

Insects as Food for Thought

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The concept of what is not acceptable as food in English culture is well conveyed by an age-old conundrum: ‘What is worse than finding a maggot in your apple?’ – ‘Finding half a maggot’ [1]. Indeed, food choices are often associated with cultural identity [2]. With the classification of insects as pests and Western stereotype of indigenous people who consume insects as primitive or uncivilized, one can hardly accept the inferiority of eating insects. However, is entomophagy purely a barbaric act [2]?

Let us begin searching for an answer with a brief overview of entomophagy. There are approximately 1500-2000 species of insects consumed by over 3000 ethnic groups across 113 countries. You may have heard of chawanmushi; but have you heard of *zaza-mushi*? Cooked in soy sauce and sugar, *zaza-mushi* – the larvae of aquatic caddis flies (order Trichoptera) – is a delicacy in rural Japanese towns. There is even an elite group of licensed Japanese hunters, who collect up to five pounds of *zaza-mushi* each per day. The hunters in turn sell their catch to insect canners for about \$40 per pound. Since 1956, canning has become the fate of most harvested insects in Japan. Apart from *zaza-mushi*, canned insects such as baby bees, silkworm pupae and grasshoppers are common in Japanese retail shops [3].

Perhaps tarantulas are the most unimaginable arthropod dish that you would have ever heard. Surprisingly, tarantulas make a favourite dish in Venezuela and Cambodia. *Theraphosa leblondi*, the biggest spider in the world, is a popular dish in Venezuelan restaurants. The big-sized spider often occupies one whole dinner plate [3]. In a remote province in Cambodia, deep-fried tarantulas are sold for 500 riels (\$0.20 U.S). The business is brisk and all the customers are men, as they think that tarantulas are good for their virility [3].

A quick glance at the commercialized practice suggests that entomophagy is not purely a barbaric act. The diverse and long established cultures of eating insects have made this practice a norm in many countries across the world. This phenomenon opens up a huge market for industries to harvest and serve insects for human consumption. Nonetheless, the scale of insects market in Japan and Cambodia may be too small to conclude the economic benefit of entomophagy. The first case study of mopane worm trade in Botswana will thus be a convincing illustration of the economic importance of entomophagy.

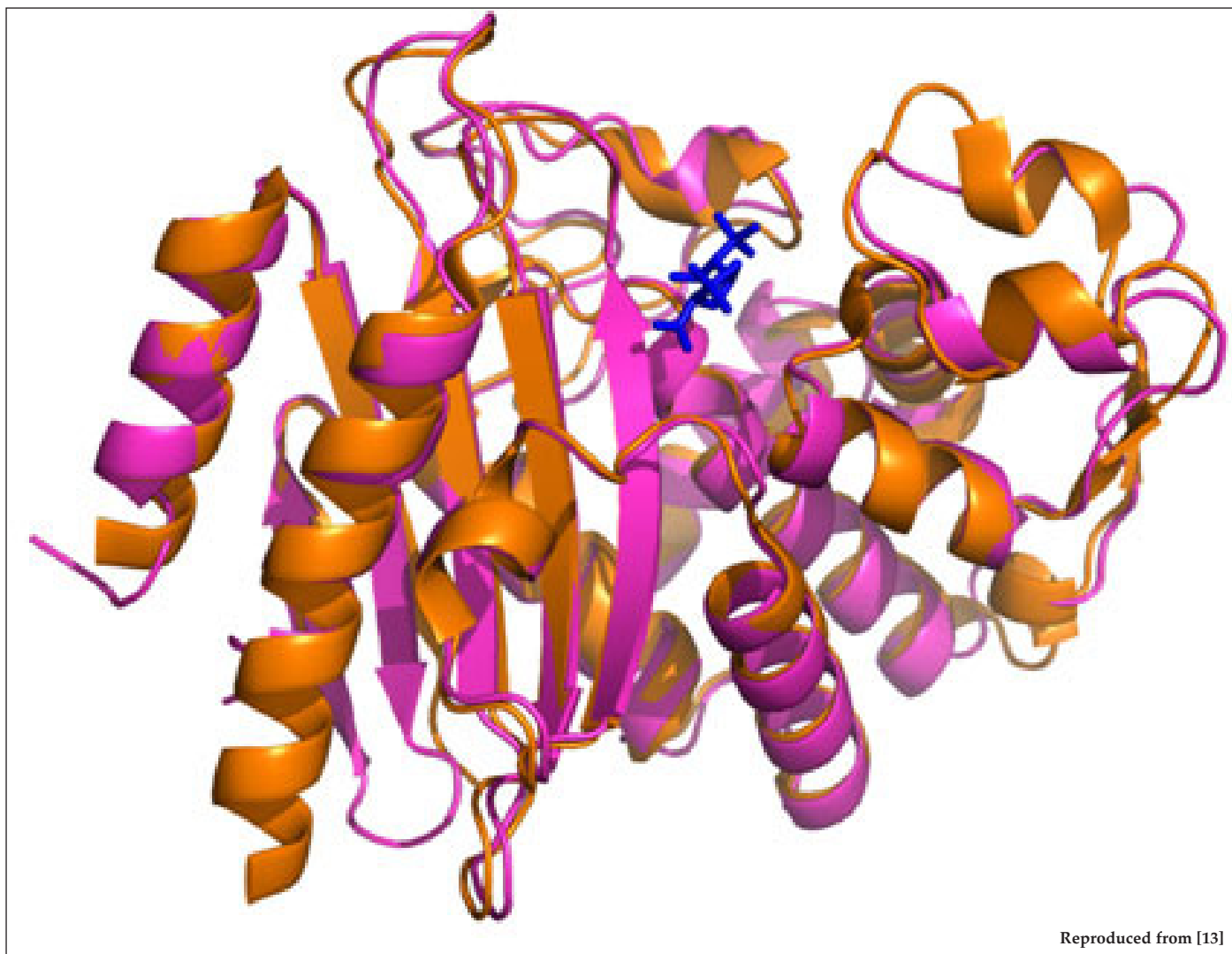
Mopane Worm Trade in Botswana – A Source of Income

In Botswana, mopane worm not only serves to satisfy hunger, but it also represents an important commercial enterprise. Mopane worm belongs to the order Lepidoptera. It is a caterpillar that feeds on mopane trees and has two seasonal outbreaks per year in April and December. The worms have thorn-like points on their backs that are sharp enough to slice unwary fingers. Yet women and children are daring enough to take the risk of harvesting them. Mopane worms offer a lucrative trade – women in Botswana sell loaded sacks full of dried mopane worms to trailers; trailers sell the worms to wholesalers, who resell them to merchants, who resell them again in the market [3]. As a country with the knowledge and tradition of harvesting the insects, mopane worm trade has long been an economy booster for Botswana. A good worm harvest in a year is estimated to be worth US \$3.3 million, providing employment to 10,000 people [4].

To achieve greater economic benefits, much research has been poured into the study of mopane worm. In 2001, the Department for International Development (DFID), a United Kingdom government department responsible for promoting development and the reduction of poverty, funded a three year research that sought to increase the understanding of mopane worm biology and its management as a valuable natural resource. Various harvesting and storage techniques have been developed through the research. Some of them include the development of a low-cost hand-held degutting device that can be made at village level and a novel dry roasting cooker that removes all the brittle spines of mopane worms [5]. These inventions have saved much work for harvesters. In particular, poor farmers, landless families and rural artisans of mopane woodland-dwelling communities in rural places such as Zimbabwe, South Africa



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and Botswana have benefited from the introduction of these inventions [4]. The increasing labor participation in mopane worm trade can thus alleviate poverty in these rural areas.

Chongcha and Ant Wine – Eating Insects for Their Medicinal and Nutritional Values

On top of underpinning major economic sectors of several African countries, the use of insects as traditional medicine exemplifies health benefits of entomophagy. Travelling north, the rich use of insects in traditional Chinese medicine is well documented. In China, insect excrement is often made into medicinal tea. *Chongcha*, a black fragrant tea that aids digestion, alleviate diarrhoea, and treat bleeding haemorrhoids, is made from tiny hard pellets of caterpillar (*Hydrillodes morose*) excrement. The medicinal properties of *Chongcha* are suggested to arise from the presence of pharmacologically active substance, ellagic acid, which is found in the caterpillar's diet and excreted out intact [3]. *Hydrillodes morose* feeds mainly on the leaves of *Platycarya stobilacea*, a plant that is rich in ellagic acid [6]. This substance is found to have antiproliferative and antioxidant properties that account for the anti-haemorrhoids properties of *Chongcha*. Apart from medicinal tea, ant wine is also widely used in traditional Chinese medicine. The formic acid and various minerals in ants are said to be effective against Hepatitis B and rheumatism [4]. As a result of its health benefits, ant wine becomes so popular that it places the medicinal ant

genus, *Polyrhachis*, in the threat of extinction [3].

Along with their medicinal properties, insects are also consumed for their nutrients. Insects are generally rich in minerals. For instance, crickets contain more than 1,550 milligrams of iron, 25 milligrams of zinc and 340 milligrams of calcium per 100 grams of dry tissue [7]. Three of them would provide an individual's daily iron requirement. In addition, many insects have a fairly high concentration of the eight essential amino acids that cannot be synthesized in human body. In Uganda, termites are the main source of lysine and tryptophan, two essential amino acids that are limited in the country's staple food [3]. Given their high nutrient and protein level, insects should indeed be included in our diets.

Grasshopper Control in Mexico – Ecological Benefit of Entomophagy

Ecologically, the consumption of plant pests is advocated as a means of pest control [9]. In the Puebla-Tlaxcala Valley in Mexico, predominant crops such as alfalfa, bean, corn, squash and broad bean are routinely attacked by the grasshopper *Sphenarium purpurascens*, an edible species [10]. It was reported that 30,339 ha of land in the state of Tlaxcala has been infested with the grasshopper. The application of insecticides, mainly parathion and malathion, is used as the primary method to control the pests. However, it has resulted in the escape of organophosphorate residues into water bodies which are lethal to many fish species. Moreover,

the farmers often apply insecticides without proper personal safety equipment. Direct contact of insecticides introduces harmful effects such as respiratory disorders and toxicity that results in chromosome deviation and abnormal sperm counts of affected farmers. In view of the negative impacts of such a chemical control, the manual harvesting of *S. purpurascens*

“ [N]o matter how many benefits entomophagy generates, the taste of insects itself ruins the dish ”

for consumption is preferred as an environmentally friendly way of controlling the pest. In addition, the replacement of insecticides by manual harvesting of the insect generates economical benefits. For the residents of Puebla, grasshopper harvesting has become their principal source of income. Sale of grasshoppers as food to the states of Oaxaca, Morelos and Mexico City yields annual profits of US \$3000 per family. In contrast, insecticide application costs US \$150 per farmer [10]. This adds up to a net gain of US \$3150 per farmer who adopts manual harvesting in pest control.

As an energy-efficient source of protein, insect consumption can potentially alleviate some of the problems associated with livestock production. Currently, there has been much concern regarding raising livestock for consumption. First, livestock production takes up a considerable amount of land, which is approximated to be 30% of the land surface area on earth [11]. Secondly, the process of raising livestock generates a large source of greenhouse gases. Ruminant livestock produce about 80 million metric tons of methane annually, accounting for about 28% of global methane emissions from human-related activities [12]. On the other hand, insects are small organisms that do not take up much space or generate much greenhouse gases. Therefore, using insects as an alternative source of protein will not only generate ecological benefit, but also alleviate the existing environmental problems concerning livestock production.

Mexican Jumil Day – Learning about Other Cultures through an Insect Feast

Finally, let us examine Mexican Jumil day, which features a ritual that is associated with a bug feast. This case study demonstrates that we can learn about other cultures through

an insect feast. Mexican Jumil day falls on the first Monday after Day of the Dead, a special day when family and friends gather around for remembrance of loved ones that have already passed away. On Jumil day, Mexicans gather on a mountaintop between Mexico City and Acapulco. As a ritual dating from pre-Aztec times, the townspeople eat jumiles (*Euchistus taxcoensis*), a type of stink bug which is half-inch long [3]. Jumiles migrate annually to the mountaintop and reproduce there between September and the next February [8]. The bugs are traditionally believed to be the souls of ancestors returning to the living [3]. Eating these symbolic bugs could mean to combine one's body and the ancestor's soul as one. This unorthodox ritual of eating bugs has also left a deep impression on people, making Mexican culture more well-known.

Still, Why Not Eat Insects?

Despite the establishment of multiple benefits of entomophagy, there is still a major attitudinal barrier to the use of insects as human food in western societies. The limited interest arises from hygienic concerns that view insects as a transmitter of disease. Interestingly, most people in western societies inadvertently consume insects from various food products. In fact, the United States' Food and Drug Administration (FDA) has permitted certain levels of insects to be found in food products. In the United States, the allowable amounts of insect per 100 g of processed food products are as follow: 80 insect fragments for chocolate, 60 aphids, thrips or mites for frozen broccoli, 100 insect fragments for macaroni and other noodle products, 60 insect fragments for peanut butter and 150 insect fragments for wheat flour [9]. Therefore, education on nutritional, health and ecological issues associated with entomophagy can partly overcome the aversion towards insects.

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To sum up, this essay has established economic, health, ecological and cultural benefits that justify entomophagy. Yet in reality, entomophagy will hardly be accepted in Western culture. At the end of this essay, you may be tempted to try the grilled witchetty grubs, or you may be appalled by the fried tarantulas. After all, insects are food for thought – food that is worth exploring into for some, while for others, only in their imagination. ■

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