Nitrogen and phosphorus recovery from anaerobic co-digestion residues of poultry manure and maize silage via struvite precipitation

Anaerobic digestion is commonly used for the stabilization of agricultural and animal wastes. However, owing to the stringent environmental criteria, anaerobic digester effluents need to be further treated to reduce nutrient loads to the receiving water bodies. Struvite precipitation is one of the promising techniques applied for this purpose. Yet, in the majority of cases, struvite precipitation is only applied to the liquid phase of anaerobic digester effluents. This study investigated the recovery of nutrients from both the liquid and the solid phases of the phase-separated effluent of a full-scale biogas plant co-digesting poultry manure and maize silage. Struvite precipitation in the liquid phase led to 72.1% and 95.1% average removal efficiencies of ammonium-nitrogen (NH$_4^+$-N) and orthophosphate respectively. Changing the external phosphorus source did not make any statistically significant difference in nutrient removal. An acidic phosphorus-dissolution process was applied to the solid phase sample to obtain a phosphorus-enriched solution. More than 90.0% of both NH$_4^+$-N and PO$_4^{3-}$-P were recovered from the phosphorus-enriched solution with the amendments of magnesium and phosphorus. In the experiments performed without any addition of external magnesium- and phosphorus-containing chemicals, almost complete (99.6%) PO$_4^{3-}$-P recovery and partial (14.6%) NH$_4^+$-N recovery was obtained. The results of this study could contribute to the understanding of nutrient recovery from anaerobic digestion residues of manure and agricultural wastes by struvite precipitation [Y Dilsad Yılmazel* and Goksel N Demirer (Civil and Environmental Engineering Department, Villanova University, Villanova, PA, USA), Waste Manag Res, 2013, 31 (8), 792-804].

Co-digestion of solid poultry manure with municipal sewage sludge

The anaerobic digestion was investigated using mixed sewage sludge and poultry manure. The experiments showed that a 30% addition of poultry manure to the sewage sludge did not increase specific gas yield (376 dm$^3$/kg VS versus 384 dm$^3$/kg VS), however gas production rate as calculated per unit volume was 1.5 higher for sludge and manure mixture. The anaerobic digestion turned out to be inefficient in terms of pathogen treatment, since the reduction of Enterobacteriaceae reached only two logarithmic units. In the course of the digestion processes, nutrients were released to the supernatant, and longer SRT favored that phenomenon. The liquor after the digestion of sludge alone was rich in phosphates (348–358 gP/m$^3$) and contained a lot of organic carbon (COD of 2705–6034 gO$^2}$/m$^3$). Conversely, more ammonium nitrogen was found in the supernatant after co-digestion of sludge with manure (2094–2221 gN/m$^3$). However, there was no evidence of ammonia inhibition [Sebastian Borowski* and Laurence Weatherley (Technical University of Łódź, Institute of Fermentation Technology and Microbiology, Poland), Bioresource Technology, 2013, 142, 345-352].

Studies on the preparation and analysis of low cost eco-friendly organic fertilizer

Fertilizer is any organic or inorganic material of natural or synthetic origin (other than liming materials) that is added to the soil in order to supply one or more plant nutrients that is essential for the growth of plants. Two different types of fertilizer are used to increase plant growth i.e., inorganic and organic. The overuse of inorganic nitrogen fertilizers is hazardous to the environment; they seriously pollute aquatic environments, including subterranean water. Bio-fertilizers being cheap provide highly cost effective supplement of chemical fertilizers,
increase farm productivity. The present study was carried out to characterise the physicochemical properties of Panchagavya, Cow horn Manure, Vermicompost, Vermiwash, Vermicast individually. Physio chemical analysis of Cow horn manure was indicating thatarbon (71.2%), Nitrogen (3.84%), phosphorus (0.06%) and C/N ratio (18.5%) of the cow horn manure was highest than ordinary [V Karthikeyan, P. A. Mohsin, J. Gowtham Kumar, Sumaiya Faiz & R Vijayakumar (Department of Biotechnology, Karpaga Vinayaga College of Engineering and Technology, Chinnako lambakkam, Kancheepuram, Tamilnadu, India), International Journal of Agricultural Science and Research, 2013, 3(2), 213-218].