UNIVERSITI PUTRA MALAYSIA

MOISTURE CONTENT OF KENAF (*Hibiscus Cannabinus L.*) STEM BASED ON MICROWAVE DIELECTRIC PROPERTIES

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By

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

MOISTURE CONTENT OF KENAF (*Hibiscus Cannabinus L.*) STEM BASED ON MICROWAVE DIELECTRIC PROPERTIES

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January 2013

Chairman: Associate Professor Khalina Abdan, PhD

Faculty: Engineering

This research investigated the relationship between microwave the dielectric properties of kenaf plant and it's MC for purpose of developing an in-situ sensor for the measurement of kenaf stem fibre MC. The rectangular waveguide resonator method was used to determine the dielectric properties of kenaf stems and the results were compared with those of the oven dried method of various drying times. The relationship between the dielectric properties and MC and frequency were investigated. The dielectric constant, ε' and loss facor, ε" in the kenaf stem, core and bast at frequencies 8.7875 GHz and 10.1882 GHz showed cubic relationship with MC. The equation for in-situ MC determination in kenaf stem was established and compared with those of the conventional drying method to evaluate the accuracy of the new equation established. The R^2 value for kenaf stem samples at B, M and T portion at frequency show strong relationship that is above 0.9 compared with kenaf core and bast samples. In bast, the correlation between dielectric properties with MC was not good thus the MC determination equation cannot be established. The ability of this technique to determine the kenaf stem MC accurately and rapidly will not

only help in improving the efficiency of decorticator machine in kenaf processing, but also in improving fibre quality and market price of kenaf fibre.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

KANDUNGAN AIR DI DALAM KENAF (*Hibiscus cannabinus* L.) BERDASARKAN PENGUKURAN CIRI-CIRI DIELEKTRIK MIKROWAVE

Oleh

MOHD NAZREN BIN RADZUAN

January 2013

Pengerusi: Professor Madya Khalina Abdan, PhD

Fakulti: Kejuruteraan

Penyelidikan ini bertujuan untuk mengkaji hubungan antara ciri-ciri dielektrik mikrowave dengan kandungan air di dalam batang kenaf sekaligus dapat membantu untuk membuat penderia yang dapat menentukan peratusan kandungan air di dalam batang kenaf secara cepat dan tepat. Teknik laluan gelombang gemaan berbentuk segiempat tepat telah digunakan dalam menentukan nilai dielektrik di dalam kenaf stem dan dihubungkan dengan proses pengeringan pada masa pengeringan yang berbeza. Data tersebut digunakan untuk mengkaji hubungannya dengan kandungan air dan frekuensi gelombang. Nilai pemalar dielektrik, ε' dan factor kehilangan, ε" di dalam batang, teras dan kulit kenaf pada frekuensi 8.7875 GHz dan 10.1882 GHz menunjukkan hubungan kubik apabila ianya dihubungkan dengan kandungan air. Formula untuk mengira peratusan kandungan air di dalam batang kenaf telah diwujudkan dan dibandingkan dengan peratusan kandungan air yang menggunakan proses pengeringan oven untuk menentukan ketepatan formula yang telah dibentuk. Nilai R^2 pada bahagian sampel batang kenaf menunjukkan hubungan yang baik berbanding dengan bahagian teras dan kulit kenaf. Kulit kenaf pula tidak

menunjukkan hubungan yang baik dengan kandungan air dan ianya tidak boleh digunakan untuk menentukan kandungan air dalam kulit kenaf. Keupayaan teknik ini untuk mengukur kandungan air di dalam batang kenaf dengan tepat dan cepat bukan sahaja dapat meningkatkan keupayaan mesin dekortikator dalam pemprosesan kenaf malah dapat meningkatkan kualiti fiber tersebut menentukan harga pasaran bagi kenaf fiber.

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I certify that an Examination Committee has met on **17 January 2013** to conduct the final examination of **Mohd Nazren bin Radzuan** on his **Master of Science** thesis entitled "**Moisture Content of Kenaf (*Hibiscus Cannabinus L.*) Stem Based on Microwave Dielectric Properties**" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree.

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any degree at Universiti Putra Malaysia or other institutions.

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MOHD NAZREN BIN RADZUAN

Date:

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