

## Importance of Insects as a Food in Human Diet

Mahajan Umesh Vishal\* and KawaleSanket Sahebrao

Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.),  
India.

ARTICLE ID: 18

### Introduction-

Increased world population, greater pressure on the environment, increased use of land resources globally and increased demand for nutrients and energy are predicted for coming decades. Insect farming has been suggested to provide an alternative to conventional livestock farming for future food production. Land clearing for agriculture is a major contributor to global warming and efficient use of land is therefore important. Edible insect has always been part of human diet, but in some societies their degree of distaste for their consumption. As insects are rich in high quality protein, fattyacids, vitamins and minerals, insect consumption is an option to reduce malnutrition in developing countries.

### History of Entomophagy-

Entomophagy is a Greek word, '*entomon*' means insect and '*phagein*' means to eat. Entomophagy is the practice of eating insects for food. The Greeks and Romans both ate insects. Records state that they ate locust and beetle larva. Aristotle wrote they tested best between molts. (Insect Cambridge World History of Food). As early as 1813, Forbes had mentioned that termites are eaten by local tribes in Mysore and the Karnataka region. (Forbes, 1813).

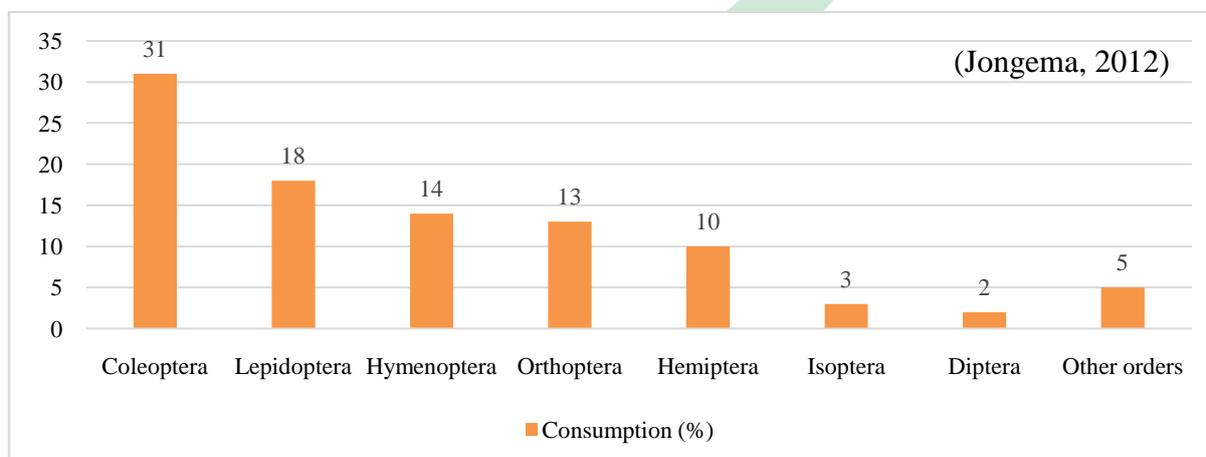


Fig.-1 Percent of insect species consumed worldwide

The locust *Schistocerca gregaria* for use both as human food and fertilizer in India and he has concluded that locusts were high in crude protein and fat. (Das, 1945).

#### **Insect species consumed worldwide-**

Globally, the most common insects consumed are beetles (Coleoptera) (31%) (Figure-1). This is not surprising given that the group contains about 40 percent of all known insect species. The consumption of caterpillars (Lepidoptera) is estimated at (18%). Bees, wasps and ants (Hymenoptera) come in third at (14%) (these insects are especially common in Latin America). Following these are grasshoppers, locusts and crickets (Orthoptera) (13%), cicadas, leafhoppers, planthoppers, scale insects and true bugs (Hemiptera) (10%), termites (Isoptera) (3%), dragonflies (Odonata) (3%), flies (Diptera) (2%) and other orders (5%). Lepidoptera are consumed almost entirely as caterpillars and Hymenoptera are consumed mostly in their larval or pupal stages. Both the adults and larvae of the Coleoptera order are eaten, while the Orthoptera, Homoptera, Isoptera and Hemiptera orders are mostly eaten in the mature stage.

**Table-1 Consumption of insects in different countries-**

Country	Consumption of Insect
South America	Butterfly, Grasshoppers, Crickets, Cicadas, Ants, Flies, Bees and Wasps
Colombia	Giant queen ants, Palm grubs and Caterpillars
Australia	Bees, Ants, Grubs, Moth and Cerambycid beetle
Africa	Caterpillars, Mopane worm, Termites and Locusts
Thailand	Giant water beetle
China	Silkworm pupa, Fly larvae, Cricket, Termites and Locusts
India	Termite, Dragonfly, Grasshopper, Ants, Eri and Mulberry silkworm, Honey bee and Cricket

(Poshadriet *al.*, 2017)

#### **Insect species consumed in India-**

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 a food is common among ethnic

people of Northeast India. The food processed and prepared traditionally by its people is connected to their sociohealth. In Northeast India culture life and 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.

A scientific study revealed that about 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 a bout (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.

**Table-2 Major edible insect species documented in India-**

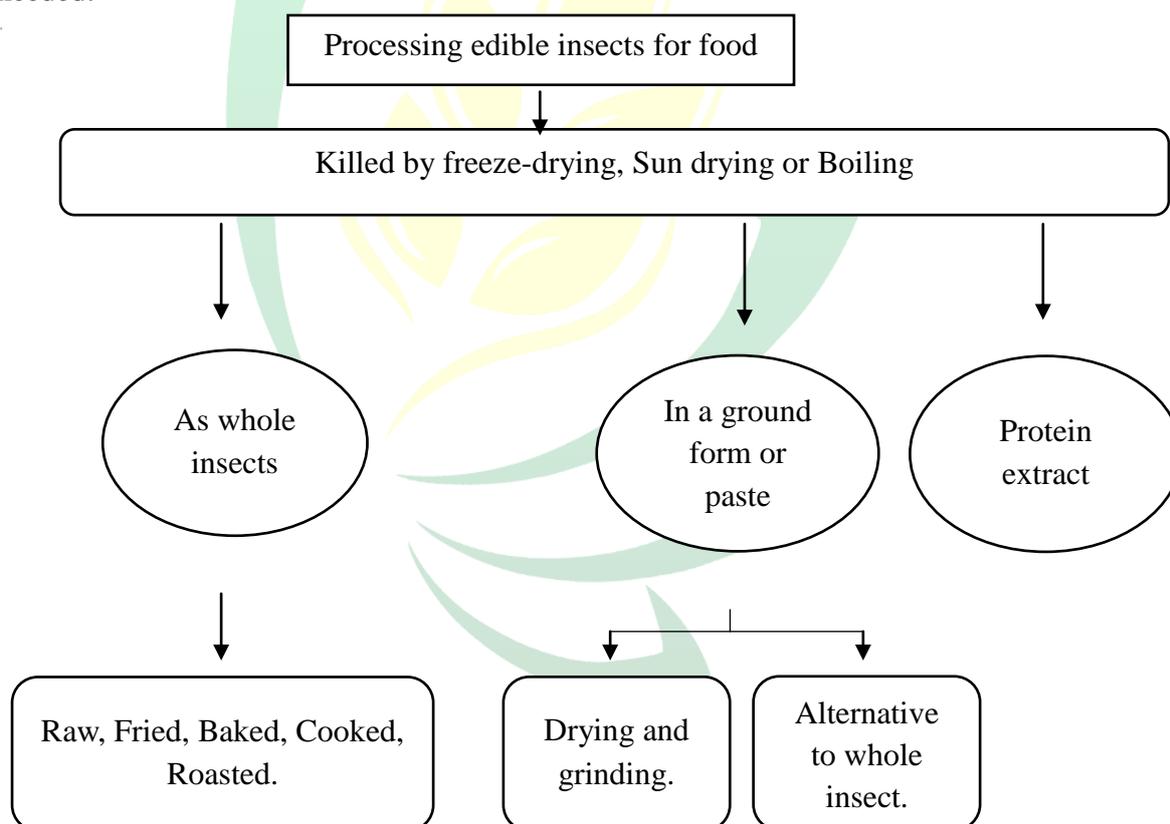
Method of Processing	Insect species	Order	Insect life stage	State
Baked	<i>Apis cerana indica</i>	Hymenoptera,	Egg, larva,	Assam
	<i>Rhynchophorus phoenicis</i>	Coleoptera	Pupa, Grub	
Cooked	<i>Locusta</i> sp.	Orthoptera	Adult	Arunachal Pradesh
Deep fried	<i>Reticulitermes flavipes</i>	Isoptera	Adult	Assam
Raw/Fresh	<i>Aeshna mixta</i>	Odonata,	Nymph,	Assam, Arunachal Pradesh
	<i>Apis dorsata</i>	Hymenoptera	Adult, Larva	
Roasted	<i>Vespa bicolor</i>	Hymenoptera,	Larva, Adult	Arunachal Pradesh, Assam
	<i>Lucanus elshphus</i>	Coleoptera		

(Gahukar, 2018)

### Why eats insects?

The world population is estimated to reach 9 billion people by 2050, demanding a greater output from available agro-ecosystems. Greater pressure on the environment, agricultural land, water resources, forests, fish supply and biodiversity, as well as an

increased need for nutrients and energy, is predicted. At the same time studies show that even with intensification of land-use, current food production systems cannot produce the food needed for a growing population. We need to find other ways to sustain both our planet and ourselves. There is an urgent need for innovative solutions. Insects are included in the human diet in most parts of the world, with Europe and parts of North America being two exceptions (FAO, 2013). Edible insects contain high quality protein, fat, vitamins and minerals and are also considered tasty and even delicious by those accustomed to eating them. Insects have a comparatively efficient feed conversion, which in a rearing system limits the amount of land required for feed production. There is also evidence that insects emit the less greenhouse gases and ammonia compared with conventional livestock. Due to these benefits, rearing of insects has been suggested as a promising alternative to conventional livestock production – even in Western societies. For this to be a sustainable industry, much new knowledge is needed.



(Thakur *et al.*, 2018)

Fig-2 How insect are eaten?

### **Advantages-**

- Insect are very important as a food supplement for undernourished children.
- Insect species are high in fatty acids
- Insects provide high- quality protein and nutrients when compared with meat and fish
- They are also rich in micronutrients.
- Insect pose a low risk of transmitting zoonotic diseases.
- New efforts and standards are required to assure nutritional quality and safety of insect foods.
- The oil which is extracted from insect used for other culinary practices and pharmaceutical preparations.
- Requires less space to raise and less pollution and by product also obtain from them.

### **Disadvantages-**

- Pesticide treated insects unsuitable for human consumption.
- Herbicide can accumulate in insect through bioaccumulation.
- Adverse allergic reactions are also a possible hazard.

### **Conclusion-**

India being tropical country, the diversity and abundance of insects are greater. Therefore, India can be a potential land for insect bio-resource. While many get nervous at the thought of insect-tasting, they are the future of protein and there is a need to develop effective means to glamorize the consumption of these often-undervalued bio-resources. Edible insects can constitute an important part of the diet of Indians and other developing nations and help combat various global issues, predominantly malnutrition and food insecurity.

### **Future aspects-**

- Need of research in processing, production related to entomophagy.
- Need of development the market for edible insect sector

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