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Life cycle assessment for the bioconversion of organic waste into valuable biomaterials for agricultural uses

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PURPOSE OF THE ABSTRACT

Bioconversion of organic waste biomasses into valuable biomolecules is a peculiar characteristic of several kinds of insects among which Hermetia Illucens (better known as Black Soldier Fly, BSF) represents an excellent example. The possibility to produce high valuable biomaterials to be employed in the agricultural sector from organic waste through the action of BSFes is the subject of a POR-FESR 2014-2020 project financed by European Union and Emilia Romagna Italian region, whose acronym is ValoriBio [1]. In the framework of that project the Life Cycle Assessment (LCA) methodology was applied in order to evaluate and accurately quantify all the environmental impacts associated to the different stages of this bioconversion process, that includes BSFes breeding on poultry manure, extraction of lipids, proteins and chitin from BSF prepupae, and their use in the preparation of biomaterials.

The extraction and fractionation of biomolecules represent fundamental steps in the whole process, in order to obtain higher added marketable products. Therefore, on the basis of the results recently obtained by some of the present authors [2], which developed different fractionation approaches to obtain the desired biomolecules in the purest possible form, an environmental sustainability assessment of these approaches was performed and the results compared, with the aim of being able to consider, in view of their possible applications, also their environmental performances beyond purity, yield and integrity characteristics of specific components.

The laboratory scale LCA analysis was performed using the software SimaPro v. 8.3 [3] and IMPACT 2002+ [4] as the evaluation method. Most of the inventory analysis employed primary data and, whenever they were not available, the Ecoinvent database was used.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

life cycle assessment | bioconversion | organic waste | biomaterials

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