

Reintroduction of Fruit and Vegetable Waste in the Food Supply Chain: From Their Bioconversion to Earthworm Meal as Protein Source

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Abstract

Food waste affects the sustainability of the food supply chain leading to the squandering of economic, social, and environmental resources. Furthermore, food wasted ends its “life” with high nutritive elements. Among the food categories, a high portion of waste and loss is represented by fruit and vegetable. Earthworms have the ability to bio-convert fruit and vegetable waste (FVW) into products of high value: the vermicompost, a high-quality fertilizer, and the earthworms themselves. Indeed, earthworms grown up on a safe substrate may represent a valuable food or feed source, reintroducing in the food chain all the nutritional components wasted in the FVW. If earthworms will be reared for food purpose, they have to be considered as “farmed animals” and FVW is admitted in EU legislation for feeding livestock. If they are reared as feed sources, earthworms could be used as feed in poultry and fish diet as a source of protein, reducing the use of soybean and fish meal and the livestock production impact. In this study, the bioconversion process of FVW to produce the earthworm meal (EM) as food or feed source, has been evaluated considering: the nutritional value of the EM as food or feed source; the safety of EM as food or feed; the propensity and willingness towards earthworms as future food and the environmental sustainability of the EM production process. The results showed that earthworms reared on FVW are a valuable source of protein 62.3% DM (Dry Matter) and essential amino acids 22.45% DM (particularly in lysine, threonine, methionine+cysteine), vitamin B12 and niacin, iron and iodine; toxicological and microbiological evaluation showed the safety of EM; as food, EM will be more accepted if included in salty snacks; compared to other food or feed protein sources the environmental impact of EM was lower. Therefore, reintroducing FVW into the food supply chain to produce earthworms is an eco-sustainable and ethical solution, which offers a valid resource of animal proteins and can reduce the downsides of meat production, addressing the future need for food in a fast-growing population scenario.

Keywords: Fruit and vegetable waste, bioconversion, earthworm meal, food source, feed source

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