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DETERMINATION OF RADIAL GROWTH IN SELECTED TROPICAL TREE SPECIES USING PINNING METHOD AND DENDROMETER

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MASTER OF SCIENCE
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DETERMINATION OF RADIAL GROWTH IN SELECTED TROPICAL TREE SPECIES USING PINNING METHOD AND DENDROMETER

By

NORLINE ZARNUDIN

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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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

DETERMINATION OF RADIAL GROWTH IN SELECTED TROPICAL TREE SPECIES USING PINNING METHOD AND DENDROMETER

By

NORLINE ZARNUDIN

November 2010

Chairman: Prof. Mohd Hamami Sahri, PhD

Faculty: Forestry

Radial growths of *Shorea leprosula* (Meranti tembaga), *Hopea odorata* (Merawan siput jantan), *Shorea parvifolia* (Meranti sarang punai) and *Endospermum malaccense* (Sesenduk), growing under humid tropics in Selangor was studied in a one year period. The objectives of this study were to investigate the radial growth increment of the above species through dendrometer and pinning methods. Meteorological data of the experimental sites for one year period were also obtained. In this method, a comparison of vessel and ray width before and after the wounding was carried out. Average vessel diameter changed from large to the small diameter. However average ray width changed from small to a large diameter once when a pin was inserted. In *S. leprosula* average vessel diameter changed from 238 to 104 µm. Average vessel diameter of *H. odorata* changed from 203 to 128 µm. Ray's width changed from 44 to 58 µm in *S. leprosula* and 43 to 54 µm in *H. odorata.* Through the pinning experiment radial growth of all selected tree species was obtained. Traumatic resin canals (TRC) usually occur sporadically due to injury in concentric formation formed in dipterocarp species. Measurement of the length of TRC in a

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tangential direction was obtained. In *S. leprosula* tangential length was 38.6 mm and average diameter of TRC was 86.7 μm (in normal wood, average diameter of resin canal was 53.4 μm). In *H. odorata* tangential length of TRC was 25.6 mm while diameter was 31.4 μm. Correlation between monthly radial growths with meteorological data was investigated. From the experiments, *S. leprosula* and *S. parvifolia* have the correlation coefficient in a range of 0.3. This phenomenon is considering *S. leprosula*, *S. parvifolia* and *E. malaccense* species correlated significantly with precipitation. The correlation between monthly radial growth and precipitation indicates a general positive relationship. The study concluded that the dendrometer and pinning method was appeared to be a simple and effective method to measure the radial growth changes in these tropical trees.

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PENENTUAN PERTUMBUHAN JEJARI POKOK UNTUK SPESIS TROPIKA YANG TERPILIH MENGGUNAKAN KAEDAH "*PINNING*" DAN DENDROMETER

Oleh

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November 2010

Pengerusi: Prof. Mohd Hamami Sahri, PhD

Fakulti: Perhutanan

Kajian Pertumbuhan jejari (diameter) bagi spesis *Shorea leprosula* (Meranti tembaga), *Shorea parvifolia* (Meranti sarang punai), *Hopea odorata* (Merawan siput jantan) dan *Endospermum malaccense* (Sesenduk) di kawasan panas dan lembap tropik di Semenanjung Malaysia telah dijalankan selama setahun. Objektif kajian ini adalah untuk menentukan pertumbuhan jejari pokok yang telah diketahui umurnya dengan menggunakan kaedah "*pinning*" (mencederakan pokok dengan pin) dan dendrometer. Data meteorologi bagi tempoh eksperimen juga diperolehi. Semua sampel spesis pokok menunjukkan corak pertumbuhan jejari berterusan berdasarkan pengukuran kedua-dua kaedah ini."*Pinning*" eksperimen, menunjukkan apabila pin memasuki sel batang dengan serta merta akan terbentuk sel luka dan musnah. Pada masa "*pinning*" dikenakan, di kedudukan kambium awal disimpulkan berlaku pembesaran sel-sel jejari dan pembentukan "*vessel*" (tempat menyimpan air) yang berdiameter kecil. Purata diameter "*vessel*" *S. leprosula* berubah daripada 238 kepada 104µm. Purata diameter vessel *H. odorata* didapati berubah daripada 203

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kepada 128 μm. Purata lebar jejari berubah daripada 44 to 58 μm pada *S. leprosula* dan 43 kepada 54 μm pada *H. odorata*. Melalui kajian "*pinning*" penentuan pertumbuhan jejari setiap pokok yang terpilih diperolehi. Salur damar trauma kebiasaannya akan terbentuk apabila berlakunya kecederaan pada pokok spesis dipterokap. Oleh itu, pengukuran panjang salur damar trauma diperolehi. Purata panjang arah melintang salur damar trauma adalah 38.6 mm dan purata diameter salur damar trauma adalah 86.7 μm (pada kayu normal, purata diameter salur damar adalah 53.4 μm). Manakala pada *H. odorata* purata panjang arah melintang adalah 25.6 mm. Diameter salur damar trauma adalah 31.4 μm. Kolerasi antara pertumbuhan jejari bulanan dengan data meteorologi dikaji. Daripada kajian, didapati, bahawa *S. leprosula* dan *S. parvifolia* memperolehi korelasi koefisiensi dalam lingkungan 0.3. Fenomena yang berlaku pada *S. leprosula, S. parvifolia* and *E. malaccense* spesis mempunyai kepentingan kolerasi dengan taburan hujan. Korelasi antara pertumbuhan jejari bulanan dan data meteorologi diselidiki. Hasil daripada kajian, mendapati kolerasi antara pertumbuhan jejari bulanan dan taburan hujan bulanan secara keseluruhannya mempunyai hubungan yang positif.

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I certify that an Examination Committee has met on 2010 to conduct the final examination of Norline Zarnudin on her Master of Science thesis entitled "Determination of Radial Growth in Selected Tropical Tree Species using Pinning Method and Dendrometer" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the student be awarded the degree of Master of Science.
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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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DECLARATION

I declare that the thesis is 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 other degree at Universiti Putra Malaysia or other institutions.

NORLINE ZARNUDIN

Date: 19 November 2010

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