TECHNIQUES FOR LIPID EXTRACTION FROM EDIBLE INSECTS

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Because of their nutritious profile and low environmental impact, edible insects have become a popular food source. The market potential of edible insect-derived products—including protein and lipid extracts, chitin and chitosan sources, insect powders or flours, and biofertilizers—is experiencing significant growth. Insects represent a valuable source of macronutrients such as high-quality animal proteins and lipids, in addition to essential micronutrients. The lipid content in edible insects typically ranges between 10% and 50%, with substantial variability influenced by species, developmental stage, sex, physiological status (e.g., migratory activity), and environmental factors such as temperature. Insect lipids are notably rich in unsaturated fatty acids, including linoleic and linolenic acids, and contain diverse lipid classes such as waxes, phospholipids, mono- and diglycerides, sterols, triglycerides, and fat-soluble vitamins. A variety of physical and chemical extraction techniques are employed to isolate lipids from insect biomass, including mechanical pressing, Soxhlet extraction, aqueous extraction, and supercritical carbon dioxide (SC-CO_2) extraction. Mechanical pressing is particularly suitable for lipid-rich insect species (≥20% w/w lipid content), such as *Tenebrio molitor* and *Hermetia illucens*. Conventional solvent extraction methods commonly utilize organic solvents such as acetone, ethanol, petroleum ether, hexane, chloroform, and ethyl acetate. Aqueous extraction, though more environmentally benign, is primarily applied to plant matrices and is characterized by low lipid yields (typically <10%) due to the emulsifying nature of water-based systems, which necessitate further separation steps. In contrast, mechanical pressing may yield approximately 35% lipids. Supercritical CO_2 extraction has emerged as a sustainable and efficient technique, offering multiple advantages including higher extraction efficiency, minimal environmental impact, the absence of solvent residues, enhanced selectivity, and reduced oxidation of lipid components. The yield and composition of extracted lipids are highly dependent on the chosen extraction method. Insect-derived lipids show considerable potential for incorporation into food systems, with applications reported in bakery spreads, confectionery, emulsified products such as mayonnaise, frying media, and as food-grade lubricants—particularly in formulations requiring liquid-state fats. This review aims to critically examine current lipid extraction methodologies applied to edible insects and to explore the prospective applications of these lipid fractions in the food and allied sectors.

Keywords: edible insect, lipid, solvent extraction, animal feed, human food