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**Entomophagy: a step towards food security****Laya A. C. and Haseena Bhaskar**

Department of Agricultural Entomology, College of Agriculture, Kerala Agricultural University, Vellanikkara, Thrissur - 680656, Kerala

**Corresponding author: [layaac.82@gmail.com](mailto:layaac.82@gmail.com)**

The world population surges ahead and is expected to reach nine billion by 2050 (FAO, 2012). Food security becomes a challenge due to growing population and limited resources, necessitating rethinking about food patterns and habits, particularly those relating to meat consumption. The word entomophagy is derived from the Greek word, *Entomon* means 'insect' and *Phagein* means 'to eat.' Thus, the practice of eating insects is known as entomophagy. Insects form a part of the human diet in many tropical countries and the earliest citing of entomophagy can be found in religious literature of Christian, Jewish and Islamic faiths (Huis *et al.*, 2013). Loaded with proteins, fats and minerals, insects offer enormous scope as an alternative source of food. About 31 per cent of all edible insects around the world belong to the order Coleoptera followed by Lepidoptera, Hymenoptera, Orthoptera and Hemiptera.

The opportunities of insects as alternate food sources are due to its environmental, nutritional and socio-economic benefits. The major environmental benefits include high feed conversion efficiency, lower emission of greenhouse gases and lower water as well as land requirement (Huis, 2013). Higher feed conversion efficiency as well as lower

emission of methane, nitrous oxide and ammonia has been reported in the edible insects *Tenebrio molitor*, *Acheta domesticus*, *Locusta migratoria*, *Pachnoda marginata* and *Blaptica dubia*, when compared to conventional livestock (Oonincx *et al.*, 2010).



**Fig. 1. Fried silkworm pupae for sale in China**

(Source: <https://images.app.goo.gl/BLiPwMsYUuA5Lmkc9>)

Edible insects are highly nutritious as they are rich in carbohydrates, proteins, amino acids, fatty acids and micronutrients. A comparative study of amino acid content in beef and mealworm larva revealed that mealworms had higher isoleucine, leucine, valine, tyrosine, alanine, glycine and proline content (Huis *et al.*, 2013). Harvesting and raising of insects involve low technology and capital investment and provides opportunities

for subsistence for both urban and rural population, which makes it socio-economically viable.

Edible insects can be obtained by wild harvesting, semi-domestication and rearing/farming. Ninety two per cent of known species of edible insects are obtained through wild harvesting, six per cent by semi-domestication and two per cent by rearing (Yen, 2009). Rearing and semi domestication are considered to be the most productive method as they have huge potential to provide a more stable supply. Bamboo caterpillar, *Omphisa fuscidentalis* and weaver ant, *Oecophylla smaragdina* are collected from the wild, while the palm weevil, *Rhynchophorus palmarum* serve as a classical example of semi-domestication (Govorushko, 2019). Rearing of insects in captivity, isolated from their natural populations and provided with controlled living conditions and diet is referred as insect farming. House crickets, palm weevils and mealworms are being successfully farmed in Thailand (Hanboonsong *et al.*, 2013).

After being harvested, the insects are processed and consumed as whole insects, in ground or paste form or as extracted protein. Blanching and drying are the common processing techniques followed, which minimizes the microbial risk and increases the shelf life of edible insect products. The effect of processing technology and storage conditions on the microbial characteristics of

mealworm larva, field cricket nymph and migratory locust adult revealed that storage after drying at 103<sup>0</sup>C for 12 hours reduced the total microbial count, as well as counts of enterobacteria, yeast and mould significantly (Adamek *et al.*, 2018).



**Fig. 2. Insect food product**

(Source: <https://images.app.goo.gl/px3ErwK6KjgKx1Co6>)

Even though use of insects as food confers many advantages, not all insects are safe to eat. Microbial, chemical, physical and allergic risk should be considered while selecting insects for human consumption. In future, meat centric diets will become increasingly expensive and grain-livestock systems environmentally unsustainable. Though entomophagy is still in its early stages, given due support, it can play a significant role in assuring global food security.

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