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ECO FRIENDLY BIO-ETHANOL PRODUCTION FROM DIFFERENT FRUITS, VEGETABLES AND FLORAL WASTE-A REVIEW OF THE RESEARCH

Pooja Vinod Jagasia*

Department of Chemistry, Vivekanand Education Society's College of Arts, Science and Commerce, Chembur, Mumbai-400071, India.

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***Corresponding Author: Dr. Pooja Vinod Jagasia**

Department of Chemistry, Vivekanand Education Society's College of Arts, Science and Commerce, Chembur, Mumbai-400071, India.

ABSTRACT

Bio ethanol has a huge potential as substitute over fossil fuels. Ethanol manufacturing from waste biomass, and the use of such ethanol as gas can reduce fossil gasoline consumption and modify its environmental impact. This review briefly describes the aspects associated with bio ethanol manufacturing and focuses on how the waste food such as fruits and vegetables and floral waste have been utilized for the production of bio fuel and waste management purposes. Ethanol is the most widely used liquid bio-fuel and is produced as a result of fermentation process from sugars, starch or cellulose biomass including food wastes, organic wastes and floral wastes. Fruit wastes could be exploited as potential source of bio ethanol. The waste of seasonal fruits was reviewed in the study. For this, the conversion of food waste (maize) and organic waste (Old newspapers) respectively carried out via acid and microbial hydrolysis to obtain sugar wort followed by conversion of sugar wort to ethanol by fermentation process. Fruit wastes are rich in sugars and carbohydrates which can be recovered and utilized for the production of bio ethanol. Floral wastes are freely and abundantly can be used as bio resource which has distinct advantages inclusive of high fermentable sugars and minimum investment. Temple floral residues generated extensive wastes at some point of or after worship. These floral wastes are renewable and rich in lignocellulose biomass resources available in large mass for bio ethanol manufacturing. Jasmine was used as material for the production of bio ethanol. Moisture content of Jasmine calculated to be 90.84%. Total sugar and reducing sugar were measured. During study. The floral waste can also be properly managed and applied in to produce bio ethanol

KEYWORDS: Ethanol fuel; Fruit waste; Organic waste; Fermentation, Floral waste.

INTRODUCTION

Bio ethanol could be a great alternative to fossil fuels, either as a pure fuel with high efficiency and performance or as a gasoline additive. Bio ethanol is produced by fermentation. Bioethanol may additionally be produced from a variety of rotten fruits. As a liquid it's easily transported, also is blended with gasoline to increase the amount of the fuel. the big fluctuations within the value of petroleum within the past years have made commercial production of fermentation ethanol a more attractive. Studies[1-4] have revealed that there are attempts to develop alternative source of energy so on conserve the dwindling reserves of crude and fossil fuels. Fruit wastes are available in plenty as wastes world over. Huge amount fruits are consumed world over as health supplements and while functional foods.[5] In fact, there is a necessity to recover value added products from these wastes. Therefore, there's a desire to explore the use of other wastes like, fruit wastes or vegetable wastes which are consumed at huge scales. In fact, fruits are rich in sugars therefore fruit wastes can be an rich source of fermentable sugars and bio ethanol. Every fruit generates 50% of its weight as a waste after its consumption, which may well be an enormous amount and its utilization to come back up with bio ethanol would help in not only solving the matter of energy security, also help in solving the matter of waste management.[6] Rotten fruits were accustomed produce bio ethanol by fermentation process. Itelima et al. estimated bio ethanol production by simultaneous saccharification and fermentation from banana and pineapple peels.[7] Grohmann et al. have studied the use of cellulase enzyme for hydrolysis of cellulose of banana peels and observed that the utmost saccharification was achieved with a cellulase enzyme.[8] Mishra et al. investigated the assembly of bioethanol from fruit peels of orange, lemon and pineapple. Pineapple produced the utmost sugar fruit wastes.[9] Reddy et al. have investigated that mango peels contain larger amounts of reducing sugars up to 40% (w/v).[10] Direct fermentation of mango peels yielded very low content of bioethanol about 5.4% (v/v). It had been reported during this study that this was shown to be enhanced up to 7.14% (w/v) by using nutrient supplementation like yeast extract, bran extract, peptone and wheat. a special and alternative source of fabric for the assembly of biofuels are often the utilization of municipal organic wastes and particularly household food wastes, which clearly indicates that they represent a challenge concerning their disposal, as a better source for the assembly of biofuels. Moreover, there is a trend of accelerating the quantities of total food wastes produced (which are coming from both domestic, manufacture, food service/catering and retail/ wholesale sectors).[11]

Mainly temple waste consists of organic waste like flowers, leaves, coconut shells, fruits etc. which find their way ultimately into bins or some water bodies and thereby lead to the pollution and hygiene problems. Floral waste however have potential of being become wealth using existing, simple and cheap technologies. This floral waste may be utilized in numerous ways to provide valuable products and might thus help to save lots of environment from pollution. Techniques like vermicomposting, composting, dyes extraction, extraction of essential oils, making of holi colors and bio-gas generation will be used.[12] After that, these flowers become waste materials and will create environmental problems if not properly disposed or used for other purpose like to supply bio fuels. Therefore, this study reviews to utilize waste flowers for bio ethanol production using different pre treatment method and fermentation methods

Important factors in production of bioethanol from fruit wastes[13]

A crucial step within the bioconversion of lignocellulosic feedstocks to biofuels is to cheaply maximize the saccharification of the cellulose and hemicellulose components to fermentable sugars. one altogether the challenges is that the still too high enzyme costs involved within the saccharification of the cellulosic component and, to a lesser extent, the loss of variety of the hemicellulosic sugars during pretreatment. Thus, in many pretreatment strategies like steam explosion, mild severity conditions are often accustomed minimize, sugar loss during pretreatment. Under these milder pretreatment conditions, variety of the hemicellulose, mostly xylan in agricultural residues and hardwood, remains associated with the cellulosic-rich water insoluble fraction. However, this residual hemicellulose component is known to exert a significant influence on the effectiveness of enzymatic hydrolysis of its cellulosic component. Recently research work on the assembly valuable added fuels and chemicals from biomass are reviewed from the author's laboratory.[14] Liguori et al. have also recently reviewed the research work on the different bioreactors used for the conversion of various lignocellulosic biomass including fruit wastes to urge fermentable sugars, bioethanol and other value added products.[15]

MATERIALS AND METHODS

Fruit as a source of bioethanol[16]

A comparative study was made to focus on the efficient ethanol production from rambutan as compared to the fruits like mango, banana and pineapple. Ethanol production from different fruit parts were studied to optimize the experimental conditions and Effect of pH on ethanol production from fruits, Effect of various time on ethanol production from fruits were studied.

Sample Preparation

In this review study, all experiments were conducted using rotten fruit to supply ethanol and compared with the Rambutan, Mango, Banana and Pineapple for the ethanol production under same conditions. The fruits were washed, cut into small pieces along with their skin and blended for 3 minutes. The skin and also the juice obtained were mixed together before dispensing them into 1L bottles and experiments results were noted as triplicates. Each bottle contained 100 ml of the mixture. The fresh weight was measured, the total Soluble Solids (TSS) and therefore the pH of the mixture before fermentation were also measured. The initial pH for Rambutan, Mango, Banana and Pineapple juices were measured.

This study was designed to utilize the waste fruits for ethanol production and reduce the possible pollution because of the waste fruit material. The results of this study had revealed that the fruit wastes including rambutan, banana, mango and pineapple can efficiently be utilized for ethanol production with the help of Saccharomyces cerevisiae in a process of fermentation. A comparison of the yield of ethanol from different fruits has made it evident that the rambutan is the most efficient fruit/fruit waste to produce maximum ethanol as compared to the other fruits. The efficiency of fermentation or the yield of ethanol production is depending on the time, concentration of yeast and optimum conditions. The engine test showed low amount of hazardous chemicals content, thus this bio ethanol could potentially be used as good bio fuel. Viscosity and acid values measured indicated that this bio ethanol was safer to be used for engine purposes and reduced corrosion problem to the engine. In short, this study is enough encouraging promoting the ethanol production from fruit wastes as well as for the solid waste management.

Vegetable waste as a source of bio ethanol[17]

Rotten, peels, shells and a scraped portion of vegetables is one quite biodegradable vegetable waste that generated in large amounts, usually dumped on ground for rotten near the household area. Bio ethanol are often produced through fermentation under controlled conditions. Microbial decomposition of vegetable waste generates bio ethanol with high humus content.[18,19] Many researchers have stated that vegetable waste is carbohydrate-rich biomass one in all the potent substrates of renewable energy generations. Vegetable waste may be a renowned non edible source of lipids, amino acids, carbohydrates, and phosphates.[20,21] All of those nonedible lignocellulose biomasses can even use for the production of bio ethanol. Lignocellulose contains of 30–50% of cellulose, 20–40% of hemicellulose and lignin around 10–15%.[22] Vegetable waste is widely used material for the assembly of bio ethanol because it contains hemicellulose and cellulose, which might be became sugar by the hydrolysis method in presence of microorganisms.[23] The sugar content in vegetable waste extracts around 5%.[24] Yeast, fungi and bacteria are often used for the fermentation process.[25] Dilute acid hydrolysis the subsequent method it's used for hydrolysis of hemicellulose and as a cellulose pretreatment to create it most accessible for the enzymes. Depolymerization of the cellulosic fraction is that the next step. Soaking and dewatered of solid residue from the primary stage waadministrated in 30–40% sulphuric acid for 50 minutes. For furthering of cellulose hydrolysis is distributed at 373 k.

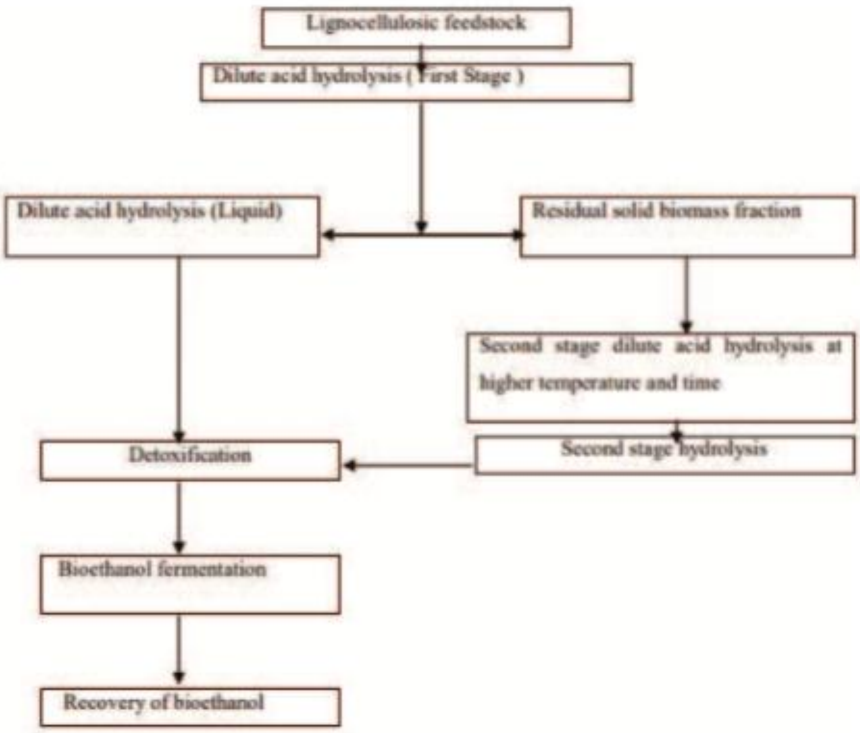

Fig: *Dilute acid hydrolysis flow chart of recovery bioethanol*

Overall ethanol production yield from house hold waste: Ethanol production yield after fermentation of liquefied household food wastes (HFW) at initial dry material (DM) content of 45% and subsequent fermentation of the residue before fermentation, residue was hydrothermally pretreated at 200°C for 10 minutes and liquefied.

Floral waste to supply bioethanol[26]

Fresh Jasminum sambac flowers were collected, and obtained flowers washed by H2O to urge eliminate dust and other debris, subsequently used solar dryer for drying the materials which was applied as a renewable energy source for reduce the moisture content. One kilogram fresh flowers of jasmine were dried. Pretreatment processes is important step for using lignocellulosic material for bioethanol production. The goals of pretreatment on lignocellulosic material are to search out a good method to scale back the price of pretreatment of feedstock, breakdown the lignin, hemicellulose and cellulose to a more accessible hydrolytic enzyme for conversion to glucose.[27] The monosugars release of stuff depends on the pretreatment efficiency. This study, pretreatment and enzyme hydrolysis results are shown in Fig. 1. Pretreatment is crucial for ensuring good ultimate yields of sugars from both polysaccharides. Hydrolysis without preceding pretreatment yields typically <20%, whereas yields after pretreatment often exceed 90%.[28]

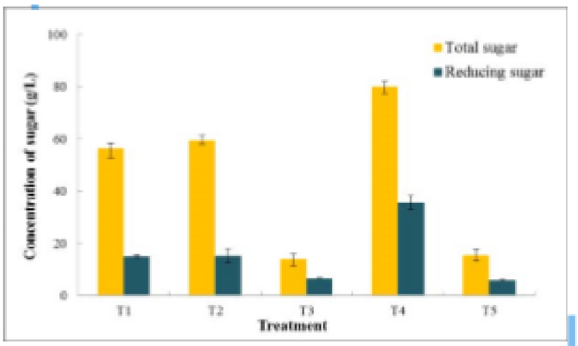

Fig. 1 Concentration of sugar yield by different treatment of jasmine flower

CONCLUSION

A comparative study was made to focus on the efficient ethanol production from fruit waste rambutan as compared to the opposite fruits like mango, banana and pineapple. Different parameters were investigated and compared regarding ethanol production from all of the four fruits. The parameters involved were including the pH, retention time, and different parts of fruits. The idea of using vegetables and fruits waste to provide bioethanol will aid to keep the environment clean from the waste of agriculture. the method helped in overcoming to the challenges of depletion of fuel with the creation of bioresearch energy. Bioethanol produced from the waste of vegetables and fruits is of fine qualities with making the engine to supply less emission. Vegetables and fruits waste are good economical choice for the assembly of bioethanol thanks to its low cost and availability. Optimization of the pretreatment, saccharification and fermentation condition improved the fermentation and proved its potential and feasibility to use as a flower wastes biomass for bioethanol production. Thus, the use of flower wastes biomass for bioethanol production necessitates the assembly technology to be cost effective and environmentally sustainable.

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