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BIOGAS PRODUCTION FROM SUGARCANE BAGASSE IN CO-DIGESTION WITH VEGETABLE WASTE

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Abstract: The aim of the project is to carry out the co-digestion of sugarcane waste in the form of Sugarcane Bagasse and Vegetable Waste to enhance the biogas production. The main issue for co-digestion process lies in balancing several parameters in the co-substrate mixture: macro and micronutrient, C: N ratio, toxic compounds, biodegradable organic matter and dry matter. The experiment was carried out in 250 ml batch digester for 24 days retention period. The co-digestion was carried on mesophilic temperature with cow dung as an inoculum. In this work, to optimize the different proportion (0%, 25%, 50%, 75% and 100%) of sugarcane bagasse, inoculum, moisture content, PH and alkalinity. The investigation helps to find the most proper ratio of different co-substrate that provide an optimize biodegradation potential or enhance methane potential. In the optimization, the feasibility of using sugarcane bagasse and vegetable waste as co-digestion in the range of (50%) both provided the best condition to increase the methane production. The biogas was collected by the water replacement method. In conclusion, anaerobic co-digestion of sugarcane bagasse waste and vegetable waste appears to be a suitable technology to treat such wastes, obtaining a renewable source of energy from biogas.

Keywords: Vegetable Waste, Sugarcane Bagasse, Co-digestion process and Biogas

1. INTRODUCTION

Anaerobic digestion (AD) is the oldest processing technology used by mankind. Until the 1970s, it was commonly used only in the wastewater treatment plants waste management. The amount of generated solid waste continuously increases and due to the large environmental impacts of its improper treatment, its management has become an environmental and social concern. Vegetable waste comprises 12.4 % of the total municipal solid waste (MSW), according to Indian EPA estimates. This corresponds to over 40 million tons, according to the 2006 State of Garbage survey of Bio Cycle (Arsova et al. 2008). Also, EPA has estimated that less than a million tons are co-composted aerobically with yard wastes (EPA 2007).

Rapid biodegradation of the organic fraction of the MSW is of key importance to identify environmental more responsible way to process it rather than landfilling or composting it. Anaerobic digestion has the advantage of biogas production and can lead to efficient resource recovery and contribution to the conservation of non-renewable energy sources.

Furthermore, anaerobic digestion is closed and controlled process and based on fugitive emissions is more preferable than landfilling and aerobic composting (Levis et al. 2010).The scarcity of petroleum and coal it threatens supply of fuel throughout the world also problem of their combustion leads to research in different corners to get access the new sources of energy, like renewable energy resources.

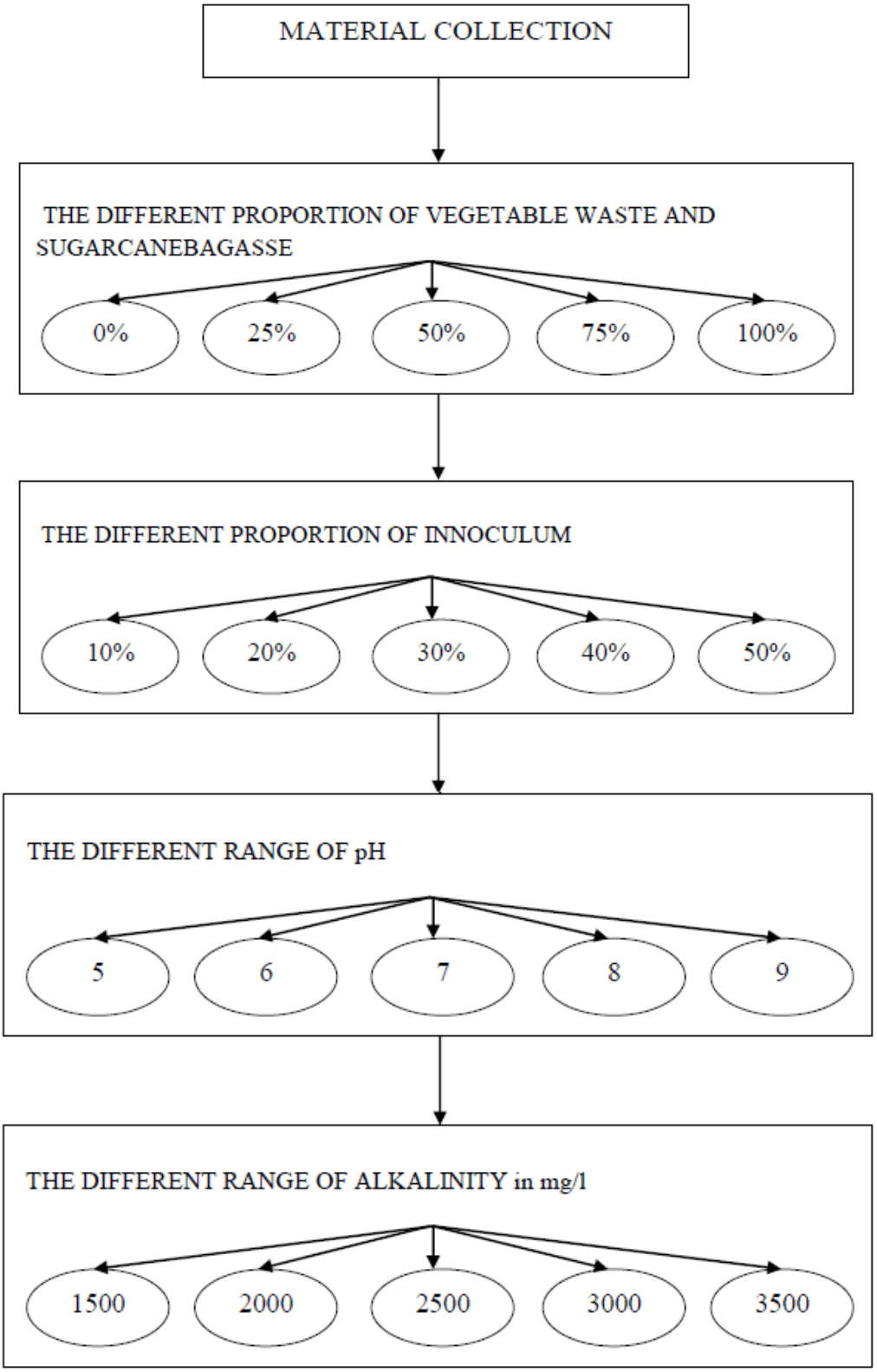
Traditionally, the single substrate can be used in the anaerobic digestion process. But recently the co-digestion process can be used in the anaerobic digestion process to improve nutrient balance and digestion performance. For higher biogas production the C:N ratio should be 25-35.

In this work, to optimize the different proportion (0%, 25%, 50%, 75% and 100%) of sugarcane bagasse, inoculum, moisture content, pH and alkalinity. The investigation help as to find the most proper ratio of different co-substrate that provide an optimize biodegradation potential or enhance methane potential. The biogas was collected by the water replacement method. In conclusion, anaerobic co-digestion of sugarcane bagasse waste and vegetable waste appears to be a suitable technology to treat such wastes, obtaining a renewable source of energy from biogas.

Sugarcane (*Saccharum officinarum*) is a grass that is harvested for its sucrose content. After extraction of sugar from the sugarcane, the plant material that remains is termed as bagasse. Currently, the bagasse production in the India is about 8.6 million tons per year.

The vegetable wastes consisted of potatoes, lettuce, tomatoes, eggplant, cucumber and carrot to give 8-9% TS with VS content of 95-97%.

2. METHODOLOGY



3. EXPERIMENTAL SETUP

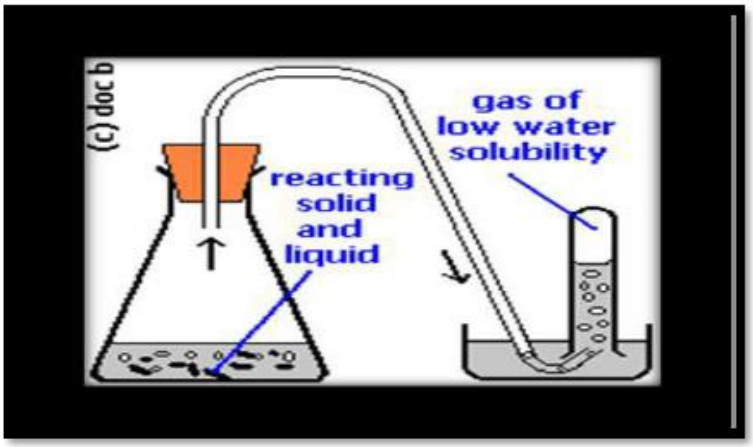


Fig 3.1 Experimental set up for the batch studies

4. RESULTS AND DISCUSSIONS

The study access the ability of sugarcane bagasse in the biogas generation using co-digestion technique and also it investigate the factor affecting the performance of sugarcane bagasse in biogas generation. From this batch studies were formulated and result obtained through each study was listed below.

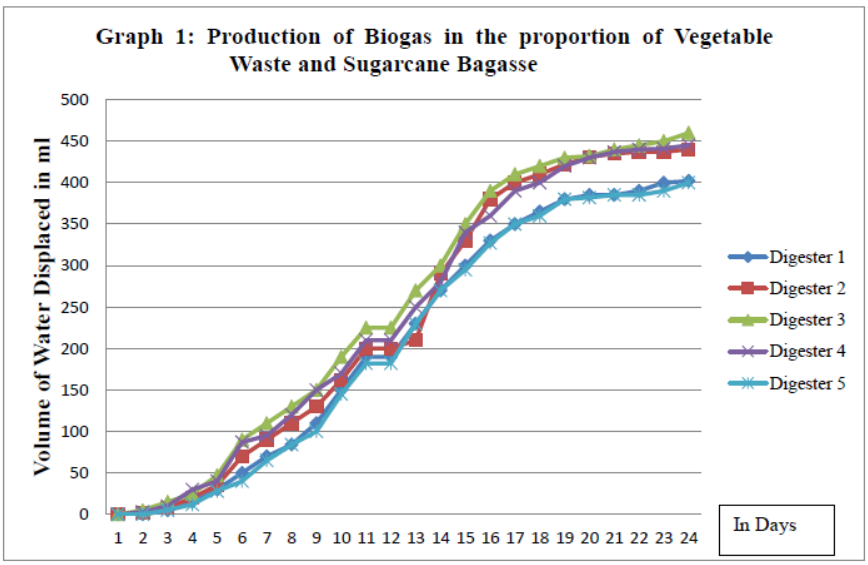
From batch studies – 1, the cumulative biogas production for different proportion of sugarcane bagasse and vegetable waste (0%, 25%, 50%, 75% and 100%) were carried out and it may be concluded that the sugarcane bagasse and vegetable waste in the proportion of 50% each were yield the higher biogas production of about 460 ml of CH4 with 10% inoculums (cow dung) as common for all.

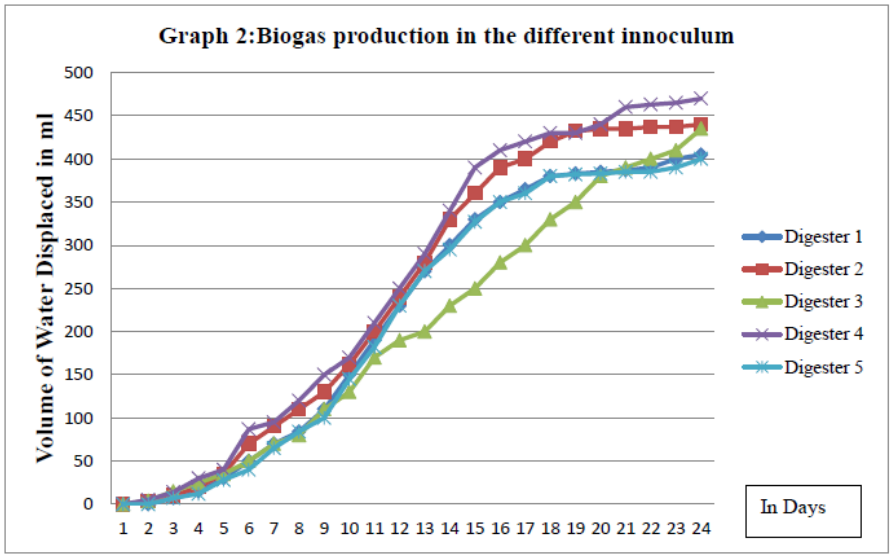
From batch studies – 2, the cumulative biogas production for different proportion of inoculums (10%, 20%, 30%, 40% and 50%) were carried out and it may be concluded that the inoculums of 40% with sugarcane bagasse and vegetable waste in the proportion of 50% each were yield the higher biogas production of about 470 ml of CH4.

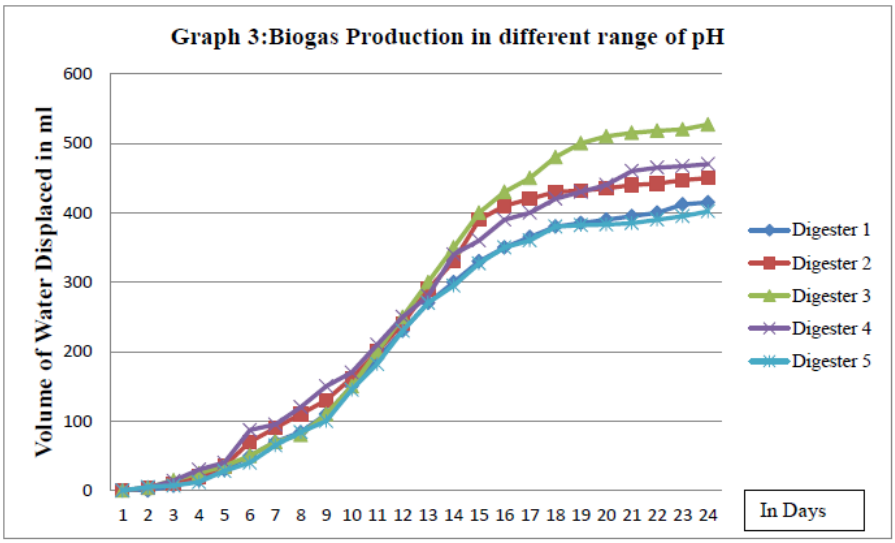
From batch studies – 3, the cumulative biogas production for different range of pH (5, 6, 7, 8 and 9) were carried out and it may be concluded that the pH in the range of 7 were yield the higher biogas production of about 527 ml of CH4.

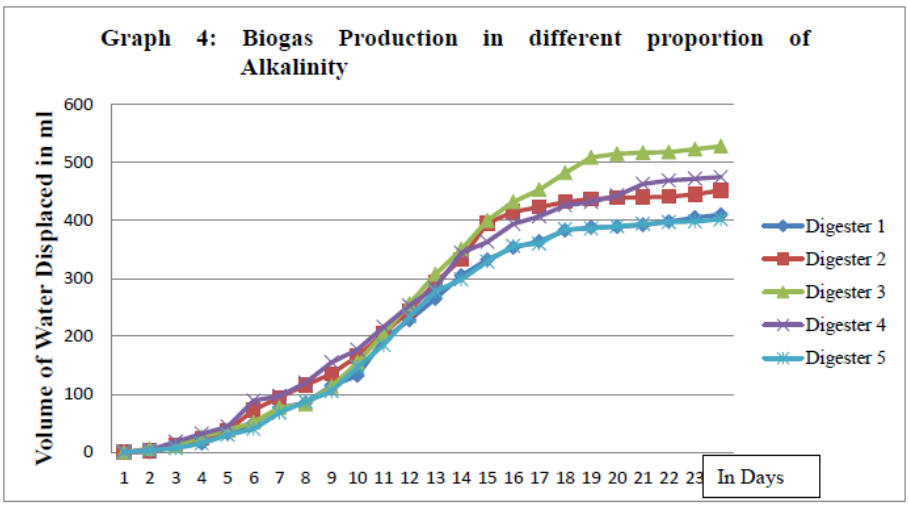
From batch studies – 4, the cumulative biogas production for different range of alkalinity (1500, 2000, 2500, 3000 and 3500 mg/l) were carried out and it may be concluded that the alkalinity in the range of 2500 mg/l of NaOH were yield the higher biogas production of about 528 ml of CH4.

GRAPHICAL REPRESENTATION









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