Production Of Bioethanol From Papaya Peel

Naguldev S[1], Divya Vellaichamy[2], Jabathersini Palanisamy[3], Saranya V[4]
[1, 2, 3] Dept of Chemical Engineering
[4]Dept of Agriculture Engineering
[1, 2, 3, 4] Sethu Institute of Technology
Virudhunagar, India

Abstract- *The aim of the study is to extract bioethanol .The production of ethanol from Carcia papaya(pawpaw) agricultural waste. Using, yeast strain(saccharomyces cerevisiae) was investigated. Effect of yeast concentration of the fermentation,pH,Temperature were investigated as they relate to optimization of production of ethanol. Our main objective is to search for relatively cheaper source for the production of ethanol and to develop easier techniques for the production so that common people can also produce it by themselves. For this purpose we are taking papaya peel as a raw material and it is treated with distilled water, small amount of sucrose and saccharomyces cerevisiae are collected. After 36hrs of fermentation process we got a yield of 38 percent ethanol. After distillation we could recover a total volume of 200ml of 48 percent concentrated ethanol from a total volume of 1500ml of substrate mixture. By redistilling the obtained product a higher concentration of ethanol can be obtained. Bioethanol, unlike petroleum, is a form of renewable energy that can be produced from agricultural feed stock, fruit wastes, vegetable wastes. The Papaya has property such as acid, fibre, sugar, carbohydrate, minerals are malic and citric, 30g, 5g, 18g, 0.08 mg/100g.For the production of bioethanol the raw material should have enough sugar content. Since papaya has sugar content. The sugar content plays a major role because of fermentation process. By producing bioethanol from fruit waste it has advantage such as it produces no toxics gases and eco -friendly. Unlike fossil fuel, it does not cause pollution to the environment. With increase in the demand for petroleum products the prices of petrol and diesel are increasing world wide. Hence alternative sources of energy for running our generators, automobiles are being considered worldwide. Thus we trying to produce biofuel from various sources.*

Keywords- Extraction,Bioethanol,Fermentation, Yeast, Papaya peel, Distillation.

I. INTRODUCTION

Ethanol fuel is(ethyl alcohol),the same type of alcohol found in alcoholic beverages. It is most often used as a motor fuel, mainly as a biofuel additive for 72 gasoline. A biofuel is a fuel that is produced from the living organisms, most often referring to plant or plant derived materials.Thus,use of biofuels is effective way to combustagainst the global climate change by reducing CO2 emission. There are two technicalhurdles to realize biofuels from non-food biomass for efficient conversion of pentose to biofuel, mitigation of fermentation inhibition by organic compound. Bioethanol is an alcohol made by microbial fermentation, mostly from carbohydrate produced in sugar or starch bearing plants. It is a renewable liquid fuel which burns clean-no smoke, no sparks, No fuss. The fermentation process involves less intake of energy and the production system much simpler than that for biodiesel. Bioethanol fuel is mainly produced by the sugar fermentation process, although it can also be manufactured by the chemical process of reacting ethylene with steam. Ethanol burns to produce carbon dioxide and water. When added to fuel, bioethanol reduces the use of cancer causing gasoline compounds such as Ethyl benzene,xylene, toluene and benzene. It also reduces the emissions of small particulates and spot from motor fuels, and greenhouse gas emissions. Water saving ethanol plant designs are very common. The United States is the world's largest producer of ethanol, having produced over 13.9 billion gallons in 2020.Most cars on the road today in the U.S. can run on blends of up to 10 percent ethanol, and the use of gasoline is mandated in some U.S. states and cities. Since 1976 the Brazilian government has made it mandatory to blend ethanol with gasoline, and since 2007 the legal blend is around 25 percent ethanol and gasoline. In addition, by 2010 Brazil had a fleet of more than 10 million flexible fuel vehicles regularly using neat ethanol fuel. In India people are trying to produce biofuel from various sources such as Jatrophacurcas,Pongamiapinnata,Azadirachtaindica,Madhucaindica. In our present study our main objective was to search for a relatively cheaper source for the production of ethanol .For this purpose we are taking fruits wastes(papaya peel)as a substrate for the production of ethanol by fermenting it with saccharomyces cerevisiae. The bioethanol as a biofuel include high octane number, low boiling point, high heat of vaporization, and comparable energy content. Blended gasoline with up to 85 percent bioethanol can be used in vehicles without modification of the existing engine. The bioethanol can be used as a transportation fuel, fuel for power generation, feedstock in the chemical industry, fuel for fuel cells and in cogeneration systems, in the cosmetic industry, and in manufacturing processes owing to its clean burning and easy availabilities. It is responsible for removing the carbon equivalent of 20 million cars from the road. A smaller carbon footprintand an increasegreenhouse in energy efficiency.And also sit reduces gas emissions by 40 to 45 percent compared to

gasoline even when hypothetical land use change emissions are included. Thus bioethanol is good to environment and produces no toxic gases. It is safe to consume. The process is obvious. Replacing fossil fuels with biofuels produced from renewable organic material has the potential to reduce some undesirable aspects of fossil fuel production and use, including conventional and greenhouse gas pollutant emissions, exhaustible resource depletion, and dependence on unstable foreign suppliers. Plant based fuels come from renewable sources, can be grown anywhere and have lower carbon emissions as compared to fuels. Use of biofuels ensure that our homes are environmentally friendly and have low carbon emissions Biofuel has various advantages over the traditional fuel as it can be prepared by anyone in the kitchen also. It is much cleaner and better for the environment and releases no toxic gases, hence not harmful to human health also. The waste materials after the fermentation can be used in the soil as a fertilizer. Engines capable of burning pure or anhydrous ethanol are now available and coming into increasing use. Bakers yeast is the most common microorganism used in the fermentation of sugars to ethanol.Bioethnaol is grain alcohol, or chemically C2H5OH or EtOH.It is a clear,flammable,colorlesss liquid that is miscible with water, as it's hydrophilic hydroxyl group is capable of hydrogen bonding with water molecules. Bioethanol refers to ethanol that is produced from biomass. By displacing hydrocarbon substances like aromatics in gasoline, ethanol also helps reduce emissions of air toxics, particulate matter, carbon monoxide, nitrous oxide, and exhaust hydrocarbons.

II. PROBLEM STATEMENT

Today fossil fuels are necessary for human survival and everyday life and are the primary source for the world's energy. They are used for heating, transportation, generating electricity, and creating common products like computers, cosmetics, paint, and household appliances .The world depletion fossil fuel happened, resulting in the continual price rising and the pressure for independence of oil and environmentconcerns lead to strong markets for biofuel. The utilization of naturalresources fuel leads to vast side problem. When we burn fossil fuels such as coal, oil and, gas, we don't just meet our energy needs we drive the current global warming crisis as well. Fossil fuels produce large quantities of carbon dioxide when burned. Carbon emissions trap heat in the atmosphere and lead to climate exchange. Understand today that humanity's use of fossil fuels is severely damaging our environment. It cause local pollution where they are produced and used, and their ongoing use is causing lasting harm to the climate of our entire planet. Also when we burn them we change the ocean's basic chemistry, making it more acidic. Our seas absorb as much as quarter of all man-made carbon emissions. Since the start of the industrial revolution, the oceans has become 30percent more acidic. As the acidity in our water goes up, the amount of calcium carbonate a substance by oysters, lobsters and countless other marine organisms to form shells goes down. This can slow growth rates, weaken shells, and imperil entire food chains. It creates climate change and releases pollutants that lead to early death, heart attacks, respiratory disorder, stroke, exacerbation of asthma, and absenteeism at school and work. Fossil fuels take a toll on environment. They cause obvious problems such as oil spills and smog filled air. They also cause other, more complicated problems that are not easy to see. Acid rain, for example, caused partially by sulphur in fossil fuels, damages buildings and harm trees, aquatic life, and insects. Thus fossil fuels cause are harmful to human beings, animals and eenvironment.Now a days fossil fuels are replaced by biofuels. Biofuels do not release as much carbon as fossil fuels do and because of this, there are fewer harmful emissions out of biofuels. Produced from biomass, biofuels have multiple uses in our daily lives as transportation fuels, fuel for power generation, in production of heat, cooking and other purposes. The, fuel spills are more easily biodegraded or diluted to non toxic concentrations. Being made from organic materials, and even organic waste, there is practically an infinite amount of biofuels available. We can grow it ourselves by producing corn, fruit waste, Vegetableswaste. Not to mention, using waste means we don't need to lose energy getting rid of our waste, but reverse the process and make sure we get all the energy out of it that we can thus may be the biggest reasons that biofuel are getting more popularity.

III. ARRANGEMENT OF MATERIALS

1)Assemblage of Fruit waste: For the production of bioethanol from papaya peel .we had collected a total of 1kg of papaya peel from the fruit market. These were washed in 5percent sodium hypochlorite solution. It is used to kill undesirable microorganisms. It is effective at killing a broad range of pathogens at concentrations between 100 and 200 ppm active ingredient, at pH around 7,and that it is relatively inexpensive. After washing they were rinsed well in distilled water. The papaya peel were crushed in a mixer. Now in a separate beaker 300ml of slightly warm distilled water was taken for production of bioethanol from papaya peel.

2) Fermentation process: And then, 50 gram of sucrose and 10 gram of saccharomyces cerevisiae collected was added and mixed well. Now this mixture was added in the previously made mixture of papaya peel and mixed in a mixture. The mixture was transferred into a 1.5ltr conical flask and made the final volume up to 1000ml with slightly warm distilled water. The flask is covered with dark paper and the mouth is

sealed and kept in a shaker incubator and allowed to incubator and allowed to incubate for 36hrs at 36 degree Celsius with a speed of 100rpm.The common method for converting biomass into ethanol is called fermentation. During this process microorganisms (e.g., bacteria and yeast) metabolize plant sugars and produce ethanol. The optimum pH, temperature and time were 5.5,36 degreeCelsius, 36 hours respectively. Upon a strictly biochemical of point view, fermentation is a process of central metabolism in which an organism converts a carbohydrate, such as starch or sugar, into an alcohol or an acid. Compared to other types of microorganisms, yeasts especially Saccharomyces cerevisiae is the common microbes employed in ethanol production due to its high ethanol productivity, high ethanol tolerance and ability of fermenting wide range of sugars. After 36hrs of fermentation process a small amount the sample was taken out and centrifuged. The process of centrifugation is separating molecules having different densities by spinning them in solution around an axis at high speed. And then, the super Nant was collected and the volume of the alcohol was determined by the specific gravity method. Then the rest of the sample was distilled usingnormal lab distiller to collect the concentrated alcohol. The concentration of ethanol was determined by the specific gravity method.

*3) Specific gravity method: T*he volume of alcohol was determined by this method. The method assumed that the difference in specific gravity before and after fermentation is due solely to the conversion of sugars before fermentation into alcohol after fermentation. To calculate alcohol by volume subs tract the original gravity from the final gravity. Multiply this number by 131.25.The original gravity and final gravity is measured using hydrometer. A hydrometer is a tool used for measuring density. Hydrometers user for brewing will tell the specific gravity of a liquid-a ratio of the liquid's density to that of water. It is essentially a specially weighted bob-you place it in a liquid, and it will sink to a certain depth, which depends on the density of the fluid. Original gravity is a measure of sugars dissolved in a water in your unfermented wort.It is typically measured with hydrometer when brewing is complete but fermentation has started. Final gravity is measured after the fermentation process. The same way after distillation, the concentration of ethanol is determined by this method. Ethanol is less toxic than gasoline. The method relieson all the wines measured, starting with the same sugar levels, all the sugars being fermented, with the wine finishing dry andun fermentable sugars being the same for all wines.

Alcohol by Volume=(Initial Gravity-Final Gravity)*131.25

IV. RESULTS AND DISCUSSION

The results of the experiments carried out in the laboratory are outlined and described in various section.

Table 1.Ethanol production after fermentation process

Yeast	Saccharomyces cerevisiae
Time	48 hrs
Volume	300ml
Temperature	34 degree Celsius
Ethanol	45 percent

V.CONCLUSION

In our present study we tried to obtain a higher concentration of alcohol using fruit waste (papaya peel).As this process is cost effective and do not yield any toxic residues .Every gallon of biofuel that replaces a gallon of fossil fuels helps reduce greenhouse gas emissions. As we could obtain 45 percent alcohol after distillation so we can predict that a higher concentration of alcohol can be obtained after predistillation of the product obtained. The left outs can be disposed in the soil and a common man can develop it as a small scale industry.

REFERENCES

[1] O. R. Inderwildi, D. A. King (2009).Quo Vadis Biofuel. Energy & Environmental Science 2: 343.

[2] NaguldevS,Esther Roselin Ramanathan,JananiChellavel,SaranyaV,Synthesis and characteristics of oil from orange rind, Inetrnational Research Journal of modernization in Engineering Technology and Science, Volume 3,e-ISSN:2582-5208.

[3] Association of Official Analytical Chemists (A.O.A.C.) (1970 and 1980). Official Methods of Analysis 13th Ed. Horwits, W., Ed. A.O.A.C., Washington D.C

[4] Akin-Osanaiye B.C., Nzelibe H.C., Agbaji A.S.(2005).Production of ethanol from Carica papaya (pawpaw) agro waste;effect of saccharification and different treatments on ethanol yield.Afr.J.Biotechnol. 4(7):657-659 Debajit Borah and Vimalendra Mishra

[5] O. R. Inderwildi , D. A. King (2009).Quo Vadis Biofuel.Energy& Environmental Science 2: 343.

[6] Production of biofuel from fruit waste ,International Journal of Advanced Biotechnology Research. Volume 1, Number 1 (2011), pp. 71-74