Environmental Science: An Indian Journal

Short Communication | Vol 18 Iss 6

Organic Waste Management by Anaerobic Digestion of Food Waste

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Received: May 30, 2022, Manuscript No. tses-22-002; **Editor Assigned**: June 1, 2022, Pre-QC No. tses-22-002 (PQ); **Reviewed**: June 7, 2022, QC No. tses-22-002 (Q); **Revised**: June 14, 2022, Manuscript No. tses-22-002 (R); **Published**: June 20, 2022. DOI: 10.37532/environmental-science.2022.18.236

Introduction

Food systems are intense sources of energy. No energy is recovered from food waste besides this the bulk solid waste that is disposed in landfills and allowed to decompose in uncontrolled manner. This gives a huge amount of greenhouse gases like methane to atmosphere. Waste with high water content and high nutritional value is perfect if digested through anaerobic method of digestion, however fruits and vegetable waste are easily biodegradable on its own [1].

When two or more organic waste are digested together it is known as co-digestion or concurrent treatment of a mixture of various organic biodegradable waste. This method gives excellent process for correct disposal and treatment of municipal solid waste by using two or more different ways like organic municipal solid waste mixed with some extra substrate increases the the yield of biogas. Conventionally anaerobic digestion was carried out using single substrate. Commonly it is used for digestion of domestic sludge, but now by addition of co substrates it not only .gives synergistic effect to digestion medium but also has increased the yield of biogas [2].

The process of digestion is carried out with wide varieties of anaerobic operations. It is clear from literature that varieties of wastes are treated in same digester where municipal sewage sludge is digested. Organic parts of municipal solid waste commonly known as OFMS that can be drawn from landfills in the form of leachate are administered successfully. And this disposal of OFMSWs by means of anaerobic codigestion is found to be best possible treatment of such type of ways and it is carried out in many countries. Among food processing waste, vegetable wastes, agriculture and plant wastes are found to be highly biodegradable and can be used for degradation via anaerobic co-digestion system. They have high percentage of readily biodegradable COD that improves the performance of anaerobic system [3].

Description

Many techniques have been explored like single stage process of treatment, multi stage process for treatment of varied food residues. Wastes obtained from cafeterias, restaurants including fruits, vegetables and grains are pulverized and homozenized then administered within the laboratory to produce methane or bio hydrogen that can be used for generation of energy [4,5]). Addition of brewing yeast extract in a waste water treatment plant, yield of biogas can be increased as given by Zitomer.et.al. [6]. When trace nutrients like Co, Fe and Ni are added, not only yield of biogas increases but dewater ability of food digestion and stabilization of ultimate bio solids also gets improved.

Often, the biogas output of existing facilities treating one waste stream is enhanced by the implementation of co-digestion [7]. Economically, combined use of wastewater treatment equipment for treating liquid and solid waste is more beneficial [8]. Co digestion in treatment of municipal wastewater sludge is generally carried out due to the low solids content, low C/N ratio, and low nutritional value of municipal sludge. And when co-substrate is added these parameters are often optimized. Codigestion of yard waste with waste matter obtained from Wal-Mart grocery stores is carried out for biogas production in Ohio [9].

Agricultural industrial waste and domestic wastewater sludge were co-digested in a study in Spain. The food wastes utilized in this study included fruit and vegetable wastes [10]. Wastes from the meat industry are also codigested with sewage sludge. In Spain similar studies were carried out for analyzing the consequences of adding waste collected from slaughterhouses into anaerobic operations operating using wastewater sludge. This waste included animal wastes residual meat slurries and combination of cow and pig manure [11]. The same study combined slaughterhouse and poultry processing wastes with OFMSWs in co-digestion operations [12].

Manure has long been used as a feed source for anaerobic digestion. There are several projects in developing countries (such as India) that use cattle manure to supply biogas in rural areas that have an oversized livestock population. Cow manure, OFMSWs and machine waste (primarily containing ground up cotton seeds that are high in fat content) were separately co-digested with municipal sewage sludge in anaerobic systems in Mexico.

Concentrated food processing waste like mixture of cheese, fried potato waste is combined with manure. Studies have been carried out in Italy by using a two – stage process to hold out co-digestion of cheese waste together with cattle manure. Co-digestion of waste glycerol obtained from the assembly of biodiesel with municipal sewage sludge is also carried out. Since glycerol is readily - biodegradable substrate for anaerobic co-digestion and thus helps to solve a significant problem of waste disposal faced by the sustainable bio fuel industry.

Conclusions

Anaerobic Co-digestion process where energy-rich organic waste materials (e.g. Fats, Oils, and Greese, FOG) are digested with dairy or wastewater digesters with excess capacity have potential of producing high quantity of biogas (methane production) . Moreover it reduces the issue of diverting food waste and FOG to landfills and the public sewer lines. Co-digestion results in balance of nutrients, improves buffer capacity of pH and stop volatile fatty acidification. Comparing the single waste digestions with co-digestion of combined wastes, it was seen that not only it results in higher methane gas yields but also had a positive impact on the quality and quantity (CH4 content) of biogas. It is a result of positive interaction in digestion and extra nutrient supply. Economic advantages of co digestion can result from shared equipment, easier handling of feedstock, and a more stable process in general. The most drawback of co-digestion is that this technology requires more research and study.

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