Abstract  Bio-diesel development from *Jatropha curcas* (JTC), a tropical plant, is currently being carried out in various parts of the world. High oil content of the JTC seed, high cetane number of the JTC biodiesel, its drought resistant characteristics, its toxicity, which makes it unwanted by both humans and animals, and its various other uses render this plant an extremely promising source for bio-fuel development in arid areas and rural communities in the developing world, in particular. Catalytic hydrocracking of various other vegetable oils, such as sunflower oil and soybean oil, has been reported. Chemical composition of JTC seed oil shows similarities in fatty acid composition to these oils. A two-stage catalytic hydrocracking process is proposed to convert JTC oil to high-cetane number biodiesel. If successful selectivities are obtained at the bench scale, this technology could be implemented in existing refineries in developing countries without major modification.

Keywords  *Jatropha curcas* · biodiesel · catalytic hydrocracking
1 Introduction

Environmental pollution and non-renewability of fossil fuels are some reasons why alternative fuels are gaining wide attention. Biodiesel is carbon-neutral, non-toxic and has a low emission profile compared to conventional petroleum (Meher et al. 2006). *Jatropha Curcas* (JTC) is a multipurpose plant with many attributes and considerable potential as an energy crop (Openshaw 2000). High viscosity and lower volatility are some of the problems with plant oils that have to be overcome before using them as fuel for conventional diesel engines (Meher et al. 2006). To date, transesterification is the most widely reported method of converting vegetable oils to biodiesel (Shah 2004). Some researchers have noted that catalytic hydrocracking of vegetable oils, such as soybean oil and sunflower oil, can produce successful synthetic diesel (Filho et al. 1992). Since JTC oil and the above mentioned oils have similar fatty acid compositions, it can be assumed that catalytic hydrocracking of JTC oil might produce high quality biodiesel. Researchers at the University of Western Ontario are planning to transform JTC oil to premium biodiesel using a two-stage catalytic hydrocracking process. This paper attempts to summarize the envisioned program. It also looks into the possibilities and challenges of JTC cultivation, the proposed technology and its application in the developing regions of the world.

2 *Jatropha curcas* – Origin and Description

JTC is a drought resistant tropical plant that belongs to the genus *Euphorbiaceae* (Gubitz et al. 1999). The JTC plant is a small tree or a large shrub that can reach a height of up to 5 m. The life-span of the JTC plant is more than 50 years (Henning 2000). This plant can be grown in low to high rainfall areas (Openshaw 2000) and is mainly used as living fence as it is toxic to both humans and animals (Gubitz et al. 1999). JTC has significant potential as an energy crop because its seed contains about 55% oil (Forson et al. 2004). With mechanical oil expellers, up to 75–80% of the oil can be extracted. With a hand press only 60–65% of the oil can be obtained (5 kg of the seeds give about 1 l oil) (Henning 2000). The properties of JTC oil are given below in Tables 1 and 2.

3 Possibility of Producing Biofuel from *Jatropha curcas*

Attempts have been made to produce biodiesel by transesterification of JTC oil and successful results were obtained. Conversion of JTC oil to useful fuels may also involve short contact time pyrolysis, catalytic cracking and catalytic hydrocracking. Table 2 shows that the calorific value of JTC oil is close to that of diesel oil and that the cetane value of JTC oil is slightly higher than that of diesel oil. The sulphur content of JTC oil is also much smaller than that of diesel oil in developing countries.