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Jurado, Esperanza; Skiadas, Ioannis; Gavala, Hariklia N.

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ENHANCED METHANE PRODUCTIVITY FROM LIGNOCELLULOSIC BIOMASSES USING AQUEOUS AMMONIA SOAKING PRETREATMENT

E. JURADO[1], I.V. SKIADAS[1] and H.N. GAVALA[1,*]

[1] Aalborg University Copenhagen (AAU-Cph), Department of Biotechnology, Chemistry and Environmental Engineering, Lautrupvang 15, DK 2750 Ballerup, Denmark.

*Corresponding author: e-mail: hng@bio.aau.dk, hari_gavala@yahoo.com, tel: +4599402586, fax: +45 99402594.

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Extended Abstract

The continuously increasing demand for renewable energy sources, such as methane, renders anaerobic digestion to one of the most promising technologies for renewable energy production. In fact, anaerobic digestion for methane production has become a major part of the rapidly growing renewable energy sector. Biogas is part of a rapidly growing renewable energy sector, which expands at a rate of 20-30 % globally [1]. However, the increasing demand for methane production cannot be satisfied by the use of anaerobic digestion only from waste/wastewater treatment. Energy crops as well as agricultural residues, such as wheat straw, can be considered as one of the best options for increasing the methane production through biomass digestion. The production of perennial crops like miscanthus, sweetgrass, and willow consumes far less resources (energy for cultivation, herbicides and fertilizers) compared to annual crops [2]. However, the efficiency of methane production from perennial crops and lignocellulosic residues is limited by the low biodegradability of the lignocellulose. The destruction of the lignocellulosic structure will release the sugars contained in the biomass and therefore can dramatically increase the production of methane.

In the present study, aqueous ammonia soaking (AAS) and subsequent ammonia removal has been successfully applied as a method to disrupt lignocellulosic structure and increase methane potential and biogas productivity using wheat straw, miscantus and willow as feedstock. AAS presents certain advantages as a pretreatment method. Ammonia is safe to handle, non-polluting and non-corrosive and can be easily recovered due to its high volatility[3].

In all three cases, an increment in methane potential has been observed. Methane production after 50 days exhibited an increase of 37%, 23% and 96% for wheat straw, miscanthus and willow, respectively. Moreover, sugar analyses showed that AAS resulted in no solubilization of sugars.

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