

Accepted Manuscript

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PII: S0960-8524(16)31406-7
DOI: <http://dx.doi.org/10.1016/j.biortech.2016.10.009>
Reference: BITE 17162

To appear in: *Bioresource Technology*

Received Date: 12 August 2016
Revised Date: 29 September 2016
Accepted Date: 2 October 2016

Please cite this article as: Tian, J-H., Poucher, A-M., Bureau, C., Peu, P., Cellulose Accessibility and Microbial Community in Solid State Anaerobic Digestion of Rape Straw, *Bioresource Technology* (2016), doi: <http://dx.doi.org/10.1016/j.biortech.2016.10.009>

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10 ABSTRACT

11 Solid state anaerobic digestion (SSAD) with leachate recirculation is an appropriate method
12 for the valorization of agriculture residues. Rape straw is a massively produced residue with
13 considerable biochemical methane potential, but its degradation in SSAD remains poorly
14 understood. A thorough study was conducted to understand the performance of rape straw as
15 feedstock for laboratory solid state anaerobic digesters. We investigated the methane
16 production kinetics of rape straw in relation to cellulose accessibility to cellulase and the
17 microbial community. Improving cellulose accessibility through milling had a positive
18 influence on both the methane production rate and methane yield. The SSAD of rape straw
19 reached 60% of its BMP in a 40-day pilot-scale test. Distinct bacterial communities were
20 observed in digested rape straw and leachate, with *Bacteroidales* and *Sphingobacteriales* as
21 the most abundant orders, respectively. Archaeal populations showed no phase preference and
22 increased chronologically.

23 Keywords: rape straw, cellulose accessibility, microbial community, solid-state anaerobic
24 digestion, leach bed reactor, methane production kinetics

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