PILOT PLANT RIBBON BLENDER BIOREACTOR FOR THE AEROBIC DEGRADATION OF ORGANIC SOLID WASTES

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Introduction. Organic solid wastes (OSW) can be stabilized by aerobic degradation in accelerated process in bioreactor (1). The ribbon blender provides some characteristics that make it suitable as a solid state fermentation bioreactor (2). Mixing time will help to design better strategies for cooling of the solids. However, it is still necessary to characterize its performance for every combination of substrate and microorganism (3). Model particles with homogenous properties (size, form, and density), represent a good system for mixing studies.
The aim of this study was to find the optimal mixing time in a ribbon blender in order to evaluate the aerobic degradation of OSW.

Methods. The ribbon blender has been described elsewhere (2). The tank held a load of 770 g of model particles (hollow long plastic cylinders). In addition, fifty similar particles, different color but same size, were used as a tracer. Agitation of the ribbon was applied (1 rpm) for different periods. At the end of each period the bed was discharged and separated in four axial fractions. The one containing the whole tracer at the beginning and the other one in the opposite side of the tank were named initial and final, respectively. Degradation of OSW was evaluated in ribbon blender bioreactor. 1 VKgM was used. The CO_2 was monitored by respirometry (4).

Results. A fast distribution or the tracer was observed. Tracer particles could be noticed in final fraction of the bed just 5 min after the onset of the movement of the ribbons. However, a period of 20 min was necessary to obtain the smaller and higher tracer concentration at the initial and final sides of the tank. This was considered the mixing time. Longer periods did not result in closer concentrations.

The resulting mixing time is longer than the 15 min recommended for this blender (3).

The aerobic degradation of mixture of OSW was conducted in intermittently mixed culture (0-96 h) in a ribbon blender at 1 rpm for 20 min. This time was selected in accord to previous results obtained for mixing time. Process presented a gradual in temperature up to 42°C and the rate of production of CO_2 reached 0.098 mol/h kg of initial dry weight (idw), (Figure 1). Mineralization reached 313 g/kg idw in a short period of time (96 h).

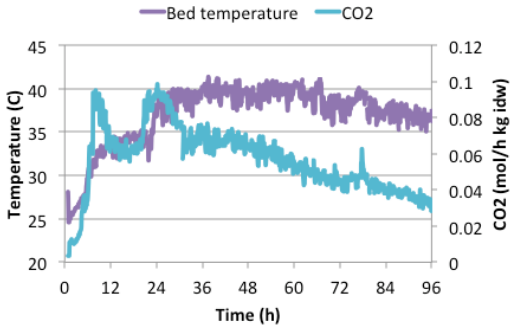

Fig.1. Changes in temperature and CO_2 during the aerobic degradation of mixture contained (idwt): OSW, 85%; paper, 3%; mature compost, 3%; bovine manure, 2%; bagasse and stubble, 7% in a ribbon blender.

Conclusions. The mixing time for homogenous cylindrical particles using a ribbon blender was close to 20 min. The aerobic degradation or OSW in a ribbon blender at intermittent mixing allows to achieve constant temperature profiles and degradation of OSW of 31%.

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