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New menu on the platter-insect delicacies: A Review

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Abstract

Insects are a great source of protein and are often low in fat, making them a nutritious and sustainable food source. Some commonly consumed insects include crickets, grasshoppers, mealworms, and beetles. Insect delicacies refer to the consumption of insects as food. While this may seem unusual or unappetizing to some, many cultures around the world have been eating insects as part of their diet for centuries. Insects can be prepared in a variety of ways, such as roasted, fried, or boiled. They can also be ground up into a powder and used as an ingredient in recipes such as protein bars or smoothies. In recent years, there has been a growing interest in insect delicacies in Western countries as a way to promote sustainable and eco-friendly eating habits. However, it's important to note that not all insects are safe for consumption and proper preparation is necessary to avoid any health risks.

Keywords: Insect, delicacy, protein source, sustainable

Introduction

Edible insects are frequently regarded as delicacy and as sustenance for humans. More than 2000 edible insect species have been identified worldwide, and they are regarded as excellent sources of nutrition for both food and animal feed (Letlhogonolo Selaledi, 2021) ^[1]. The majority of people in the world like eating ants, termites, locusts, grasshoppers, crickets, beetles, caterpillars, and moths, among approximately 2000 other species of insects, as snacks and seasonal pleasures. According to Wayne Roberts (2008) ^[2], in Colombia, large queen leafcutter ants are considered a delicacy. Since ancient times, people have eaten insects, sometimes as emergency food, other times as a staple, and still other times as delicacies (Patrick B Durst and Kenichi Shono, 2010) ^[3]. Although estimates of the number of insect species consumed by humans vary, at least 1400 species have been identified as food for people globally (Pedro Cardoso, 2020) ^[4]. The habit of eating insects, or entomophagy, has waned in many countries in the contemporary era and is frequently derided as antiquated, filthy, or unhealthy. Nonetheless, insects continue to be a necessary and favoured diet as well as a crucial source of protein, fat, minerals, and vitamins in a variety of civilizations all over the world. In several emerging nations, the upper and middle classes are urban society's fastest-growing segments, and for some of them, insects are "nostalgia food," conjuring up memories of simpler, more idyllic times in the countryside (Patrick B. Durst and Kenichi Shono, 2008) ^[3].

Entomophagy

For many societies, entomophagy has been a long-standing tradition and a source of sustenance. Nonetheless, many communities consider it to be a primordial behaviour and have long since abandoned it. However the current food demand crisis, coupled with the need for new nutritious sources and the issues of under nourishment, particularly in poor nations, has reached a stage where a fresh viewpoint is required (Nelson Mota de Carvalho, 2020) ^[8]. The term "entomophagy" refers to the eating of insects in science. When eaten, arthropods are just one part of a diet that typically includes many other food categories, the term "entomophagy" is favoured. As a result, an organism that consumes fruit, vegetables, eggs, fish, and meat may also be entomophagous, or an insect eater (Victor Benno Meyer-Rochow, 2010) ^[9]. In its stead, entomophagy is demonstrating the enormous potential of insects as a feed and food source. The biggest impediments to entomophagy acceptance in western cultures are neophobia and revulsion; nevertheless, modern understanding of this practise and processing capabilities can transfer that source to any meal in any shape. A straightforward but nutrient-dense insect powder can pave the way for an abundant, sustainable, and rich food source. (Nelson Mota de Carvalho, 2020) ^[8].

What made people choose insects for eating?

There is growing interest in edible insects worldwide. This is seen not only in the academic sphere, but also in the availability of food products containing insects as an ingredient (F.V Dunkel and C Payne, 2016) ^[5]. So what made people include insects in their diet? concerns about “the environment” and “health”, and a willingness to try something “exciting” were the three main reasons for choosing insects as an alternative protein source (Maria Nyberg, 2020) ^[6].

Additional factors could be the mounting evidence that insects can protect against environmental changes and improve human health, particularly in light of the cultural emphasis on sustainable consumption. As people start thinking historically, perhaps subconsciously, they will learn that insects were their primary food source in the beginning, not large mammals, which were only a lucky break after a successful hunt. In the early days of human evolution, mothers and young children preferred eating insects as a source of high-quality protein (F.V Dunkel and C payne, 2016) ^[5].

In India, there are several traditional dishes that include insects as an ingredient. Here are some examples:

- Chaprah - Chaprah is a dish from the state of Chhattisgarh that is made with red ants and their eggs. The ants are roasted and then mixed with spices to create a tangy and spicy dish.
- Eri Polu - Eri Polu is a dish from the state of Assam that is made with the pupae of the eri silk moth. The pupae are boiled and then mixed with vegetables and spices to create a hearty and flavorful dish.
- Saoji keede - Saoji keede is a dish from the state of Maharashtra that is made with grasshoppers. The grasshoppers are roasted and then mixed with spices to create a crunchy and flavorful snack.
- Chermoula-coated Crispy Grasshoppers - This is a modern take on a traditional Moroccan dish, and it's become increasingly popular in India. Grasshoppers are coated in a spicy chermoula sauce and then deep-fried until crispy.
- Jumiles - Jumiles are a type of stink bug that are consumed in the state of Oaxaca in Mexico, which has a large Indian population. The dish is typically made by grinding the bugs with garlic, chilies, and other spices, and then using the mixture as a topping for tortillas.

Not only in India, Insect delicacies are a part of traditional cuisines in many countries around the world. Few examples are as follows:

- Escamoles - Escamoles are the edible larvae of ants and are considered a delicacy in Mexico. They have a nutty and buttery taste and are often used as a filling for tacos or omelets.
- Fried tarantulas - Fried tarantulas are a popular snack in Cambodia. The tarantulas are marinated in a mixture of sugar, salt, and garlic, and then deep-fried until crispy.
- Fried crickets - Fried crickets are a popular snack in Thailand and are often sold by street vendors. The crickets are seasoned with soy sauce, garlic, and chili, and then deep-fried until crispy.
- Witchetty grubs - Witchetty grubs are the larvae of the cossid moth and are a traditional food of Aboriginal Australians. They are often roasted over a fire and have a nutty flavor.
- Sago worms - Sago worms are the larvae of the sago palm weevil and are a popular snack in Malaysia and parts of Indonesia. They are usually fried or grilled and have a creamy, buttery taste.
- Hachinoko - Hachinoko is a traditional Japanese dish made from the larvae of honey bees. The larvae are often served raw or lightly cooked and have a sweet, nutty flavor.

How insects help us to have good Nutrition?

As a result of their nutritional content and effectiveness as food converters, edible insects are growing in popularity (Monica A Ayieko *et al.*, 2016) ^[7]. Insects provide for incredibly nourishing food. In a diet that is primarily plant-based, insects are an essential source of fat, protein, and minerals. Certain insects, particularly those in the larval stage, are also high in fat, and the majority of insects contain large amounts of important vitamins, minerals, and amino acids. Insects are excellent sources of protein for enhancing the human diet, particularly for people who are undernourished due to a protein deficit. In reality, dietitians are the top researchers in food insects due to their aim to address the issues caused by diets low in protein (Patrick B Durst, Kenichi Shono, 2010) ^[3]. Dunkel and Payne (2016) ^[5] opined that many insect species have the same amount of protein or even more than meat or fish. They frequently have more mineral content than meat. Hence, eating delicacies made of insects aids in achieving nutritious balance in the body.

Table 1: Nutritional index of few insects is listed below

Insect	Energy (Kcal)	Protein (g)	Fat (g)	Carbohy-drate (g)	Fe (mg)	Ca (mg)	P (mg)	K (mg)	Vitamin	
									B1	B2
Grasshoppers (Large)	95.7	14.3	3.3	2.2	3	27.5	150.2	217.4	0.19	0.57
Grasshoppers (Small)	152.9	20.6	6.1	3.9	5	35.2	238.4	237.4	0.23	1.86
True water beetles	149.1	21	7.1	0.3	6.4	36.7	204.5	197.9	0.31	3.51
Mole crickets	125.1	15.4	6.3	1.7	41.7	75.7	254.1	267.8	0.20	1.89
Red ant eggs (A mix of egg and pupae)	82.8	7	3.2	6.5	4.1	8.4	113.4	96.3	0.15	0.19
Silkworm pupae	98	9.6	5.6	2.3	1.8	41.7	115.4	138.7	0.12	1.05
Giant water bugs	162.3	19.8	8.3	5.5	13.6	43.5	225.5	191.7	0.09	1.50

Production of Edible Insects

Producing edible insects sustainably has a lower negative impact on the environment than raising other types of livestock. More focus should be placed on environmentally sustainable harvesting techniques, such as indigenous knowledge systems, in order to control the production of

insects for the sake of food security. Understanding indigenous ways of life can help the industries that produce edible insects grow sustainably (F.V Dunkel and C payne, 2016) ^[5]. In order to secure food security, national governments and assistance programmes should pay more attention to the production of edible insects because it has

economic, nutritional, and ecological benefits (Letlhogonolo Selaledi, 2021) ^[1].

There are three methods for eating insects. Entire insects, whole insects that have been processed into a powdery paste or granular powder, or an extract like protein isolate. Whole, recognisable insects are prepared and eaten in many different ways around the world, with fried or dried nibbles being the most common. There are 13 methods of preparing insects in Thai cuisine, which can be divided into three categories: precooking (singeing), cooking in oil (frying, sautéing), and cooking without oil (paste, soup, curry, poaching, steaming, and hot salad). Burgers, sandwiches, and bug fritters have all gained popularity recently. These novel techniques might result in customers consuming more calories (Jintana Yhoun-Aree 2010) ^[10].

Preservation:

Insects raised for food can be kept as dried or milled products, generally as a powder that can be added to foods for improved functionality or nutritional content. In the past, insects were only lightly processed by canning, chilling, roasting, toasting, drying, and baking in order to preserve quality and lengthen shelf life (F.V Dunkel and C payne, 2016) ^[5]. Enhancing the shelf life of captured insects is feasible by adding salt, pure honey, and palm oil additives (Niassy and Fiaboe, 2016) ^[11]. Insects may now be processed on a large scale, almost industrially. Using entire insects is not compatible with many food products or food processing tools. Working with insects raised in vast indoor farms by one is possibly ideal right now. Working with insects that have been raised in big indoor farms by one company and processed (whole) into a fine powder may be the best option for the time being (Dunkel and payne, 2016) ^[5].

All of these processing techniques alter the product's nutritive value, sensory quality, and shelf life, just like they do with many other foods. Processing can help extend shelf life, get rid of pathogens, and lessen the amount of poisonous phytochemicals that are present on insects (Niassy and Fiaboe, 2016) ^[11].

Benefits

Insects as an alternative protein/nutrient source that is ideal for food companies, nutritionists, entomologists, food entrepreneurs, and athletes, etc. Beyond protein and food, the fibre component of insects have a very wide and lucrative set of benefits. Chitin is the second most important polymer in the world. Chitosan a natural polysaccharide is widely used in pharmaceutical ingredients (F.V Dunkel and C payne, 2016) ^[5].

Health benefits

Among the many edible insects that sustain human nutrition are ants, bees, termites, caterpillars, water bugs, beetle larvae, flies, crickets, katydids, cicadas, and dragonfly nymphs. Compared to beef, chicken, pig, or lamb, termites, grasshoppers, caterpillars, weevils, houseflies, and spiders are better providers of protein. They are nutrient-dense in terms of minerals and protein (40–75 g/100 g dry weight). The nutritional composition of insect protein includes a high concentration of essential amino acids (46–96%) and is of high quality with a high digestibility (77–98%). As medication, traditional healers use insects. Insects can create chemicals that can be used to make antibacterial and

anticancer medications. We should promote the capture of edible insects because their nutritional and financial significance is frequently overlooked.

Limitations

The Food and Agricultural Organization of the United Nations (FAO) has certain concerns regarding food safety when it comes to edible insects:

Allergenic: Eating insects has the potential to cause life-threatening allergic reactions. For instance, those who are allergic to shellfish should steer clear of edible insects.

Biological: *E. coli* and *Campylobacter*, among other bacteria known to cause illness in humans, have been identified in insects. In addition to these bacteria, other potential biological contaminants include viruses, parasites, and fungi.

Chemical: Insects are particularly susceptible to chemical contamination because many of them are consumed whole. Chemicals such as pesticides, hazardous metals, and dioxins should be avoided when eating insects.

Physical: Because of their hard parts, such as stingers, wings, rostrum (sharp mouthparts), and spines, insects can be a choking threat.

Insect overconsumption increases the danger of developing kidney stones and chronic degenerative disorders by filling the stomach with chitin and chitosan, protein, and fat. Excessive consumption of insects may fill the stomach with chitin and chitosan, protein and fat, which carry the risk of urinary track stone formation and development of chronic degenerative diseases.

Conclusion

Protein and amino acids, especially those that are crucial for human health, are abundant in edible insects. They are one excellent source of protein. In particular, high levels of unsaturated fatty acids, which have exceptional nutritional value, can give rich fat, fatty acids, nutritive components, vitamins, and carbs. Insects also include other components that are beneficial to human health, including as antimicrobial proteins and peptides, enzymes, and hormones. Certain insects provide for exceptional health food. Future research should concentrate on the industrialisation of edible insects as a nutritional resource. According to the FAO, by 2050, there will be a steady rise in global population to 9 billion, which will raise the demand for food and feed from existing agro-ecosystems and put even more strain on the environment. Together with nutrient deficits and the depletion of non-renewable resources, there will be a shortage of agricultural land, water, forests, fisheries, and biodiversity resources. Insects offer a sustainable alternative to giving up meat, which can help alleviate these constraints.

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