Chapter 16
Characterization and Comparison of Various Blends of Honge Oil Methyl Ester (Biodiesel) With Diesel Fuel

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ABSTRACT

The Honge oil, known as pongamia oil, is one of the most widely used lamp oils around the world. It is also used in leather tanning, in soap making, and as a lubricant. The Honge oil methyl ester can be used as an alternative fuel for diesel. The transesterification of methanol and Honge oil in the presence of base catalyst results in Honge oil methyl ester. In the current work, the Honge oil methyl-ester known as biodiesel was produced. It was mixed with petroleum diesel fuel in different proportions. Various physical and petroleum properties were investigated for Honge oil biofuel and also for various diesel and ester mixtures. The optimum parameters were temperature was 65^{o}C, catalyst quantity, 0.4 grams and oil: alcohol ratio, 1:6. The blends of 10%, 20%, and 30% compositions were most suitable as potential alternative fuel. Different proportions of biodiesel ester in diesel fuel have been also compared with petroleum diesel fuel to identify a suitable blend having good engine fuel potential.

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INTRODUCTION

Worldwide economy runs on energy and with increase in population, the fuel demand is increasing rapidly (Natarajan and Venkatesh, 2012; Ahmad et al. 2009; Kumar et al., 2013; Patil et al., 2008; Hayyan et al., 2010). These needs, coupled with environmental changes, increasing costs and exhaustion of fossil fuel have motivated investigators to discover new energy assets (Georgianna and Mayfield, 2012; Ramadhas et al., 2004; A. Kumar and P. Kumar, 1984; Khan et al., 2007). Biodiesel has been considered to be one the best option forfuture fuel needs.Itcan be renewed because of its biodegradability (Bobade and Khyade, 2012; Santana et al., 2012; Ma and Hanna, 1999). Biodiesel creation from a renewable source can fulfill goals of a balanced environment and manageable monetary quality (Bobade and Khyade, 2012; Hossain and Salleh, 2008). Advantages of biodiesel are, its biodegradability and no requirement of alteration of engine to accommodate the fuel (Ahmad et al. 2009). Biodiesel can be smoothly blended (Anya et al., 2012; Saribiyik et al., 2010; Hribernik and Kegl, 2007). Any alternative fuel should be characteristically achievable, agreeable and financially feasible.

The source of Honge oil is the seeds of the Millettia pinnata tree. Karanja oil (in Hindi), Honge oil (in Kannada), Kanuga oil (in Telugu) and Pungai oil (in Tamil) are different terms used for this oil, Pongamia being the generic name. The Pongamia tree is around 40 feet tall after complete growth. Pink and white flower are grown on their branches. These mature and develop into brown seed pods (Allen O and Allen E., 1981). They grow in temperature range 0 to 40°C.Also they can survive in 5–25 cm annual rainfall. This tree grows wild on soil that is rough and hard (Meher, et al., 2004). The plant is nonedible, has harmful properties and can cause harmful effects on body if injected orally. However, it finds applications in the traditional medicines via its fruits, flowers and seeds (Bobade and Khyade, 2012). Honge plant derived oil and juices are effective on skin disease and have pest control abilities. Complete growth of this plant takes 10 years and it takes 5 years only to develop pods. A single tree can yield oil in the range of 10 to 50 kilograms depending on its size (Meher et al., 2004). Different methods like extraction and pressing (expeller and cold) can be used for Pongamia oil for its extraction from seeds. Pongamia oil is antiseptic and resistant to pests. The bitter flavonoid constituents results in disagreeable taste and odor and also has a high content of triglycerides.

In the recent years Pongamia oil industry has caught great attention in the global market. India, being one of the largest Pongamia producers, has a very important role in it. Pongamia pinnata (the Derris Indica trees) has been identified a definite source of next generation fuel. This plant can grow on barren and unused land. The plant has no food applications and hence its use as a source of biodiesel doesn't affect food requirement. High oil recovery is another important advantage of this source. All these advantages makes Honge oil, even more attractive alternative. This plant can minimize nitrogen requirement of soil as it can fix nitrogen from atmosphere.

Meng et al. (Meng et al., 2008) optimized the reaction temperature at 65^0C whereas Freedman et al. (Freedman et al.., 1986) suggested that optimal catalyst concentration is generally between 0.5 wt. % to 1.0 wt. %. The effect of ratio of oil to alcohol was also optimized experimentally at 1:6 by Alia and Taya (Alia and Taya, 2013). The major objective of the current investigation is to prepare the biodiesel from Honge oil and to study its petroleum properties, compare with pure petroleum diesel. Initially parametric studies were performed and parameters were optimized for experiments on different blend compositions. Prepared biodiesel and its blends were analyzed by comparing their properties with pure diesel. The words Honge oil and Pongamia oil are used in the investigation interchangeably.