ENZYMATIC ACTIVITIES (AMYLASE AND CELLULASE) DURING AEROBIC DEGRADATION OF ORGANIC SOLID WASTES

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Introduction. The aerobic digestion of organic solid wastes (OSW) refers to a process of microbial degradation in the presence of O_2 under controlled conditions (1). The ability of microorganisms to digest the organic matter depends on their capacity to produce the hydrolytic enzymes required for degradation of complex substrates (2). Microorganisms produce extracellular enzymes that catalyze the hydrolysis of polymers such as polysaccharides, in order to obtain monomers capable of crossing the cell membrane (3). In this study we measured the production of amylase and cellulase during the first stage of aerobic digestion of OSW. As well as the amount of reducing sugars.

Methods. Aerobic digestion was carried out in glass column lab reactors. Reactors were packed with 84% OSW, 8% bulking material, 3% paper and 5% microbial consortium. This mixture had initial moisture of 70-75%. Columns were incubated at 35 °C for about 48 hours at an air flow of 50 mL/min. Exhaust gas was monitored on line (1) throughout the process. Two samples were taken every 4 hours, to measure amylase and cellulase activities. Enzyme activities were measured by the method of Miller (1960) at a temperature of 45 ˚C.

Results. Figure 1 shows the production of CO_2, the amount of reducing sugars through the aerobic digestion process. It was observed a remarkable decrease on the amount of reducing sugars during the first 28 h of process. These data could be related to the microbial activity. Figure 2 shows the cellulase and amylase activity found sice the beginning of the assays. Both enzymes had maximum activity at 8 h with a slight increase in the concentration of reducing sugars in the subsequent time 12 h probably due to the release of these sugars by activity enzymatic. We observed that an increase on enzyme activities results in greater degradation of the waste. An increase in activity enzymes probably accelerate the process with a better efficiency of degrading the wastes meanwhile that the enzymatic hydrolysis offers the potential for higher yields, greater selectivity, lower energy costs and milder operating conditions (4).

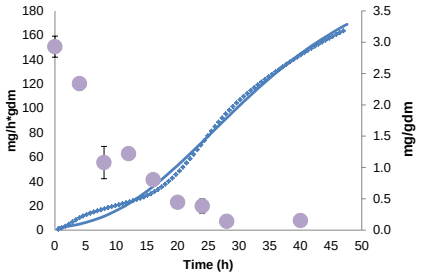

Fig.1 CO_2 production rate (♦) during the aerobic digestion and reducing sugars ( ).

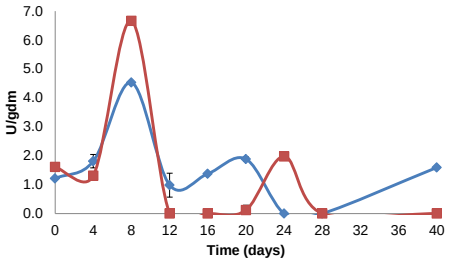

Fig.2 Enzyme activity of amylase at pH 7 (■) and cellulase at pH 5 (♦).

Conclusions. The amount of reducing sugars decreases during the early stage aerobic degradation of OSW**.** The highest enzymatic activity of cellulases and amylases were detected at 8 h.

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