International Engineering Journal for Research & Development

Vol. 5
Issue 7

THE PRODUCTIVITY OF SLUDGE BANANA PEELS IN THE BIOFUELS

Dr. M. S. Ambatkar
Head and Associate Professor Department of Zoology Vidya vikas Arts.Commerce and Science College.
Samudrapur Dist:Wardha

ABSTRACT

Two separate batch processes were used to limit the amount of carbon and glycolysis produced by the effluent from banana fruit peel powder for 7–10 days in a co-culture of Candida niger and Staphylococcus subtilis oocytes, as well as a co-culture of Bacillus subtilis and Saccharomyces cerevisiae. To produce aerobic glycolysis in the third batch of brewing, Penicillium biomass -amylase protein is mixed with Saccharomyces cerevisiae. The reference electrode ethanol test may be used to determine the entire ethanol yield from the ethanol generated by the fractionating column procedure. Fermentation and production techniques provide ethanol yields of 6.34, 4.6, and 11.73 percent correspondingly.

Keywords: methanogenesis, Saccharomyces cerevisiae, lactic acid fermentation, potentiometric ethanol

INTRODUCTION

Ethanol is a sustainable energy source that is entirely made up of biological products. It is produced by processing the refined sugar elements of plant by-products, mostly sugarcane, with yeast to produce bio-ethanol. It may also be prepared from maize, potatoes, rice, beetroot, and, more recently, grapes, bananas, dates, and other fruits and vegetables, The country's agriculture is a major factor. More than 51,000 million gallons of biofuel have been produced worldwide, with the United Nations taking the top two spots in terms of total production, followed by Brazil and India. Feed stocks for the manufacture of bio-ethanol include sugarcane in Brazil and maize in the United States, as well as a number of other farm products from across the globe. Molasses is the primary source of ethanol in India, although it has a wide range of uses, is in short supply, and is always in demand because of the country's rapidly expanding population.Growing demand for ethanol for a variety of industrial applications, including alternative energy, industrial solvents, cleaning agents, and preservatives, has resulted in a rise in the price of ethanol. It was necessary to increase the amount of alcohol produced. Ethanol production is usually accomplished by chemical synthesis of petrochemical substrates and microbiological conversion of petrochemical substrates carbohydrates present in agricultural products. Owing to the depleting reserves and competing industrial In order to meet the growing demand for petrochemical feedstock, there is an international effort. The fermentation process is used to produce ethanol, which is highlighted below. Increased output of ethanol generation due to microbial fermentation depends on the use of ideal microbial strain, adequate fermentation substrate as well as a suitable fermentation procedure technology. An excellent microorganism for the production of ethanol Production must have a high fermentative potential in order to be successful, enhanced flocculating ability, suitable osmotic pressure, etc. tolerance, improved ethanol tolerance, and excellent thermoregulation tolerance. Despite the fact that no microbial strain possesses all of these characteristics,

HANDLING OF AGRICULTURAL PROCESS WASTE AT THE PRESENT TIME

At the moment, waste material from pasteurization is handled in a number of different ways. Many manufacturers just dispose of their garbage in the vicinity of the plant. Because these wastes include high concentrations of nutrients and water, and because they may enable pathogen activity and fermentation, they may emit aromas and cause other environmental concerns. The transportation of garbage to a dumpsite for disposal may be necessary in some instances; however, landfill disposal fees may be charged in some nations, which might result in additional expenditures. Another method of disposing of wastage is by its use as animal feed, primarily for the purpose of cow feed. It is possible to dry the waste and convert it into pellets before selling it as animal feed. However, because the majority of food wastes contain little protein, they are not suitable for use as animal feed. a significant amount of lignin.

At the beginning of the 1980s, the potential applications of microwave energy were well recognised by scientists. There were obvious advantages, such as speedier operation and lower energy use savings, and higher product quality, as in applications like Enzymatic inactivation, sterilisation, and pasteurisation are all methods of preserving food. Decareau and Peterson (1986) defined drying as the process of removing moisture from a surface.Furthermore, the widespread usage of microwave ovens in homes and businesses Homes and eateries were already acquainted with one another.customers are familiar with this technology and its benefits, as a result reducing some of the concerns and taboos that previously existed in the starting. It is vital to take the following into consideration:The societal changes that occurred throughout this time period, as well as the continuous Changes in home routines contributed to the fast growth of the economy. Domestic ovens have gained widespread acceptability in society. This is the situation research that was encouraged in order to have a better understanding of food's dielectric characteristics, information that was previously available.

MATERIALS AND METHODS

1) BANANA PEELS ARE PREPARED WITH A PRESERVATIVE BEFORE EATING.

In Dombivli, Maharashtra, India, discarded banana peels were purchased from a local market where they became compostable. Ripe abandoned banana peels were scrubbed, custom (3–5 cm) and cleaned with 70% ethanol until being bleached in the sun for 7 days and pulverized to a fine powder in anticipation for processing.

2) MICROORGANISMS HAVE BEEN ISOLATED AND STUDIED.

Micro-organisms necessary for bio-ethanol generation, Penicillium and Bacillus subtilis were found in soil by spread-plate method on Sabouraud’s medium and starch agar medium respectively. As a result, the isolated colonies generated were maintained on Sabouraud's agar slants at a temperature of 4 degrees Celsius. The fungus strain Cellulases (Baker's yeast) was purchased from a local store for this experiment. 4°C Sabouraud's Agar slants were used to keep it at the proper temperature.

3) ANALYSIS OF AMYLOLYTIC ACTIVITY IN A VARIETY OF ORGANISMS

The amylolytic activity of two isolated species, Aspergillus niger and Candida albicans, was investigated.

AMINO ACID BIOSYNTHESIS AND EXTRACTION OF THE ENZYME -AMYLASE

The protease production experiment was carried out on a 50 ml medium containing cell lysate (5 gm/l), saccharomyces extraction (5 gm/l), $(NH4)2SO4$ (2 gm/l), $MgSO4.7H2O$ (0.2 gm/l), $KH2PO4$ (3 gm/l), and $CaCl2.2H2O$ (0.25 gm/l). After that, the medium was kept at 50°C with 200 rpm agitation and 2.5 percent of an Alcaligenes culture that had been cultivated for 24 hours was injected.

Fractional distillation and the potentiometric ethanol test were used to assess the ethanol yield quantitatively.

ESTIMATION OF ETHANOL

Ten millilitres of the specimen exact solution after the evaporator was treated with acidified dichromate and maintained in a water bath for 10–15 minutes before being mixed with 100 millilitres of distilled water and ten millilitres of potassium iodide solution, which causes the solution to turn brown. This is the solution

The study's significance and impact are as follows:

One of the most serious environmental challenges facing the world today is the dramatic growth in the creation of enormous quantities of garbage. Agricultural operations and the production of farm produce create large amounts of waste materials each year, which are disposed of in landfills. In part because of their accessibility and renewable nature, the generation of ethanol from such substrates looks to have tremendous economic prospects. It is also being investigated if a separate trash from the food processing sector may be used as a possible feedstock for value-added goods like bio-ethanol. From the entire fruit output globally, the banana (Musa sapientum) accounts for 16 percent of overall production; Maharashtra, being the second largest global fruit grower, accounts for 21.4 percent of total production in India.

Because these wastes include high concentrations of nutrients and water, and because they may enable bacterial growth and fermentation, they may emit aromas and cause other environmental concerns. The transportation of garbage to a landfill site for disposal may be necessary in some instances; however, landfill disposal fees may be charged in some nations, which might result in additional expenditures. Another method of disposing of food waste is by its use as animal feed, primarily for the purpose of cow feed. It is possible to dry the waste and convert it into pellets before selling it as animal feed. However, because the majority of food wastes contain little protein, they are not suitable for use as animal feed. The presence of high lignin concentration in some wastes, such as sugarcane bagasse, also restricts its use as animal feed since it renders the waste harder to digest.

Agro-Industrial Residues Have a Wide Range of Uses Agro-industrial waste is mostly constituted of lignocellulose biomass, which is a kind of wood. Lignocellulose waste has gotten a lot of attention lately because of its mechanical and thermal qualities, renewability, wide availability, non-toxicity, low cost, and biodegradability [13,14]. It also offers a lot of potential for recycling. It is owing to the wide variety of lignans and celluloses found in agricultural and industrial leftovers that they have such immense potential as feedstocks for chemical and biotechnological conversion processes. For example, the enzymatic breakdown of cellulose and hemicelluloses into glucose and xylose allows fermentative microbes to further ferment these monosaccharides into ethanol, allowing for the production of ethanol. Aside from that, the pyrolysis and anaerobic digestion of lignocellulose biomasses might result in the production of combustion gases such as H_2 and CH_4 [13, 15, 16]. Organic and agro-industrial wastes now account for a significant fraction of global trash (Figure 1a), which is one of the reasons for making effective use of these materials.

BANANA RESIDUES ARE PRODUCED DURING THE PROCESSING OF BANANAS

A banana plant is a tall and sturdy herbaceous plant with a succulent and extremely juicy tubular stem constructed of leaf-petiole sheaths made up of long and tightly overlapping fibres known as pseudostem, which are arranged in a tubular shape.Each pseudostem produces fruit just once before dying and being replaced by a new pseudostem; this pseudostem is the first to yield fruit on this plant.A leaf sheath and a crown of big leaves are arranged in concentric layers on the stem [15].The biomass of bananas is composed mostly of four components: pseudostems, leaves, rachis, and skins, in that order.Furthermore, a considerable percentage of rejected bananas are used as starchy feedstock for biorefineries, which helps to reduce waste.Feedstock obtained from rejected bananas can account for up to 30 weight percent of overall output (the remainder being used for other purposes).Overripe fruits that have not been sold also fall under this group) [15]. Normally, all of these biomass leftovers are disposed of in landfills.

RESULTS

It is feasible to quantify the number of reducing sugars produced in the banana peel medium throughout the saccharification process using this method. Cutting carbs were detected in the platform, indicating that the starch or carbohydrates in the banana peels had been transformed to reducing sugars, the most basic kind of glucose (Figure 1). This conversion happens as a result of the bacteria Propionibacterium and Bacillus subtilis producing the chemical B- amylase, respectively.

A titrimetric ethanol test may be used to quantify the percent ethanol content in banana peel powder after it has been exposed to the simultaneous saccharification and fermentation process. In this case, the percent ethanol yield may be calculated using the following formula:

Ethanol Yield as a percentage

100 grammes of alcohol per 100 millilitres of water=The amount of substrate that was utilised (gm)

The % ethanol yield obtained is shown in Table 1.

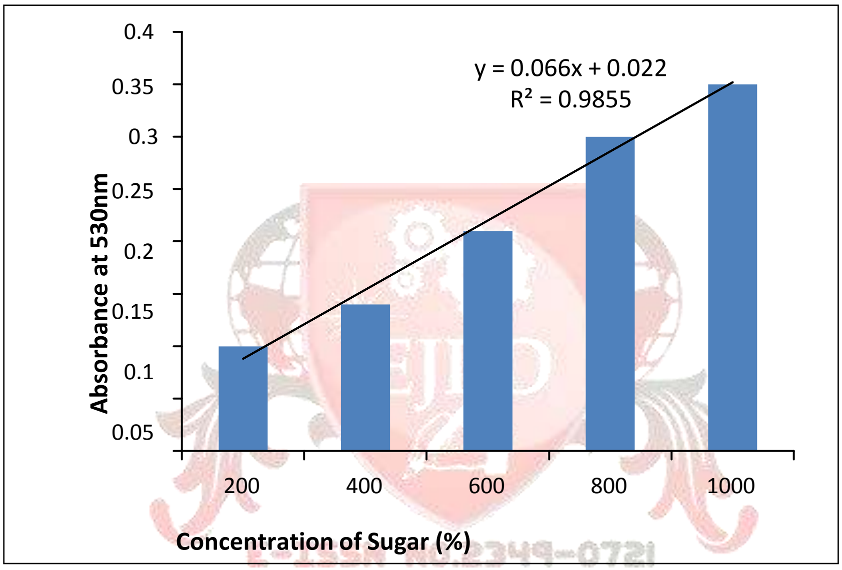

Fig. 1: *The DNSA Technique is used to predict the amount of sugar that is being reduced..*

DISCUSSION

Decomposition is a well-known and well-established process for converting maize and other food crop residues (such as sucrose and beet polysaccharides) into biofuel. However, in some situations, waste from food production, such as banana peels, might be utilised to make bio-ethanol.

To convert banana peel starch to reducing sugars without resorting to expensive methods such as enzymes and enzyme combinations, microorganisms such as Penicillium and Subtilis can be employed efficiently. Due to enzymatic processes occurring inside the microorganisms, the starch in the banana peels is converted into reducing sugars such as maltose and glucose. It is the enzyme - amylase, which is generated by both Penicillium and Bacillus subtilis, that aids in the conversion of starch to sugar. These reducing sugars are converted into ethanol and carbon dioxide by the yeast Saccharomyces cerevisiae during the fermentation process.

REFERENCES

[1] Oberoi Harinder Singh. Ethanol Production from Banana Peels Using Statistically Optimized Simultaneous Saccharification and Fermentation Process. *Waste Manag*. 2011; 1576– 1584p.

[2] Singh Ajay Kumar. Bio-Ethanol Production from Banana Peel by Simultaneous Saccharification and

Fermentation Process Using Co-Cultures Aspergillus niger and Saccharomyces cerevisiae. Int J Curr Microbiol Appl Sci. 2014; 3(5): 84–96p.

[3] Mazlan MF. Optimization of Ethanol Production from Waste Bananas. University of Technology Petronas; 2013.

[4] Emaga TH. Dietary Fiber Component and Pectin Chemical Features of Peels during Ripening in Banana and Plantain Varieties. Bioresour Technol. 2008; 99: 4346–4354p.

[5] Sukamaran RK, et al. Lignocellulosic Ethanol in India: Prospects, Challengesand Feedstock Availability. Bioresour Technol. 2010; 101: 4826–4833p.

[6] Agricultural Research Data Book. New Delhi: Indian Agricultural Statistics Research Institute; 2004.

[7] Martínez-Ruano, J.A.; Caballero-Galván, A.S.; Restrepo-Serna, D.L.; Cardona, C.A. Techno-economic and environmental assessment of biogas production from banana peel (Musa paradisiaca) in a biorefinery concept. Env. Sci. Pollut. Res. 2018, 25, 35971–35980. [CrossRef] [PubMed]

[8] Gumisiriza, R.; Hawumba, J.F.; Okure, M.; Hensel, O. Biomass waste-to-energy valorisation technologies: A review case for banana processing in Uganda. Biotechnol. Biofuels 2017, 10, 11. [CrossRef] [PubMed]

[9] Kamm, B.; Kamm, M.; Gruber, P.R.; Kromus, S. Biorefineries-Industrial Processes and Products; Kamm, B., Gruber, P.R., Kamm, M., Eds.; Wiley: Hoboken, NJ, USA, 2005; ISBN 9783527310272.

De Corato, U.; De Bari, I.; Viola, E.; Pugliese, M. Assessing the main opportunities of integrated

[10] Fava, F.; Totaro, G.; Diels, L.; Reis, M.; Duarte, J.; Carioca, O.B.; Poggi-Varaldo, H.M.; Ferreira, B.S. Biowaste biorefinery in Europe: Opportunities and research & development needs. N. Biotechnol. 2015, 32, 100–108. [CrossRef]

Rojas Alfaro, J.J.; Fernández Araya, L.M.; Redondo-Gómez, C.; Vega-Baudrit, J. Bio Refinery of Oily Wastes. Org. Med. Chem. Int. J. 2018, 6, 1–7. [CrossRef]

[11] Banerjee, A.; Bhaskar, T.; Ghosh, D. A biorefinery approach for sewage sludge. In Waste Biorefinery; Elsevier: Amsterdam, The Netherlands, 2020; pp. 293–421.

[12] Pérez, V.; Pascual, A.; Rodrigo, A.; García Torreiro,M.; Latorre-Sánchez,M.; Coll Lozano, C.; David-Moreno, A.; Oliva-Dominguez, J.M.; Serna-Maza, A.; Herrero García, N.; et al. Integrated innovative biorefinery for the transformation of municipal solid waste into biobased products. In Waste Biorefinery; Elsevier: Amsterdam, The Netherlands, 2020; pp. 41–80.

[13] Anwar, Z.; Gulfraz, M.; Irshad, M. Agro-industrial lignocellulosic biomass a key to unlock the future bio-energy: A brief review. J. Radiat. Res. Appl. Sci. 2014, 7, 163–173. [CrossRef]

[14] Cardoso Araújo, D.J.; Machado, A.V.; Lobo Guerra Vilarinho, M.C. Availability and Suitability of Agroindustrial Residues as Feedstock for Cellulose-Based Materials: Brazil Case Study. Waste Biomass Valorization 2019, 10, 2863–2878. [CrossRef]

[15] Tock, J.Y.; Lai, C.L.; Lee, K.T.; Tan, K.T.; Bhatia, S. Banana biomass as potential renewable energy resource: A Malaysian case study. Renew. Sustain. Energy Rev. 2010, 14, 798–805. [CrossRef]

[16] Pisutpaisal, N.; Boonyawanich, S.; Saowaluck, H. Feasibility of Biomethane Production from Banana Peel. Energy Procedia 2014, 50, 782–788. [CrossRef]

[17] Yang, X.; Choi, H.S.; Park, C.; Kim, S.W. Current states and prospects of organic waste utilization for biorefineries. Renew. Sustain. Energy Rev. 2015, 49, 335–349. [CrossRef]

[18] Sommer, S.G.; Hamelin, L.; Olesen, J.E.; Montes, F.; Jia, W.; Chen, Q.; Triolo, J.M. Agricultural waste biomass. In Supply Chain Management for Sustainable Food Networks; John Wiley & Sons, Ltd.: Chichester, UK, 2016; pp. 67–106.

[19] Padam, B.S.; Tin, H.S.; Chye, F.Y.; Abdullah, M.I. Banana by-products: An under-utilized renewable food biomass with great potential. J. Food Sci. Technol. 2014, 51, 3527–3545. [CrossRef]

[20] Pathak, P.D.; Mandavgane, S.A.; Kulkarni, B.D. Valorization of banana peel: A biorefinery approach. Rev. Chem. Eng. 2016, 32. [CrossRef]

[21] Cutz, L.; Haro, P.; Santana, D.; Johnsson, F. Assessment of biomass energy sources and technologies: The case of Central America. Renew. Sustain. Energy Rev. 2016, 58, 1411–1431. [CrossRef]