Chapter 23
Biofuels and Health Hazards: An Overview

Swapan Banerjee
Department of Nutrition, Seacom Skills University, India

Soumen Ghosh
Agricultural and Food Engineering Department, Indian Institute of Technology, Kharagpur, India

Gourav Dhar Bhowmick
Agricultural and Food Engineering Department, Indian Institute of Technology, Kharagpur, India

Digvijay Pandey
https://orcid.org/0000-0003-0353-174X
Department of Technical Education, IET, Dr. A.P.J. Abdul Kalam Technical University, Lucknow, India

Binay Kumar Pandey
https://orcid.org/0000-0002-4041-1213
Department of Information Technology, College of Technology, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, India

Pankaj Dadheech
https://orcid.org/0000-0001-5783-1989
Swami Keshvanand Institute of Technology, Management, and Gramothan, India

ABSTRACT

Biofuels, such as coal and oil, have been the most suitable and sufficient substitutes for other conventional fuels in the energy sector for the last few years. For decades, entire populations have suffered from deforestation, global warming, and carbon monoxide issues. Biofuel production is an eco-friendly process that still has health hazards for manufacturing unit workers. That is due to flammable and combustible raw materials and their chemical reactions. Bioethanol is a flammable biofuel prepared by cellulose items and the fermentation of grains. Biodiesel is another combustible liquid-based biofuel produced by alcohol and glyceride in vegetable oil duly catalyzed by strong alkaline like caustic soda. Biofuel plants or trees are the biggest isoprene producers, which meet the ozone layer in the earth's atmosphere. While combining with ozone always causes many health hazards for manufacturing units' employees despite several safety measures. One of the significant consequences is that some factory workers often have asthma, allergy, and lung disorders due to ozone attacks.

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1. INTRODUCTION

Global energy supply primarily depends upon fossil fuels now. The need for alternative green technology in the explosive energy domain is well understood. The reason is that fossil fuel resources become scarce gradually, negatively impacting the environment and livelihood. Randomly using fossil fuels has become the primary cause of global warming, air& water pollution, and health-related issues. It creates a crisis in energy sectors due to the depletion of exhaustible energy resources. Biofuel is the future of fuel technology obtained from different biomasses and potential renewable energy sources. It includes organic matter derived from plants, animals& microorganisms. This will be a game-changing option in the energy industry with competitive, sustainable economic growth over traditional fossil fuel industries. Bio-based energy can also compete with other forms of renewable energy that are non-exhaustible, e.g., wind, tidal, geothermal, solar energy, inefficiency, and other parameters.

1.1. Biofuels and Biomass

As cetane and octane number is a matter of concern, biofuels can be used after blending with different fossil fuels to minimize carbon monoxide and sulfur oxide (SO_x) emissions (Chen, H. et al., 2015).The first initiates took in the late 19th century to produce bioethanol from corn and peanut oils. The alternative of fossil fuels has been prioritized due to the price hike at the beginning of the 20th century. Continuous research and development are being conducted to search for different biomass sources afterward. In 1980, bioethanol started to produce from sugarcane in Brazil. It has been observed that bioenergy production from various biomass sources encourages farmers to be involved in biomass production. Besides that, GHG (greenhouse gas) emissions are comparatively much lower in biofuels than in fossil fuels. As biofuels are derived from biomasses having closed carbon cycles, thus it does not have a significant contribution to the emission of GHGs (Van &Romijn, 2008).There are some disadvantages tothe synthesis of biofuels from organic resources. Especially in the 20th century, when the world fights against hunger, the ongoing competition between food and fuel has been aroused. Over the last few decades, the production of biofuels has become costly due to the need for more implementation of proper cutting-edge and sustainable technologies resulting in its expensive nature than fossil fuels.

1.2. Biofuels Production and Health Hazards

The industry persons involved in different stages and steps of biofuel production may have various health hazards, i.e., from asthma, allergy, lung disorders, for ozone attacks (Ajanovic & Haas, 2014).Several accidents during biodiesel production have been reported in many articles so far. Researchers are still developing a statistical and mathematical model to analyze the root cause and the severity of accidents classified into different groups.

Risk assessment is becoming essential before establishing a bioenergy plant as safety engineering is concerned (Jenkins, A. et al., 2013). Most accidents occur in biodiesel production plants due to a lack of experience in complex industrial and chemical engineering processes and management (Harper, S. W. et al., 2008). These trace gasses and aerosols harm air quality, negatively impacting human health (Verma, N., et al., 2021). So it is indisputable that bioprocess engineering principles involved or appropriate bioreactor designing for a controlled process and byproducts utilization & handling is a complex task (Fink &Medved, 2013; Gaffney & Marley, 2009).It has been observed that most of the accidents took