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Vehicles to Run on Household Wastes- Bio Ethanol Production from Agricultural Wastes Using Saccharomyces Cerevisiae

Bindu Elizabeth Koshy[1], Dr. Fanish Kumar Pandey[2], Dr. Tripti Bhatnagar[3]

[1,2,3] Department of science and Technology, Noida International University, India

Abstract: **Petroleum products are running out of race due to unbalanced relation between demand and supply besides air pollution. Bio ethanol is alcohol made by fermentation and the same can be used as a fuel for vehicles in its pure form. Lignin portion of the plant raw materials can be converted into fuel components by fermentation. Saccharomyces cerevisiae is the most useful yeast having been used in the fermentation process. Agricultural wastes have been used for the bio ethanol production after lignin degradation using Saccharomyces cerevisiae. Orange peel, and agricultural wastes like vegetable peel offs weeds (Parthenium) were used as substrates. A pH of 5- 5.5 was maintained in all samples to have the optimum growth of microorganisms. The maximum concentration of was found to be 34% in orange peel, 32% in Pine apple and 39% in agricultural wastes. At a pH of 5-5.5, the optimised conditions of sugar molasses are of temperatures 35 degree celcius and Time 72 hours which gave maximum ethanol yield of 39%. The strength and persistence of bio ethanol development is contingent on successfully addressing a number of challenges. Challenges include increasing ethanol use in current markets and expanding its use in new markets; increasing production relative to cost; developing the use of feedstocks and optimizing the environmental benefits of ethanol in comparison to the use of petroleum products.**

Keywords: **Agricultural wastes, Fermentation, Saccharomyces cerevisiae, Bio ethanol, Pineapple peel.**

I. INTRODUCTION

The biological conversion of ligno cellulosic materials to ethanol is a versatile process which can be used in various applications for replacing or improving petroleum products, treating wastes or reducing air pollution. Increase on world's energy demand and the progressive depletion of oil reserves motivate the search for alternative, energy resources especially for those derived from renewable materials such as biomass(Saxena etal, 2009)

Global concern about climate change and the consequent need to diminish green house gases emissions have encouraged the use of bio- ethanol as a gasoline replacement or addictive (Balat etal, 2008).An eco friendly bio ethanol is one such alternate fuel that can be used in unmodified petrol agents.

Lignin portion of the plant raw materials can be converted into fuel components by fermentation The sugars present in the plants are fermented to ethanol by Sacchaomyces cerevisiae. The use of mango peel as a source of pectin and fibre production also has been reported (pandia et al. , 2004). Grohmann et al. (1994;1995;1996;1998) previously reported ethanol production from orange peel. Ethanol production from banana (Manikandan et al. , 2008) and pineapple peels (Ban-koffi and han , 1990) were also investigated. Dried orange peels have a high content of pectin, cellulose and hemi cellulose, which make it suitable as fermentation substrate when hydrolysed. Insoluble carbohydrates are present in the cell walls of the peels , particularly in the form of pectin, cellulose and hemicelluloses. Escalating petroleum prices and the threat to fuel security are strong drivers in the search for sustainable fuel alternatives. Increasing evidence that rising carbon dioxide levels are contributing to global warming, and the growing consumer demand for environmentally-friendly energy solutions have also added to the attractiveness of bio fuels. Governments around the world have recognised the role that bio fuels will play in a renewable fuels portfolio and have introduced minimum targets for their implementation in the future [1]. Ligno cellulosic biomass is seen as an attractive feedstock for renewable fuels, particularly ethanol. Ligno cellulosic feed stocks include agricultural residues; wood, municipal solid waste and dedicated energy crops which have significant advantages over first generation feed stocks for ethanol production. The net energy balance of ligno cellulosic ethanol, in terms of energy reported to be 50-85% lower for lingo cellulosic ethanol than those from gasoline, with corn ethanol providing a 25-40% reduction [2,3]. Ligno cellulosic ethanol presents a means of satisfying demand for ethanol without further pressuring food supply. Marginal land, not suitable for food crops can be used, with less intensive use of water and fertilisers. Production of cellulosic ethanol can also utilise 'waste materials' such as agriculture and forest residues as feed stock.

The present study was therefore undertaken to optimise the bio ethanol production from resources that do not compete with food production.

II. MATERIALS AND METHODS

2.1 Collection of sample

The sample collected for the study included agricultural waste material like orange peel, pineapple peel were collected from a juice shop located at sec- 63, Noida. Weeds and House hold wastes were collected from Sec-33, Noida

2.2 Equipments

Glass wares, plastic wares chemicals and equipments included beakers, conical flask, petri plates, inoculating loop, tips, micro pipettes, wash bottles and test tubes. Chemicals used are dextrose, agar, yeast extract and urea .Equipments include weighing machine, Laminar air flow, autoclave, Incubator, water bath, Microscope and spectrophotometer

2.3 Media

PDA media was used for obtaining the growth of two yeast forms-indegenous and exotic

2.4 Pretreatment of agricultural wastes

About 1 kg of post harvested substrates were taken dried to remove all the moisture present in it this dried substrate undergoes size reduction by the help of a grinder. In the case of orange and pineapple peel drying is not required.

2.5 Hydrolysis.

5 gms of each of the sample is weighed and taken in separate conical flasks to which 100 ml of D.W and conc. sulfuric acid of concentration 0.2Mwas added. Same way 0.5 M and 0.8M media are also made. This is kept for24 hrs. for the hydrolysis of lignin.

2.6 Culture preparation

Saccharomyces cerevisiae (both exotic and indigenous) were used by culturing in PDA media.

A pH of 5- 5.5 was maintained in all the samples to have the optimum growth of micro-organism by adding NaOH. Added 10gm Dextrose, 1gm urea and 0.2 gm yeast extract to each media. Left for autoclaving.

2.7 Fermentation

To the 100 ml media, 0.5 gm of yeast was added. The flasks were then placed in incubator for 24 hrs.

2.8 Ethanol estimation - Potassium dichromate method.

0.5ml sample from each percent solution was taken in the test tubes in a laminar air flow. Add 1ml of potassium dichromate solution in each test tube. Incubate all the test tubes at 50degree centigrade for 30 minutes. After incubation 2ml of 2 M NaOH was added.

2.9 OD of the samples taken in spectrophotometer

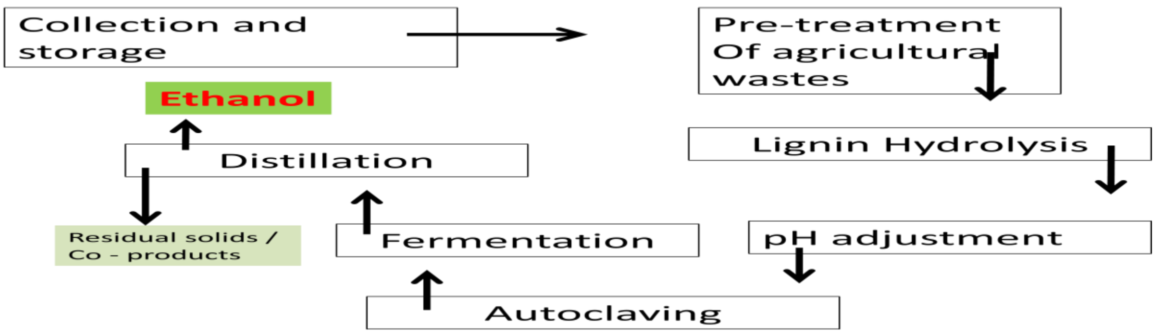

Fig. 1 Agricultural wastes to ethanol

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III. RESULTS AND DISCUSSION

The maximum concentration of Bio – ethanol was found to be 34% in orange peel,32% in pine apple and 39% in agricultural wastes at the pH of 5 using Saccharomyces. Maximum production using exotic variety of Saccharomyces.

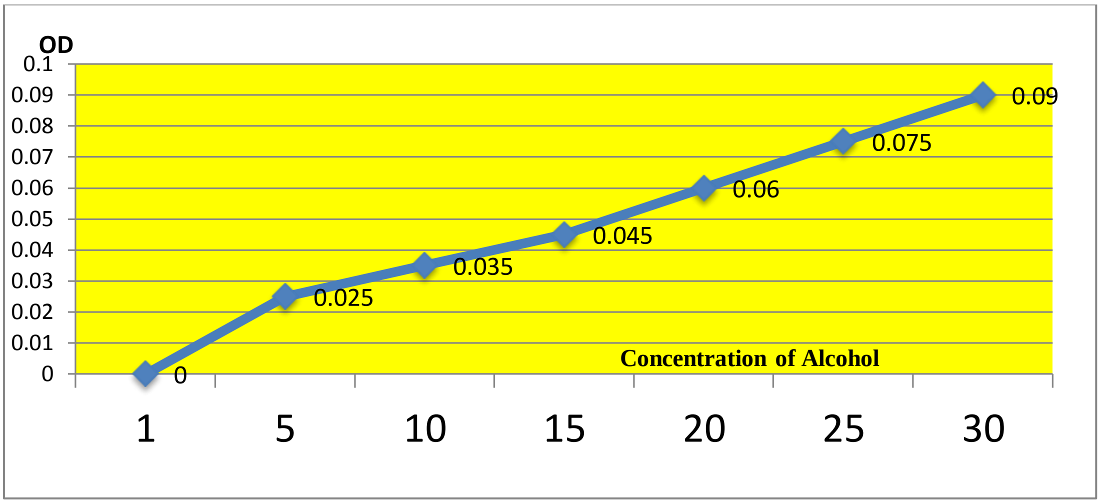

Fig. 2 Standard Curve of OD

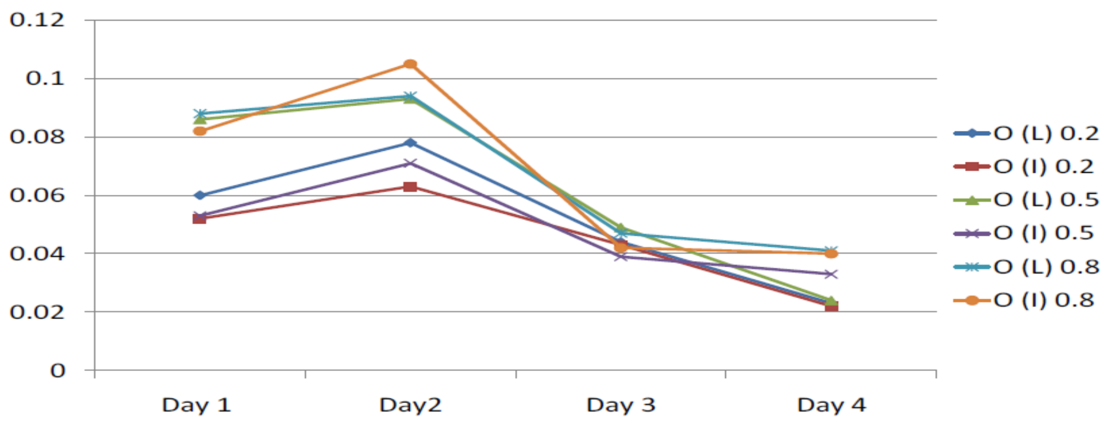

Fig. 3 OD of orange peel with local and imported Yeast

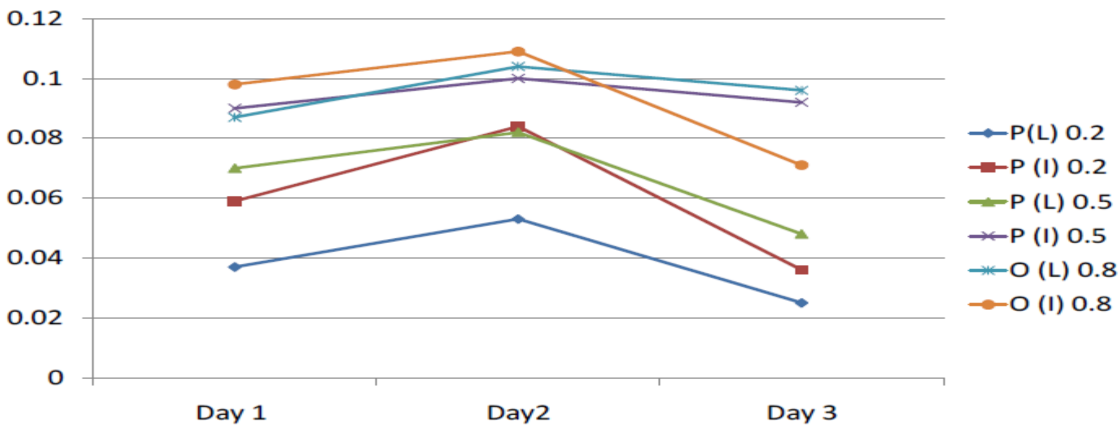

Fig. 4 OD of pineapple crust with local & imported yeast

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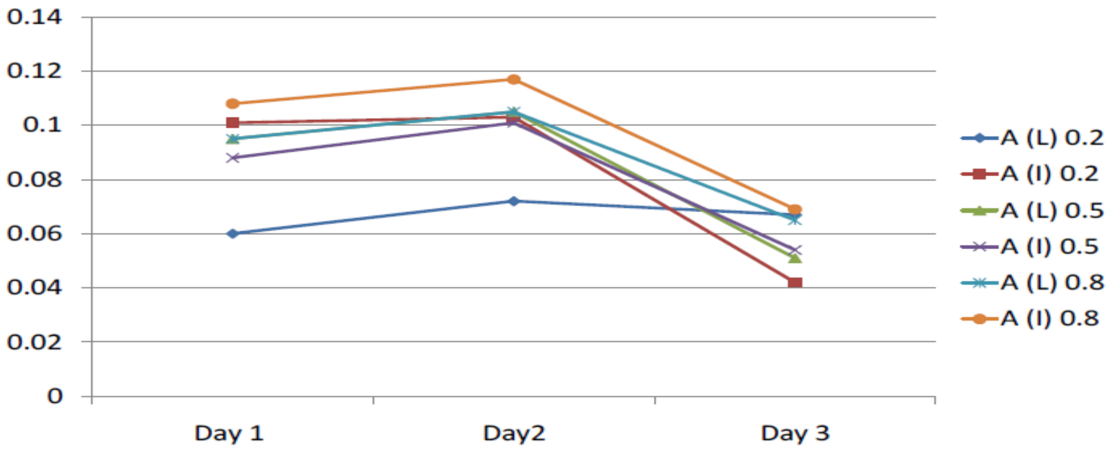

Fig. 5 OD of Agricultural weeds with local & imported yeast

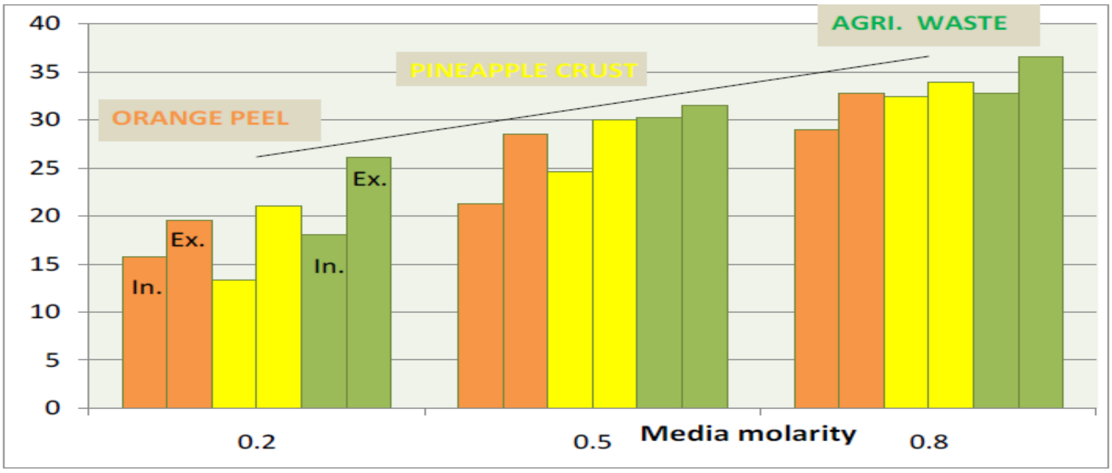

Fig. 6 Alcohol Production

IV. DISCUSSION

The culture was replenished with fresh media and inoculated with an activated culture of Sacchromyces cerevisiae. The culture was transferred to Duran wide mouthed bottles. The bottles were sealed and kept static in an incubator at 28°C. The samples were withdrawn in every 24hrs and the changes in pH, RI and ethanol concentration are displayed graphically as follws In table .1. Similar procedure was carried out with different substrates as shown in figures 2,3,4, 5&6. The profile of change in pH, residual sugar and ethanol production was monitored regularly at 24hr intervals.

Table:1 Showing maximum yield

Subsrate	Maximum yield
Pineapple	32%
Orange	34%
Agricultural wastes	39%

The highest ethanol production could be obtained with agricultural wastes as substrate.

The strength and persistence of ethanol development is contingent on successfully addressing a number of challenges. Challenges include increasing ethanol use in current markets and expanding its use in new markets; increasing production relative to cost; developing the use of feedstocks other than corn; and optimizing the environmental benefits of ethanol in comparison to the use of petroleum products.

V. CONCLUSION

This study focuses on explanations for the revival, and on issues associated with ethanol development. The revival is due, in part, to the need for alternative agricultural markets due to all time low crop prices, mandates requiring fuel additives and alternative fuel vehicles purchases, and recent gasoline price hikes. The strength and persistence of ethanol development is contingent on successfully addressing a number of challenges. Challenges include increasing ethanol use in current markets and expanding its use in new markets; increasing production relative to cost; developing the use of feedstocks other than baggasse and optimizing the environmental benefits of ethanol in comparison to the use of petroleum product.

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