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Mini Review on Importance, Application, Advantages and Disadvantages of Biofuels

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Abstract

Consumption of the energy carriers produces large amounts of carbon dioxide and other pollutants that pollute the environment. For example, a light vehicle transports 1 to 2 kg of carbon dioxide (660 kg per year) to the environment per day. On the other hand, coal, which is known as one of the most important and richest fossil resources in the world, has long been used by humans and can be said to be the first fossil fuel to be widely used in industry and standards. Improve people's lives. After the oil crisis, and due to the growing energy consumption in the world and the limitation of crude resources, the issue of finding an alternative to an oil producer in the world was raised. These issues have led many countries to look for alternatives to oil resources. For this reason, scientists have turned their attention to energy sources that, in addition to being renewable, do not cause widespread pollution of the environment. Some sources, such as water and wind, have long been used as renewable energy sources. Recently, the use of sunlight, geothermal, tidal seas, and biofuels have also been considered. Understanding the proper and efficient use of clean energy for the future is one of the most worrying challenges in society and is closely related to the stability of the planet, economic growth, and quality of life. Fuels account for 70% of the total energy needs of the planet, especially in transportation, industry, and home heating are included. At present, electricity accounts for 30% of the world's energy consumption. In the European Union, the transport sector is responsible for emitting 25% of greenhouse gases [1]. Especially since we are witnessing the harmful environmental effects of industrialization every day, such as soil erosion, climate pollution, global warming, and as a result, climate change is widespread around the world. There are ways to slow down or control this trend, with advances in alternative fuels and the development of renewables as part of these effort [2]. Therefore, this study aims to present the importance, advantages, and disadvantages, and briefly investigate the potential impact of these factors on people's lives.

1. Introduction

During the last decade, MPs particles have entered directly into marine and fresh water environments, affecting habitats and animals negatively. Despite raised questions and concerns by this issue, there is no good understanding about environmental interactions of MPs [1-2]. Accordance with the U.S. National Oceanic and Atmospheric Administration (NOAA), MPs are defined as plastic particles smaller than 5mm in length. MPs can be categorized two major classifications as primary and secondary MPs, depending on their source [3].

To study the problem and challenges of energy sources, the first options considered are oil and gas. The reason is their age and wide distribution. Oil and gas reserves, which are the result of the long-term function of nature, will be exhausted after consumption, which is why they are called non-renewable resources [3]. In fact, energy sources can be generally defined and defined in two parts:

Non-renewable energy: which is not replaced at a certain and predictable time after use and their reserves are depleted with gradual consumption like fossil fuels.

Renewable energies: are energies that are replaced after consumption at a certain time and are not inexhaustible, such as solar energy, wind energy, hydroelectric energy, gas energy, geothermal energy or geothermal energy, Wood energy, energy from methanol and ethanol fuels, hydrogen energy, sea, and ocean heat energy, sea tide energy, Fuel Cell Energy, energy [4].

Improper use of oil not only causes a loss of energy resources but also causes effects such as environmental pollution, increased pollutants, problems in plant and animal life, pollution of the seas, serious damage to aquatic life, global warming, and Increasing crises such as storms, floods, global warming, melting ice at the poles will eventually destroy the earth and seriously damage human life [5]. Today, there is no doubt that most of man's industrial activities have been so unregulated that they have caused serious damage and threats to the environment and its health. Second, industrialization has occurred at the expense of the extraction and overconsumption of fossil fuel resources, so a fundamental shift toward clean energy in the world and a deep and rapid reduction in CO_2 emissions must occur simultaneously and in unison. A revolution in energy efficiency is necessary to avoid the catastrophic consequences of the effects of rapid climate change, especially by all developed and industrialized countries on the use of clean energy [6].

The need to change direction is thus a vital necessity. Change has begun, but it still lacks the necessary speed and quality. At the same time, access to sources of renewable resources, mainly biomass and especially lignocellulose, is rapidly increasing [7].

Therefore, the use of renewable energy is necessary to provide an important part of the energy of the future, so the study and research of resources shows us how to use and replace renewable energy is crucial. Today, renewable energy is booming in Europe compared to other parts of the world. But what is important is the existence of strategic policies around the world and the expansion of applied research in prestigious scientific and research institutes that introduce renewable energy as one of the ways to deal with pollution and offset the limitations of fossil fuels [8].

In recent years, concerns about the depletion of non-renewable fuels and the resulting pollution have led many countries around the world to undertake large-scale and costly research on renewable energy [9].

2. Methodology

2.1 Importance and goals of biofuels

Clean fuels have inherent physical and chemical properties that make them cleaner than gasoline with the current structure and composition in combustion [10]. Actually, these fuels produce less unburned hydrocarbons during combustion, and the emissions from their combustion have a less chemical activity to form ozone and other toxic substances [11]. The use of alternative fuels also reduces the intensity of the increase and accumulation of carbon dioxide that causes global warming [12]. With these requirements, human society needs renewable energy sources such as sun, biomass, wind, and has water [13]. Energy is essential for economic growth and quality of life. Global energy demand is constantly increasing, especially in the transport sector, leading to an energy crisis around the world [14]. The majority of the world's energy supply is derived from fossil fuels, which are known as non-renewable and depleting resources. The result of using this type of fuel is an increase in the price of crude oil and an increase in the accumulation of greenhouse gases in the atmosphere [15].

Global warming is the result of increasing greenhouse gas emissions, many of which are the result of the combustion of fossil fuels, and has become a major concern in the world. For this reason, the use of alternative energy sources such as biofuels is essential [16].

Biofuels come in solid, liquid, and gaseous forms and are derived from biological materials and an interesting renewable source [17]. Biofuel production has many benefits, including reducing greenhouse gas emissions and creating opportunities for sustainable economic growth. Plant biofuels are biodegradable and their low toxicity has made them a useful and attractive alternative to diesel fuel [18].

Plant biofuels are known as the best alternative to diesel fuel and can be used in a conventional compression combustion engine without much modification [19]. Chemically, plant biofuels are a combination of long-chain fatty acid methyl or ethyl esters. They are usually produced by the exchange of mono, di, and triglycerides (TAGs) or free fatty acids (FAAs) with alcohols (ethanol or methanol) [20].

In addition, transesterification is a multi-step reaction in which alcohol such as methanol is converted to methyl ester (biofuel) and glycerol in the presence of a catalyst as an oil source such as triglycerides. Glycerol formed during the ester exchange reaction is a by-product and has many applications (for example, as a strong detergent) [21].

Other plant biofuels are major refined oils that are used directly in diesel engines and are preferred to fossil fuels, small fat particles, and hydrocarbons obtained by thermal decomposition and transesterification. Plant fuels produced in engines are used, thermal decomposition is very calorific and leads to much higher production costs [22].

The raw materials of biofuels include vegetable oils (edible and non-edible), animal fats, and recycled oils or waste. At present, biofuels are mainly produced from edible oils such as rapeseed, soybean, flaxseed, or sunflower oil [23].

The use of vegetable oils to run diesel engines dates back to 1983, where the inventor of the diesel engine, Rudolf Diesel, used his engine model with peanut oil. The production of biodiesel from food products requires a large amount of arable land and increases competition with edible oils on the market, which in turn increases the price of edible oils and biodiesel; this is why the focus of research has shifted to biodiesel production from non-food sources such as algae [24].

Although microalgae can be produced on a large industrial scale, about 0.4% of the world's arable land will be needed to meet current fuel needs. This statistic will be significantly lower than what oilseeds need, for example, microalgae can produce about 30 times more oil than oilseeds per unit area of land [25]. Single-celled microalgae are simple organisms that use photosynthesis to convert solar energy into chemical energy. These organisms can use carbon dioxide (CO2) to produce biomass, which can be used as a raw material for biofuels, high-value bioactive substances, and food products [26]. Four main categories of microalgae are Cyanophyceae (green-blue algae), Chlorophyceae (green algae), Bacillariophyceae (diatoms), and Chryophyceae (golden algae) [27].

Microalgae are known for their rapid growth rate and the fact that they can grow in both freshwater and saltwater environments and require only sunlight and simple nutrients [28]. The basic conditions for the growth culture medium used for algae culture include light CO2 and essential elements such as nitrogen, phosphorus, iron, and, depending on the species, silicon [29]. Microalgae are known to have up to 50 times higher biomass productivity than terrestrial plants due to their higher growth rate and fat content. Another advantage of using microalgae is low water demand and high efficiency in reducing CO2 [30]. Regardless of the cultivation method, algal biomass harvesting is a process that forms a major part of microalgae biofuel production. This process involves the concentration of algal biomass from the culture medium and can be done biologically, physically, or chemically. Harvesting methods include centrifugation, filtration, ultrafiltration, or a combination of flotation. The harvesting process can account for about one-third of the cost of biodiesel production and can be explored over a wide area for further research. [31].

Despite the many benefits, it is still not economically feasible to produce biodiesel using microalgae [32]. The cost of producing biodiesel from microalgae is very high due to low-fat efficiency and harvesting costs. However, having huge potential as an alternative energy source and positive environmental benefits, the cost cannot be considered a discouraging factor [33]. There is still little understanding of microalgae and more research is needed to find solutions to the technological challenges that increase biodiesel production costs [34]. The potential to find an alternative energy source to protect the environment and increase our quality of life demonstrates the need for increased research on microalgae to produce biodiesel [35].

Microalgae are a group of simple single- or multi-celled photosynthetic microorganisms that grow rapidly and are capable of carbon dioxide fixation as long as they trap sunlight 10 to 50 times more efficiently than other soil plants. These microalgae include both prokaryotic algae such as cyanobacteria and eukaryotic algae such as chlorophyll and bacilliophyta. Because biofuels are made from oily products such as cabbage, soybeans, sunflowers, and palms [36].

Suitable substitutes are used to produce biofuels. Because under suitable cultivation conditions, the production of biomass and oil of microalgae is much higher than vascular plants. Some microalgae species are rich in oil that can be extracted and then processed and refined using existing technology and used as vehicle fuels [37].

Among the benefits of microalgae over excellent plants are [31]:

High absorption of carbon dioxide, rapid growth, and the possibility of reaping in 6 periods during a year or even their daily harvest.

Due to the lack of wood structure in these plants, seaweed will not need to prepare the seedlings to be converted into biofuels. Each algal cell is photosynthetically active, while only one set of higher plant cells perform photosynthesis.

Algal cells can absorb mineral nutrients directly from the environment. Algae, therefore, do not rely on energy consumption, long-distance transmission of nutrients through roots and stems.

The process of photosynthesis requires CO2 in addition to light. In plants, photosynthetic tissue can access carbon dioxide only through the pores. These pores are not always open, and the path of CO2 release from the surface of photosynthetic tissue in higher plants is longer than that of a photosynthetic cell in microalgae, and this path becomes longer as the thickness of the photosynthetic structure increases. Therefore, algae absorb CO2 more easily than vascular plants, and this affects the relatively rapid growth of algae [31].

On the other hand, as the main prohibition, the average production efficiency of biodiesel from microalgae can be 10 to 20 times higher than the average production obtained from oilseeds or plant ores. Using a method invented by Korean researchers, all samples of mosses and seaweeds can be converted to simple sugars using a special enzyme, and finally, bioethanol can be obtained using yeast. Such biofuels have lower prices and higher production speeds and will not have any adverse effect on food prices [31].

3. Clarification of biofuels

Biofuels based on raw materials have four categories, the second and third types are called advanced biofuels.

3.1 Sources of the first type: sugary and originating substances

The first type of biofuels is made from sugars, starches, vegetable oils, or animal fats. Their raw materials are usually grains such as corn and wheat, from which starch is fermented and ethanol is produced. Or sunflower and soybean seeds whose oil is extracted and used as diesel fuel. Instead of entering the human food chain or animal feed, these materials are used in the production of fuel energy, which has increased their prices and has led to global criticism [38].

The first type of biofuels for biodiesel production are:

3.1.1 Vegetable oil

Vegetable oils are not usually used to make biofuels, but lower-quality oils can be used for this purpose. Waste vegetable oils, whose water and particles are separated, are used to make diesel fuel. To completely burn waste oil in diesel engines, its concentration must be reduced [39].

3.1.2 Biofuel of diesel engines

The use of biodiesel for diesel engines is common in Europe. This fuel is prepared from vegetable or animal oils, soy, mustard, sunflower, flax, hemp, and algae. After performing chemical processes on them, they become similar to ordinary diesel in terms of compounds, whose chemical name is the ester of methyl fatty acids (or ethyl) with the abbreviated name FAME (Fatty acid methyl ester (Biodiesel)). Oils combine with soda and methanol or ethanol to produce FAME and glycerol. In this chemical process, one part of glycerol is produced for ten parts of diesel [40].

The mixture of biodiesel with ordinary diesel can be used in any diesel engine [41]. Biodiesel is not usually used 100%, because it is very concentrated and needs to be heated before consumption. For this reason, most vehicle manufacturers recommend that 15% of biodiesel be blended with conventional diesel. Today, due to the changes that have been made in diesel engines, it is possible to use 100% biodiesel [42].

Biodiesel is also a good solvent, dissolving residues left in the tank and fuel pipes in vehicles. It also cleans the engine sand of ordinary diesel residues. For this reason, the filter of these cars must be replaced sooner. Biodiesel is very effective in keeping the combustion site clean of residual carbon. In many European countries, 5% of biodiesel is mixed with ordinary diesel and distributed at fuel pumps [43]. Biodiesel has less carbon and more hydrogen and oxygen than conventional diesel. This property reduces the combustion of biodiesel and reduces unburned carbon particles. In the United States, more than 80% of trucks and buses use ordinary diesel, but today biodiesel production has increased in this country [44].

3.1.3. Bio-alcohols

The bio-alcohols produced are mostly ethanol and to a lesser extent propanol and butanol, which are produced by the fermentation of sugars, starches, and cellulose by microorganisms and enzymes. Bio-butanol, also known as biofuels, can directly replace regular gasoline (like biodiesel in diesel engines) [45].

Ethanol is the most common biofuel in the world, especially in Brazil. Ethanol can be produced by fermenting carbohydrates in corn, wheat, sugar beet, sugarcane, and mustard [46]. Ethanol production steps include: using enzymes to break down starches into sugars, fermenting sugars, distilling, and dehydrating. Butanol is obtained by fermentation of butanal acetone [47].

Besides, butanol consumption is associated with higher energy production than ethanol and is used directly in vehicles without engine changes. Also, the corrosion and solubility of butanol are less than ethanol and its distribution is possible with the available facilities [48].

3.1.4. Biogas

Biogas is produced in anaerobic conditions from the decomposition of waste (organic matter). Remnants of biogas production can be used to produce biofuels with organic fertilizers [49]. Methane gas can also be obtained from coal using microorganisms. The purpose of biomass gasification is to produce synthetic gases (H2, CO) [50].

Catalyst or direct fermentation can be used to convert gases to ethanol. In factories with low capacity, the direct fermentation route is more suitable and Clostridium lungdahlii is used for fermentation at 37 ° C with acidity control. In this route, in addition to ethanol, the acetic acid by-product is also produced [7].

$$6\ CO + 3\ H_2O \rightarrow C_2H_5OH + 4\ CO_2$$
$$6\ H_2 + 2CO_2 \rightarrow C_2H_5OH + 3\ H_2O$$
$$4\ CO + 2H_2O \rightarrow CH_3COOH + 2\ CO_2$$
$$4\ H_2 + 2\ CO_2 \rightarrow CH_3COOH$$

Biomass gasification consists of two pyrolysis stages and the gasification stage. In the pyrolysis stage, which takes place at about 500 ° C, the biomass is converted to liquid and gas, and in the next stage, volatile and non-volatile materials are converted to artificial gas, which means that the gasification stage is performed at 1000 ° C or more [7].

3.2 Sources of the second type: cellulosic materials and agricultural wastes

It is the source of cellulose biofuels, which is the main material of plant cell walls. Cellulose materials are diverse and abundant, but in some cases, their disposal, such as citrus peel or sawdust, has problems. For this reason, cellulosic substances have been used to produce ethanol that does not consume food and thus are not in competition with the human food chain or animal feed [51].

In nature, they eat the four ends of cellulose materials, such as grasses, and convert the cellulose into glucose using enzymes in their digestive tract [52]. For problems in the production of ethanol from cellulose in the laboratory using the pattern of nature, cellulose is broken down in various ways and the sugar produced after fermentation is converted to ethanol [53]. Therefore, research has been done that can ferment microorganisms to break down cellulose, hemicellulose and also convert all the sugars produced. Therefore, in addition to bacteria, an enzyme must be added to break down cellulose [54].

The advantage of tolerating higher temperatures by bacteria is that enzymes become more active at higher temperatures, so fewer enzymes will be needed to break down cellulose [55]. If an enzyme or set of microorganisms can be used to break down cellulose and hemicellulose together and convert the sugars produced into ethanol, it will be economical and thus industrialize the production of ethanol from cellulose. For example, to produce ethanol from sugarcane bagasse, a combination of the acid, enzyme, and two types of bacteria are used. The cellulose sauce is broken down using enzymes and fermented by the bacterium Klebsiella oxytoca, and the five carbons released from the hemicellulose are also fermented by the Escherichia coil [51].

Today, due to the benefits of ethanol production from cellulosic materials, this is vital and one of the goals of biofuel production [56]. Conversion of cellulose biomass to ethanol is more difficult than starch or sucrose, but its abundance and cheapness are more suitable than other sources. Ethanol is also produced from starch and sucrose in competition with human food and animal feed, which is not a problem for cellulose [57].

Cellulose biomass can be obtained in a variety of climates and soils [58]. To produce corn, sugarcane, and sugar beet requires a lot of energy while burning lignin in cellulosic materials can produce energy. Waste corn, sugarcane, and sugar beet contain cellulose and their conversion to ethanol, which is a step towards reducing environmental problems. Because these materials are currently incinerated, which in addition to being costly, also pollutes the environment [59].

3.3 Sources of the third type: biomass from algae

Biofuels produced from algae include the third type of biofuels. The advantages of using algae in biofuel production include low algae requirements and high biofuel production. Algae, for example, produce 30 times more energy per hectare than soybeans. Algae such as Chlorella Vulgaris can be easily grown, but oil is difficult to extract [60].

3.4 Sources of the fourth type: conversion of biofuels

The fourth type of biofuels is based on the conversion of vegetable oils and biodiesel into gasoline. Research is also underway to ensure that microorganisms can produce fuel directly from carbon dioxide [61].

4 Production of biofuels

From sugars (raw sugarcane syrup, sugarcane molasses, sugar beet, and sweet sorghum syrup, which mainly contain glucose, fructose, and sucrose), starches (such as wheat, corn, barley, sweet potatoes), and cellulose materials (such as wood residues, Straw and agricultural wastes (including cellulose, mannose, and xylose) are used as raw material for ethanol production (Figure 1). On the other hand, it should be noted that the predominant sugars in these raw materials are different, the stages of ethanol production are also different depending on the type of raw material [62].

After ethanol production, it is time to ferment, a process in which certain microorganisms produce ethanol from sugars under certain conditions. Fermentation on an industrial scale is mainly done in two ways, continuous and discontinuous. But before that, the raw material needs to be prepared [62].

Finally, in order not to use ethanol as a fuel in vehicles, water mixed with it must be removed. Most of this water is removed by distillation. This ethanol, which is mixed with water, can not be added to gasoline unless the water is separated from it. To mix with gasoline, 99.2% ethanol is required, which is accompanied by some organic matter [62].

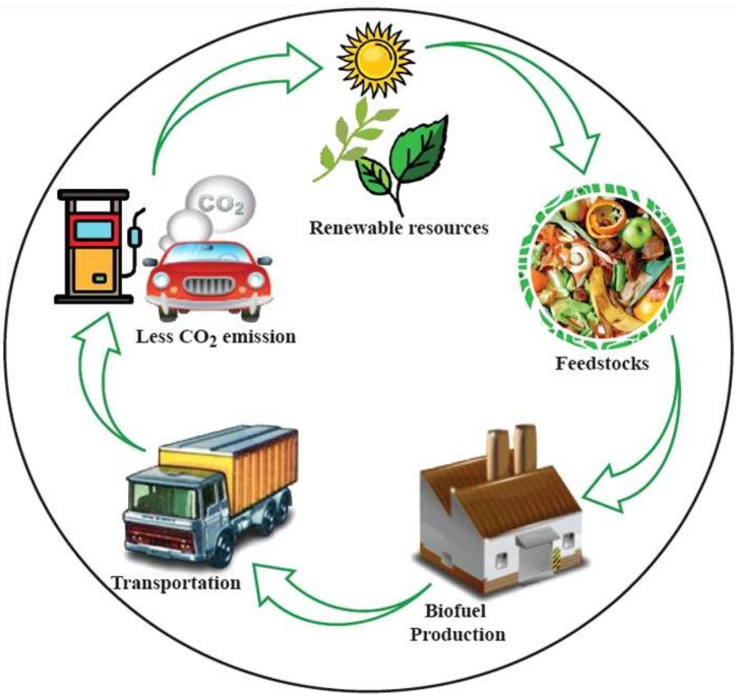

Figure1: Production of biofuels [63]

4.1 Ethanol production

Ethanol is the famous medical alcohol that is used in medical centers for disinfection. But its use as a fuel back to the 1970s. Ethanol can be produced from oil, natural gas, or from sugars, starches, and cellulosic substances. Biologically produced ethanol is called fermented ethanol or bioethanol, which is used as a biofuel with less carbon dioxide emissions than fossil fuels. The stages of ethanol production on an industrial scale include three stages of preparation of raw materials, fermentation, and dewatering [64].

4.2 Preparation of raw materials

The method of preparation is different for each raw material. For example, plants such as sugarcane, which has sugar stores, are easily fermented. While products such as corn, wheat, etc. that contain starch must first be hydrolyzed to simple sugars and then fermented [65]. Therefore, the preparation of raw materials includes the extraction of sugar from the plant and the hydrolysis of starch to glucose [66]. Given that ethanol-producing microorganisms use more than six-carbon sugars such as glucose, fructose, galactose, and mannose, and less than disaccharides such as sucrose, lactose, xylose, and maltose, and rarely use polymers, it is necessary to first Preparation step: Starch and cellulose are converted into simple and fermentable sugars [67].

5 Fermentation

Yeast, when it has enough oxygen, breaks down glucose by the following process and obtains energy from it [68].

$$C6H12O6 \rightarrow 6CO2 + 6H2O + energy$$

But if the cell is in a state where there is not enough oxygen, it decomposes glucose according to the following formula, and energy and ethanol are obtained.

$$C6H12O6 \rightarrow C2H5OH + CO2 + energy$$

This recent reaction is the same as fermentation. In simple terms, fermentation is the conversion of sugars to ethanol and carbon dioxide by yeast, which is the same for all raw materials.

$$C_6H_{12}O_6 + Yeast \rightarrow 2CO_2 + 2C_2H_5OH$$

Due to the calorific value of these interactions, the system must be cooled to prevent evaporation and consequent loss of ethanol. Also in this system, side compounds such as glycerol, acetic acid, lactic acid, fossil oil, and furfural are formed. In the past, the fermentation method used a discontinuous method that did not continue at low concentrations of ethanol, causing rapid death of yeast cells. But today, in ethanol factories, yeast is used twice, which reduces the fermentation time and increases the speed of interactions, and as a result, smaller housework is created by producing more ethanol [68].

5.1 Distillation and dehydration

The mixture produced by fermentation contains 7 to 9% ethanol, the water of which must be separated by distillation, which results in the production of 95% ethanol. Dehydration of ethanol is required to mix it with gasoline as a biofuel, which is 99.95% using compounds such as cyclohexane, benzene, toluene, or pentine.

Today, molecular sieves are used to dehydrate, reducing energy consumption by half [69].

5.2 Use of by-products

Fermentation residue is the liquid leaving the distillation column which has non-fermentation compounds, a small amount of yeast, and other organic compounds after fermentation and has good animal nutritional value, but from different materials and sources could be produced. In a sugarcane factory, sugarcane stalks are passed through a mill to extract its syrup. This raw syrup is heated after lime (to remove impurities) and then transferred to the settling section. After concentrating, the refined syrup is transferred to vacuum cooking pots, which may include several steps, and at each step, the syrup is centrifuged and the sugar crystals are separated from it [70].

The syrup still has a large amount of sugar, which usually requires evaporation and centrifugation three more times to extract it. During these steps, sugar crystals are separated from it and the rest of this syrup during these steps are called effluents A, B, and C, respectively. By repeating these evaporations and centrifuges, more sugar is removed from the effluent and the last effluent, which has a lot of salts and impurities, is called molasses. But the production process should generally include three stages of production, fermentation, and distillation [70].

There are also 5 types of molasses which are:

1) Sugarcane molasses
2) Refined sugarcane molasses
3) Sugar beet molasses
4) Refined sugar beet molasses
5) Citrus molasses

Molasses differs from other raw materials for ethanol production such as corn, sorghum, and sweet potatoes. Because the carbohydrates of these substances are starch and must first be hydrolyzed and then converted into fermentable carbohydrates, molasses carbohydrates do not need to be hydrolyzed and can be used by yeast. Glucose is the simplest form of carbohydrate that is fermented by yeast in the factory. In nature, glucose units are mostly fermented in the form of starch or the form of glucose and fructose [71].

6 The impact of biofuels on communities

Bioenergy accounted for about 10% (50 EJ of the total world primary energy supply (TPES) in 2009, most of which came from traditional sources in countries other than OECD countries [72]. In OECD countries, Bioenergy supply is mainly done using modern technologies and generally plays a much smaller role than in developing areas, although today bioenergy can be achieved with fossil fuels under favorable conditions. (High prices for fossil fuels or very low raw material costs) In many commercial cases, the existence of protectionist policies to compensate for the cost difference with fossil fuels is inevitable [73].

Currently, the highest consumption of bioenergy is related to the housing sector. A major part of these expenditures is in developing countries in Asia and Africa, where the traditional use of biomass in primary cooking stoves as the main source of energy is common in homes [74]. Traditional biomass, including wood, charcoal, agricultural waste, and animal feces, is mainly used for cooking and heating water; in colder climates, the biomass stove also heats the space. Traditional use of biomass is associated with very low efficiencies (10% to 20%) and health problems due to the release of significant amounts of smoke [75].

In addition, biomass is often obtained from unstable sources, leading to deforestation and soil degradation. However, population growth in developing countries means that the increasing use of traditional biomass in the coming decades could potentially lead to significant health and environmental problems unless more efficient stoves and biogas fuels are used. And ethanol should be on the agenda to reduce pollution and improve productivity [76].

In many OECD countries, bioenergy plays only a minor role in the energy supply of buildings and its growth rate is low. Pellet stoves are being developed in certain developing countries that are government-sponsored and/or more economical than fossil fuels. On the other hand, commercial heat production is growing faster [30].

This amount has doubled in the last decade, with the increase of biomass combined fuel in coal-fired power plants and the installation of combined-stage biomass power plants. Electricity supply from bioenergy has been steadily increasing since 2000. In 2010, bioenergy supplied with electricity worldwide was about 280 TWh, equivalent to 1.5% of world electricity production [77].

Biomass power generation is still concentrated in OECD countries, but China and Brazil are also becoming major producers of this form of energy, because of the support programs for biomass power generation, especially agricultural waste. Projects in China and Brazil could also be a good way to promote bioenergy power generation in other non-OECD countries, which are experiencing high rates of energy demand growth and biomass waste in agricultural-related industries such as sugar and rice [78]. At present, bioenergy-derived electricity is mainly generated through the combustion and generation of electricity by steam turbines, including the combustion of biomass with coal [74].

In several industrialized and industrializing countries (including Brazil, Canada, China, the European Union, South Africa, and the United States), protectionist policies are an important driving force for the development of modern bioenergy methods. They have experienced tremendous growth in electricity and commercial heating of bioenergy over the past decade. In some countries, the growth rate has slowed due to limited government support rising raw material costs, and the lack of competitiveness of bioenergy with other energy sources [79]. Concerns about bioenergy sustainability have also been mainly related to biofuels in the transportation sector. Addressing these economic and non-economic barriers will be critical to ensuring sustainable growth in bioenergy utilization [80].

7 Advantages of using biofuels

There is a wealth of information and commentary on the benefits of using biofuels, especially in transportation. But in general, the benefits of biofuels can be summarized as follows in Table 1.

Table 1. Advantages of using biofuels

	Advantage	Description	Reference
1	Less pollution	Create much less pollution than gasoline and diesel (all types of air pollutants, including monoxide and carbon dioxide, are greatly reduced).	[81]
2	Fuel usages	They can be used as both full fuel and dual fuel (with gasoline and diesel).	[82]
3	No need to build new (gas) stations	There is no need to build new gas stations to supply them.	[83]
4	No need to modify the engine of the cars	For their consumption, there is no need to modify the engine of current cars, for diesel up to 20%, for ethanol-gasoline up to 10% bioethanol (for example, E5 and E10 fuels, which contain 5 and 10% ethanol, respectively).	[84]
5	Octane number	Octane number booster	[85]
6	Eliminating the carcinogenic contaminant MTBE	Possibility of eliminating the carcinogenic contaminant MTBE (methyl tert-butyl ether, which is banned in the United States and minimized in the European Union and is being eliminated).	[86]
7	Reduce the complication of knocking	Reduce the complication of knocking in the engine.	[87]
8	Price	The cost of biofuels is lower than gasoline and other fossil fuels.	[88]
9	Raw materials	While oil is a limited source and is obtained from certain materials, biofuels are obtained from a wide range of materials such as waste products, fertilizers, and other by-products. This is an effective step in recycling materials.	[89]
10	Renewability	The production of fossil fuels is time-consuming, but biofuels can be produced by producing products and collecting waste.	[90]
11	Security	Biofuels can be produced locally, which reduces dependence on other countries. By reducing dependence on foreign fuel sources, countries can maintain their use of energy resources and protect themselves from external influences.	[91]
12	Special benefits	If the fuel produced is biochar or biochar, it has special benefits, such as agricultural management, its effect on soil quality, which includes increased water retention, cation exchange capacity, and soil carbon content. In addition, it may cause soil fertility.	[92]

8 Disadvantages of using biofuels

Despite many positive features of biofuels, there are also many disadvantages regarding the consumption of this energy. Energy output: Biofuels have lower energy output than traditional fuels, so more energy sources must be used to produce the same amount of energy. Carbon Emission Production: Numerous studies have been performed to analyze carbon from biofuels, and while they may be clean for incineration, there are strong reasons why the process of fuel production - including machinery for growing crops and plants - For fuel production - has a high carbon emission.

High cost: High initial investment is required to correct and refine biofuels to more energy-efficient output, and to build plants to increase biofuels.

Food shortages: There are concerns that the overuse of wheat fields for fuel crops could affect food costs and could potentially lead to food shortages. Water consumption: Large amounts of water are needed for proper irrigation of biological group products as well as for production, which can threaten local and regional water resources [93]. Recently, the issue that has been considered around the world is solutions to reduce fuel and energy consumption. Research and implementation of projects in the field of replacing fossil fuels with natural alternative fuels, because if the current trend continues, up to less than 5 decades are over. In recent years, expert studies on oil and gas fields in the world indicate that gas and oil reserves will be depleted in the next few decades, so scientists are already researching to find ways. To replace fossil fuels with alternative and sustainable fuels [94].

Conventional fuels include fossil fuels (oil, coal, propane, natural gas, and nuclear fuels such as uranium). Some of the best alternative fuels are biodiesel, alcohol, methanol, ethanol, and electricity stored in chemicals such as batteries. And fuel cells), hydrogen, non-fossil gas methane, non-fossil natural gas, vegetable oil fuel, and other biomass, on the other hand, increased US ethanol production as a result of increased corn production in this country [95].

USA allocated about 69 million hectares of its land for cultivation in 2007, which was 18% more than the previous year. This increase is mainly due to the decrease in soybean cultivation. Last year, a 15% reduction in biofuel production from agricultural products, especially necessity, not only reduced pollution and food security but also increased the price of agricultural products. Biofuel production for food security, especially for poor countries, seemed clear. It is more than expected [96].

This issue can be examined both in terms of rising food prices and in terms of the environment. Initially, there was a lot of publicity about the environment, which led to the production and use of fossil fuels, but recently this has not been widely accepted [97].

9 Conclusion and discussion

It seems that bio-sourced hydrogen gas can be introduced as a new fuel source [98]. Due to the cheap and cost-effective production of this fuel and the lack of greenhouse gas effects and compliance with environmental standards on the one hand and the ability to properly ignite and not produce CO2 as an environmental pollutant on the other hand and also the ability to convert it to an energy source of electricity, and this as a renewable energy source in nature, can be a good alternative to reduce the future human need for fossil fuel sources [99].

Biogas production of hydrogen gas is also more cost-effective and safer than industrial methods [100]. To produce hydrogen electrochemically requires strong solar batteries to electrolyze water and produce hydrogen. This requires high energy and production costs, while with biological solutions the cost of production is greatly reduced and less energy is required [101].

The expanding knowledge of biotechnologies will enable engineers and designers in this field to achieve high concentrations of biohydrogen production, and in the not-too-distant future, the design of many industrial devices will lead to the use of this alternative fossil fuel. Give [102].

Given the growing population of the planet and the limited environmental and mineral resources of the earth, the need to replace new and renewable fuel sources is fully felt. Undoubtedly, the production of bio-hydrogen by many species susceptible to cyanobacteria can be one of the best options for this need [103].

Due to the limited oil resources and the non-renewability of these resources, the world will undergo many changes in the not-too-distant future. One of the most important and practical methods is replacing fossil fuels with biofuels [104]. Reducing environmental damage emitting greenhouse gases, preventing global warming, are among the major achievements of using biofuels. In this study, some important biofuels were studied and the benefits of each were briefly stated. Biodiesel is a renewable fuel that is produced from various types of vegetable oils animal fats and waste oils [105]. One of the successful methods for biodiesel production is the esterification reaction, which has been able to reduce the viscosity of biodiesel and increase its capabilities [106]. Diesel fuel is a suitable alternative to diesel fuel, of which the B20 compound is distributed worldwide as a commercial compound due to its characteristics [107]. Also, the use of biogas for fuel, lighting and its conversion into electrical energy, control of environmental pollution by concentrating waste in the disposal of waste and preventing the dispersion of waste and pollution and thus improving the environment, the benefits of using this Biomass is for energy production [108-110].

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