

ANAEROBIC DIGESTION OF DRIED LEAVES (*samanea saman*) FOR BIOGAS PRODUCTION AND MANURE DEVELOPMENT

Abstract

Biogas is a potential an alternative energy source particularly for rural community. Biogas produced by decomposition of live stock wastes.manure from poultry,cattle and pigs.biogas arte ecofriendly .The maharastra state is first in biogas plants.India has over 5 billions biogas plants all around the country. Eventhough the technology is simple and is available worldwide. High technology with improved efficiency plants has been introduced . The study suggests that biogas technology encouraged, promoted, and implementation and demonstration. In this work, the anaerobic digestion using microalgae and their residues, resulting from biogas digester for biodiesel production, using two inoculums (sludge and poultry manure) for biogas production was investigated. The biogas generated from microalgae residue from the extraction process .The biochemical estimation ,pH, Nitrogen, Phosphorus and Potassium. This approach based on a bio refinery concept and focusing on the anaerobic digestion process could be a key technology for energy production from biomass.

Keywords: Biogas, Digestion, Microalgae, Sludge, Poultry manure, Anaerobic digestion,

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I. INTRODUCTION

The basic requirement of adequate resources are needed. The energy services, to satisfy the basic needs of an individual and the society for improving the social welfare and economic development (**Alemayehu *et.al.* 2015**). Energy as an input for goods and services is a prerequisite for economic development. Anaerobic digestion is a technology is widely used for for biogas production. Climate goals and rural livelihoods are positively contributed by the production of Biogas. (**Akinbami *et.al.*, 1996**).

Biogas is a type of bio fuels.it is mainly decomposition of organic matter mainly methane gas is produced by bacteria fermentation. It occur on under anaerobic condition (in the absence of oxygen). It can be produced from sewage sludges, animal manures, and municipal organic waste (**Ismail *et.al.*2016**). Biodegradable waste, straw, manure, sugarcane. The by-products from agricultural and industrial processed products can also be used for the production of biogas.

The widely used simple methodology is the anaerobic digestion. Animal manure (cow dung) is used as inoculums, pre-treatment of substrate (**Talib *et.al.* 2016**). The thermophilic conditions suitable to improve the biogas yield by approximately 92%. The fermentation of all kinds of waste and manure and organic waste. The process are HYDROLYSIS, Acetogenesis. Hydolysisand Methanogenesis. During the process, biomass the large organic polymers are broken down into smaller molecules by chemicals and microorganisms. After completion of the anaerobic digestion process, the biomass is converted into biogas, (methane, carbon dioxide and traces of other contaminant gases), as well as liquid digestate (nutrient rich fertilizer) (**Raja *et.al.*, 1997**).

The rain trees (*Samanea saman*) tree belongs to Fabaceae family. This are flowering family.it is ornamental purpose.it is so called rain tree because ,its leaflet closed at night or cloud time and permit rain to easy passthrough .it is otherwise called Mimosa in philliphines. which are mostly present in Rabiammal Ahamed Maideen College For Women, Tiruvarur, which are over 25 meters high and can live for more than 25 years, produce large quantities of waste all year long, due to their leaves and branches shedding and it is also called as 'monkey pod tree' and in this study it is taken as one of the inoculums to produce biogas and also act as fertilizer .

The scraps and rain tree leaves used to produce compost and act as a biofertilizers. This mixed compost soil contained 1.25% nitrogen, 0.15% phosphorus and 0.38% exchangeable potassium, whereas soil without fertilizer has 0.05%, 0.01%, and 0.02% of nitrogen, phosphorus, and potassium, respectively (**Suntararak *et.al.*,2014**).

II. MATERIALS AND METHODS

1. Feedstock and Inoculums: The (*Samanea saman*) were collected from Rabiammal Ahamed Maideen College for Women, Tiruvarur (18°56'14"N; 99°3'38"E), and Tamilnadu, India. The leaves were crushed by machine into small particles. The crushed leaves dried in 40 °C for 48 hours. The moisture content reduced of < 10%. then reduce to a particle size of 0.5–1 mm using a blender (OTTO BE-127 blender). The dried powder was stored and sealed in a desiccator under ambient temperature for further usage. The

inoculum was collected from a Galileocean Offshore Research and Development Private Limited, Nagapattinam, Tamilnadu, India. It was kept in air-tight buckets at 4 °C in a walk-in cooler. Prior to use, the inoculum was acclimated and degassed at 35 °C for 3 weeks to minimize the effect of methane production from inoculum.

2. **Algae culture (*Chlorella vulgaris*):** A total of 500ml of cultured microalgae was collected and were kept in a Biogas Digester (total volume = 22.0 L) for the production of a large amount of biomass through N-2 Balanced Salt solution medium. The medium was prepared with rice fertilizer (100 g), rice bran (400 g), fish meal (100 g), lime (50 g), and urea (200 g). The Biogas Digester has the dimensional of width and height was 80 and 40 cm, respectively. The Biogas Digester was filled with 10 L of water and medium, a total of 10 L of water and mixed ingredients were to a Biogas digester which was connected with an air pump.

The pond was left for one night to release ammonia and to allow the medium to dissolve in the water properly. The stock algae were transferred in the following day to the triplicate Biogas Digester. Algae growth was measured and recorded every day. Additionally, the pond was stirred every day to prevent precipitation of the algae. Estimation of available Nitrogen (Zhang changai *et.al.* 2011), Estimation of available Phosphorous (Gao yuhuan *et.al.* 2011), Estimation of available Potassium (Gao yuhuan *et.al.* 2011)

III. RESULTS AND DISCUSSION

The purpose of this work is to produce biogas. organic kitchen wastes used for this study.

One can check various facets of the anaerobic digestion process.

1. **Substrate:** Among the physical and chemical characteristics of substrates fed to the digesters the N and P ratios in biogas digester were 14 and 64, respectively. Substrates with C/N ratios of less than 15 and C/P ratios of less than 75 are most suited for stable biological conversions. This indicates *samanea saman* leaves have potential as a substrate for biogas production in India. The N, P, K content of *samanea saman* leaves accounts for their usefulness as green manure in India.

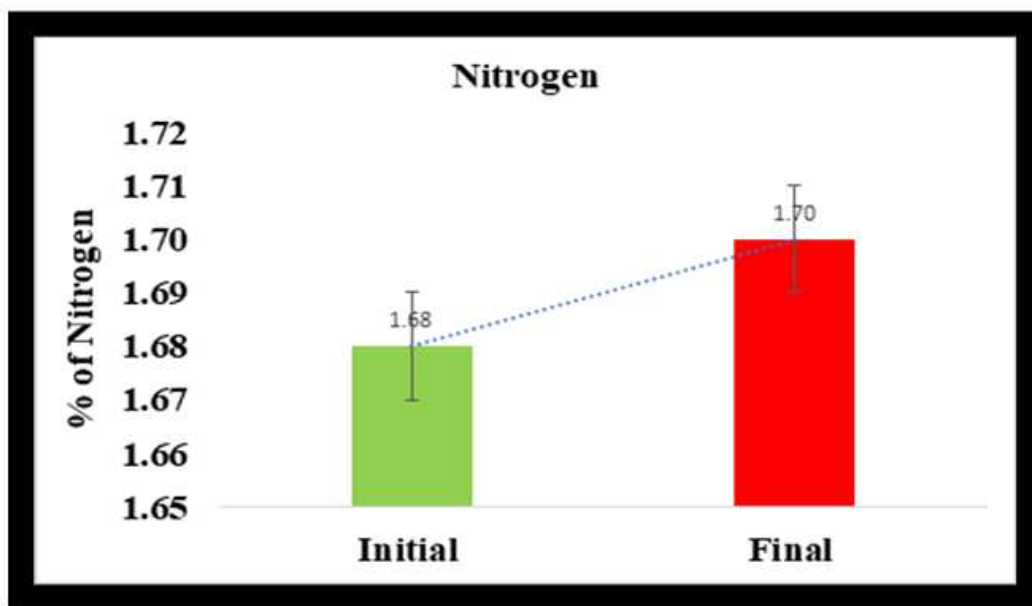


Figure 1: Effect of anaerobic Digestion on the amount of fertilizer elements Nitrogen of *Samanea saman* Leaves

The value of Nitrogen fluctuates initially 0 the maximum value (1.68 %) was recorded in the initial and the high values of nitrogen in final stage (1.70%). Similar results reported by (Arvind kumar *et.al.* 2022).

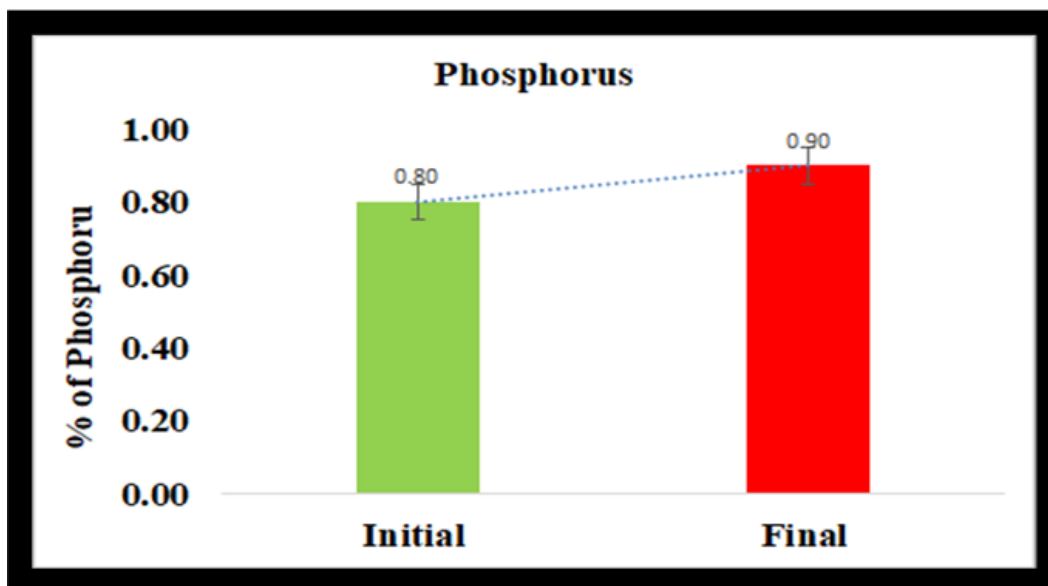


Figure 2: Effect of anaerobic Digestion on the amount of fertilizer elements Phosphorus of *Samanea saman* Leaves

The value of Phosphorus fluctuates initially 0 the maximum value (**0.80%**) was recorded in the initial stage of the experiment has decreased and The high values of phosphate in final stage (**0.90%**) was recorded Similar results reported by (**Arvind kumar *et.al.*,2022**).

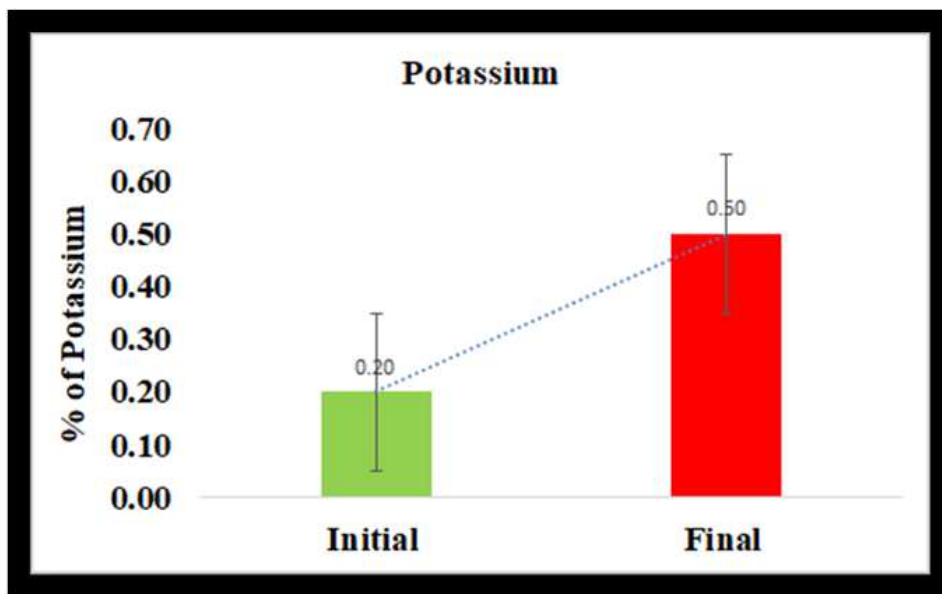


Figure 3: Effect of anaerobic Digestion on the amount of fertilizer elements potassium of *Samanea saman* Leaves

The value of potassium fluctuates initially 0 the maximum value (**0.20%**) was recorded in the initial stage of the experiment, and the high values of potassium in final stage (**0.50%**) Similar results reported by (**Arvind kumar *et.al.* 2022**).

Table 1: Nutritional contents of biogas slurry

TOTAL NITROGEN	TOTAL PHOSPHOROUS	TOTAL POTASSIUM
1.70 %	0.90%	0.50%

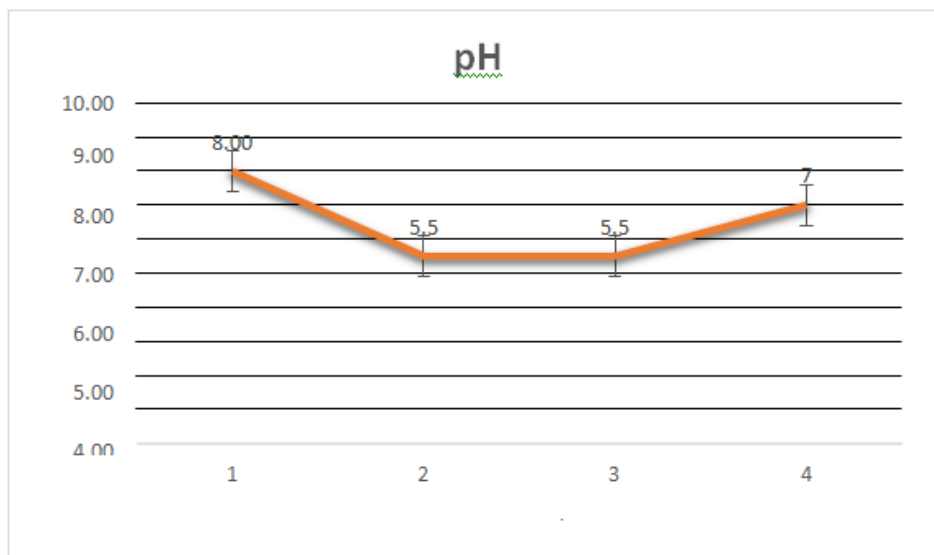


Figure 4: Changes in pH in Leaves during batch fermentation of *Samanea saman* leaves

The dried leaf inoculums of 1 liter of digested slurry with a P^H of 8.2. The P^H in the dried leaf treatments (Figure. 4) was within the desirable range of 6.6 to 8.2 and it concluded as hence methane production started immediately till the end of the third week there was no methane production. The overload of organic overload leads digestion upset.

However, in the fourth week the P^H increased to the level of 6.8 and methane production started.

The biogas slurry is rich in readily available N, P, and K, which are vital nutrients for plants. According to reports, the availability of N from digested slurry directly affects the yield during the growing season, whereas the availability of P and K can be measured over the course of the following year or several years. Due to the higher nitrogen availability, Pathogen survival is reduced during anaerobic treatment.

In this study, with its high concentrations of nitrogen (N), phosphorus (P), potassium (K), and other trace elements, biogas slurry is employed as a biofertilizer and as a biological insecticide due to its high concentrations of amino acids, growth hormones, and antibiotics, all of which encourage plant growth.

This work, reported that biogas slurry contains abundant nitrogen, After fermentation, the content of ammonium ions (NH_4^+) and pH of the biogas slurry increased, while the concentration of carbon (C) from the dry matter decreased, and the C/N ratio also decreased.

Moreover, compared to conventional fertilizers, biogas slurry provides higher N that is easily available to plants. The accessible nitrogen, which includes inorganic

nitrate (NO₃) and ammonium (NH₄) as well as simple structured organic nitrogen derived in part through the decomposition of organic materials, can be directly taken by plants.

IV. SUMMARY AND CONCLUSION

Anaerobic digestion is an important technology which is used for the production of biogas. This technology is simple and it can be readily use in domestic and farming applications. It can contribute substantially to the sustainable energy recovery from organic waste particularly agriculture and municipal. Apart from significant energy source, comprehensive utilization of biomass, agricultural, animal husbandry, forestry and fishery residues are important and, thus controlling the pollution and meeting the environment. The biogas technology provides two important benefits: environmentally safe waste management as well as the generation of clean renewable energy. From this study, Biogas was obtained from the organic waste which gives a renewable energy. It produce valuable fertilizers for agriculture. It reduces global warming effect by reducing methane formation from organic waste and animal dung. It is also possible to convert Bio-gas may into bio methane for automobile fuel.

V. ACKNOWLEDGEMENT

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