

## Edible Insects: A Brief Guide for Polish Consumers

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**Abstract:** For several years, the concept of consuming insects has been attracting significant interest in Europe, given its potential to provide an environmentally sustainable, meat-alternative source of protein in the diet, not only for animals but also for humans.

In Poland at the beginning of 2023, there was a considerable interest around edible insects, but in a negative context. A disinformation campaign was conducted on television and social media, claiming that edible insects threaten human health. It was suggested that consuming insects is a futuristic fad, an ideological madness, a concept conflicting with Polish economic interests, particularly affecting farming areas.

This work aimed to present the most important, reliable data regarding edible insects to create a comprehensive and objective informational foundation. This foundation can serve as a basis for making decisions regarding the potential utilisation of insects as a food source.

**Keywords:** edible insects, Polish consumer, human behaviour

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## 1. Introduction

For several years, the concept of consuming insects has been attracting significant interest in Europe, given its potential to provide an environmentally sustainable, meat-alternative source of protein in the diet, not only for animals but also for humans. In Poland, at the beginning of 2023, there was a considerable 'buzz' around edible insects, but in a negative context (Facebook, n.d.; Globalna.info,

n.d.; Dziennik.pl, n.d.; TVN24.pl, n.d.). A disinformation campaign was conducted on television and social media, claiming that edible insects threaten human health. It was suggested that consuming insects is a futuristic fad, an ideological madness, a concept conflicting with Polish economic interests, particularly affecting farming areas.

This work aimed to present the most important, reliable data regarding edible insects to create a comprehensive and objective informational foundation. This foundation can serve as a basis for making decisions regarding the potential utilization of insects as a food source.

## 2. Entomophagy – Eating Insects

Consuming insects, known as entomophagy, is a concept foreign to Western culture, but estimated to be an integral part of the diet for at least two billion people in Asia, Latin America, Africa, and Australia (Raheem et al., 2019; van Huis et al., 2013, 2022). Worldwide, over 2000 species of edible insects are consumed (Jongema, 2012), the most commonly eaten include beetles, butterflies, bees, wasps, ants, locusts, crickets, grasshoppers, and bugs (van Huis et al., 2013). Insects are eaten at different stages of their life cycle, including eggs, larvae, pupae, and adults. Various culinary techniques such as deep frying, boiling, and baking are employed in preparing insects (van Huis et al., 2016). They are typically consumed either in their entirety or in a processed form such as ground (powdered or made into paste) (Carpentieri et al., 2024; Żolnierczyk and Szumny, 2021). Protein and fat isolates derived from insects have also found applications (Purschke et al., 2018; Rumpold and Schlüter, 2015).

Dried, ground insects known as cochineal insects (*Dactylopius coccus*) are used to extract a dark red food dye called carmine (Sikorski, 2007), widely employed in the food industry to colour sauces, fruit fillings for pastries, yoghurts, and toppings, among other applications (Rozporządzenie Ministra Zdrowia w sprawie dozwolonych substancji dodatkowych, 2011). In the cosmetic industry, it is used for colouring eyeshadows, shampoos, and other products.

### 2.1. Insects as Food in Europe

In the current legal framework based on the provisions of Regulation (EU) No 2015/2283 (European Parliament and Council of the European Union, Regulation (EU) 2015/2283, 2015) regarding novel food and the executive regulations issued on its basis by the Commission, the following insects have been approved as novel food (either as such or as an ingredient in other food): *Tenebrio molitor* (mealworm), *Locusta migratoria* (migratory locust), *Alphitobius diaperinus* (lesser mealworm), *Acheta domesticus* (house cricket) (Commission Implementing Regulation (EU) 2021/1975; 2022/169; 2022/188; 2023/5; 2023/58). Depending on the insect species, larvae (mealworm, lesser mealworm) or whole insects (migratory locust, house cricket) are eaten.

It must be known that the European Union does not force people to consume insects, and furthermore, it does not impose specific diets or regulate what people should consume. Choosing a meal product containing insects lies solely with the consumers. By reading the product labels, consumers can be sure about the composition of the meal/product.

### 2.2. European Attitudes to Eating Insects

The introduction of insects into the diet requires a change in European mentality and cultural beliefs because insects traditionally evoke disgust, being perceived as undesirable, primarily treated as parasites and pests rather than a source of food (Moszyński, 1967a, 1967b; Orkusz et al., 2020). Europeans are cautious about the concept of consuming edible insects. Acceptance of entomophagy among European consumers is highly correlated with neophobia (Moruzzo et al., 2021; Orkusz, 2020).

Piha et al. (2018) found that Northern Europeans generally have a more positive attitude towards insect-based food products than consumers in Central Europe. In Poland, the consumption of insects is sporadic, and they are often perceived as exotic novelties (Gałęcki et al., 2021). The lack of a tradition of consuming insects, and therefore the lack of knowledge that insects are a valuable source of nutrients and understanding of how to prepare them for consumption so that the dish is attractive, contributes to the reluctance to try them (Orkusz et al., 2020; Zielińska et al., 2020). However, when the typical form of an insect is concealed (ground/crushed) and incorporated into other food products (bread, pancake batter, pasta), it is easier to persuade the consumer to try a dish with the addition of insects (Orkusz et al., 2020). In a Belgian study, 61.9% of the respondents were familiar with entomophagy, and 46.6% had a negative attitude towards insect consumption. However, 77.7% of the surveyed were willing to try edible insects (Megido et al., 2014). Sogari, Menozzi and Mora (2019) found that the respondents in Southern Italy were less willing to try edible insects than those in other regions of Italy, suggesting a firmly rooted traditional food culture of Southern Italy. Additionally, Menozzi et al. (2017) compared insect acceptance in Italy and the Netherlands found that the Dutch, with their plain food culture, had a stronger intention to eat products containing insect flour than Italians, who have their well-established gastronomic tradition.

### **3. Why Edible Insects?**

#### **3.1. Environmental Aspect**

Insects efficiently assimilate nutrients from feed, producing several times more mass from the same amount of dry food than poultry or cattle. They can thrive on any type of food, including agricultural by-products like leaves, bran, vegetable and fruit residues. Insect farming requires minimal space and water. Additionally, insect farming is associated with significantly lower greenhouse gas emissions than livestock farming. Insect waste can be utilised as fertiliser. The production of insects is cost-effective and does not require highly skilled workers (van Huis et al., 2013).

#### **3.2. Nutritional Value**

Edible insects are rich in essential nutrients, but their nutritional value varies significantly depending on the species, life stage (higher nutritional value in adults compared to developmental stages between successive larval lines), habitat, and the insect's diet (Orkusz, 2021a, 2021b). The protein content in edible insects averages around 50%, whereas in meat, it is 18%. They are also a source of unsaturated fatty acids (Orkusz et al., 2024), vitamins, and mineral components (Ghosh et al., 2017; Orkusz, 2021b, 2021a).

Although edible insects are a valuable source of nutrients, some compounds, such as chitin, are perceived as antinutritive. Chitin is a polysaccharide composed of a long-chain polymer of N-acetyl-glucosamine, the main component of insect exoskeletons (Elieh-Ali-Komi and Hamblin, 2016; Iber et al., 2022). Humans can digest chitin into a deacetylated form, chitosan, a functional food ingredient providing beneficial effects as an antimicrobial and an immune modulator in chronic disease healing and cholesterol reduction (Singh et al., 2018). Studies have shown that chitin can improve gastrointestinal health when gut microbiota ferment it (Zhou et al., 2010). It can also decrease the risk of bacterial infection through antimicrobial effects and reduce chronic inflammation associated with cardiovascular disease and cancer (Singh et al., 2018). Chitin is also present in the cell walls of algae and fungi (Pellis et al., 2022), which are also a source of food. In particular, fungi constitute a well-liked product, commonly used to prepare holiday dishes (Christmas).

### 3.3. Food Safety

Edible insects have the potential to play a significant role in the bioconversion of agri-food wastes, which have a vast global production estimated at 1.3 billion tons per year (Żuk-Gołaszewska et al., 2022). Numerous studies indicate that the accumulation of pesticides and heavy metals in insects is mainly associated with agricultural waste materials fed to insects (Houbraken et al., 2016; Malematja et al., 2023). Pesticides used on plants could build up over the lifespan of insects that feed on waste materials, potentially posing a health hazard to humans who consume those insects. When using vegetal waste streams for rearing insects intended for human or animal consumption, it is essential to scrutinise their quality. It was observed that products exhibiting low pesticides are deemed acceptable when a sufficiently long period of food starvation is used before processing the insects for consumption. Conversely, products contaminated with higher pesticides present more significant challenges for inclusion in the insect diet, as evidenced by their reduced excretion and propensity for accumulation (Houbraken et al., 2016). The cultivation of edible insects must be, therefore, strictly controlled. When it is known what insects are fed and how they grow, the risk of heavy metal accumulation and pesticides is eliminated.

Like any food, edible insects may cause allergies. There are as many predispositions and tendencies as there are people, and allergic reactions are an individual matter that can be triggered by almost any substance or food product. Insects belong to the arthropod family, similar to crustaceans (e.g. shrimps). Allergic reactions to crustaceans are well known, therefore individuals allergic to crustaceans, molluscs, and mites should exercise caution. Insects may also contain additional allergens if they were present in their feed (Commission Implementing Regulation (EU) 2021/1975; 2022/169; 2022/188; 2023/5; 2023/58).

## 4. Availability of Edible Insects on the Polish Market

Edible insects (bars, chips, cookies, instant meals, granola, pasta, flour, whole insects, and larvae without additives and with seasonings) are available for purchase in online stores (Table 1) and selected brick-and-mortar stores throughout Poland, for example:

### **Warszawa**

Carrefour store chain – Galeria Wileńska, Targowa 72; Galeria Złote Tarasy, Złota 59; Westfield Mokotów, Wołoska 12

Auchan – Galeria Wola Park, Górczewska 124; King Cross Praga, Jubilerska 1/3; Galeria Ursynów, Puławska 427

### **Łódź**

Carrefour – Centrum Handlowe Nowa Górna, Kolumny 6

EuroSpar – ul. Św. Teresy Od Dzieciątka Jezus 100

### **Kraków**

Carrefour store chain – Galeria Kazimierz, Podgórska 34; Galeria Zakopianka, Zakopiańska 62

Auchan Bronowice – Stawowa 61; Centrum Handlowe, Henryka Kamieńskiego 11

### **Wrocław**

Carrefour store chain – Plac Dominikański 3; Centrum Handlowe Borek, al. Gen. Józefa Hallera 52

### **Poznań**

Carrefour – Galeria Poznania, Pleszewska 1

Auchan Komorniki – Głogowska 432

### **Gdańsk**

Carrefour – Galeria Morena, Schuberta 102 A

Auchan – Szczyliwa 3

**Gdynia**

Intermarche – Galeria Szperk, Pułkownika Stanisława Dąbka 338

**Table 1.** Selected products containing edible insects available on the Polish market**Tabela 1.** Wybrane produkty zawierające owady jadalne dostępne na polskim rynku

Type of insects	Type of product		Composition	Nutritional value in 100 g of product				Price (EUR)
				Energy value (kcal)	Protein (g)	Fat (g)	Carbohydrates (g)	
Mealworm larvae (Tenebrio molitor)	Flour (1000 g)		100%	511	56.6	26.6	2.0	46.6
	Larvae in spices (20 g)	chilli	97.5% insects, salt 2%, chilli 0.5%	563	48	40	2.8	3.2
		curry	96.5% insects, salt 2%, curry 1.5%	563	48	40	2.8	3.2
		garlic	96.7% insects, salt 2%, garlic 1.3%	563	48	40	2.8	3.2
		fromage	96% insects, rapeseed oil 1%, spice mix 3%	521	53	30.9	7.8	3.2
		pizza	96% insects, rapeseed oil 1%, spice mixture 3%	518	53	30.9	7.5	3.2
		salt	98.0% insects, salt 2%	563	48	40	2.8	3.2
		cinnamon salt	95% insects, salt 2%, cinnamon 1.5%, sugar 1.5%	563	48	40	2.8	3.2
		gyros	94% insects, spices 2%, salt 2%, sugars 2%	546	50	38	2.9	3.2
		masala	94% insects, spices 2%, salt 2%, sugars 2%	546	50	38	2.9	3.2
	salted caramel	96% insects, 4% spice mix: sugar, salt, spice flavour	546	50.0	38	4.8	3.2	
Instant rice porridge with strawberry flavour (40 g)		rice husk 84%, corn flour 2.5%, insect flour 11.5%, freeze-dried strawberry 2%	391	17.7	5.1	73.8	2.4	
Cookies (20 g)		94% insects, spices 4%, sugar 2%	546	50.0	38.0	4.4	3.2	
House cricket (Acheta domesticus)	Flour (500 g)		100% insects	431	64.3	17.7	0.2	21.1
	Whole insect without spices (20 g)		100% insects	429.6	65	21.9	6.5	3.3
	Whole insect with spices (20 g)	garlic	92.0% insects, oil 3%, salt 2%, garlic 3%	480	61	22.1	9.4	3.3
		pizza	92.0% insects, oil 3%, spices 5%	475	60.1	22.2	8.4	3.3
		bacon and mustard	90% insects, spices 10%	454	60	19.8	11.1	3.3
		chilli and lime	90% insects, spices 10%	454	60	19.8	11.1	3.3
		tomato and basil	90% insects, spices 10%	454	60	19.8	11.1	3.3
		tomato and basil	90% insects, spices 10%	454	60	19.8	11.1	3.3

	Chips	garlic and spices (80 g)	pea flour 75%, insects 10%, garlic 7%, sunflower oil, herbs 3.2% pepper, potato starch, yeast extract, salt	373	25	11.2	46.4	2.6
	Protein bar	banana and chocolate (60 g)	19% insects, dark chocolate 17%, soy protein, almonds , freeze-dried bananas 6.3%, rice protein, salt	394	30	16	25	2.6
		caramel and nuts (60 g)	17% insects, dark chocolate 17%, peanut paste 11%, rice syrup, soy protein, rice protein, cocoa butter, soy protein extrudate, natural flavours	410	30	19	23	2.6
		pineapple and coconut (40 g)	dates, almonds, and dried pineapple 16%, insects 10%, coconut flakes 8%, lime juice concentrate, dried apricots, rice flour	414	15	19	41	2.2
	Protein chocolate drink (650 g)		pea protein, defatted cocoa powder 15%, insects 10%, sunflower protein, thickener: guar gum, sunflower lecithin, chocolate flavour 0.5%, salt, sucralose	373	70	9.2	3.2	16.6
	Pasta in sauce with beans, spinach and olives (142 g)		pasta 28% (semolina 80%, insect flour 20%), tomato passata 18%, spinach 18%, white beans 13%, onion, kalamata olives 4%, parmesan, dried tomatoes, rapeseed oil, garlic, salt, pepper	404	25	12	43	11.1
Lesser mealworm larvae (Alphitobius diaperinus)	Apple and vanilla granola (350 g)		5% insects, 95% oat flakes, rice syrup, pumpkin seeds, dried apples, puffed rice, honey, rapeseed oil, coconut sugar, pea protein, vanilla extract	391	13	11	57	5.1
	Honey and almond granola (300 g)		5% insects, 95% oat flakes, rice syrup, pumpkin seeds, puffed rice, almonds, rapeseed oil, coconut flower sugar, pea protein	401	14	13	55	4.4
Migratory locust (Locusta migratoria)	Whole insect without spices (10 g)		100% insects	347	59.9	24.5	0.5	6.2
	Whole insect with spices (10 g)	curry	74% insects, curry 13%, salt	371	43	10	21	6.4
		cocoa	59% insects, sugar, cocoa powder 6.3%	371	43	10	21	6.4
		pepper and tomato	75% insects, wheat flour, dried tomato 3.8%, spices and aromatic plants	363	47	11	13	6.4
		Pepper	65% insects, spices (ground coriander 3.6%, ground white pepper 1.5%, ground black pepper 1.5%, paprika powder, cumin)	363	47	11	13	6.4

According to the manufacturer's declaration, the insects are produced in the European Union. They are certified and meet standards allowing for human consumption of insects.

Source: developed based on products available on the Polish market; 1 EUR = 4.5 PLN.

At present, there are no regulations regarding the labelling of food products with added edible insects. On November 28, 2023, the Ministry of Agriculture and Rural Development (Ministerstwo Rolnictwa i Rozwoju Wsi, 2023) published a draft regulation amending the regulation on labelling certain types of food products. According to this project, food containing edible insects must carry the graphic label “Contains edible insects” (Figure 1). The labelling is intended to enable consumers to quickly identify products containing edible insects at a glance while shopping.

## 5. Summary

In light of the presented facts regarding the consumption of insects, it appears crucial to distinguish truth from myth. Despite controversies, edible insects have been integral to the diet in many communities worldwide for centuries. Their nutritional value is unquestionable. However, introducing insects into the diet of Polish consumers poses a cultural challenge, requiring educational initiatives. Informing society about insect consumption’s nutritional benefits, safety, and ecological aspects becomes vital. Doing away with myths such as alleged threats of heavy metals or allergies, is essential in this context.

Ultimately, consumers have complete control over their product choices, considering the growing availability of edible insects in stores. With the introduction of mandatory labelling for products containing edible insects, consumers can consciously decide on their dietary preferences.

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## WZÓR ZNAKU GRAFICZNEGO



**Fig. 1.** Graphic label: “Contains edible insects”

**Rys. 1.** Wzór graficzny „Zawiera owady jadalne”

Source: (Ministerstwo Rolnictwa i Rozwoju Wsi, 2023).

- Commission Implementing Regulation (EU) 2023/58 of 5 January 2023. Authorising the Placing on the Market of the Frozen, Paste, Dried and Powder Forms of *Alphitobius diaperinus* Larvae (Lesser Mealworm) as a Novel Food and Amending Implementing Regulation (EU) 2017/2470. Official Journal of the European Union L 5/10. Retrieved December 9, 2023 from [https://eur-lex.europa.eu/eli/reg\\_impl/2023/58/oj](https://eur-lex.europa.eu/eli/reg_impl/2023/58/oj)
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## Owady jadalne: Krótki przewodnik dla polskich konsumentów

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**Streszczenie:** Od kilku lat koncepcja spożywania owadów budzi ogromne zainteresowanie w Europie w związku z możliwością zapewnienia zrównoważonego środowiskowo, alternatywnego do mięsa, źródła białka w diecie nie tylko zwierząt, ale i ludzi. W Polsce z początkiem 2023 r. zrobiło się bardzo głośno o owadach jadalnych, ale w negatywnym kontekście. W telewizji oraz mediach społecznościowych prowadzono kampanię dezinformacji, podając, że owady jadalne są zagrożeniem dla bezpieczeństwa zdrowotnego człowieka. Wskazywano, że spożywanie owadów jest fanaberią przyszłości, ideologicznym szaleństwem, koncepcją sprzeczną z polskim interesem uderzającą w polską wieś. Celem pracy jest przedstawienie najważniejszych, rzetelnych danych dotyczących owadów jadalnych w celu stworzenia pełnej i obiektywnej podstawy informacyjnej. Ta podstawa może posłużyć jako fundament do podejmowania decyzji dotyczących potencjalnego wykorzystania owadów jako źródła pożywienia.

**Słowa kluczowe:** owady jadalne, polski konsument, zachowanie ludzi

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