UNIVERSITI PUTRA MALAYSIA

EFFECTS OF FERTILIZERS AND MEDIA ON JUSTICIA GENDARUSSA BURM F. CUTTINGS AND THEIR BIOMASS

NUR ADNILAILA BINTI HAMZAH

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By

NUR ADNILAILA BINTI HAMZAH

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

July 2012

DEDICATE TO

MAMA AND ABAH

MY BROTHERS AND SISTERS

WE FIGHT WE HUG WE'RE FAMILY

NEPHEW AND NIECE

SARANGHAE

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

EFFECTS OF FERTILIZERS AND MEDIA ON *JUSTICIA GENDARUSSA* BURM F. CUTTINGS AND THEIR BIOMASS

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NUR ADNILAILA BINTI HJ HAMZAH

July 2012

Chairman: Associate Professor AzmyHj Mohamed, PhD

Faculty: Forestry

Justiciagendarussa is considered as an important medicinal plant species. This species has been used in both traditional and modern medicine practice and has a vast potential to be commercialized in future market. In order to get better growth performance of the plant, several aspect should be considered such as cutting selection, suitability of the media and types of fertilizer. These factors are important to ensure better growth performance thus increase yield and enhance the biomass value.However, little information is available on the growth performance or on the biomass aspect of *J. gendarussa*. A silvicultural study was conducted with objectives to determine the best media for *J. gendarussa*cutting, the best organic fertilizer for *J. gendarussa* growth and also to determine the biomass based on various treatments on the cuttings of *J. gendarussa*.In order to determine the best propagation part of *J. gendarussa*, the plant was divided into three different cutting parts: shoot, mid-stem and basal part. Cutting from these parts were assigned to four different media of topsoil only, topsoil mixed with treated palm oil mill effluent (POME) at the ratio 1:1, topsoil mixed with POME at the ratio 1:2, and POME only. After four months, the plantlets were transferred into planting site inSeremban, Negeri Sembilan. Three types of organic fertilizers with four

different rates were applied according to the experimental design. The fertilizers were wood charcoal, bamboo charcoal and chicken manure and the rates are 0 g, 50g, 100g and 150g. The experimental design used for this study was Randomized Completely Block Design (RCBD) with total of eight replicates. After six month in planting site, the *J. gendarussa* were harvested to determine its wet and dry weight. Height, crown diameter and stem diameter of the plants were measured and growth increment data was used for statistical analysis. For growth performance in nursery, the data were collected once a week while in planting site the data were collected twice a month. The result indicated that in the nursery stage, the shoot cutting had showed the highest in height, crown diameter and also stem diameter with mean value at 13.09 cm, 12.4 cm and 0.46 cm respectively. The result also indicate that medium of topsoil (1): POME (2) hadthe highest mean value for all parameters with 10.14 cm for height, 10.33 cm for crown diameter and 0.36 cm for stem diameter. For growth performance of *J. gendarussa* at the planting site, the result showed that there was significant different for interaction between the medium, type of fertilizer and the growth rates. The result also showed that for height parameters, *J. gendarussa* have the highest mean value of 26.36 cm when cutting at the shoot part and medium consisting of topsoil (1): POME (2) gave the best result with mean height at 33.28 cm. The best fertilizer is chicken manure with application at 150 g which gave the highest mean height of 36.43 cm. For crown diameter of *J. gendarussa*, the cutting at mid-stem gave the superior result of 9.05 cm. The best medium was topsoil (1): POME (2) which record the mean crown diameter length at 11.73 cm and the best fertilizer for crown diameter was chicken manure with 14.89 cm by application at 100 g. Meanwhile, for the diameter of *J. gendarussa*, the shoot cutting again gave the biggest mean value of 0.9 cm. However, the best medium was topsoil with mean diameter for *J. gendarussa*at 1.01 cm. Wood charcoal gave the biggest mean diameter value of *J. gendarussa*1.35 cm when applied at 150 g. The dry weight was used to determine the biomass value. The results indicated that

the leaves and stem portion of *J. gendarussa* had higher dry weight compared to root part. Cutting at the shoot part had produced mean dry weight of *J. gendarussa* at 0.6 t/ha with media of topsoil (1): POME (2) had resulted mean dry weight of *J. gendarussa* at 0.8 t/ha. The result also showed that both chicken manure and bamboo charcoal produced higher dry weight for *J. gendarussa* which both application resulted at 0.4 t/ha when allotted 1.5 t/ha of either fertilizers. Thus, *J. gendarussa* can be propagated from shoot cutting with medium consisting of topsoil (1): POME (2). In addition, the best fertilizer to be applied is chicken manure at 150 g.

Abstraktesis yang dikemukakankepadaSenatUniversiti Putra Malaysia
sebagaimemenuhikeperluanuntukijazah Master Sains

KESAN BAJA DAN MEDIA TERHADAP KERATAN *JUSTICIA GENDARUSSA* BURM F. DAN BIOMASS

Oleh

NUR ADNILAILA BINTI HJ HAMZAH

Julai 2012

Pengerusi: ProfesorMadyaAzmyHj Mohamed, PhD

Fakulti: Perhutanan

*Justiciagendarussa*merupakansalahsatudaritumbuhanubatan yangpenting.Spesiesiniseringdigunakansamaada di dalamperubatantradisionalmahupunperubatanmodendanmempunyaipotensi yang luasuntukdikomersilkan di pasaranakandatang. Bagimemastikanpertumbuhan yang baik, beberapaaspekperludiambilkirasepertipemilihankeratan, kesesuaian media danjenisbaja.Faktor-faktorinipentingdalammemastikanpertumbuhan yang baik yang manadapatmeningkatkanhasildanseterusnyanilai biomass.Walaubagaimanapun, hanyasedikitsahajamaklumat yang terdapatmengenaitumbuhaniniterutamadarisegipertumbuhanatau pun jugadariaspek biomass.Suatukajiansilvikulturtelah pun dijalankandenganbeberapaobjektifiaituuntukmenentukan media terbaikbagikeratan*J. gendarussa*, menentukanbajaterbaikbagipertumbuhan*J. gendarussa*danjugauntukmenentukan biomass *J. gendarussa*berdasarkanrawatan-rawatan yang dijalankankeataskeratannya.Untukmenentukankaedahpembiakantampang yang paling

sesuaibagi*J. gendarussa*, keratanpadatigabahagian yang berbezadigunakaniaitu; pucuk, batangtengahdanbahagianbawah.Setiapkerataninikemudiannyadiletakkankedalamempatjenis media yang berasinganiaitutanahatassahaja, sisakilangkelapasawit yang dirawat (POME) sahaja, campurantanahatasdan POME dalamnisbah 1:1 danjugacampurantanahatasdan POME dalamnisbah 1:2. Selepasempatbulan, tumbuhanini di alihkankekawasantanaman di Seremban, Negeri Sembilan.Tigajenisbajaorganikdenganempatkadar yang berbezadigunakanmengikutrekabentukeksperimen yang telahditetapkan. Baja yang digunakanadalaharangkayu, arangbuluhdanjugabajatahiayam.Manakalakadar yang digunakanadalah 0 g, 50 g, 100 g dan 150 g. Rekabentukeksperimen yang digunakanuntukkajianiniadalahRekabentuk Blok PerawakanLengkap (RCBD) denganlapanreplikasi. Selepasenambulan di lapangan, tumbuhaniniduaibagimenentukanberatbasahdanberatkering.Tinggipokok, diameter silaradanjuga diameter diukurdan data peningkatanpertumbuhandigunakanbagitujuananalisisstatistik.Untukpertumbuhan di nurseri, data dicatatsetiapminggumanakala di lapangan, data dicatatdua kali dalamsebulan.Keputusankajianmenunjukkanbahawa di peringkatnurseri, keratanpadapucukmenunjukkanhasil yang tinggipada parameter ketinggian, diameter silaradan diameter dengannilai min 13.09 cm, 12.4 cm dan 0.46 cm mengikutsetiap parameter. Keputusanjugamenunjukkanbahawa media campurantanahatasdan POME padanisbah 1:2 jugamenunjukkannilai min tertinggiterhadapsemua parameter iaitu 10.14 cm pada parameter ketinggian, 10.33 cm pada diameter silaradan 0.29 cm pada diameter. Bagipertumbuhan*J. gendarussa* di lapangan pula, keputusankajianmenunjukkanterdapatperbezaanketaradalaminteraksiantara media, jenisbajadanjugakadarbaja. Keputusanjugamenunjukkanbahawauntuk parameter ketinggian, keratanpadapucuksekalimemberikanhasilpertumbuhan yang terbaikdengannilai min

padaketinggianiaitu 26.36 cm dan media tanahatas (1): POME (2) merupakan media terbaikdengan min pertumbuhanketinggian 33.28 cm. Jenisbajaterbaikuntukpertumbuhanketinggianpokokadalahbajatahiayamdengannilai min ketinggianpada 36.43 cm apabilapenggunaanpadakadar 150g. Bagi diameter silara pula, keratanpadabahagianpertengahanbatangmenunjukkankeputusanterbaikdengan 9.05 cm dan media terbaik pula adalahcampurantanahatasdan POME padanisbah 1:2 dengannilai diameter silarapada 11.73 cm. Baja terbaikuntukpertumbuhan diameter silarabagi*J. gendarussa* pula adalahbajatahiayamdenganpenggunaanpadakadar 100 g dengannilai diameter silarapada 14.89 cm. Untuknilai diameter, keratanpadabahagianpucuksekalilagimemberikannilai min tertinggiiaitu 0.9 cm. Walaubagaimanapun media terbaikbagipertumbuhan diameter adalah media tanahatassahajadengannilai diameter pada 1.01 cm. Baja arangkayumemberikannilai min diameter tertinggidengan 1.35 cm padakadar 150g. Beratkeringtelahdigunakanbagimenentukannilai biomass. Hasilkajianmenunjukkanbahawabahagiandaundanbatang*J. gendarussa*memberikanberatkeringtertinggiberbandingbahagianakar.Keratanpadabahagianpucukmemberikannilaiberatkering*J. gendarussa*pada 0.6 t/ha dengan media campurantanahatas (1): POME (2) memberikanberatkering*J. gendarussa*pada 0.8 t/ha. Keputusankajianjugamenunjukkanbahawabajatahiayamdanarangbuluhmemberikannilaiberatkeringtertinggipada*J. gendarussa* yang manakeduanyamenunjukkankeputusanberatkering*J gendarussa*pada 0.4 t/ha apabiladiberikan 1.5 t/ha darisalahsatubaja.Denganitu, *J. gendarussa*bolehdibiakkandenganmenggunakankeratanpadabahagianpucukdanmenggunakan media yang mempunyaicampurantanahatasdan POME padanisbah 1:2. Sebagaitambahan, baja yang terbaik pula adalahbajatahiayamdengankadar 150g.

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I certify that a Thesis Examination Committee has met on 23rd July 2012 to conduct the final examination of NurAdnilailabintiHamzah on her thesis entitled "Effects of fertilizers and media on *Justicia gendarussa* BURM F. cuttings and their biomass" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

Zaidon binAshaari, PhD
Professor
Faculty of Forestry
Universiti Putra Malaysia
(Chairman)

MohamadAzani bin Alias, PhD
Associate Professor
Faculty of Forestry
Universiti Putra Malaysia
(Internal Examiner)

MohdZaki bin Hamzah, PhD
Associate Professor
Faculty of Forestry
University Putra Malaysia
(Internal Examiner)

AbRasip bin AbGhani, PhD
Tree Improvement/ Agroforestry
Biotropics Malaysia Berhad
Malaysia
(External Examiner)

SEOW HENGFONG, PhD
Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of requirement for the degree of Master of Science. The members of Supervisory Committee were as follows:

Azmybin Hj Mohamed, PhD
Associate Professor
Faculty of Forestry
Universiti Putra Malaysia
(Chairman)

MohdNazrebin Saleh@Japri, PhD
Senior Lecturer
Faculty of Forestry
Universiti Putra Malaysia
(Member)

BUJANG BIN KIM HUAT, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

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, and is not currently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

NUR ADNILAILA HJ HAMZAH

Date: 23 July 2012

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