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ETHANOL PRODUCTION FROM AGRICULTURAL WASTE

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ABSTRACT

India's economy mainly based on agriculture, since almost 70 % of peoples are dependent on agriculture so for the economic growth of the nation, we have to concentrate on agriculture, so we need to implement advanced control strategies, which give maximum profit, with minimum raw material and at minimum cost. One of the techniques to proceed in such a direction is to cultivate such a crop which gives maximum yield or by processing on the crops we are getting different by-products, which give maximum profit. Ethanol is nothing more than water, alcohol, or ethyl alcohol. We are required to remove the water content from alcohol ethanol. As it is mixed with petrol and ethanol molecule contains some amount of oxygen, which results in incomplete combustion of fuel and less amount of emission and beneficial for environmental problems especially air pollution and playing a major role in the pricing of fuel. Currently, ethanol is produced from sugar cane, but we can produce it from agricultural waste too, such as sorghum. In our project, we are going to build a model consist of two distillation columns, a juice feed tank, a yeast culture tank, a fermentation tank, a condenser, an accumulator, and two solenoid valves.

Keywords: Agriculture Waste, Cyclohexane, Ethanol, Fermentation, Sweet Sorghum.

I. INTRODUCTION

India's economy is mainly based on agriculture almost 70% of people are dependent on agriculture. For the economic growth of the nation, agriculture will play an important role and thus there is a need to implement advanced control strategies, which will give maximum profit, with minimum raw material and at minimum cost. It will be beneficial for the economic growth of farmers and ultimately that of the nation. One of the techniques to proceed in such a direction is to cultivate such a crop which gives maximum yield or by processing on the crops to obtain different byproducts, which give maximum profit. To step up in such a direction, ethanol production from sweet sorghum might be just that. Ethanol is nothing but anhydrous alcohol or ethyl alcohol. When water contents are separated from the alcohol it becomes ethanol. Ethanol can be obtained from a variety of sources such as sweet sorghum, sweet corn, soybean, or all types of the crop which contain glucose. Currently, ethanol can be yielded from sugarcane but when it is compared with sweet sorghum latter is more beneficial, since there is always a scarcity of water in some parts of India. Sweet sorghum is one of the best substitutes for sugarcane for producing ethanol. As the fuel prices are increasing and ethanol prices are within a certain limit and it is observed that the production of ethanol from sweet sorghum will definitely increase the economic growth of farmers and ultimately that of the nation. The main objectives of this initiative of Ethanol production from waste agriculture material for example sweet sorghum, sweet potato, sweet corn, etc. Initially, ethanol can be obtained by extracting juice from the stem of sweet sorghum, yeast is added to the fermentation tank. In the fermentation tank, the fermentation process is carried out in these bacteria from yeast consumes the sugar content from juice and release alcohol. The fermentation process requires 48 hours after becoming in vapour form it is passed through the condenser and converted into liquid. This liquid is added to another tank and cyclohexane is added to it. At a certain temperature, it again becomes vapour. This vapour is passed through a condenser and becomes liquid from ethanol. Ethanol is a key biotech product in terms of volume and market values is intensely researched and out of many findings, one good finding suggests that lignocelluloses can be the most useful alternatives to renewable energy sources in the future. Sugar substances like molasses, sugarcane juice, and starch-based materials like sweet sorghum, corn, rice, and wheat have proved to be promising raw materials for ethanol production. Lignocelluloses (cellulose, lignin, etc.) obtained from plant materials are the initial source for bio-ethanol production. Most of the agricultural waste contains a high percentage of sugar which is more efficient to ferment into ethanol with an appropriate catalyst which is fermenting organisms. This review is a survey of various aspects of bio-ethanol production, focusing on India, and also gives a clear picture of various generations of biofuels, their benefits, and also their limitations.

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Physical properties of ethanol

Molecular weight	:	46.07
Boiling point	:	78.5 C
Melting point	:	-117.3 C
Density of vapour	:	0.7893 kg/m^3
Refractive index	:	1.3611
Solubility	:	Water, Benzene, Acetone.

II. MATERIALS AND METHODS

Raw Materials used for producing ethanol:

Ethanol is liquid alcohol that is manufactured by the fermentation of a wide variety of biological materials. Most of the materials are grains like wheat, corn, wood, barley, and sugar cane. In Canada, crops - particularly grains - are likely to be used because they have both high productivity and high levels of carbohydrates needed for ethanol manufacture. From as perspective of value-producing ethanol from low valued grains are beneficial like feed wheat, barley, and corn. Higher value "bread" kinds of wheat would remain in ample supply for export sales when Canada begins major ethanol manufacturing. Also, poor quality (weather damaged, immature) grains which are less suitable for either human or livestock use are excellent for ethanol production. Corn and starch-based crops are the most common medium used in ethanol production. Evert thing is directly proportional when ethanol will be high consumption rate then prices of its raw material will also increase. To avoid this crisis other alternatives are also in the phase of research. Among these is the use of domestic cellulosic biomass feedstocks such as herbaceous and woody plants, agricultural and forestry residues, and a large portion of solid waste and industrial waste streams.

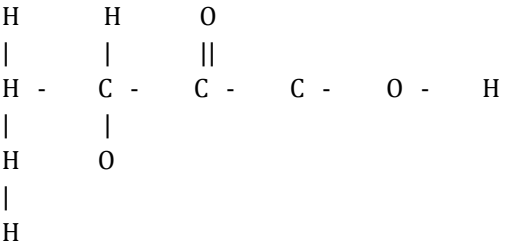
Fermentation Process:

Fermentation is a process carried out by many micro-organisms and which produces a variety of useful compounds. Depending upon the availability of oxygen, there are mainly two types of fermentation.

1. Aerobic fermentation.
2. Anaerobic fermentation.

Aerobic Fermentation: When the fermentation process is carried out in the presence of oxygen then the process is called aerobic fermentation.

Anaerobic fermentation: When the fermentation process is carried out when oxygen is not present in sufficient quantity then it is called anaerobic fermentation. In the fermentation process, the chemical reaction can be investigated in terms of the various factors that affect the rate of chemical reaction including the reactant concentration, stoichiometry, and temperature. Grains, Fruits, Juices, Milk, and another organic liquid ferment naturally. Some speculate that fermented drinks and the dairy product must have been available not long after early people developed agriculture. Fermentation is carried out by both bacteria (prokaryotes) and fungi (eukaryotes) during their metabolism. Both of the types of organisms also figure in the world of human diseases, as they are both sources of antibiotics, as we'll see out this module. Fermentation is carried out in absence of oxygen well call it an anaerobic process. It is a method by which organisms such as yeast obtained their energy by converting sugar into other chemical compounds, particularly carbon dioxide and water. Interestingly our bodies also use this same anaerobic fermentation to obtain energy from sugars when oxygen is in low supply in our blood, such as during vigorous exercise. The product of this process is lactic acid and water rather than the carbon dioxide and H2O that human metabolism normally produces.



[Lactic Acid]

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In this day and age pharmaceutical companies utilize the fermentation carried out by microorganisms to produce antibiotics harmonies and specialized proteins such as antibodies and insulin. This wide range of products is possible because the bacterium or fungus involved in fermentation has been genetically changed to produce a specific substance.

III. RESULTS AND DISCUSSION

The model principally consists of 2 distillation columns, a juice feed tank, yeast culture tank, fermentation tank, condenser, accumulator, and 2 magnet valves. Cylindrical-shaped juice feed tank & the yeast culture tank square measure connected to the fermentation tank through the magnetic valves SV_1 & SV_2, on to the fermentation tank, and the stirrer is enforced for the continual stirring of the reaction mixture. Also, there's provision for dioxide removal from the tank. The output of the fermentation tank is supplied to distillation column one as a feed. Distillation column one accommodates eight sieve plate below distillation column one, heater one is mounted for heating the reaction mixture. the highest product of distillation column one is given to distillation column two through the condenser. Distillation column two may be a hollow tube during this column cyclohexane is extra for the plant product and water separation. the highest product of distillation column two once passing through condenser given to the column as reflux. all-time low product of this distillation column two is collected within the accumulator as AN plant product.

Table 1: Physical parameters of raw materials

Raw Material	Colour	Bitterness	Moisture	pH
Sugarcane Bagasse	5.35	0.03	4.59	4.76
Sugarcane Bark	4.40	0.16	3.95	4.42
Corn Stalk	3.96	0.16	3.72	5.57
Corn Husk	2.0	1.96	6.87	4.93

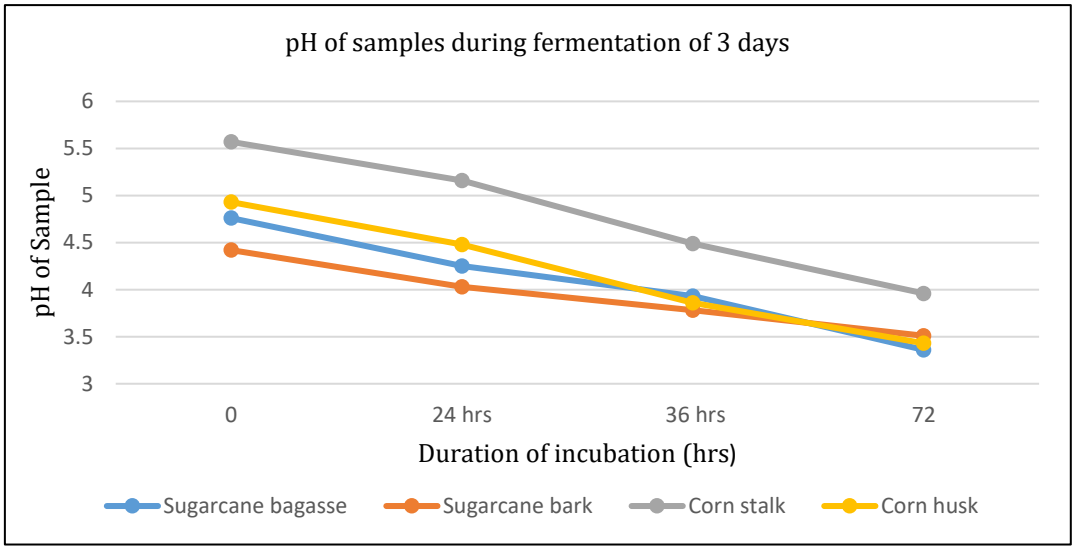

Figure 1: pH samples of raw material during fermentation for 3 days

Table 2: Result of ethanol obtained after complete process

SrNo.	Samples	Ethanol produced in 72hrs (in ml)
1	Sugarcane Bagasse	286.53
2	Sugarcane Bark	265.32
3	Corn Stalk	272.80
4	Corn husk	180.42

The Ethanol concentration increases as the days passed and sugar concentration decreased to zero in the fermentation process. This resulted in sugar is been fermented with help of microorganism yeast used for the fermentation process. The above data shows that the ethanol produced from sugarcane bagasse is highest as compared to the other raw material used during the complete process of 72 hours.

IV. CONCLUSION

Ethanol production was carried out under the principle of anaerobic fermentation. The results and the data show that the ethanol obtained from sweet sorghum plays a vital role not only in the economic growth of farmers but also that of the nation. It is a simple method of ethanol generation because the model used for ethanol generation is extremely simplified. Better utilization of waste agriculture material. It is possible to reduce the import of fuel due to the availability of optional fuel and also to reduce pollution because it emits less CO.

V. FUTURE SCOPE

According to the survey in Brazil, in 1979 there are about 5.4 million cars that ethanol-powered. In 1998 it is found that these cars consume 7.6 billion liters of ethanol. 5.3 billion liters of ethanol are used for the production of gasohol (22 % ethanol + 78 % gasoline), which is used for the remaining cars in Brazil. As ethanol has great importance in the fuel, we can implement this technique in our nation, 80 it helps to our economy. With the replacement of 2,00,000 barrels of gasoline per day, we can save hard currency amount to 1.8 billion US dollars per year. Ethanol can create 7,20,000 direct jobs & 2,00,000 indirect jobs in regular areas.

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