Potential for methane production and optimization of the anaerobic digestion of waste and wastewater from a candied fruit – jam factory

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Keywords: fruit processing waste, high organic load wastewater, digestibility tests, mesophilic process; sulfite
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Waste and wastewater generated in industries for the transformation and conservation of fruit contain high amounts of organic matter. This characteristic can turn these waste products into attractive feedstock for the process of anaerobic digestion (AD). However, because of some peculiarities like the imbalance between carbon and nitrogen, low pH (3-4) and, in some cases, presence of sulfite, the AD process must be carefully regulated.

This work investigated the possibility to change the actual destination of solid waste and wastewater produced in a candied fruit – jam factory towards a Waste-to-Energy solution, that is the production of green energy by means of AD. The factory generates approximately 40 t/y of solid waste made of scraps of candied fruits and products not suitable for sale and 13,000 m^3/y of wastewater. The present fate of these waste is, respectively, disposal via composting for solid waste and a conventional biological treatment, after chemical pretreatment, for wastewater.

By using fed-batch digestibility tests at a lab-scale, we quantified the methane potential production of solid waste and wastewater and searched for the best operating conditions according to which to carry out the AD process. Digestibility tests demonstrated that the solid waste had an average methane specific production of 0.276 $Nm^3/kgVS_{added}$ and that liquid waste that make up wastewater had methane specific productions ranging from 0.250 to 0.330 $Nm^3/kgVS_{added}$. A carefully regulation of the food vs. microorganism ratio (F/M) and the addition of nitrogen and buffering resources, and agents for the inhibition of H_2S generation, demonstrated to be compulsory for a steady development of the AD process.