

## Entomophagy: Future human food

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The term “Entomophagy” derives from the Greek term “entomos” meaning insects; and “phagein” means “to eat”, combining both term mean “insect eating”. The consumption of insects as food is as old as the history of mankind. Although insects form a small part of the bulk of the diet, they are important in compensating for the general deficiency in animal proteins, fats and calories that occurs among marginal societies. Entomophagy or the consumption of insects has been practiced in India for centuries by several tribes. Entomophagy needs to be revalidated and promoted in the near future as food scarcity in India is increasing day by day. Edible insects are a natural renewable resource of food with nutritional, economic and ecological benefits to the rural people. The high protein content with digestibility as well as some minerals, vitamins, fats and carbohydrates make the insects a perfect food. In fact, insects are the cheapest source of protein compared to animal meat and fish.

A review on the practices of entomophagy in India revealed that about 255 species of insects are taken as food by different tribes of India. Among these edible species of insects, consumption of coleopteran species was highest constituting about 34%; followed by Orthoptera (24%), Hemiptera (17%), Hymenoptera (10%), Odonata (8%), Lepidoptera (4%), Isoptera (2%) and the least was Ephimeroptera (1%). Practices of entomophagy is quite common among the ethnic people of North East India particularly among the tribes of Arunachal Pradesh, Assam, Manipur and Nagaland and to a lesser extent by the tribes of Meghalaya and Mizoram. Comparatively this practices is much lower (constituting about one to five insect species) among the ethnic people of Kerala, Tamil Nadu, Madhya Pradesh, Odisha of South and Central part of India.

**Importance of insects as food :** Insects as food and feed emerge as an especially relevant issue in the twenty-first century due to the rising cost of animal protein, food and feed in security, environmental pressures, population growth and increasing demand for protein among the middle classes. Thus, alternative solutions to conventional livestock and feed sources would be consumption of

insects or entomophagy, which contributes positively to the environment and to health and livelihoods (FAO, 2012).

Approximately, 1990 insect species are eaten worldwide, mainly in developing countries. Globally, the most commonly consumed insects are beetles (Coleoptera, 31%), caterpillar (Lepidoptera, 18%) and bees, wasps and ants (Hymenoptera, 14%). Lepidoptera are consumed almost entirely as caterpillars and Hymenoptera are consumed mostly in their larval or pupal stages. Both adults and larvae of the Coleopterans are eaten, while the Orthopteran, Homopteran, Isopteran and Hemipteran are eaten in the mature stage.



Fig. 1: Fried immature stages of insects as human food

**Nutritive values of insects:** Insects are highly nutritious and healthy food source with high fat, protein, vitamin, fibre and mineral content. 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 green house gases. Insects can be used as a replacement for fish meal and fish oil in animal diet.

Insects are of a higher calorific value than meats, maize, soybeans, lentils, or other legumes. Available data show that of the insects, it had 50% a caloric value higher than soybeans, 87% higher than corn, 70% higher than fish, lentils and beans and 95% scored higher values than wheat, rye.

Caterpillars contain proteins to the extent of 50-60g/100g dry weight, the palm weevil grubs contain 23-36g, Orthoptera contain 41-91g, ants contain 7-25g and termites

contain 35-65g/100g. In the case of silkworm caterpillars, eating them can be sufficient for daily requirements of copper, zinc, iron, thiamine and riboflavin and the deficiency of riboflavin can be fulfilled by eating those insects containing this amino acid.

**Factors favouring entomophagy:** There are many factors that cite in favour of entomophagy of consuming insects as food.

- For one, the growing human population is incessantly forcing the demand for more food, on the other side there is simultaneous reduction in the availability of land resources for food production.

- Insects also have a faster growth rate and high fecundity. Insect production can be possible in small spaces and causes less pollution as compared to livestock.

- Insects are far more capable in converting plant biomass into animal biomass. Therefore, more animal protein is generated as compared to conventional livestock.

- Most of the edible species of insects contain protein; some of them are also rich in fat and hold good amounts of amino acids, essential vitamins and minerals.

**Are all insects safe? :** Not all insects are harmless to eat. Just like plant and animal food products, some insects are not fit for human consumption or cause allergic response. Some insects even contain repulsive or toxic chemicals as a part of defence mechanism. Some insects bear stout hairs like hairy caterpillars, which may cause red itching patches and eruption on skin. Insects collected from the wild are generally safe to eat as compared to those collected from cropped areas, which are in the cross hairs of pesticide sprays. However, these health hazards can be eliminated by eating edible insect species grown on desired feed. For all insects, proper processing, handling

and storage are necessary in order to avoid contamination and to ensure safety levels.

**Conclusion:** Awareness of entomophagy among consumers and insect rearing entrepreneurs is necessary. Entomophagy can be revalidated by worldwide campaigns that are to be launched in those countries that are facing acute food shortage. A multi-faceted and linked global strategy is, therefore, needed to ensure sustainable and equitable food security (FAO, 2010). This novel approach of entomophagy can play an interdisciplinary role associated with forestry, traditional medicine, agriculture and animal husbandry to combat the present scenario of global food crisis.

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