

Evaluation of cottonseed oil for biodiesel production

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ABSTRACT

The methyl ester of cottonseed oil (CSME) has been found to be a potentially functional substitute for diesel fuel. This paper discusses the procedure used to produce CSME for use as a diesel fuel substitute. Reaction variables, reaction rates, equipment and detailed procedures for producing biodiesel are discussed. Cottonseed oil was used to evaluate it for biodiesel production, its properties and its performance in CI engine. It was observed during the experimentation that, cottonseed oil can be used for production of quality biodiesel by base catalysed transesterification. The biodiesel produced meets ASTM specification and its calorific value was 7.47 per cent less than that of diesel. Brake Specific fuel consumption (BSFC) decreased with increase in the brake power and also with percentage of biodiesel in the fuel blend. The engine efficiency was found to increase with increase in brake power and increased with the increase in CSME percentage in blend.

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Cotton is the most vital commercial crop popularly known as White Gold and plays a key role in economical and social affairs of the world. In India, it is cultivated mainly for fiber cotton, cottonseed being the byproduct of the cultivation process. Due to the abundant production of Cotton and hence cottonseed oil in the Vidarbha area, the present study was undertaken for production of cotton seed methyl ester (CSME) *i.e.* biodiesel. A small scale "PKV-Biodiesel Processor" was developed and biodiesel produced in it was evaluated for its potential as renewable source for Vidarbha.

Maharashtra (2005) has annual production of cotton lint 2871900 MT and Vidarbha (2005) with 1303700 MT which is actually 33% of the total cotton production. The remaining 67% account for cotton seeds which is around 3002460 MT = 51041820 kg. Cotton seed contains about 13% oil, hence annual oil production for Vidarbha region is 66354379 kg. is a sufficient amount for production of biodiesel if not considered for edible use.

In addition to depleting nature of fossil fuel resources and their increasing costs, Global warming is driven by man-made climatic gases, mainly CO₂ emissions; which are a consequence of energy production from fossil resources. Rational use of energy is of crucial importance now, sustainable use of renewable energy has a high potential in combating global warming. So, Biodiesel produced from plant materials appears to be an excellent alternative to replace diesel fuel. Bhatt and Mathur (2002). Rudolf Diesel, the 19th-century originator of diesel technology, used refined groundnut oil to run his invention. But the rise of cheap crude oil killed his vision of farmers growing their own fuel. Now, after a century of burning

fossil fuels, the diesel engine is finding its way back to its agricultural roots.

Biodiesel is derived from vegetable oils biologically derived almost any oils such as jatropha oil, karanj oil, soybean oil, cottonseed oil, rubberseed oil, sunflower oil, coconut oil, peanut oil, palm oil, corn oil, mustard oil, ricebran, pumpkin seed oil, cashewnut oil, euphorbia oil, waste cooking oil, rapeseed oil, beef tallow as well as other types of animal fat. It is similar to diesel fuel except that it is produced from commonly grown oil crops (Lele, 2004 and Peterson *et al.*, 1983).

Cottonseed oil is a vegetable oil extracted from the seeds of the cotton plant after the cotton lint has been removed. It must be refined to remove gossypol, a naturally occurring toxin that protects the cotton plant from insect damage. Cottonseed has a blend of crude protein (23%), fat (20%) and crude fiber (24%) that makes it a nearly ideal ingredient in dairy feed formulations.

Cottonseed oil is also used for agricultural pesticide applications instead of water or petroleum based oils. The suitable fatty acid content for production of biodiesel and abundance in the region has created a modest new application of cottonseed oil. On extracting oil from cottonseeds, its meal is obtained which is the second most valuable product of cottonseed. It may be sold in the form of meal, cake, flakes, or pellets. Cottonseed meal is used principally as feed for livestock. Its major value is as a protein concentrate. The good quality protein is necessary for animals to build muscles, nerves, blood, internal organs, hair, and skin.

High viscosities, low volatilities and polyunsaturated character of neat oils cause problems in substituting them