CHEMICAL COMPOSITION (PROXIMATE ANALYSIS) AND OIL CONTENT OF *JATROPHA CURCAS* SEED WITH DIFFERENT MATURITY

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5. Report

5.1 Proposed Executive Summary

Jatropha curcas is classified as one of the plant oil similar to palm oil and has potential as a renewable energy crop as its oil may be used directly with slow speed diesel engine or upgraded via transesterification to conventional biodiesel. The assessment of performance and benefits of *Jatropha curcas* in relation to its oil content and oil quality is based on extrapolation of its potentials by multiplying observation from singular or small plots to plantations on a per hectare base. In addition, it is reported that plants from *Jatropha curcas* seeds have a large biological variation.The objectives of the study are to determine the oil content of seeds at different maturity as indicated by the colour of the fruits and to compare the oil content of seeds from four different cultivars. In this study, Soxhlet method will be applied for oil extraction by using n-hexane solvent. The output of the study is to developing a grading system for buyers to determine the market price of the seeds based on the crude oil content.

5.3 Introduction

The increasing industrialization, modernization and development have led to high demand of petroleum worldwide. In Malaysia, the final energy consumption has risen at an annual growth rate of 7.2% from 1990 to 2008 and reached 44.9 metric tonne in 2008 (Ong *et al.*, 2011). The crucial challenge faced by power sector in Malaysia currently is the issue of sustainability. Thus, there is an urgent need to find an alternative renewable energy resource that is renewable, clean, reliable and yet economically feasible. Biodiesel, a cleaner renewable fuel has been considered as the best candidate for diesel fuel substitution due to it can be used in any compression ignition engine without any modification on the engine. In Malaysia, the potential of biodiesel are using Palm Oil and *Jatropha Curcas*.

Sarawak as well looking for the posibilities to produce biodiesel by using *jatropha curcas* under Sarawak Corridor of Renewable Energy or SCORE. The interest in the development of *Jatropha curcas* plantation has been aligned to its potential as an energy crop in biodiesel production in order to reduce the nation's dependence on imported petroleum and other fossil fuels. In addition, massive planting of *Jatropha curcas* will have a huge employment generation and job creation impact in the rural areas where poverty or unemployment is high, since crop establishment/care (first to second year) and harvesting of fruits of *Jatropha curcas* is labor-intensive.

Jatropha curcas oil which is a branched triglycerides type of non-edible vegetable oil is a potential alternative diesel fuel. Its methyl ester properties are close to diesel fuel and able to reduce CO_2 to the environment. There are generally four advantages of *jatropha curcas*, mainly attributed to its economic seed yield and oil recovery as listed below:

a. Cultivation of Jatropha is not capital-intensive.
b. It can be planted on any kind of soil and grows well under tropical and subtropical climate.
c. It can easily be propagated by seed/ cutting, has lesser gestation period and can generate high yield per hectare.
d. It has a lower price since there is no other application, except for biodiesel feedstock.

5.4 Brief Literature Review

Chen, *et al.,* (2008) reported that in December, 2007, the Wall Street Journal ran a story highlighting an internal report at Goldman Sachs that cited Jatropha as one of the best candidates for future biodiesel production. According to Openshaw (2000), numerous NGOs including the World Bank, the International Plant Genetic Research Institute, Austrian and German Technical Assistance Programs, the Rockefeller Foundation, Appropriate Technology International and Intermediate Technology Development Group are all promoting the planting and use of *Jatropha curcas*. *Jatropha curcas* is widely grown in Mexico, Nicaragua, Thailand and in part of India and being promoted in Southern Africa, Brazil, Mali and Nepal. In Sarawak, Jatropha cultivation by private sectors by the private sectors either individually or companies is at its infancy stage established from scattered experience and observations (Chan, 2008).

Jatropha curcas is classified as one of the plant oil similar to palm oil and has potential as a renewable energy crop as its oil may be used directly with slow speed diesel engine or upgraded via transesterification to conventional biodiesel (Sricharoenchaikul *et al*, 1997). There are several advantages of biodiesel including safe for use in all conventional diesel engines, renewable, same performance and engine durability as petroleum diesel fuel, reduces tailpipe emissions, non-flammable and nontoxic, visible smoke and noxious fumes and odors (Akbar *et al.*,2009).

According to Pramanik (2003), the oil content of Jatropha seed ranges from 30 – 50% by weight and the kernel itself ranges from 45 to 60% when harvested at maturity indicated by the colour of the fruits which have changed from green to yellow-brown, 90 days after flowering. A study conducted by Rajneesh *Mahajan et al. (*2009), the average maximum oil content was 41.67 percent at yellow fruit stages while the average minimum oil content was 34.63 percent at green fruit stages and then 39.45 percent at black fruits stages. In term of chemical analysis, Sricharoenchaikul *et al.* (1997) had been study the proximate analysis of physic nut (jatropha curcas Linn) which the volatiles matter was about 79%, fixed carbon (18.9%), ash (1.50%) and moisture content (0.66%). Thus, high percentage of volatile matter and low percentage of ash are an indicator a good for production fuel.

According to Shahidi (2005), there are four basic methods for extracting vegetable oils from seeds, nuts and fruits: the first method being the basic wet process in which the oil-bearing material was boiled in water leading to a partial separation of oil, which was skimmed.; the second being the cage-type press in which pressure was put on a stationary mass by levers, screw jacks or hydraulic cylinders and the vegetable oil