Proceedings
The 2nd International Conference
On Green World in Business and Technology

Intellectual Property Rights in Technopreneurship Based on Green Business and Technology
Yogyakarta, 23 March 2013
Ahmad Dahlan University

Published by:
UAD Press
Kapas Street No.9, Semaki, Umbul Harjo
Yogyakarta 55165
PROCEEDING OF
THE 2nd INTERNATIONAL CONFERENCE ON GREEN WORLD IN BUSINESS AND TECHNOLOGY

"Intellectual Property Rights in Technopreneurship based on Green Business and Technology"

Author and Speaker
Prof. Dr. Margareth Gfrerer, et. al.

Reviewer
Prof. Dr. Margareth Gfrerer
Prof. Mustafa bin Mat Deris
Prof. Achmad Mursyidi, M.Sc, Apt.
Dr. rer.nat. Endang Darmawan, Apt.
Dr. Abdul Fadlil, MT.

Editor
Ali Tarmuji, M.Cs.
Herman Yuliansyah, M.Eng.
Edwin Daru Anggara, S.Farm.

Publisher
UAD Press
Jln. Kapas No. 9 Semaki, Yogyakarta 55166
Tel. 0274-563515, Fax. 0274-564604
# Table of Contents

## Plenary Speaker

*Reduce – Reuse – Refuse: The Way to Sustainable Innovation*
Margareth Gfrerer ........................................................................................................ 1

*Biotechnology of Indonesian Natural Orchids*
Endang Semiarti ........................................................................................................ 16

## Education

*The Effectiveness Of Mathematics Learning With Quiz Seen From The Point Of View Of Learning Time In The Achievement Of Student Study Performance Grade VIII Semester Of II SMP Negeri 2 Kasihan Regency Of Bantul Year 2009/2010*
Abdul Taram, Mariyani ............................................................................................... A-1

*Implementation Of Waste Pins Interactions To Improve Students Tk Pkk 27 Jambean Bantul Training Approach Behavior And Healthy In Academic Year 2012/2013*
Febritesna Nuraini ..................................................................................................... A-11

## Health

*Antibacterial Activity Of Soyghurt With Sugar Corn Addition Against Bacterium Of Aeromonas hydrophila*
Ameilia Indi Nur Ramadhani, Dwi Suhartanti ....................................................... B-1

*The Association Between Desirable Diatery Pattern Score Of Family’s Consumption With Nutritional Status Of Children Under Five Years In Shelter Gondang 1 Sleman, Yogyakarta*
Asep Rustiawan, Widodo Hariyono, Sunarti, Abdul Rohim Mansur ..................... B-15
Review: Curcumin Activities on Prostate Cancer
Edwin Daru Anggara, Wima Anggitasari ................................................................. B-21

Breastfeeding, Demographic Transition, And Employment (A Review)
Lina Handayani, Azlina Md. Kosnin, Yeo Kee Jiar, Solikhah ............................ B-28

Geographic Information System for Climate Change Impact Assessment
Sulistyawati ................................................................................................................. B-34

Effects of the Addition of Vitamin C to Fe and Vitamin A Supplementation on the elevation of Feritin Level of Malnourished Infants Aged 2-5 years
Sunarti ......................................................................................................................... B-40

Isolation And Identification Of Bacteria In Lindi Derived Fromcompost And Garbage As Inisiation Of Processing And Developmentfertilizer Product And Composting Bio-Starter
Surahma Asti Mulasari .............................................................................................. B-49

Resistance Status Of Aedes Aegypti L.Dengue Vector Towards Malathion, Sipermetrin, A-Sipermetrin And Temefos Effectivness In District Of Mertojoyudan, Regency Of Magelang
Tri Wahyuni Sukes ................................................................................................... B-57

The Implementation of Save Green Programs to Realize A Green Hospital at PKU Muhammadiyah Gamping Hospital Yogyakarta
Triyani Marwati, Edwin Daru Anggara, Asep Rustiawan ........................................ B-64

Science

The Gastropods Diversity in Intertidal Zone at Sundak Beach District Gunungkidul
Agung Budiantoro, Andri Firmansyah Persada ....................................................... C-1
The Influence Of Long Incubation To pH Of Durian (Durio zibethinus, Murr.) Seeds Yogurt (Yobidur)
Anna Atiq Priyadi, Dwi Suhartanti ........................................... C-8

Organoleptic test yoghurt-based seed Durio zibethinus (Yobidur)
Aprilia Pangestika, Dwi Suhartanti ........................................... C-15

Propagation Metarhizium Anisopliae In Rice Bran Media, Waste Tofu Flour Media, Rice Husk Flour Media
Dwi Suhartanti, Tri Puryani ................................................... C-23

The Availability of Soil Nitrate Concentration around Kawah Sikidang, Dieng Plateau, Central Java
Hendro Kusumo Eko Prasetyo Moro ......................................... C-29

Production and Kinetic Study of Oleic Acid Ethyl Ester Synthesis Using Lipase From Germinated Jatropha Seeds (Jatropha curcas. L)
Indro Prastowo, Chusnul Hidayat Pudji Hastuti ................................ C-37

Consumer Acceptance of Innovative Waterproof Pineapple Fiber Papers
Jarinya Wuttitien, Kawee Srikulkij ........................................... Ç-47

Yogurt Of Tempe Extract Aroma "Ringo (Strawberry and Mango)" on Incubation Temperature 42°C
Leni Apriliiana Sari, Dwi Suhartanti ........................................... C-55

Fermentation of Crabs (Paratelphusa) As Material Energy Oil Produced from Waste Coconut Membrane
Nellis Eka Risnita ................................................................. C-60

Insecticidal Activity Of Celery (Apium Graveolens, L) Root Against Aedes Aegypti's Larvae
Novi Febrianti, Yuliyandra ..................................................... C-68
Characterization of Kapok Seed Oil as Feedstock to Produce an Alternative Energy of Green Diesel
Siti Salamah, Martomo Setyawan ..................................................................................E-89

A Vibration Belt As Directional Tool For The Blind
Son Ali Akbar, Anton Yudhana .....................................................................................E-96

Media Consultation To Diagnose Diseases On Fruits Of Post-Harvest Using Expert System
Sri Winiarti, Reni Wijayanti ............................................................................................E-102

Phosphor Recycling from Sewage Sludge Ash for Sustainable Agricultural Production
Suhendra, Christian Adam, Christian Vogel, Oliver Krueger,
Karola Tetzlaff ..................................................................................................................E-111

Optimization of the Use of Social Media to Support the Paperless Office
Ali Tarmuji .........................................................................................................................E-121

MCLA : Categorical Data Clustering Based On Maximum Cardinality Lower Approximation
Iwan Tri Riyadi Yanto, Aris Thobirin .............................................................................E-129

Performance Index Assessment Software Lecturer (IKD) As The Basis For Academic Peer Review (APR) (Case studies at the Faculty of Industrial Technology UAD)
Fiftin Noviyanto, Murinto, Tedy Setiadi ........................................................................E-144
Characterization of Kapok Seed Oil as Feedstock to Produce an Alternative Energy of Green Diesel

Siti Salamah¹, Martomo Setyawan²

¹,² Chemical Engineering Study Program
Faculty of Technology Industry
Ahmad Dahlan University
Campus III, Jln Prof. Soepomo, Janturan Yogyakarta
salamah1995@yahoo.com

Abstract. Green Diesel is diesel oil derived from hydrogenated vegetable oils that have better quality than biodiesel, which is in the form of an efficient produce process with no waste and producing less CO₂ than petroleum diesel and biodiesel. There Green Diesel is environmentally friendly. Kapok seed is one of the potential sources of raw materials that can be tan oil resource. Kapok seed produces the Green Diesel. Kapok seed was produced from fruit that has some different characteristics from one tree to the other tree. Therefore, the characteristics of kapok seed must be known. The research was prepared to know the characterization of kapok seed oil by determining the water content, fatty acid, FFA (free fatty acid) and quality of kapok seed oil. The quality of kapok seed oil was tested in the laboratory of Technology Oil Gas and Coal Chemical Engineering Department, Faculty of Engineering University of Gadjah Mada. The results showed brown kapok seed oil. The analysis of kapok seed oil contained several fatty acids; the most dominant was 50.89% linoleic acid, palmitic acid 20.93%, and oleic acid 17.84%. The FFA content was 7.35%. The results quality of oil had Specific Gravity with 0.911 g/ml, Kinematic viscosity 37.29 mm²/s, and Flash Point 252.3° C and 3° C Pour Point.

Key Words: kapok seed oil, alternative energy, green diesel

1 Introduction

The increasing energy needs and the decrease in petroleum energy sources are energy problems to be solved. Biodiesel is one of the alternative solutions to solve the problems of energy needs, by substituting the petroleum diesel with diesel equivalent oil which is processed from vegetable oils such as kapok seed oil, jatropha oil, and others [1]. Biodiesel produced from vegetable oils with a transesterification process known as biodiesel generation 1 (G1). Recently, the used raw material is a product of biodiesel derived from vegetable oils. To refine the weakness of biodiesel on engine compatibility G1 as well as gas emissions, it is necessary to develop biodiesel generation 2 or G2 [2].

Biodiesel G2 is the alkane compound from the result of processing by hydrogenation of vegetable oils that have the similar characterization to diesel fuel. The alkane is the reaction products that were equivalent to diesel oil namely green diesel or biodiesel generation 2 (G2) with a better quality than the G1 biodiesel transesterification results [2]. It is called green diesel because it is environmentally friendly process without wasting the result and emissions generated from burning waste that is smaller than the other diesel [3].
The Green Diesel process removes the oxygen by reaction of hydrogen that produces a pure paraffin product. The primary co–product is propane and the by-products are water and carbon oxides. The green diesel process reaction equation can be written as follows:

\[ \text{trigliserida} + H_2 \rightarrow \text{green diesel} + H_2O + CO_2 + \text{Propana} \]

From the equation above shows that there is no waste to be processed specifically as a result of the reaction, but it is better quality of Green Diesel from biodiesel. The advantages of Green Diesel or biodiesel G2 are able to achieve a cetane number 70-90 that is much higher than biodiesel G1 achievement which only reaches 50-65, so that the resulting oil can be used directly as a fuel for diesel engines without adding to diesel first and even without making any modification to the machine [3]. The kapok seed is similar to cotton seed, when it is processed to produce oil which is a vegetable oil that would have the potential used as renewable fuel [4]. The kapok seed is for the manufacture of industrial waste fill pillows, bolsters and mattress are one of the vegetable oil properties and fatty acid content similar to palm oil. Thus, kapok seed oil has a good potential to be used as biodiesel G1 [5] and kapok seed oil can be produced for Green Diesel.

Several researches on kapok seed in making biodiesel from cotton seed oil prepared by non-catalytic SCF conditions that was carried out by Demirbas [4]. Performed by Salamah, Ahtawan, Hendra, utilization of kapok seed is as industrial waste kapok to make an alternative biodiesel fuel [5]. The researcher has [1] characterized the rubber seed oil and the decrease of the FFA value (Free Fatty Acid) as an introduction to produce alternative biodiesel fuels. SNARE [6] researched an overview of catalytic Pd on active carbon support with a saturated production of the next generation biodiesel from natural oil. The renewable production fuels Green Diesel from vegetable oil (palm oil and soybean oil) [3]. This research will be carried out the characterization of kapok seed oil to determine the chemical properties (the water content, fatty acid, FFA and quality of kapok seed oil) as the introduction of Green Diesel production so it could increase the value of kapok seed that has been wasted.

**Kapuk Seed Oil**

One of the materials forming potential of biodiesel is kapok seed oil. Kapok seed oil is derived from the seeds of kapok and kapuk contains in the fruit that produces fibers, cotton for example are used as raw material manufacturing industry home contents pillow, bolsters, and mattress. Kapok seeds as a by-product are rarely used or simply discarded as waste and are sometimes fed to feedstock. Kapuk seed is pressed to obtain the oil. The one of kapok seeds beneficial is that it can be potential feedstock of Green Diesel which has more economic value [4]. Kapok seed is similar to cotton seed, when it is processed to produce oil which is a vegetable oil that would have the potential used as renewable fuel.
Each kapok seed has its own characteristics. The characteristics include of water content, fatty acid, Free Fatty Acid (FFA), specific gravity, viscosity kinematic, Flash Point, Pour Point so any raw materials are necessary to be researched. This research is intended to give knowledge about the characteristics of kapok seed oil as a feedstock to produce Green Diesel in order to increase the effective used and economic value of kapok seed, especially for kapok industry that has waste or animal feed.

2 Experimental

2.1 Determination of Water Content

The water content determined with heating the oven. Kapok Seed was weight then heated in oven about two hours at 110°C. The sample cooled until it reached a steady of temperature room, then wait for the sample weight until it got constant. The water content contained in kapok seed with comparison weight before and after heated.

2.2 Analysis of Fatty Acid Content of Kapok Seed Oil

Kapok seed oil was produced from pressing seed gum. The oil was analyzed by using GC-MS (Gas Chromatography - Mass Pec) in the laboratory of Organic Chemistry, Faculty of Mathematics and Natural Sciences, University of Gadjah Mada Indonesia.

2.3 Analysis of Free Fatty Acid (FFA)

Kapok seed oil weight was 10-20 grams. Neutral alcohol 96% was added and then heated in a water bath 10 minutes while stirring and cooling with a closed back cooling. After cooled and then titrated with 0.1 N KOH used the indicator which was red phenolphthalein until the proper of the solution guava red cooler. FFA is determined by the formula:

\[
\text{Determination of FFA value} \quad \text{The Acid value was calculated using the formula:}
\]

\[
\% \text{ FFA} = \frac{A \times N \times Mr}{G \times 10}
\]

A : amount of ml KOH for titration
N : normality of KOH
G : weight of sample (gram)
Mr : weight molecule relatif of fatty acid dominant

2.4 Quality Test of Kapuk Seed Oil

Kapok seed oil which was used for the manufacture of Green Diesel quality was tested to meet the standards quality of the oil, since it was necessary to check the
quality results of Green Diesel product. Green Diesel was acquired in the end of the phase accordance with the specifications established by the Government of Green Diesel.

3 Result and Discussion

3.1 Water Content

Based on the result of water content that obtained in the kapuk seed was 4.07%. The water content contained in the kapok seed was still normal. According Sunanto (1994) water content in 100 grams of material is 7 grams (7 %) [5].

kapuk seed used researched are in figure 1 as follows:

Figure 1  Kapok seed

3.2 Analysis of Fatty Acid

The analysis of fatty acid content in kapok seed oil was analyzed by Gas Chromatography Maspec (GC-MS). The results of the analysis by GC-MS are in Figure 2 as follows:
The data from GC-MS analysis results in getting the most predominant fatty acids were linoleic acid (located on the graph line 6 of 50.89 %, followed by other fatty acids content of 20.93% and 17.84% (peak number 7), such as palmitic acid and oleic acid. The fatty acid content of the seed cotton oil with a molecular weight of 294 was the data that could be calculated from the levels of FFA (free fatty acid) of kapok seed oil.

3.3 The analysis FFA kapok seed oil

The FFA content of kapok seed oil obtained FFA value of 7.35%. This value was relatively high. Considerably from the manufacture of Green Diesel, it should not be lowered due to the decrease in its FFA. Because of the decreased of FFA using H2SO4 catalyst (PA) concentrated will cause corrosive to the reactor. Oil with FFA 7.35 will be manufactured to produce the green diesel.

3.4 The quality of kapok seed oil

The brown kapuk seed oil quality was tested in the laboratory of Oil Gas Technology and Coal Chemical Engineering Department, Faculty of Engineering, University of Gadjah Mada, Yogyakarta, Indonesia. Oil content quality test results can be seen in Table 1 below:
Table 1  Test results of the kapok seed oil quality

<table>
<thead>
<tr>
<th>No.</th>
<th>Type of test</th>
<th>Unit</th>
<th>Result Test</th>
<th>Methods of test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Specific Gravity at 60/60 °F</td>
<td>gr/ml</td>
<td>0.911</td>
<td>ASTM D 1298</td>
</tr>
<tr>
<td>2</td>
<td>Viscosity Kinematic at 40 °C</td>
<td>mm²/s</td>
<td>37.29</td>
<td>IKU/5.4/TK-02</td>
</tr>
<tr>
<td>3</td>
<td>Flash Point PM.c.c</td>
<td>°C</td>
<td>252.5</td>
<td>IKU/5.4/TK-03</td>
</tr>
<tr>
<td>4</td>
<td>Pour Point</td>
<td>°C</td>
<td>3</td>
<td>IKU/5.4/TK-04</td>
</tr>
</tbody>
</table>

The test results demonstrated the quality of cotton seed oil that can be used for the manufacturing of Green Diesel. Furthermore, these physical properties results showed that the kapok seed oil has properties same with jatropha oil [7] which could be used for the production of Green Diesel feedstock.

4 Conclusion

From the result of the research, the researchers could draw conclusion as follows:

1. The kapok seed oil feedstock has 4.07% water content. The FFA value of kapok seed oil is 7.35%. The kapok seed oil contained several fatty acids, the most dominant was 50.89% linoleic acid. The characteristics of kapok seed oil has been appropriated with the characteristics of vegetable oil which can be used for the Green Diesel production.

2. The kapok seed oil is as well as the vegetable oil quality which is ready to be processed.

5 Reference


