



Bamboo Role in E20 Production for Petrol

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The increasing demand for the non-renewable fossil fuels and their effects on the environment leads to the demand for the ethanol blended petrol by the government of the India. It leads to increase the demand for the bioethanol. Sugarcane is the one of the major sources for the production of bioethanol but we have the better alternative for the production of the bioethanol that is bamboo, which is better than sugarcane in production of ethanol. This article helps to know the importance of bioethanol and role of bamboo in ethanol production.

Keywords: Non-renewable, fossil, environment, ethanol, bioethanol

Introduction

The increasing demand for energy has prompted scholars to research alternative energy sources. Bamboo is a species of woody perennial grass that belongs to the Gramineae family and the Bambusoideae subfamily. It could be considered a possible lignocellulosic substrate for the production of bioethanol due to its favourable environmental effects and increased yearly biomass yield. Non-renewable fossil fuels cannot provide enough energy to meet the needs of contemporary societies. Among the various alternative energy sources, bioethanol has drawn a lot of attention from people all around the world. Deshmukh et al. (2024) Ethanol is now being produced from diverse feedstocks including surplus rice, bamboo, maize, damaged grains, and Agri-residues, aligning with India's push for second-generation (2G) biofuels. This not only reduces environmental impact but also strengthens rural incomes. India Today Business Desk. (2025, August 5). Bamboo has been identified as a promising solution to the energy crisis and climate change as a source of biomass energy. Due to its rapid growth and high- value products, bamboo is considered as a potential source of biomass energy. Bamboo contains a significant amount of cellulose and hemicellulose, which can be converted to sugar constituents, making it an ideal raw material for energy production. Bamboo is an attractive feedstock for the production of bioethanol, as it is a non-food crop and contains a high lignocellulose content, which makes it a promising source of second- generation biofuels. However, due to its natural resistance and high lignocel lulose content, additional pretreatment steps are required to make the bamboo biomass more digestible, which can reduce the economic feasibility of second- generation bioethanol. Liang et al. (2023).

Ethanol blending in petrol

Ethanol can mix with petrol, reducing fossil fuel consumption and harmful carbon emissions. The Union government is reportedly targeting 30% ethanol blending with petrol by 2030 to reduce dependence on imported oil further while addressing environmental concerns. Ethanol can be mixed with petrol, cutting down on fossil fuel consumption and reducing harmful carbon emissions. One of the primary biofuels, ethanol is naturally produced through the fermentation of sugars by yeasts or through petrochemical processes like ethylene hydration. It is widely used not only as an alternative fuel source but also in various industries as a

chemical solvent and in the synthesis of organic compounds. Ethanol also has medical applications as an antiseptic and disinfectant. The Ethanol Blended India Today Auto Desk. (2025, April 16).

The Ethanol Blended Petrol (EBP) Programme was launched in India in January 2003 with an aim to promote the use of alternative and environmentally friendly fuels that reduce import dependency for energy requirements. This programme would not only give a much-needed boost to the industry and the value addition chain, but also directly to the farmer in terms of timely payments and the final consumer who could end up paying up to Rupees 3 per litre less for petrol. Ethanol is usually produced from sugarcane molasses, cane juice, maize, wheat and other grains having a high starch content. The science behind blending ethanol with petrol is that since the ethanol molecule contains oxygen, it allows the engine to more completely combust the fuel, resulting in fewer emissions of carbon monoxide and carbon dioxide by up to 30 percent. Moreover, it cleans the dirt from the engine's pipes and chambers while also acting as an anti-knocking agent which reduces engine knocking. Compared to only petrol, ethanol blended petrol burns cleaner, thereby reducing the occurrence of environmental pollution and since it is produced from plants that harness the power of the sun, ethanol is classified as a renewable bio fuel. Ethanol blended fuel is widely used in Brazil, USA and Europe, where cars run on blends of upwards of 10 percent. In fact, Brazil, a world leader in ethanol blended fuel since 1976, today has a legal blend ratio of around 25 percent ethanol and 75 percent gasoline. India started its experiment with ethanol blended fuel in 2001. (Arya, 2019).

Blending ratio types

Ethanol-blended petrol is a mixture of conventional petrol (gasoline) with ethanol, a renewable, alcohol-based biofuel derived from plant sources such as sugarcane, corn, and another agricultural biomass. In India, the commonly used blend is E10 (10% ethanol, 90% petrol), but the country is now scaling up the use of E20, which contains 20% ethanol. Some countries even use E85, which contains 85% ethanol, particularly in specially designed flex-fuel vehicles. Ethanol (C_2H_5OH) burns more cleanly than petrol. It acts as an oxygenate, helping fuel combust more completely and reducing harmful emissions like carbon monoxide and unburned hydrocarbons. It also works as a fuel extender, reducing reliance on non-renewable petroleum. While ethanol has slightly lower energy content than petrol, the difference in fuel economy is marginal at lower blends like E10 or E20. The government is targeting 30% ethanol blending with petrol by 2030 to further reduce dependence on imported oil, while addressing environmental concerns. However, higher ethanol content may require engine modifications due to ethanol's corrosive nature. India Today Science Desk. (2025, August 5).

Whether E20 fuel could damage older vehicles or degrade the driving experience?

Amid growing concerns over the impact of 20% ethanol-blended petrol (E20) on vehicle performance, the Ministry of Petroleum and Natural Gas has issued a detailed clarification dismissing such fears as "largely unfounded and not supported by scientific evidence or expert analysis." In a post on X (formerly Twitter), the ministry responded that whether E20 fuel could damage older vehicles or degrade the driving experience. India Today Business Desk. (2025, August 5).

History of ethanol in fuels

The practice of blending ethanol with petrol began in India in 2001 as a pilot project. The public sector oil marketing companies (OMCs) achieved the target of 10% ethanol blending in June 2022. This increased to 20% by March 2025. Most of the original equipment manufacturers (OEMs) in India have already updated their vehicles with E20 fuel-compliant engines. E20 fuel is petrol blended with 20% ethanol. Under the Ethanol Blended Petrol (EBP) programme, the government fixed the target of introducing vehicles with E20 fuel-

tuned engines from April 2025. The vehicles running on E20 fuel experience a slight decrease in mileage compared to petrol. In March 2024, Union Minister of Petroleum and Natural Gas Hardeep Singh Puri introduced Ethanol 100 fuel, which was available at select outlets across New Delhi, Maharashtra, Karnataka, Uttar Pradesh and Tamil Nadu. With its high-octane rating, typically between 100-105, Ethanol 100 fuel is claimed to be ideal for high-performance engines, ensuring improved efficiency and power output. It can also be used in flex-fuel vehicles. India Today Auto Desk. (2025, April 16).

Challenges of ethanol production from sugarcane

There are a few challenges that remain to produce ethanol from sugarcane to realise its full potential. Firstly, a few hurdles that prevent new companies from setting up standalone distilleries need to be addressed. It would not be possible to meet the required demand for ethanol with only the existing sugar mills that have distillation units or those that are building one. Entry into the market for new companies is difficult owing to a number of reasons. To begin with, companies must first submit their intent to setup a distillery to the State excise department (as alcohol and licensing for the same falls under the ambit of State Governments). Following this, they must separately take permission from Central Pollution Control Board (falling under the ambit of the Central Government) as distilleries are classified as 'red' industries, i.e., industries that cause maximum pollution. The process to obtain a NOC from the Pollution Control Board is a long and tedious one that takes upwards of 12-14 months if everything goes according to plan (owing to various public hearings that must be conducted at the site of the proposed distillery with local stakeholders) (Arya, 2019).

Replace sugarcane with bamboo

1. **High ethanol production:** we are relying on sugarcane for ethanol it produces around 20 to 70 Liters of ethanol per ton. But we have better option that is bamboo if we use bamboo instead of sugarcane for ethanol it goes around 20% increase.
2. **Water conservation:** Sugarcane needs more water than the bamboo. China is actively investing in bamboo-based ethanol as future bio fuel source. But in India we still import ethanol from Brazil through, efforts are underway to boost domestic production.
3. **Withstand extreme conditions:** After the atomic blast temperature reaches up to 4000 degrees Celsius every inch was rubbed of but this one plant can grow back where no life could. After the atomic blast bamboo started growing back because of its underground system and high silica content helps to withstand radiation compare to other plants.
4. **Regenerate capacity:** Bamboo plants don't grow as individuals they are part of a connected colony that interact with an underground network of horizontal root like stems. These rhizomes act as a life line between different bamboo stalks. if one part of the bamboo grove has access to more water or nutrients the rhizomes transfer resources to weaker or struggling plants these ensure that all the plants survive even in harsh conditions when a bamboo stalk is damaged it releases chemical signals through the rhizomes and protects the others. Through the rhizome network all connected bamboos in a grove, can coordinate their growth and this is why bamboo can regenerate so quickly compared to other plants. The underground communication system makes it one of the most sustainable plants on earth.



Advantages of bamboo

- It can survive in 42-degree heat
- Degraded, dry and low rainfall areas
- Bamboos are also used for pulp making for biodegradable packaging eco-friendly paper and cardboards
- Absorbs 5 times more carbon dioxide releases 35% more oxygen.
- Absorbs carbon from the atmosphere and stores it in the soil a process known as carbon sequestration
- It acts as an oxygen generator
- Every human need 180 to 240 kg of oxygen for year
- One mature bamboo can produce 300 to 400 kg of oxygen per year
- We can grow the Tissue culture bamboo
- These plants help in reforestation, improve air quality, create green cover for a healthy planet.
- India phases several challenges like soil erosion, landslides and spends too much money on disaster management
- Bamboo underground communication system is one of the nature's most fascinating networks.

Conclusion

As one of the largest bamboo growers in the world, we need to rethink what we are doing, do we really need sugarcane for ethanol even we have better alternative in surplus as we have the solution that bamboo lets create a real sustainable change. Why can't we plant these plants and help our environment from different problems.

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