

Mini Review

Biofuel Plants: Potentials and Challenges

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BACKGROUND

Currently, Due to the continuous consumption of fossil fuels and increase Carbon emissions, which affect negatively climate conditions, there are more interested in using renewable energy sources. Produce biofuel from different plants like jatropha, jojoba, and neem considered alternative sources of energy, reduce carbon footprints, and protect the environment [1].

There are different environmental and socio-economic benefits of producing biofuel from non-edible plants. Furthermore, non-edible plant-oil is considered a valuable source to produce biodiesel with a significant amount, particularly in marginal lands that could irrigate with wastewater [2]. Biofuel is classified as a smart solution to mitigate climate change resulting from the increasing consumption of fossil energy to provide adequate energy for humanity [3], especially with the continuous growth of the population worldwide, as well as reduce environmental pollution and reduce extreme climate changes.

Main plant species producing biofuel

There is various non-edible plant used as bio-resources for biofuel (Table 1) like jatropha, jojoba, neem, Castor oil plant, Poonga Oil Tree, the Ceylon ironwood, and Coconut.

It is known that biofuel plant species must be non-edible and have distinct Characteristics that make them attractive such as harsh conditions tolerance, rapid growth, ease of propagation, low requirements of water and nutrients, high biomass content, and resister for common pests, quick harvest, and abundant seed production, etc..., [4].

Importance of plants as bio-source of biofuel

There are various benefits for biofuel plants as follow:

1. Developing marginal lands
2. Protecting the environment by
3. Absorbing carbon dioxide
4. Reducing the carbon footprint.
5. Store carbon and sequester carbon.
6. This work explores the role of Jatropha and jojoba are considered talented biofuel plants, in addition to their impact on reducing Co2 emissions, and protecting the environment.

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Table 1: Main plant used as bio-resources for biofuel.

Common name	Scientific name	Family
Jatropha	<i>Jatropha curcas L.</i>	Euphorbiaceae
Jojoba	<i>Simmondsia Chinensis (Link) Schneider</i>	Simmondiaceae
Neem	<i>Azadirachta indica</i>	Meliaceae
Castor oil plant	<i>Ricinus communis</i>	Euphorbiaceae
Poonga Oil Tree	<i>Pongamia pinnata</i>	Fabaceae
The Ceylon ironwood	<i>Mesua ferrea</i>	Calophyllaceae
Coconut	<i>Cocos nucifera</i>	Cocoseae

Jojoba and jatropha represent the main plants to produce biofuel, particularly in developing countries in arid and semiarid regions. In addition to being non-edible crops, and providing good economic returns. In addition, these plants are cultivated in degraded or marginal lands (Figure1), mostly inhabited by poor communities with hard conditions [2].

Jatropha and jojoba have the ability to grow in harsh environmental conditions and can survive with negligible water quantity and salty soil conditions. Thus, considered promising plants for biofuel production, particularly under arid and semiarid conditions (Figure 2).

Both species had low water and nutrients requirement comparing other crops, drought tolerant, growing under high



Figure 1 Jojoba in Egyptian desert 2020.



Figure 2 Field image of Jatropha (by Abobatta 2018).

temperatures, salinity conditions, and soil alkalinity. However, planting jatropha and jojoba in degradable lands is considered a key solution for enhancing soil properties and fighting desertification [5].

Socioeconomic potential of growing jojoba and jatropha

Due to fluctuation in climate conditions, there is increasing in soil degradation, which affects negatively live-hoods, particularly in developing countries [3]. Therefore, the cultivation of wastelands with biofuel crops like jojoba and jatropha has numerous socioeconomic benefits as follows:

1. Reclaimed marginal lands.
2. Irrigated with the treated sewage water.
3. Improve income of live-hoods of poor rural regions.
4. Act as carbon traps.
5. Reduce pollution levels.
6. Fighting desertification.

In addition, the crops producing bio-source of biofuels have a critical role in the green economy and could be dealt with as a higher contributor to decreasing CO₂ emission, besides the socioeconomic livelihood support, particularly in poor rural areas, as well as low-income desert communities.

Challenges for biofuel plants

There are a lot of arguments and controversies about biofuel production, especially with using new species of plants in different local environments, which increases the chances of their negative impacts on biodiversity in these areas. Therefore, there are many risks associated with the production of biofuels, including major environmental, economic and social risks that may appear in the near future.

There are some challenges facing the production of biofuel

for different reasons, like some environmental issues, missing awareness, lack of technology, and economic reasons [6]. While spread rapidly of the biofuel plants into new environments could represent an environmental problem that affects the biodiversity in these areas. Due to the negative effects on biodiversity, especially when cultivated in wide areas with these plants, they turn into invasive plants and bring new diseases and pests that negatively affect the agricultural production in these areas.

Currently, mitigating the negative effects of climate change is a primary goal for humanity. Production of biofuels from non-food plants to reduce the consumption of fossil fuels is one of the essential ways to sustain natural resources. While, there are alternative impacts of increasing cultivated areas with biofuel plants, which could be considered invasive plants in some environments, and affects the biodiversity in these areas.

CONCLUSION

Producing biofuel from nonedible plants is considered an alternative way to reduce the consumption of fossil fuels and mitigate the impacts of climate change. Biofuel plant species have attractive properties like adapted to environmental stresses, quick growth, low water requirements, high biomass content, and resistance to pests and disease. There are significant roles of plants as bio-source of biofuel like developing wastelands, storing and absorbing carbon dioxide, reducing the carbon footprint, and protecting the environment by reducing pollution.

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