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Waste Materials: Good Sources of Biofuels

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Abstract:

Nowadays, the increasing waste material like fruit and vegetable waste, industrial waste, paper waste, and so on has made an vast problem in both developed and developing countries. According to the report of waste management, India produce 1, 20,000 tons solid waste materials per day. Researchers give an idea to reduce these waste materials by using these material in the production of fuels. The fuels, called biofuels are produced by these wastes with the help of fermentation using the microorganisms. The generation of fuel from the waste material is considered as a renewable energy resource that are used in transportation. By the investigation of composition of ash material, the law regulation preferred the use of biomass combustion because of the zero emission of carbon dioxide. Paper mills are the major source that produce approximately 25% primary fuel. This paper represents the different sources of biomass and their use in the production of biofuel, a renewable energy sources.

Keywords: *Paper Waste, Biofuel, Renewable Energy*

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Introduction

In developed and developing countries, the increasing quantity of solid waste is one of the rising problems. The rural population are shifting to the urban areas in the search of employment as the growth in industrialization area. Approximately, 1, 20,000 tonnes/day solid waste materials are produced by India. Waste processing are uncontrolled due to which water and soil pollution occur. There are various methods of disposal of organic solid wastes such as physical, chemical and microbiological methods which are time consuming and expensive.

These waste materials are used to generate the fuel called biofuel. These biofuel are comes under the renewable energy sources because it is developed from the waste materials of plant, crop and agricultural activities. Renewable energy has become most popular because of the declining the fossil fuels, a conventional energy source. The industries and population have a large demand of fuels to full-fill their demands. On the demand, Government started the use of alternative sources of energy such as biomass, biofuel, biohydrogen etc.

One source of solar energy is also biomass that is collected by plants and other organic materials produced by animals and plants. Crops, tree and food waste are the biomass feedstock that can produce more convenient energy such as solid fuels (wood chips, pellets, briquettes), liquid fuels (methanol, ethanol, bio-diesel, bio-oil) and gaseous fuels (synthesis gas, biogas, hydrogen). Liquid fuels such as bio-ethanol and bio diesel are useful for transportation purposes because of their characteristics such as high energy density and handling convenience.

A fuel that is derived from biological materials is called biofuel. The conversion of non-edible plant biomass into the valuable bio products, biofuels, and biochemical are come under the modern biotechnology. Biofuel, a quasi-renewable energy produced by the agriculture feedstock such as sugarcane, potato, cassava and corn. Ethanol is also a type of biofuel called bioethanol that is produced on a large scale. The production of biofuel in the form of ethanol is considered as first generation of biofuel. The major steps of production is Microbial (yeast) fermentation of sugars, distillation and dehydration and denaturing. The hydrolysis of carbohydrate (cellulose and starch) into sugar by the help of enzyme. In simple terms, the microbial fermentation of sugar produce the biofuel.

There are two main component of plant; starch and cellulose which are made from the sugars. Cellulosic ethanol area have much activity as the plant' cellulose is broken down into sugars and then into ethanol. This bioethanol is environmental friendly fuels because of the production of oxygen. The pressure on global food supply is due to the production of ethanol in large quantity. Then second generation of biofuel is from waste chicken feathers, cellulosic biomass (agriculture residue and industrial waste) and organic waste. This second generation biofuel can be generated by the mixed paper waste from the municipal solid waste, cash crops, Jatropha Honge, cotton, Maize etc. And third generation of biofuel is produced by micro-organisms like algae.

The paper industries in the world produce 300 to 350 million tons paper and board in which small part of waste is recycled while large amount of waste materials of paper is thrown out. Paper materials, part of the plant considered as abundant, renewable and inexpensive sources of raw materials which stored in a huge amount **(Prema, Prabha and Gnanavel, 2015; Byadgi and Kalburgi, 2016).**

Alternative sources of biomass

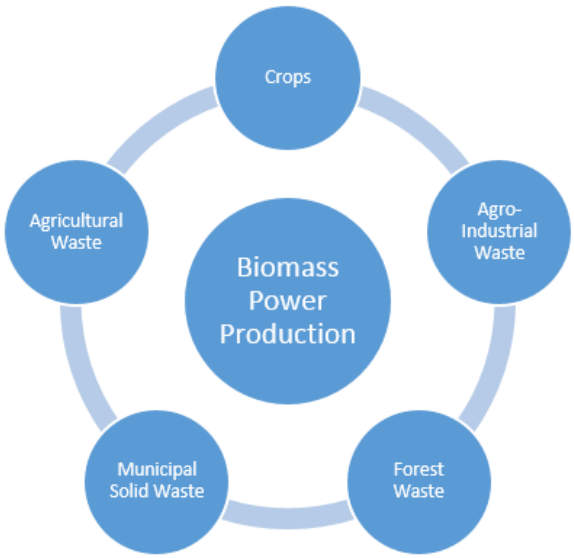

Figure: Sources of Biomass

Different forms of biomass resources are available which are classified according the nature as follows:

Agricultural crop residue: In India, a large area of land is busy in the agricultural field due to which massive residue is produced. These residue is used for the production of energy. These agricultural residue are categorized into two form; primary and secondary. Primary residue is produced in the field during yield example rice straw, sugar cane tops etc. while secondary residue is produced during the processing

such as rice husk and bagasse. The primary residue is the feed of animals and fertilizers due to which is less reliable for the energy production.

Wastewater and Industrial Waste: The waste materials and sewage are the major cause of soil and water pollution. The decomposition of organic materials on land, filtrate into groundwater and surface water cause health problems. Black liquor from paper and pulp industry, milk processing units, breweries, vegetable packaging industry, and animal manure are the discharge from the industries.

Food Industry Waste: Lots of waste such as vegetables flay, stale food (uneaten bread, rice and vegetables) is produced by the hotel, restaurants and community kitchens. Confectionary industries also produce a large amount of waste.

Solid Waste such as fruits, vegetables scrap, non-standard food, pulp and fiber are obtained from the industries. These solid wastes are used as a potential feedstock for biogas generation produced by the anaerobic digestion.

Liquid Wastes are produced by the fruits, vegetables, meats, washing process, cleaning of poultry and fish, wine making process. Organic matter (sugar and starch) is also present in the waste water. The fermentation of these waste material produce the ethanol.

Animal Waste: These waste material is composed of organic material, moisture and ash. The process of decomposition of animal manure can take place in both environment aerobic and anaerobic. Carbon dioxide and stabilized organic materials (SOM) are produced in the aerobic condition whereas methane is also produced with these product in the anaerobic environment. These reaction is very noticeable in India because of the large production of animal manure that produce huge energy.

Municipal Solid Waste: Each year, a large number of household waste materials are produced that is thrown out in the open field. Paper and plastic in India are the major composition of municipal solid waste (MSW). By the direct combustion or anaerobic digestion, MSW can be converted into energy.

Sewage: Another source of biomass energy like other animal wastes. Anaerobic digestion process helps in the production of biogas energy from the sewage.

(Kumar *et al*, 2015)

Review of Literature

Alfonsin and Poole stated the successful result was obtained in the production of bioethanol form the waste paper office. This production was done under the optimal condition as autoclave at 121°C. After the production, some properties of products were measured and stated that waste material is a very suitable raw material for the production of bioethanol.

Kajikawa and Takeda (2008) studied that for the sustainable and renewable energy, biofuel and biomass are good sources. By the new and improved bio-energy technologies, the lack of energy and economic feasibility against other energy sources and agricultural sector like food and textile production should be overcome. There are many limitation in the production of bio energy. For reducing this limitation, text based approach or expert based approach corpus re-examination techniques can be helpful.

According to Ingale, Joshi and Gupte (2014) the need of alternative sources is very urgent because of the large population and their need of fuels. The biofuel of cereal grain and edible oil are not affordable because of the food commodities. While lignocellulose based plant biomass is the best option for the production of biofuels. In India, banana is a major fruit that give cellulosic biomass waste to the agriculture by which the production of bioethanol is done. The production of biofuels from the banana is done using cellulolytic fungi and yeast. But there is a need of development of more efficient and economic pretreatment process.

Prema, Prabha and Gnanavel (2015) stated on the basis of their analysis that only 40% fermentable sugar by the microbial process was obtained from the hydrolysis of waste paper. 0.86 liters of 95% ethanol is produced from 20 g waste paper and maize substrate that is converted into 55% and 63% fermentable sugar.

Kumar *et al* (2015) concluded that India has many resources of biomass such as agricultural waste, food wastes, industrial waste water give the hint of renewable energy sources. In recent, there are two major techniques thermo-chemical and bio-chemical that convert the biomass in the form of energy. The use of these technique depends upon which type of energy is required for example combustion produce heat, mechanical electricity energy, pyrolysis, fermentation and mechanical extraction produce liquid fuels, used as the transportation fuels etc. In their paper, they also discussed about the prime motive of Government in which Government provides the subsidy and financial assistance for the use of non-conventional sources of energy that helps in the sustainable development of nation.

Byadgi and Kalburgi (2016) discussed the production of bioethanol from the waste newspaper, most common solid waste material of municipal. The

pretreatment is done under the optimized condition; 1.5% concentration of sulfuric acid at 121°C with 45 minutes of contact time. 0.148g of reducing sugar and 0.123g are obtained from Cytophaga Hutchnisonni and isolated organism respectively. From the result, they concluded that the Cytophaga Hutchnisonni give better efficiency in the biological hydrolysis of cellulose compare to isolated bacteria.

Seer, Nandong and Shanon (2017) concluded on the basis of their comparative study between durian seed and cassava for the production of ethanol that durian seed produce higher sugar content compare to cassava powder. The fermentation of ethanol by mixing the cassava and durian seed give highly affected by pH, temperature and ratio of hydrolysed cassava to durian seeds.

Conclusion

Biofuel is a renewable energy resources that reduce the pressure of fossil fuels, limited on the earth. This paper concluded that waste material such as agricultural waste, paper waste and animal waste and industrial waste water are the good sources of the biofuels. There are two different methods bio-chemical and thermo-chemical that are used in the production of biofuels. One of the biofuel 'bioethanol' is produced by the fermentation of starch and cellulose in the presence of microorganism. The use of waste materials in the production of fuels is a great opportunity without much efforts. There are various advantages of biofuel such as production of electricity, and transportation fuel. In the use of waste material, the optimal condition should be maintained for the production of biofuel. Government is also giving their effort for the use of non-conventional resources by providing the subsidy and financial support.

References:

Byadgi, Shruti A., and P.b. Kalburgi. "Production of Bioethanol from Waste Newspaper." *Procedia Environmental Sciences*, vol. 35, 2016, pp. 555–562.

Prema, D., *et al.* "Production of Biofuel Using Waste Papers from Pseudomonas Aeruginosa." *International Journal of ChemTech Research*, vol. 8, no. 4, 2015, pp. 1803–1809.

Seer, Q H, *et al.* "Experimental Study of Bioethanol Production Using Mixed Cassava and Durian Seed." *IOP Conference Series: Materials Science and Engineering*, vol. 206, 2017, p. 012020.

Kajikawa, Yuya, and Yoshiyuki Takeda. "Structure of Research on Biomass and Bio-Fuels: A Citation-Based Approach." *Technological Forecasting and Social Change*, vol. 75, no. 9, 2008, pp. 1349–1359.

Ingale, Snehal, *et al.* "Production of Bioethanol Using Agricultural Waste: Banana Pseudo Stem." *Brazilian Journal of Microbiology*, vol. 45, no. 3, 2014, pp. 885–892.

Kumar, Anil, et al. "A Review on Biomass Energy Resources, Potential, Conversion and Policy in India." *Renewable and Sustainable Energy Reviews*, vol. 45, 2015, pp. 530–539.

Maceiras, R., et al. "Bioethanol Production from Waste Office Paper." *International Scientific Journal Journal of Environmental Science*. Available at: http://environment.scientific-journal.com/articles/6/7.pdf