“HEY! Today I have brought cockroach fry in my lunch box.” In India, we are not yet there. But with the changing food scenario the world over, after enjoying burgers, noodles, Chinese foods, Italian foods and Thai foods, now insects could soon be a part of our menu.

With the growing human population incessantly forcing the demand for more food, the day is not far when insects might soon be a part of our menu.

Scrummy Insects in My Stomach?

PASHTE VRUSHALI VIJAYKUMAR AND SAID PRASHANT PANDHARINATH

SCIENCE REPORTER, FEBRUARY 2014
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. Insects collected from the wild are generally safe to eat as compared to those collected from cropped areas, which are in the crosshairs of pesticide sprays.

However, health hazards can be eliminated by eating edible insect species grown on desired feed.

Just imagine a yummy grasshopper and worms staring at us from huge hoardings, with some attractive offers. The day is not far when such scenarios would be commonplace and a necessity to feed the growing population. Alternative sources of food, rather than regular foods, would provide the solution. Even now, in several parts of India insects form part of the diet. Many restaurants have also introduced delicious insect dishes in their menus.

The term for eating insects is “entomophagy”. Humans have been eating various types of insect since thousands of years. The consumption of insects appears to be racially common, simply changing with locality, group of people and available insect population.

Factors Favouring Entomophagy

There are many factors that one can cite in favour of entomophagy or 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. The mass production of insects has great potential to provide animal proteins for human consumption indirectly as livestock feed. Insect culturing also has a much smaller environmental impact, particularly if a closed structure can be made at the village or farm level.

Besides, more and more people are becoming calorie conscious and concerned about the nutritional requirements (fats, vitamins, etc). Researchers have now found that insects as a food source are about twice as efficient as chickens and pigs, and more than five times as efficient as beef. Space scientists are even thinking of employing insects as human food in space journeys and habitation. The beneficial spin of entomophagy is also on account of many insect ‘pests’ being edible.

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. Chitin comprises about 10% of whole dried insect and the chitin by-product could be of considerable value as a fibre source.

The United Nation’s Food and Agricultural Organization (FAO) released a study and handbook which argued that “six-legged livestock – edible bugs and worms” that can assist to meet the global food demand are expected to grow 60% by 2050.

Recently, Eva Muller, director of FAO’s forest economic policy and products division, said in a report, “We are not saying that people should be eating bugs. We are saying that insects are just one resource provided by forests, and insects are pretty much untapped for their potential for food, and especially for feed.”

A study by FoodServiceWarehouse.com recommended that substitution of pork and beef with crickets and locusts could help to reduce greenhouse gas emissions by as much as 95%. The FAO has been funding projects since 2011 intended at promoting the eating and farming of insects in South-East Asia and Africa, where an estimated two billion people already eat insects and caterpillar larvae as a regular part of their diet.

The US Food and Drug Administration (FDA) also allows definite levels of natural or unavoidable defects in foods, as long as they do not pose a health risk. For example, chocolate can have up to 60 insect fragments per 100 grams, tomato sauce can contain 30 fly eggs per 100 grams, and peanut butter can have 30 insect fragments per 100 grams (3.5 ounces).

Insect Cuisine

Hundreds of insect species have been used as human food. In Africa, insects have been eaten as part of regular diet. Africa is followed by Asia and America as far as consumption of insects is concerned. In India, eating of honey bee comb with the brood (eggs and larvae) is common practice in certain areas. Interestingly some Indian tribes eat the pupae of silkworm. The different features of entomophagy practiced by different ethnic communities inhabited in North-East India are well documented.

The edible insects are prepared as curry, roasted, fried and also eaten raw. In the tropics, insects are big, more diverse, and available the year round. In the winter season, the insects are smaller and not always accessible due to hibernation.

Some of the well-known edible insect species are termites, silverfish, crickets, mayflies, dragonflies, grasshopper, butterflies, moths (silkworms), cockroach, true bug, cicadas, leafhopper, mealybugs, beetles, flies, mosquitoes, ants, bees, wasps, etc. Ordinarily, insects are not used as emergency food to ward off starvation, but are included as a planned part of the diet throughout the year or when seasonally available. Insects are consumed at all stages of growth: eggs, larvae, pupae and adults.

In Africa (Congo), nearly about 10% of the population’s protein comes from insects. Zambian people eat bee larvae and pupae with honey. In South Africa,
Mopane worms, *Gonimbrasia belina*, commonly known as mopani found chiefly on Mopani trees, are consumed. Normally, one would find big bags of dried or smoked Mopane worms in local marketplaces all over Zimbabwe, South Africa, Botswana, Zambia, and Namibia. They are greyish looking when dried and at first look might be confused with beans. In Zimbabwe, termites are a trendy snack, commonly found in bars. Locusts (*Schistocerca gregaria*) are used by various African groups persistently as food.

Among the Mexican regions, caterpillars of the Giant Skippers (maguey worms) and escamoles (ant larvae) are considered a delicacy. Sold fresh in markets, they are then fried before consumption.

The winged termites are collected and fried or made into bread. In South Africa, they are eaten with a maize porridge. Termite oil is utilized for cooking purpose in African countries.

They are also used to feed the fishes in fish ponds. In Zimbabwe, farmers hang lights above the lakes to attract the alates in order to be a feast for fishes.

Pliny the Elder, the Roman scholar, noted that “aristocrats loved to eat beetle larvae reared on flour and wine” while Aristotle illustrated the best time to collect cicadas: “The larva on attaining full size becomes a nymph; then it tastes best, before the husk is broken. At first the males are better to eat, but after copulation the females, which are then full of white eggs.”

Palm weevils, including the famous sago grub (*Rhynchophorus ferrugineus*), are also favoured for consumption. Usually, the grubs are either boiled or roasted over an open fire. They are very sweet with a little nutty flavour. “Sago Delight” or different types of the sago dish are considered a speciality in many South-East Asian countries. In several regions, sago worms are roasted to celebrate special occasions.

Almost eighty grasshopper species are habitually eaten in Ghana throughout the spring rains. The cone-headed grasshopper, *Ruspolia nitidula*, is famous among many tribes in Uganda (local name: nsenene) and other central and eastern countries of Africa. The chocolate-coated bees are well-liked in Nigeria. Rice cooked with crunchy wasps (*Vespula lewsi*) was a favourite meal of the late Emperor Hirohito in Japan. Cooked wutchery grubs, *Xyleutes leuchmochla* have been often likened in taste to almonds found in central Australia. Dragonflies boiled in coconut milk with ginger are an Indonesian delicacy.

The larvae of butterfly, modrono worms (*Eucharia socialis*), are eaten by Mexicans. Colombians enjoy the roasted leaf cutting ants in the cinema cinema halls just as we gorge on popcorons and peanuts. Thai people prefer males of the giant water bug due to their distinctive flavour because of their pheromone glands.

The day is not far when such scenarios would be commonplace and a necessity to feed the growing population. Alternative sources of food, rather than regular foods, would provide the solution.
The ant species Polyrhachis vicina Rogen is the most important food insect in China consumed in various forms such as dried bodies, ant powder and ant wine, as also the honey bee (Apis cerana Fabr. and Apis mellifera L.) and its products. During the cool winters, the Chinese keep warm with a steaming bowl of ant soup. The Pangwe in Cameroun also eat Odonata larvae for their diuretic properties.

The Japanese are also munching the rice grasshopper regularly. There caddis fly larvae (zazamushi) are sold in tins and served in restaurants. The processed insects are commercially available in Japan. The most widely eaten is inugo (grasshopper) which is preserved in soy sauce. Restaurants in Japan serve up hachi-no-ko (boiled wasp larvae), zazamushi (aquatic insect larvae) and sangi (fried silk moth pupae).

Locusts are also becoming a food item in South Korea especially among the rice farmers. Termites are lightly fried and sold in many corners of the world’s marketplaces. Commercially edible insects also make good value e.g. leaf cutter ant sells for $20 per pound, hornet larvae sells for $20 per 100 g. The cost varies among the regions according to season and availability.

Generally, there are three ways insects are consumed: as whole insects, processed in some form and as an extract of the insect. Insects are sundried, roasted, ground and mixed with other ingredients and processed into different food products.

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 crosshairs 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. The zoonotic possibility of insects also needs to be kept in mind as insects are carriers of various microorganisms.

Pashte V rushali V ijaykumar (pashte.vrushali@gmail.com) is with the Department of Entomology, MPKV, Rahuri, Dist. Ahmednagar (Maharashtra)-413722 and Said Prashant Pandharinath is with the Department of Farm Engineering, IAS, BHU, Varanasi (Uttar Pradesh)