

## **Effect of Solubility of Carbohydrate and Protein in Biogas Generation with Solid Waste**

S.M.W.T.P.K. Ariyaratna\* and M.A.V. Wathsala

\*thusharia@pdn.ac.lk

University of Peradeniya, Sri Lanka

Municipal Solid Waste (MSW) management is a hot topic in most of the countries and it is a burning issue in Sri Lanka too. The MSW typically consists of high percentage of organic matter, about 65% by weight. The organic fraction of MSW is a sound substrate for biogas generation. These substrates can be divided into three main categories according to their molecular structure: i.e., carbohydrate, protein and lipid. It was suggested that the different solubility rates of these molecules effect on accumulation of volatile fatty acids (VFAs) in the digester and then biogas generation, especially in solid waste digestion. This study is to observe the effect of solubility via VFA accumulation with carbohydrate and protein in biogas generation. The experiments were performed in the laboratory scale in the batch mode. Imitating the food waste found in MSW, white nadu rice and chick-pea were used as carbohydrate and protein rich substrate, respectively. Triplicates were experimented for three mixing ratios of rice to chick-pea with inoculums grown by cow-dung. The VFA accumulation was monitored in terms of the pH. The daily biogas production and pH variations were observed for 50 days. The cumulative biogas generation was found as 8.59 ml/gVS, 8.96 ml/gVS and 35.95 ml/gVS for digesters with carbohydrate-rich, equal carbohydrate and protein and protein-rich, respectively. The average pH values in the digesters were observed as 3.94, 4.72 and 5.28 with respect to the above order. Solubility of carbohydrate molecule is higher than protein and therefore carbohydrate-rich digester had gained more VFA than in the protein-rich digester. It can be concluded that the molecular solubility effects the VFAs accumulation in digesters and then in biogas generation.

**Keywords:** Solid waste, Biogas, Volatile fatty acids, Carbohydrate, Protein, pH