

## **Microbial characterization of hydrogen producing bacteria in fermented food waste at different pH values**

### **ABSTRACT**

An anaerobic fermentation of food waste was conducted in a 0.5 L bioreactor incubated at a thermophilic temperature of 55 °C to evaluate the effects of different controlled pH values (5.0, 5.5 and 6.0) on biohydrogen production. Effective biohydrogen production was found at controlled pH 5.5 and 6.0 corresponding to lower lactic acid production compared to pH 5.0. It was demonstrated that biohydrogen production from food waste was pH-dependent with hydrogen yields of 79, 76 and 23 mmol H<sub>2</sub>/L-media/d for pH 5.5, 6.0 and 5.0, respectively. Specific microbial determination for *Clostridium* sp. and total bacteria quantification were carried out by the fluorescent in-situ hybridization (FISH) technique. The number of *Clostridium* sp. for acclimatized sludge, fermentation broth at pH 5.0, 5.5 and 6.0 were  $2.9 \times 10^8$ ,  $3.6 \times 10^8$ ,  $7.8 \times 10^8$  and  $5.4 \times 10^8$  cells/ml, respectively. The quantification analysis showed that 92% of the total bacteria belonged to *Clostridium* sp. from clusters I and XI from the sample at controlled pH 5.5. The denaturing gradient gel electrophoresis (DGGE) bands of the sample after heat-treatment, acclimatization and during fermentation indicated the presence of *Bacteroidetes*, *Caloromator australicus* sp. and *Clostridium* sp.

**Keyword:** Biohydrogen; Food waste; Thermophilic; pH; Fluorescent in situ hybridization; Denaturing gradient gel electrophoresis