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FRUITS AND VEGETABLES WASTES UNDER ANAEROBIC SUBMERGED FERMENTATION TO PRODUCE HOUSEHOLD GOODS

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Abstract: About 1,300 million tons of food such as fruits and vegetables are wasted yearly in the world. This problem provokes environmental, social, economic and health impacts. Fermentation of wastes has been successfully used to engender organic products such as "garbage enzyme" and organic acids. In particular, the garbage enzyme is considered a multipurpose solution for household uses. It is also clear that any effective multipurpose solution may reduce, at any home, the use of several chemical products such as disinfectants or cleaning goods. Nevertheless, chemical products can cause allergic reactions in humans and some of them are listed as toxic air contaminants in some areas overseas. Lactic acid is traditionally used in several industries and, recently, it is employed as a monomer in the synthesis of biodegradable plastics. The objective of this research was to evaluate five organic acids (malic, oxalic, lactic, acetic and citric) and four enzymes (lipases, pectinase, amylases, and proteases) underneath anaerobic submerged fermentation to produce household goods using fruit and vegetable wastes as substrates. Plastic jars were chock-full with a homogenous mixture of fruits and vegetables wastes (orange, papaya, banana, apple, beet, carrot and pineapple), clean water and molasses. The jars remained in dark and a dry zone for 112 d. Samples of every treatment were obtained and analyzed every week. The parameters, reducing sugar (RS), total sugar (TS), protein content (PC), and enzyme activities (EA) were assayed using colorimetric methods, while organic acids (OA) were quantified using RP-HPLC (Thermo Scientific, Ultimate 3000). The results showed that RS and TS decreased in the first 14 d; and after that remain constant with a level of 2.5 g L^{-1} for RS and 8.0 g L^{-1} for TS. The PC was 49±7 µg ml^{-1} at 28 d in all samples, and then decreased to 23±2 µg ml^{-1} until the end of the fermentation process. Amylase or proteases were not found in any sample, lipase was low and pectinase activity was detected from the 21th d just when TS decreased to lowest concentrations. From the evaluated organic acids, only lactic and acetic were detected during fermentation. Lactic acid increased up to a maximum concentration of 16.5 mg ml^{-1} after 77 d. Our results present an alternative to take advantage of food waste to reduce the use of chemical compounds (household cleaners and antiseptics) that may represent a health risk.

Key Words: Fruit and vegetable wastes, organic acids, enzymatic activity, RP-HPLC, garbage enzyme.

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