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Microbiota and metabolites in the spontaneous fermentation of agricultural products in the Ecuadorian Amazon

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Abstract

The transformation of agricultural products into inputs with added value is one of the main challenges of modern agriculture. The fermentation of agricultural waste carried out by indigenous microorganisms is one of the pathways to close production cycles with the desired added value while conserving the environment. The fermentation process is an option for the utilisation and environmental management of residues generated by the commercialisation of agricultural products and can be used to produce photochemicals, structural polymers, and bioactive compounds. Organic residues, specifically agricultural and forestry wastes, have the potential to be raw materials for the creation of third-generation biofuels, in addition to being used for the creation of biofertilisers, biomaterials, and bioremediation, among others. Therefore, the objectives of this research were (i) to characterise the inoculum obtained from residues generated by the commercialisation of agricultural products in the city of Tena, (ii) to identify the morphology of the microorganisms present in the ferment and (iii) to identify the volatile compounds resulting from the semi-solid fermentation of the primary inoculum. The results showed that 68% of the surveyed premises discard 1 to 3 kg of waste per day, including cereals, roots, tubers, oilseed plants, fruits, and vegetables, from which the inoculum for the fermentation process was obtained. Yeasts were the predominant microbial group in the ferment with $2.6E+06$ CFU mL⁻¹. The isolated fungi presented morphologies typical of the genera *Fusarium*, *Geotrichum*, *Acremonium*, and *Scopulariopsis*. For bacteria, the most frequent morphology was bacilli. In the liquid phase of the ferment, 20 volatile compounds were identified, including lactic acid, butyrolactone, and 1,3-propanediol. These results demonstrate the potential of fermentations of agricultural residues in local markets for obtaining compounds of biotechnological interest.

Keywords: Bioproducts, fermentation, isolates, microorganisms, waste