

The Use of Microalgae Cultivation for Improving the Effluent Behavior of Anaerobic Digestion of Food Wastes at Psychrophilic Range

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Abstract : Anaerobic digestion (AD) plants of food waste (FW) produced by agro-industry, have been widely developed from last decade to nowadays, because of the advantages over aerobic active sludge systems. Despite several bioreactor configurations and operation modes have been successfully improved and implemented at industrial scale in a wide range of applications, effluent behavior, after AD, does not commonly meet requirements for direct disposal into the environment without further treatments. In addition, literature has rarely shown AD of food waste at psychrophilic range. This temperature range may be of interest for making AD plant operation easier and increasing the stability of digestion. In spite of literature shows several methods for post-treatment, such as the use of microalgae, these have not been cultivated on effluents from AD at psychrophilic range. Hence, with the aim of showing the potential use of AD of FW at the psychrophilic range (25°C) and the viability of microalgae post-treatment, single batch reactors have been used for methane potential tests at laboratory scale. Afterwards, digestates, derived from this AD of FW sludge, were diluted with fresh water at different ratios (1:0, 1:1; 1:4) and used as culture media for photoautotrophic microalgae. Several parameters, such as pH, biogas production, and chemical oxygen demand, were measured periodically over several months. Results show that methane potential is 150 ml g⁻¹ per volatile solid with up to 57.7 % of methane content. Moreover, microalgae has been successfully cultivated on all tested effluents and in case of 1:1 and 1:4 rates, the resulting effluents meet the quality levels required for irrigation water.

Keywords : anaerobic digestion, biogas, food waste, microalgae, psychrophilic range

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