

Insects Innovation in Gastronomy

COURSE SUPPORT



Episode 4: Insect-Derived Ingredients

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Synopsis

Insect-based flours are gaining attention in the food industry as a sustainable and nutritionally rich alternative to traditional protein sources. These ingredients are produced by processing whole or partially dehydrated insects into fine powder through specific methods. The functional properties of insect-derived ingredients, including emulsification, water retention, gelation, and thermal stability, make them highly versatile for various food applications. The growing interest in these ingredients is driven by their efficiency in stabilizing emulsions, improving product texture, and enhancing shelf life.

Key Insights & Takeaways

Production Process

The typical production of insect-based flours follows these key steps:

- **Blanching:** Reduces microbial load and ensures product safety.
- **Dehydration:** Enables better preservation and handling of the ingredient. This can be done through oven drying, smoking, or freeze-drying.
- **Grinding:** Converts dried insects into fine flours for food applications.
- **Fermentation (optional):** Enhances flavor, functional properties, and nutritional profile.

By adding the appropriate enzymes, refined insect flours with higher protein content can be obtained, making them suitable for innovative product formulations.

Functional Properties of Insect Flours

- **Emulsification:** The proteins in insect-based flours, particularly from crickets and mealworms, interact with both water and oil molecules. This property stabilizes emulsions, preventing phase separation. As a result, these flours are useful in products like sauces, dressings, mayonnaise, and protein beverages. For instance, insect-based mayonnaise benefits from reduced water-oil separation, ensuring a stable and creamy texture over time.
- **Water Retention:** Insect proteins bind water molecules through hydrogen bonding and electrostatic interactions, making them valuable for various applications. Chitin, found in the insect exoskeleton, further enhances water retention. This property is crucial for:
 - **Baked goods:** Preventing dryness and extending freshness.
 - **Meat alternatives:** Ensuring a juicy texture in burgers and meat substitutes by reducing moisture loss during cooking.
 - **Ready-to-eat and frozen meals:** Preventing ice crystal formation and maintaining quality upon reheating.
- **Gelation:** When heated, insect proteins undergo thermal denaturation, forming a three-dimensional network that traps water and fat. This contributes to the firmness and elasticity of products like sausages, meatballs, and plant-based burgers. Additionally, in desserts like

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mousses and puddings, insect-based flours can act as stabilizers, replacing traditional gelling agents.

- **Foaming Ability:** Insect proteins stabilize air bubbles, forming long-lasting foams. This property is essential for creating light and airy textures in desserts such as soufflés, mousses, and whipped snacks. Dehydrated foams can also be used to produce crunchy snack formulations.
- **Thermal Stability:** Insect-based flours maintain their functional properties at high temperatures, making them suitable for baked goods (bread, biscuits, crackers), ready-to-eat meals, and frozen foods. This ensures structural integrity and product quality after processing.
- **Extended Shelf Life:** The stabilizing effects of insect-based ingredients help prolong the consistency and quality of emulsions, gels, and baked goods. Products such as sauces, soups, and desserts benefit from improved stability over extended storage periods.

Types of Insect-Based Ingredients

1. **Whole insect flours:** Milled from various insect species.
2. **Pure protein isolates:** Extracted through specialized processing for high-protein applications.
3. **Blended protein isolates:** Mixed with other protein sources to balance flavor and nutritional profiles.
4. **Extruded granules:** Crisp and friable, useful in diverse formulations.
5. **Insect-derived oils:** Used in various food applications.
6. **Chitosan:** A polysaccharide derived from chitin, offering multiple functional benefits:
 - **Thickening and stabilizing agent:** Enhances texture and consistency in food products.
 - **Clarifying agent:** Removes impurities in beverages like wine, juice, and beer.
 - **Natural preservative:** Used in health products, cosmetics, and pharmaceuticals.
 - **Environmental applications:** Acts as a flocculant for heavy metal and organic pollutant removal in wastewater treatment.
 - **Bioplastics and sustainable packaging:** Applied in eco-friendly material production.

Final Thought

The utilization of insect-derived ingredients exemplifies how food innovation aligns with sustainability. With strong functional properties and an environmentally friendly production process, insect-based flours and proteins are gaining traction in diverse food formulations. Their unique emulsifying, water-binding, and thermal stability properties make them valuable across various applications, from baked goods to meat substitutes. As research continues to expand, these ingredients hold promising potential not only in the food industry but also in pharmaceuticals, cosmetics, and environmental technologies. Further exploration of their antimicrobial properties and additional processing techniques will help integrate insect-based products into mainstream markets.



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Further Reading & Sources:

European Food Safety Authority (EFSA): www.efsa.europa.eu

FAO Report on Edible Insects: www.fao.org

Regulation (EU) 2015/2283 on Novel Foods: eur-lex.europa.eu

Scientific Publications on Insect-Based Ingredients (Google Scholar, ResearchGate)