Review

Prediksi Kualitas Biodiesel Berdasarkan Komposisi Asam Lemak Bahan Mentah (Minyak-lemak)

*Prediction of Biodiesel Quality Base on The Feedstock Fatty Acids Composition (Oils and Fats)*

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**Abstract**

The characteristics of biodiesel are similar to diesel fuels, and therefore biodiesel becomes a strong candidate to replace the diesel fuels if the need arises. Biodiesel standard – so called SNI 04-7162-2006 has been approved by the Indonesian National Standardization Agency (BSN). The basic fuel properties for biodiesel are influenced by the fatty acid composition of the feedstock such as the density, viscosity, cetane number, heating value and cloud point. Therefore, the value of these properties can be predicted from the fatty acids composition of the feedstock using the blending equations. This work uses pure component data for methyl palmitate, methyl stearate, methyl oleate, and methyl oleate to develop and test blending equations for the prediction of the basic fuel properties. The results from the blending equations are compared with literature values for biodiesel for a number of triglyceride sources such as palm and jatropha oils. Typical average errors are less than 10% for the density, cetane number and heating value. The blending equation for the viscosity and cloud point are suitable only for a specified biodiesel.

**Keywords:** biodiesel, basic fuel properties, blending equation, SNI.

Developing A Calibration Model of Leaf Water Potential Determination in Tomato Plants Using NIR Spectroscopy with Temperature Compensation

Pengembangan Model Kalibrasi untuk Penentuan Leaf Water Potential Tanaman Tomat Menggunakan NIR Spectroscopy dengan Kompensasi Suhu

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Abstract

In this study a calibration model with temperature compensation for leaf water potential (LWP) determination in tomato plants was successfully developed. A number of 150 tomato plants (Lycopersicon esculentum cv. Momotaro T-93) were used as samples. The plants were cultivated under same EC level (0.8 dSm⁻¹) in Deep Flow Technique (DFT) using Wagner's pot. For each leaf, the "on-plant" six spectral acquisitions from six positions were conducted. The measuring condition for spectral acquisitions was 10 ms for scanning time and 50 scans for averaging. Immediately after the "on plant" spectral acquisition, leaf was cut and its LWP value was measured using the pressure chamber method. The Partial Least Squares (PLS) Regression was used to develop a calibration model. The result showed that the best calibration model with temperature compensation was identified for the original spectra in the wavelength range of 700-1040 nm. This calibration model had $R^2 = 0.83$, SEC = 0.091 and SEP = 0.120. This calibration model resulted in low SEP and bias for prediction of LWP for samples having temperature 15, 25 and 35°C. This study has shown the superiority of using calibration model with temperature compensation to that without temperature compensation. This result opened the possibility of using NIR spectroscopy as a tool for nondestructive on-plant LWP determination on the field.

Keywords: calibration model, temperature compensation, leaf water potential, pressure chamber method, on-plant spectral acquisition, on-plant LWP determination

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Technical Paper

Aplikasi Model Artificial Neural Network Terintegrasi dengan Geographical Information System untuk Evaluasi Kesesuaian Lahan Perkebunan Kakao

Application of integrated Model Artificial Neural Network and Geographical Information System for Land Suitability Evaluation of Cocoa Estate

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Abstract

Land evaluation for specific purpose in plantation sector become very important due to increasing the competition in land use and the development of plantation sector. Land evaluation produces information of land economic values for specific land use. The objective of the research is to develop land evaluation method for cocoa estate using integrated model Artificial Neural Network (ANN) and Geographical Information System (GIS). Back propagation ANN model were used to predict cocoa yield base on land qualities parameter. The result shows that the best of ANN model to predict cocoa yield have 15 input layer, 15 hidden layer, and 1 output layer, with the determination coefficient (r²) of 0.99 and Root Mean Square Error (RMSE) of 93.83 in the training process, otherwise in the testing found the r² of 0.76 and RMSE of 113.83. In verification stage the integrated model of ANN and GIS was used to evaluate land suitability of Wijayaarga Cocoa Plantation is seem accurate in predicting cocoa yield and easers to mapping the land suitability unit.

Keywords: ANN, GIS, Land Evaluation, Cocoa

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Technical Paper

Pendekatan Analitik untuk Menduga Koefisien Pindah Panas Konveksi

Analytical Approach in Estimating Convective Heat Transfer Coefficient

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Abstract

Convective heat transfer coefficient has an important role in thermal processes. It is commonly determined and formulated using empirical models, while some workers have also proposed formulas based on analytical methods. This paper describes the formulation of convective heat transfer coefficient using an analytical approach which could be expressed as \( h = 5.277 V^{0.5} \).

Keywords: convective heat transfer coefficient, analytical approach

Technical Paper

Pengukuran Parameter Sifat Viskoelastis Biji Kedelai Berdasarkan Model SMK (Simplified Maxwell-kelvin) dan DM (Degenerated Maxwell)

Measuring The Parameters of The Viscous-elastic Property of Soybean Grain using SMK (Simplified Maxwell-Kelvin) and DM (Degenerated Maxwell) Models

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Abstract

Soybean seed with high proportion (25%) of hard grain is reported to have long storability and minimum pre harvest deterioration. Therefore, it is imperative to measure the parameter of the viscous-elastic properties of soybean grain in conjunction with the hard grain characteristic. This information is important in optimizing the post harvest processing system of soybean seed, especially at threshing process. Willa variety of soybean with grain moisture of 13.78% wet basis was used in this study. The measurement of the parameters of the soybean grain viscous-elastic property was conducted using a Rheometer (Model EZtes/CE, Merek Shimadzu), based on the SMK and DM models, combining three parameters of spring (Kc) and dashpot (C). The measurement of the parameters of the soybean grain viscous-elastic property was done with 15 replications through 15 soybean grains taken randomly. The values of soybean grain viscous-elastic parameters using SMK model were K1 = 48.21 N/mm (Standard Deviation (SD) = 3.46 N/mm) K2 = 46.44 N/mm (SD = 8.66 N/mm) and C1 = 380.79 N-s/mm (SD = 59.19 N-s/mm) respectively. While using DM Model the values of soybean grain parameters were K3 = 23.34 N/mm (SD = 3.46 N/mm); K4 = 24.87 N/mm (SD = 1.68 N/mm) and C2 = 1001.93 N-s/mm (SD = 7.70 N-s/mm) respectively. Model validation show that both SMK and DM models had coefficient determination (R²) > 0.90.

Keywords: Soybean grain, Viscous-elastic property, SMK and DM models.

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Technical Paper

Kinerja Hidrolika Sistem Fertigasi Mikro

Hydraulic Performances of Micro Fertigation System

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Abstract

A micro fertigation system was designed using local components, simple and easy to build, operate and repair by farmers. Evaluation of hydraulic performances consists of long-path size in emitters, relationship between discharge and head in emitter, head loss along the lateral, and emission uniformity. The result of the research indicated that the micro fertigation system with 0.5 mm inside diameter micro-tubing used to control the flow from outlets along laterals. The individual microtube was 0.5 m long and spaced at 0.3 m interval along laterals. The discharge was adjusted by stop valves and ranges from 0.40 – 2.74 ltrs/h at operating heads of 0.2-1.5 m. The emission exponent, n was 0.86, and the head-discharge equation was \( Q_v = 1.94 H^{0.86} \). The coefficient of manufacturing variation, CV was 0.043 from 125 samples of emitters, and an interpretation of values was excellent. Accordingly allowable length of lateral (at operation head, \( H = 1 \) m) 15 meters of length PVC hose ¼ inch size was acceptable and 25 meters of length PVC hose 5/16 inch size was acceptable. The design of micro fertigation system have emission uniformity, \( EU > 85\% \) for all treatments.

Keywords: micro fertigation system, hydraulic performance, emission exponent, head loss, emission uniformity

Technical Paper

Lama Pemanasan Metode Vapour Heat Treatment (VHT) dan Pelilinan Untuk Mempertahankan Mutu Pepaya Selama Penyimpanan

Exposure Time of Vapor Heat Treatment Method Following Waxing to Maintain Fruit Quality of Papaya During Storage

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Abstract

Horticulture products are host for Tephritidae fruit flies that are considered a quarantine risk by many importing countries. This research was conducted to find out the specific condition for the heat treatment using vapor heat treatment (VHT) method to control pests and diseases of papaya and the fruit quality during storage. Papayas were vapor heat treated at medium temperature of 46.5 °C for 0, 15, and 30 minutes. After the treatment, the fruits were waxed using beeswax of 6% in concentration and then stored at temperature of 10°C. The results show that the fruit fly of oriental fruit fly (Bactrocera dorsalis) was completely killed by treating in deep water testing at temperature of 46 °C for 10 minutes or at 43 °C for 30 minutes. The VHT of papaya at fruit core temperature of 45.5-46.0 °C for 15-30 minutes following waxing using beeswax of 6% in concentration was found to be effective to control pest and diseases until 21 days of storage without any visible signs of heat injury and without adversely affecting the quality of the fruit.

Keywords: Papaya, vapor heat treatment, waxing, quarantine

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Technical Paper

Porancangan dan Konstruksi Mesin Sortasi dan Pomutuan Buah Jeruk dengan Sensor Kamera CCD

Design and Construction of Sorting and Grading Machine for Citrus with CCD Camera as The Senso

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Abstract

Citrus is one of important fruits in Indonesia and its production increases every year. However, postharvest equipment for citrus is very limited, leading to low postharvest technology utilization. The objective of this research was to develop a real-time quality evaluation system using a color CCD camera, to be used as an image sensor and processing unit for quality evaluation of the citrus from acquired image. The system consists of a color CCD camera, a computer with an image frame grabber, an image acquisition chamber, a logic control panel, and a software to run all the installed hardware.

Some important parameters of visual quality of citrus were studied. Five groups of different quality of citrus, obtained from a big trader in Pasar Induk Kramatjati, were used for samples. The images were captured and then analyzed with image processing program using area projection and RGB and HSI color model algorithms, for the fruit size and color respectively. The results were analyzed to determine whether there were parameters that correlates with weight, sweetness and firmness, to be used for quality evaluation. Visual parameters that figures the real quality of citrus best were then selected to be used for quality parameters to develop a real-time quality evaluation system for citrus in the next step.

Keywords: Image processing, sortasi, pomutuan, otomatis

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Simulasi Penggunaan Lahan Untuk Kelestarian Bendung Bila pada Sub Das Bila Propinsi Sulawesi Selatan

The Land Use Simulation For Bila Weir Continuity In Bila Sub-Watershed, Province Of South Sulawesi

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Abstract

The optimal land use system in Bila sub-watershed is the land use system that can give erosion contribution rate below or minimally equal to the Tolerable Soil Loss (TSL) value of Bila sub-watershed soil. The erosion factors are determined by parameter: \( R \) (rain erosivity), \( K \) (soil erodibility), \( LS \) (topography), \( C \) (land coverage), and \( P \) (land conservation). Each parameter is overlaid, then it is evaluated in each land unit in Bila sub-watershed. The acquired data is processed by using Geographic Information System (GIS) supported with Arc View program and Microsoft Word and Microsoft Excel softwares.

The qualified erosion and sediment rate values obtained from simulation result which is meet the standard for erosion and sediment control and management in Bila sub-watershed area and Bila weir were 10,597 tonnes/he/year and 50,864 m$^3$/km$^2$/year respectively.

Keywords: ---

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The design of modified atmosphere packaging (MAP) requires steady state respiration rate data. The respiration rate of fresh produce is usually measured by the open system method where a steady stream of gas is passed through a respiration jar. It needs gas mixing unit to get certain level of controlled atmosphere (CA) conditions and an instrument to analyze gas composition. In this research, a gas chromatograph of Hewlett Packard of HP 5890 series with thermal conductivity detector and suitable column was used to analyze the composition of oxygen, carbon dioxide and nitrogen simultaneously. The measuring result of respiration rate of broccoli under CA conditions indicated that the gas composition gave significant influences. The respiration rate at a constant CO$_2$ concentration decreases with decreasing O$_2$ concentration.

**Keywords:** broccoli, respiration rate, modified atmosphere packaging, gas chromatograph

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