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MANAGEMENT AND POSSIBLE VALORIZATION OF BIOPLASTICS SEPARATED FROM ORGANIC FRACTION OF MUNICIPAL SOLID WASTE

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Abstract

Italian law requires bioplastics to meet precise degradability criteria under aerobic conditions to be treated with Organic Fraction Municipal Solid Waste (OFMSW) but does not provide specific controls on anaerobic degradation capacity. The result is longer composting times for bioplastics than OFMSW. The marketing and use of biodegradable single-use products, such as shopper bags, sidesteps the problem of using common plastics without completely solving it. Therefore, there is a need to identify technological solutions that allow for the complete degradation of biodegradable plastics without the need to modify the process in place in organic waste treatment plants. For this purpose, on biodegradable plastics composed mainly of starch and PBAT, anaerobic digestion tests were carried out to assess whether the degradation kinetics are consistent with the digestion hydraulic retention time of the organic fraction. Alongside this process, pre-treatment tests involving chemical hydrolysis and commercial enzymes were conducted. The tests were performed on laboratory and pilot scales, using organic matter and culture medium for methanogenic bacteria growing also in comparison with Clostridia consortia and both in mesophilic and thermophilic conditions. During the tests, samples were collected after 30 and 55 days of reaction. Microplastic content was analysed in terms of weight loss and presence of PBAT building blocks: adipic acid, terephthalic acid, and 1,4-butanediol. The results showed that both types of pre-treatments increase the degradation yield of bioplastics at different processing times. These results lead the way for the prospect that pre-treated biodegradable plastics can be delivered along with organic waste to existing anaerobic digestion and could increase the quantities normally handled in the aerobic composting plants.

Key words: anaerobic digestion, bioplastic, chemical pre-treatment, enzyme, PBAT

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