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Biochemical Methane potential study of residues and polylactic acid produced from food waste

[1]A. E. Maragkaki, [1]I. Sampathianakis, [2]N. Malliaros, [2]C. Tsompanidis, [3]K. Velonia and [1]T. Manios

[1]*Laboratory of Solid Waste & Wastewater Management, School of Agricultural Science, Hellenic Mediterranean University - Educational and Research Committee, Heraklion, 71401, Crete, Greece*
[2]*ENVIROPLAN SA, 23 Perikleous & Iras Str, 15344 Gerakas Athens, Greece*
[3]*Department of Materials Science and Technology, University of Crete, Heraklion, 71003 Greece*

Abstract

With more than 8 Mt of plastics released into the global environment each year, the majority of which ends up in the sea, plastics contamination has become – together with global warming – the largest worldwide environmental problem. States and organizations are taking firm actions towards tackling plastic pollution, with the EU (Single Use Plastics Directive 2019/904) banding single use plastics by summer 2021. Lactic acid (LA) is an organic compound used in food, pharmaceutical and chemical industry. LA can be polymerized to form the biodegradable polymer PLA. Bioplastics could act as a replacement material for petroleum based plastics. Biochemical methane potential (BMP) tests were carried out on food wastes (FW), a PLLA produced from pure commercial lactic acid and a mixture of food waste and different molecular weight of produced PLLA and commercial PLLA to examine the anaerobic biodegradability of those materials. Anaerobic tests were carried out in mesophilic (37 ^{o}C) conditions. The aim of this work is to study the anaerobic degradation of produced polylactic acid in anaerobic digestion. The produced PLLA of different molecular weight added to the feed did not have a negative effect on BMP tests, but seemed to have higher biogas production. Moreover, co-digestion with PLLA improved biogas production by 1.1-1.2 times and as PLLA biodegrades it increases. The best biogas increment of approximately 20% was achieved for FW & PLLA(2) substrate. Therefore, when the produced PLLA was used as a combination of substrate with food residues it produced larger amounts of biogas than samples containing only food residues. This result highlights the fact that the produced PLLA does not adversely affect the process.

Keywords: food waste, polylactic acid, anaerobic digestion, biogas

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