Thesis Title	Glucose Degradation by Pure Culture Isolated Microorganisms from the Anaerobic Digestors of Pineapple Peel
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Abstract

Previous work on the anaerobic digestion of pineapple wastes in the mesophilic digestor (37°C) reported the production of propionic acid as one of the intermediate products during the digestion. When shifting temperature to 55 °C, mixed microbial populations showed their ability to grow at 55°C but failed to produce propionic acid as observed at 37°C. Two hypotheses have been proposed for this reason. Firstly, the mesophilic digestor consists of the mixed microbial populations which can grow at different temperature at mesophilic and/or thermophilic temperature hence activity of each microbial group would be stimulated by the operated temperature leading to product formation. Secondly, same microbial group could change its metabolic pathway when changing temperature. To test the hypothesis , the pure culture isolated from the anaerobic digestors of pineapple wastes was used and conducted in this thesis.

This research focused on the study of the glucose degradation and product formation affected by glucose concentration (0.1% and 0.2% w/v) and the temperature shift (from 37°C to 55°C and 55°C to 37°C). The microorganisms are pure cultures isolated from the anaerobic digestors of pineapple peel operated at 37°C and 55°C, namely, A, XO 7.37 and XO 5.37 from 37°C and B as well as Z_8 from 55°C.

The microorganisms, A, XO 7.37 and XO 5.37, are the facultative anaerobe and hydrolytic/ fermentative bacteria isolated from the mesophilic anaerobic digestor. All culture degraded glucose, xylose and xylan. A and XO 7.37 could hydrolyse cellulose but not XO 5.37.

The three isolated pure cultures grew at temperature range from 15-60°C, however, the optimum temperature was 37°C. The products of the glucose degradation at 37°C were ethanol, acetic acid and propionic acid. The proportion of these products varied according to the strain. In addition, butyric acid was produced by XO 7.37 and XO 5.37.

The microorganisms, B and Z_8 are the strictly anaerobe and hydrolytic/ fermentative bacteria which were able to degrade glucose, xylose, xylan and cellulose. The optimum growth temperature is 55°C corresponded with the isolated temperature. Nevertheless, these two strains showed the ability to grow within the range of 15-60°C. Ethanol and acetic acid were the main products from the utilization of glucose at 55°C. No propionic acid was detected.

The initial glucose concentration affected the rate of glucose uptake and the product formation. Glucose was not fully utilized by B and Z_8 when the glucose concentration was increased from 0.1 to 0.2 %. In contrast, no glucose was remained with increasing glucose concentration to 0.2 % in the presence of A, XO 7.37 and XO 5.37. But the accumulation of lactic acid was observed from the utilization of higher glucose concentration by A and XO 7.37. Consequently the ratios of ethanol, acetic acid and propionic acid to the glucose uptake were lower at 0.2 % than those at 0.1 % glucose. There were no lactic acid accumulation by XO 5.37.

When the temperature was shifted from the optimum growth temperature, the product formation was changed. It was observed that no propionic acid was produced by the five isolates when growing at 55°C. When the temperature was shifted from 55°C to 37°C, Z_x produced propionic acid in addition to ethanol and acetic acid.

Results from this study of pure cultures indicated the microorganisms themselves which has ability to grow at a wide range of temperature produced products differently at mesophilic and thermophilic temperature. Propionic acid was produced from the degradation of glucose at 37°C but not at 55°C. In addition the populations found in the mesophilic and thermophilic digestors of pineapples wastes are not the same due to the long term acclimatization and selection. Hence, no propionic acid was produced from mixed culture in the mesophilic digestor when shifting temperature to 55 °C; it might due to the microorganism itself change its pathway in degradation of glucose and resulted in product formation.

Keywords : Anaerobic digestor / Glucose degradation / Pure culture / Temperature