Qualitative Study on the Jatropha Curcas Plant Resources and Production of Biodiesel for Societal Benefits

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Abstract: Biodiesel can be produced from any material that contains fatty acids, be they linked to other molecules or present as free fatty acids. Biodiesel (BD) is manufactured by chemically reacting lipids (Triglycerides) e.g., present in Jatropha oil, with alcohol-producing fatty acid esters. It is basically an ester derived from glycerol and three fatty acids (tri + glyceride). Globally Jatropha curcas plant is one of the most promising resources for biodiesel. Present biodiesel is a liquid fuel, which is obtained by methyl esterification of fatty acid. The main constituent is fatty acid methyl ester. Production of such chemically enriched energy compounds is a subject of intense research worldwide. The reaction commonly called "transesterification" was being researched both in light of chemical diversity as well as mathematically refined parameters to enhance the reaction process. From an economical point of view, BD production is limited to the high price of oils and purification of secondary product (glycerol). Systematic amalgamation of the chemical reaction and mathematical analysis leads to unified process dependency and has provided improved oil production from such natural resources. The production of biodiesel from terrestrial (Jatropha curcus Oil) sources is the prime focus area in developing nations and how to develop a renewable resource for future-ready energy demands is a serious thought in the global scenario. We have already initiated thematic research on the Jatropha curcus plant to yield biodiesel for future energy demands and provided sound production parametric resolutions entirely on mathematically obtained analytical findings and numerically verified process parameters like mass resistance, molar ratio of the reactants, use of catalysts, stirring effect rpm, etc. We have also produced some research on the plant ecology which serves as the raw material for the production of the oil seeds theoretically. Biodiesel is produced from Jatropha seeds by extracting the crude oil. A healthy plant will benefit us in producing a greater amount of biodiesel. Since the Jatropha plants are not disease resistant and the cost-effective production is still to be addressed in the view of societal benefits in the developing countries, the focus has now been shifted to how to get pest-free plants as well as the maximum production of biodiesel with less production cost. If we can resist or minimize the pest attack on the Jatropha plant, consequently it will lead to a steady production of alternative fuel, i.e., biodiesel. Securing clean and uninterrupted energy means growing the economy. On a large-scale production system, such ventures must be validated on cost-benefit accountability which is yet to be explored under different technological domains. Mathematical comparative product features are yet to be arrived at under different phases of the cumulative biodiesel production process without catalysts. We will focus our research on this direction as well as find the enhanced production from different technical and chemical processes without catalysts with mathematical studies. It will lead us to arrive at a balanced production where the optimized cost-benefit trade-off is achieved. This is for the overall betterment of societal aspirations, as such holistic studies will create entrepreneurial and job opportunities, decrease pollution environmentally, and boost the national economy with self-reliance in energy demands. Building mathematical models using different mathematical as well as numerical techniques, would be predicted under the studies, what is to be controlled and how to be controlled of certain reaction parameters for extraction and conversion of biodiesel from natural resources effectively and with sustainable yield.

Keywords:Jatropha curcas plant; Pest control; Pesticides; Stability; Functional response; Biodiesel; Supercritical; Optimization; Cost-effectiveness.

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