouth and tongue in young children.

The larvae and eggs of yellow jacket wasp (*Vespa orientalis*, *Vespa magnifica*) and the “nest” of potter wasp (*Eumenus* spp.) were used to treat stomach problems. Egg, larvae of honey bee (*Apis* spp.) and its products (honey) were used to cure whooping cough. Cockroach (*Periplaneta americana*) was consumed for the treatment of asthma problems.

## Seasonal Availability of Edible Insects

Edible insects generally occur throughout the year, the availability of insects depends upon their food plants as well as by seasonal conditions. Coleopterans occurred during June to September (pre monsoon and monsoon) and then got reduced during winter and early spring. Seasonal trends were also observed in some Odonata and Orthopterans, which were most abundant in September and October (late summer). Insects belonging to the Hemiptera and Hymenoptera were found to be restricted to the period lasting from November to February (winter). Some edible insects like certain bugs and ants were found to be available (and used) throughout the year.

## Conclusion

Worldwide more than 2000 insects are consumed by local people on a regular basis. Edible insects are an important component in the diet of the different tribal communities of Northeast region. It will play important role in future generations. It has more vitamins, amino acids, fat and proteins compared to other animal meat and plants. Some of edible insects are pest of agriculture and horticulture crops, entomophagy practices reduce the pest population as well as pesticide application. According to recent data, world population is increases year by year. We have to create awareness about insect food to rural people. Again, we should continue the research in other parts of Northeast India to explore the uncharted edible insect species. In future we may get some more new insects which will be used as food and also, they can be used as medicine for different diseases. Molecular work about insect nutrition and medicinal properties of insects also enhance the Entomophagy culture in future.

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Table 1. Nutritive value of different insects

Insects	Protein (g)	Fat (g)	Carbohydrate (g)	Calcium (g)	Iron (g)
Giant water beetle	19.8	8.3	2.1	43.5	13.6
Red ants	13.9	3.5	2.9	47.8	5.7
Silk worm pupa	9.6	5.6	2.3	41.7	1.8
Mealworms	20.2	12.7	N/A	13.3	N/A
Wax moths	15.5	22.1	N/A	28.3	N/A
Super worms	17.4	17.8	N/A	12.4	N/A
Fly larvae	15.5	7.8	N/A	87.4	N/A
Dung beetle	17.2	4.3	2.0	30.9	7.7
Cricket	21.3	6.01	5.1	75.8	9.5
Small grasshopper	20.6	6.1	3.9	35.2	5.0
Large grasshopper	14.3	3.3	2.2	27.5	3.0
June beetle	13.4	1.4	2.9	22.6	6.0
Caterpillars	6.7	N/A	N/A	N/A	13.1
Termites	14.2	N/A	N/A	N/A	35.5
Weevils	6.7	N/A	N/A	N/A	13.1

\*\* N/A= Not Analyzed

(Source: Srivastava et al., 2009)

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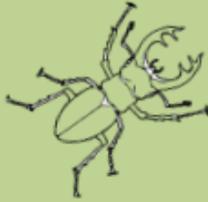
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