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EFFECT OF THERMAL, ALKALINE, AND THERMAL-ALKALINE PRETREATMENTS ON THE ANAEROBIC DIGESTION OF POULTRY SLAUGHTERHOUSE WASTE

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Abstract

Residues rich in proteins and lipids are typically generated in poultry slaughterhouses and can be used to generate energy through anaerobic digestion. However, these residues are barely soluble and tend to form crusts inside the reactors, causing a reduction and delay in biogas production. These drawbacks can be resolved by pretreatment applications to enhance biomass degradation without inhibiting the process. The objective of this study was to evaluate the effects of thermal (120–190°C), alkaline (0.3–0.6 $gNaOH/gVS_{substrate}$), and thermal-alkaline (0.6 $gNaOH/gVS_{substrate}$ at 120–190°C) pretreatments on the flotation sludge from poultry slaughterhouse. The biochemical methane potential and biodegradability of the substrates were evaluated. The thermal pretreatment resulted in the lowest rates of sludge solubilization (1.0–5.8%), while the alkali pretreatment resulted in comparatively higher rates of sludge solubilization (48.1–52.1%). The thermal and thermal-alkaline pretreatments did not increase the volume of methane or result in the inhibition of substrate hydrolysis. The pretreatments with 0.3 and 0.6 $gNaOH/gVS_{substrate}$ produced 20.0% and 42.3% more methane than the control, respectively, and 90% of the cumulative biogas production was reached after 15 and 28 days of digestion, respectively. Although the alkaline pretreatment with 0.6 $gNaOH/gVS_{substrate}$ resulted in a greater accumulated volume of methane, the initial degradation activity of organic matter was inhibited, while the consumption of the chemical reagent (NaOH) was doubled. Thus, the alkaline pretreatment with 0.3 $gNaOH/gVS_{substrate}$ stood out for its satisfactory performance in methane production, lower reagent demand, and no inhibition of microbial activity.

Key words: agro-industrial waste, inhibition, sodium hydroxide, solubilization

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