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# CRAWLING TOWARDS FOOD SECURITY: EMBRACING ENTOMOPHAGY

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**Abstract–**It is challenging to supply the protein needs of the world's rapidly expanding population using sources from both plants and animals. In addition to insects, other options like algae, fungi, in vitro meat, and other single cell protein sources were researched. Insects among them appear to be more environmentally friendly, require less financial investment, and use less technology during production.As a result, eating insects as food can be a different way to get protein. It has advantages for animals as well as people, and it can be fed to poultry and fish. It is affordable, healthy for the environment, and nourishing. In the global food programmes, insect meals are becoming more important. The current ongoing studies and next research could highlight the importance of entomophagy's potential in the food security sector.

## INTRODUCTION

The practise of eating insects as food is known as entomophagy. The word "entomophagy" comes from the Greek roots "entomos" (insects) and "phagein" (eating). It is used in nations including China, Japan, Thailand, Mexico, and Zimbabwe among others. The most common insects eaten as food include cockroaches, silk worms, ants, termites, grasshoppers, flies, leaf hoppers, wasps, bees, crickets, dragon flies, and beetles, among others. The main groups of insects ingested include Lepidoptra, Hymenoptera, Orthoptera, Hemiptera, Isopteran, and Diptera (Kumar *et al.,* 2017).

### Antiquity of edible insects

Entomophagy has been a practise since the beginning of time and is not a recently developed idea. In his Historia Animalium, Aristotle (384–322) discussed the flavour of adult female cicada which were primarily employed medically. Because of their wide variety, edible insects have a diverse nutritional profile. Depending on the stage of life, insects have different nutritional values. These eatable insects provide good quality nutritional energy as well as vital amino acids, fatty acids, macro and micro vitamins and minerals (Pal and Roy, 2014).

### Scenario of entomophagy in India

Worldwide, more than 2,000 bug species from 18 orders are eaten. Since ancient times, biodiversity has existed in India as a result of peaceful cohabitation between tribal tribes and the environment (Jongema, 2017). Despite this, no government entity has conducted a thorough survey on edible insects. 298 edible insects from the phyla coleopteran (34%), orthoptera (24%), hemiptera (17%), hymenoptera (10%), odonata (8%), lepidoptera (4%), isoptera (2%) and ephemeroptera (1%), according to reports, have been discovered. There are 158 species of insects in Arunachal Pradesh, 41 species each in Manipur and Nagaland, 38 species in Assam, 16 species in Meghalaya, 5 species in Kerala, and 1 species each in Karnataka, Tamil Nadu, Odisha, and Madhya Pradesh (Chakravorty, 2014).

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**Status of insect farming in India**

Most edible insects are now harvested from nature, however domesticated insects, particularly silkworms, are being investigated for large-scale outdoor and indoor commercial cultivation. While mulberry silkworms are used to make cocoons in other locations, larvae and pupae of silkworms are eaten in the North East region. The following is a breakdown of some crucial points to help you understand the situation as it is in this regard. In some parts of India, it is standard practise to consume honey bee comb that contains the brood (eggs and larvae). It's interesting to note that some Indian tribes consume silkworm pupae. The World Health Organization (WHO, 2021) suggests insects as a meat substitute in a report due to their high nutritional content in the case of a food crisis over the following century.

**Organoleptic characteristics**

Edible insects have a different sensory quality than other foods. The cooked, boiled insects have a distinct flavour and taste. As the insects are thoroughly cleansed, the tastelessness is also noticed (Kouøimská and Adámková, 2016). To improve the flavour and taste, other ingredients can be added, such as salt and spices. The exoskeleton chitin on the insects can typically feel the texture. From one insect to the next, the hue and appearance are all different and considered (Kim *et al.*, 2017)

**Combating malnutrition**

Entomophagy has a part to play in the fight against malnutrition in developing and underdeveloped nations. Denmark was the first country where the Win Food Project, run by a consultative research council, successfully created foods with better nutrition by combining them with fruits, roots, fish, snails, frogs, and insects. Cambodia and Kenya then did the same thing (Evans *et al.*, 2015)

**Scenario of entomophagy in the world**

The order Coleoptera, which accounts for roughly 31% of all bug species utilised worldwide for food purposes, is followed by the Lepidoptera, which accounts for the remaining 18% and is primarily used by sub-Saharan Africans. In Latin America, people commonly consume hymenopteran insects including bees, wasps, and ants, which make up 14% of all entomophagy. Orthoptera (grasshoppers, locusts, and crickets) come in second with an estimated 13 percent of the market, followed by Hemiptera (planthoppers, scale insects, cicadas, and leafhoppers) at 10%, Isoptera (termites), Odonata (dragonflies), 3 percent, Diptera (flies), 2 percent, and the remaining orders at 6% (Adeyeye and Olaleye, 2016). The eating phases of insects differ from order to order; for instance, both adults and larvae of beetles (Coleoptera) are devoured, while caterpillars and pupae are rarely eaten in the case of lepidopterans and hymenopterans, respectively. While Orthoptera, Homoptera, and Isoptera are in their mature stages.

**Nutritive value of edible insects**

Due to their wide species diversity, edible insects have a wide range of nutritional properties. Depending on the stage of the insects (egg, larval, pupa, and adult for holometabolous insects, and egg, nymph, and adults for hemimetabolous insects), their food sources, habitats, preparation techniques, and nutritional qualities might vary even within the same insect species (Hayes, 2002). The majority of edible insects provide a good amount of dietary energy, vital amino acids, fatty acids, macro and micro vitamins, and minerals despite the existence of differences in nutritional content (Gahukar, 2018).

**Feed forlivestock**

The main sources of protein are poultry, meat, fish, and livestock, but supply cannot keep up with demand from a population that is expanding quickly. The use of edible insects as food for insects and a substitute food source has since been developed (Van Huis, 2013). It has a low technology base and very low production costs. The capacity of an animal to turn food into biomass is known as feed conversion efficiency. In contrast, as insects are poikilothermic, they do not require as much energy to maintain body temperature (Gahukar, 2018).

**Least contribution for global warming**

The main cause of global warming is greenhouse gases, which are created by a variety of processes including the use of fossil fuels, industrialization, the farming of animals, and enteric fermentation. According to the study, compared to pigs and calves, which produce more greenhouse gases per kilo gram of mass, the three-insect species like mealworm larvae, crickets, and locusts produced less ammonia and greenhouse emissions per kilogramme of mass (Premalatha *et al.*, 2011).

## CONCLUSION

In the future, customers in various nations may include insects in their regular diets because they are an intriguing source of nourishment. They could also be utilised as a dietary addition for specific diets, such as those for athletes. Insect species that may be acceptable for inclusion in the standard diet must be raised under defined and standardised circumstances, and their composition, including any biologically active ingredients, must be carefully monitored. In order to properly incorporate edible insects as food into the EU law documents, more study on their composition and nutrient profile is necessary as well as an assessment of the sanitary and toxicological hazards associated with them. The population is rapidly expanding, and the increased production of farmed insects provides an additional food source. It works well with human nutrition, the environment, livestock feed, and it also contributes to improving food security and safety. The more research done on its growing and manufacturing, the bigger the market it would have as a brand-new food source.

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