MACRONUTRIENT CONTENT IN MANGROVE SEDIMENT AT SELANGOR RIVER, KG . KUANTAN

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MACRONUTRIENT CONTENT IN MANGROVE SEDIMENT AT SELANGOR RIVER, KG . KUANTAN.

By

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A Project Report Submitted in Partial Fulfillment of the Requirements for the Degree of Bachelor of Forestry Science in the Faculty of Forestry

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DEDICATION

Specially Dedicated to :

My Dear Family :

Zaini Bin Che Lah

Maimunah Bt Abd Wahab

Amir Hamzah Zaini

Nurul Hamizah Zaini

Nurul Husna Zaini

Amir Faez Iskandar Zaini

ABSTRACT

Mangrove forests are a group of trees and shrubs that live in the coastal inter-tidal zone. The mangrove species grow in saline soil and brackish water. Due to water logged condition in mangrove forest, little free oxygen available. The litter fall and decomposition process make mangrove soil consist of nutrient which is important for mangrove tree such as Nitrogen (N), Phosphorus (P), Potassium (K) and others. Therefore, to know the information on nutrient content in mangrove forest, the study on macro nutrient content was carried out at Sungai Selangor, Kg.Kuantan. The objectives of this study were to determine and compare macronutrient content in Sungai Selangor sediment between plot and different depth.   Along the river, five plots were chosen with distance of 50 m between each plot. The sample was collected in five plot and the five plot represent the area of river at Kg. Kuantan. The soil sample were collected using peat auger at different depths. All samples were analyzed using SAS. Based on the finding, the content of Nitrogen (1.36%, ±0.0016) and Potassium (27.26,±4.23) were higher in the upper depth (0–15 cm) while the content of Phosphorus (1.21,±0.08) were higher only in lower depth (15–30 cm). In term of plot, Plot 1 contain higher Phosphorus (1.32,±0.15) and Nitrogen (1.37%,±0.0016) but less content of Potassium (22.96,±1.38). The content of Potassium   was higher in Plot 3 with value (29.54,±10.79) but low Nitrogen (1.36%,±0.004) and Phosphorus (1.12,±0.08) content compared to other plots.. Therefore, the result obtained show there are different amounts of nutrients of macro nutrients between plot and depth along with it physical and chemical properties.

ABSTRAK

Hutan bakau adalah sebuah hutan yang terdiri daripada pokok-pokok renek yang hidup di zon pasang surut pantai. Spesies bakau tumbuh di tanah yang salin atau mengandungi tinggi kandungan garam dan air payau. Kerana keadaan air masuk di hutan bakau, sedikit oksigen percuma. Proses penguraian disebabkan daun-daun yang gugur menyumbang kepada penambahan kandungan nutrient di dalam tanah dan mendapa seperti Nitrogen(N), Phosphorus(P), Kalium(K) dan sebagainya. Oleh itu, untuk mengetahui maklumat mengenai kandungan nutrient di hutan bakau, kajian terhadap kandungan nutrient makro telah dijalankan di Sungai Selangor, Kg.Kuantan. Objektif kajian ini adalah untuk menentukan dan membandingkan kandungan makronutrient dalam sedimen Sungai Selangor antara plot dan kedalaman yang berbeza. Sepanjang sungai, lima plot dipilih dengan jarak 50 m di antara setiap plot. Sampel dikumpulkan dalam lima plot dan lima plot yang dipilih mewakili kawasan sungai di Kg. Kuantan. Sampel tanah dikumpulkan menggunakan "auger" gambut pada kedalaman yang berbeza. Semua sampel dianalisis dengan menggunakan SAS. Berdasarkan analisis yang dijalankan, kandungan peratusan Nitrogen (1.36%, ± 0.0016) dan Potassium (27.26, ± 4.23) lebih tinggi pada kedalaman pertama (0-15 cm) manakala kandungan Fosforus (1.21, ± 0.08) lebih tinggi dalam kedalaman kedua (15-30 cm). Bagi perbandingan antara plot, Plot 1 mempunyai peratusan kandungan Nitrogen (1.37%,±0.0016) dan Phosphorus (1.32,±0.15) yang tinggi tetapi rendah kandungan Kalium Potassium (22.96,±1.38). Kandungan Kalium lebih tinggi dalam Plot 3 dengan nilai (29.54,±10.79) tetapi mempunyai kandungan Nitrogen (1.36%,±0.004) and Phosphorus (1.12,±0.08) yang lebih rendah berbanding plot lain. Oleh itu, hasil yang diperoleh menunjukkan terdapat jumlah nutrien nutrien yang berbeza antara plot dan kedalaman selari dengan sifat fizikal dan kimia tanah yang berbeza bagi setiap plot.

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APPROVAL SHEET

I certify that this research project report entitled " Macronutrient content in mangrove sediment at Selangor River, Kg Kuantan, Selangor" by "Nurul Nazhifah Binti Zaini" has been examined and approved as a partial fulfilment of the requirement for the degree of Bachelor of Forestry Science in the Faculty of Forestry, Universiti Putra Malaysia.

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EC   Electrical Conductivity

CEC   Cation Exchange Capacity

P   Phosphorus

N   Nitrogen

K   Potassium

CHAPTER 1

INTRODUCTION

1.1 Background

Mangrove are one of the world's dominant coastal eco-systems comprised chiefly of flowering trees and shrubs uniquely adapted to marine and estuarine tidal conditions (Tomlinson,1986; Duke, 1992; Hogarth 1999; Sengar,2002; FAO,2007).

Malaysia's coastline is estimated to be 4810 km distributed along the West Coast Peninsular Malaysia (1110 km), East Coast of Peninsular Malaysia (860 km), Sabah (1800 km) and Sarawak (1040 km). In Malaysia, mangrove forest mainly located along the west coast of Peninsular Malaysia, for Sarawak at estuaries (1st Division), Rejang (6th Division) and Trusan-Lawas (5th Division) rivers of Sarawak and along the east coast of Sabah (Shukor & Hamid , 2004).In Malaysia, there are comprises less than 2% mangrove of the total land area. Malaysia consists of 641886 ha of mangrove forest which is 57% in Sabah, 26% in Sarawak and the remaining 17% in Peninsular Malaysia (Shukor & Hamid, 2004).

The main purpose of these study is to identify the macronutrient content in mangrove sediment at Selangor river at Kampung Kuantan. The state of Selangor is one of the states had evolved to urbanization in Malaysia yet there is still big area consist of large areas with forested land scattered in the state either as forest reserves, owned by the state, private companies or private landowners. In the state of Selangor,Selangor river known as one of the main river with the head water orginated from the highland area from the Titiwangsa Range. Titiwangsa range is known as the main range and the backbone of Peninsular Malaysia (Environmental Quality Report, 1996). there are mangrove forest located near Kampung Kuantan before the area undergoing urbanization.These mangroves are believed can give provide high value in wildlife conservation and ecotourism activities. These mangroves are highly colonies by fireflies which glow in the dark which provide a beautiful view during night time. This mangrove also has an abundant of Berembang tree along the riverbank of Kampung Kuantan which extends until 18 km downstream and 8 km upstream. These type of tree grows well in areas of low salinity. Other than that, the this tree also can attract a species of firefly. Based on previous studies, *Pteroptyx tener* lives in big colonies and most of the tree with young leaves is inhibited by each colony in the areas of low involvement of human (Hamzah & Mohkeri ,1997).

Conservation of mangrove forest is one of an important step because mangrove forest is an important habitat especially for wildlife including fishes, shells and microbes and for a specific and unique plant species. Other than that, mangrove forest can contribute to eco-tourism activities and also play a role as a socio-economic importance as a hydrological regulator, flood mitigation and buffering zone. As an example, Kg Kuantan is famous with fire flies which can give aesthetic and beautiful view during the night due to the

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high abundance of Berembang tree along the river bank at Selangor river. Due to these, it can increase the salary income for the local communities at Kg. Kuantan and increase the eco-tourism activities in Malaysia. Mangrove forest also provides the natural sources such as fuelwood, timber and variety product for local inhabitants. Hence it is important to protect mangrove forest which can benefit both to human and wildlife and as a unique forest type. In Malaysia, a working plan for the Matang mangrove forest reserve, Perak (fifth revision) provides a comprehensive overview of the management and conservation of the mangrove ecosystem in Malaysia and can be as a guide in the management of mangrove forest conservation (Latiff &Faridah,2013)Sediment plays an important role in elemental cycling in the aquatic environment. Most sediment in surfaces waters derives from surface erosion and comprises a mineral component, arising from the erosion of bedrock and an organic component arising during soil-forming processes (including biological and microbiological production). Other than that, sediment plays an important roles as the sources of nutrient to freshwater (Nowlin, Evarts & Vanni ,2005).

To ensure the metabolism or growth of the plant in the mangrove forest, the plant needs nutrient from the soil. The nutrient is one of the important key element for the plant for growth and maintains the biological process in the plant. The main nutrient or known as macronutrients in the soil are nitrogen (N), phosphorus (P) and potassium (K). the combination of these three nutrients called as NPK. There are other important nutrients in the soil which is needed in a low quantity such as iron, ferum, boron, zinc, manganese and molybdenum. These studies are conducted to identify the macronutrients availability in mangrove sediment at Selangor river, Kg,Kuantan.

1.2 Problem Statement

One of the unique attraction in Kampung Kuantan is the area famous with fireflies and one of the places which have the largest firefly colonies.Kampung Kuantan has the largest colonies of fireflies due to the present of *Sonneratia caseolaris* along the riverbank of Selangor river (Kuala-selangor.com, 2016). These trees are really important to fireflies as their source of food and habitat. These mangrove species is the dominant species along the riverbank of Kampung Kuantan which extends up to 18 km downstream and 8 km upstream and the only tree to have an ecological role as an habitat for fireflies to dwell on during the night (Hamzah & Mohkeri ,1997).

Other than that, these villages are associated and famous for agriculture and eco-tourism activities (Hamzah & Mohkeri, 1997). Due to these activities, it may affect the value and presence of macronutrients in the sediment in mangrove sediment along the Selangor River. Other than that, the sediment properties of sediment may also be affected by the human intervention and natural disaster such as flood which can affect the nutrient content in the sediment. Hence nutrient is an important element for living things including the plant for their growth.

Due to less study regarding the nutrient content in mangrove forest at Selangor river and the mangrove forest are highly related with agriculture and eco-tourism activities a study is been conducted to know the value and presence of macronutrients in sediment of mangrove forest at Kampung Kuantan which can help in maintaining and planning for future development of mangrove forest conservation and restoration.

1.3 Objectives

The objectives of this study were:

i. To determine the macronutrients content (Nitrogen,Phosphorus,Potassium) in mangrove sediment at Selangor River, Kg. Kuantan.

ii. To compare the macronutrients (Nitrogen,Phosphorus,Potassium) content in mangrove sediment between different plots and depths.

REFERENCES

Abd. Shukor, A. H. (2004). The use of mangroves in Malaysia. *Promotion of Mangrove-Friendly Shrimp Aquaculture in Southeast Asia*, 1, 136–144.

Amaruddin N.S.. (2017). Major Nutrients Present On Sediment Along Sungai Tiram Laut, Perak.Faculty Of Forestry Universiti Putra Malaysia, 1, 1-60.

Bates & Roger G. (1973). Determination of pH: theory and practice.Publisher New York,Wiley.

Bird, E.C.F & Barson M.M, (1977). Measurement of physiographic changes on mangrove fringed estuaries. Bittner, A., 1996. Aspects of the Focal theme. Natural. Resource, 1, 1-17.

Cunha-Lignon, M., Coelho Jr.,C.,Almeida, R.,Menghini, R.P., Schaeffer-Novelli, Y., Cintron, G. & DahdouhGuebas, F. (2011). Characterisation of mangrove forest types in view of conservation and management: a review of mangals at the Cananéia region, São Paulo State, Brazil. *Journal of Coastal Research, SI 64 (Proceedings of the 11th International Coastal Symposium),* 1, 349 - 353.

Davis III, S.E.,Corronado-Molina, C., Childers,D.L.&Day,Jr. J.W. (2003). Temporally dependent C, N and P dynamics associated with the decay of *Rhizophora mangle* L. leaf litter in oligotrophic mangrove wetlands of the southern Everglades. Aquatic Botanical, 75, 199-215.

Delgado A. & Gomez A. J. (2016). Chapter 2 The Soil. Physical, Chemical and Biological Properties. *Springer International Publishing* , 1, 15-18

Duke, N. C., (1992). Mangrove floristics and biogeography,1, 63–100*. In Robertson, A. I., and Alongi, D. M. (eds.), Tropical MangroveEcosystems.Washington, D.C.: Coastal and Estuarine Studies Series, American Geophysical Union*, 1, 329.

FAO, (2007). The World's Mangroves 1980–2005, FAO Forestry Paper 153. *Rome: Forest Resources Division, FAO*, 1, 77.

Govindasamy, C. (2011). What is the Significance of Mangrove Forests : A Note. *Department of Oceanography and Coastal Area Studies,School of Marine Sciences Alagappa University,Thondi Champs-623 409,Taminadu,India. Current Botany*, 2(2), 50-55.

Greve, M.H., Kheir, R.B., Greve, M.B. & Bocher, P.K., (2012). Quantifying the ability of environmental parameters to predict soil texture fractions using regression-tree model with GIS and LIDAR data: *The case study of Denmark. Ecology Indicators,* 18, 1-10.

Hamzah J. & Mohkeri S. (1997).The Kampung Kuantan Firefly Reserve.Wetlands International-Asia Pasific, 1, 15-20.

Hogarth, P. J. (1999). The Biology of Mangroves. Oxford, New York: Oxford University Press.

Kathiresan, K. (2003).How do mangrove forests induce sedimentation?. *Revista de Biología Tropical*, 51(2), 355-360.

Kuala-selangor.com. (2016). Kampung Kuantan Fireflies Park Kuala Selangor. Retrieved 25 February 2018, from http://kuala-selangor.com/kampung-kuantan-fireflies-part-kuala-selangor.html

Latiff A., Faridah-Hanum I. (2014). Mangrove Ecosystem of Malaysia: Status, Challenges and Management Strategies. *In: Faridah-Hanum I., Latiff A., Hakeem K., Ozturk M. (eds) Mangrove Ecosystems of Asia. Springer, New York.*

Lugo,A.E. & Snedaker,S.C. (1974).The ecology of mangroves.*Annual Revision Ecology System*, 5, 39-64.

Macnae, W. (1968). A general account of the flora and fauna of a mangrove swamps forest in the Indo-West Pacific region. *Advances in Marine Biology*, 6, 73-270.

National Geographic Society. (2011).Sediment. Retrieved 23 October 2018, from https://www.nationalgeographic.org/encyclopedia/sediment/

National Oceanic and Atmospheric Administration (NOAA). (2018). What is a "mangrove" forest? Retrieved 7 December 2018, from https://oceanservice.noaa.gov/facts/mangroves.html

Nowlin, W. H., Evarts, J. L., & Vanni, M. J. (2005). Release rates and potential fates of nitrogen and phosphorus from sediments in a eutrophic reservoir, 1, 301–322.

Peter, K.L.Ng & Sivasothi, N. (2001). Guide to the Mangroves of Singapore, The   Ecosystem : Abiotic components : pH. Retrieved 12 November 2018, from http://mangrove.nus.edu.sg/guidebooks/text/1010a.html

Ruth Reef, Ilka C. Feller, Catherine E. Lovelock. (2010).Nutrition of mangroves,*Tree Physiology,* 30(9), 1148–1160.

Saenger, P. (2002). Mangrove Ecology, Silviculture and Conservation. *Dordrecht: Kluwer Academic Publishers*, 1, 360.

Sah, K.D., Sahoo, A.K.,Gupta, S.K & Banerjee, S.K. (1989). Mangrove vegetations of sunderbans and their effect on the physicochemical and nutrient status of the soils. *Proceeding of Indian National Science Academy Part B: Biology Science*, 55, 125-132.

Schimper, A.F.W. (1903). Plant geography upon a physiological basis. *Englemenn and Wheldon and Westley Ltd.*, 1. 395-410.

Shukor, A.& Hamid, A. (2004). The use of mangroves in Malaysia. *In : Promotion of mangrove-friendly shrimp aquacultures in Southeast Asia. Tigbauan, Iloilo Philippines: Aquaculture Department,Southeast Asian Fisheries Development Centre,* 1, 136–144.

Singh, V.P., & Odaki, K. (2004). Mangrove Ecosystem : Structure And Function. Jodphur, India : Scientific Publishers (India).

Sofawi, A. B., Nazri, M. N., & Rozainah, M. Z. (2017). Nutrient variability in mangrove soil: Anthropogenic, seasonal and depth variation factors. *Applied Ecology and Environmental Research*, 15(4), 1983–1998.

Sukardjo, S. (1994). Soils in the mangrove forests of the Apar Nature Reserve, Tanah Grogot, East Kalimantan, Indonesia. *Southeast Asian Study*, 32, 385-398.

Tomlinson, P. B. (1986). The Botany of Mangroves. *Cambridge: Cambridge University Press.*

Ukpong, I.E. (1997). Vegetation and its relation to soil nutrient and salinity in the Calabar mangrove swamp, Nigeria. *Mangroves Salt Marshes*, 1, 211-218.

Walsh, G.E. (1974). Mangroves — A review. *In: R.J. Reimold & W.H. Queen (eds), Ecology of Halophytes* , 1, 51–74.

Walsh, G.E. (1974). Mangroves : A Review. In : Ecology of Halophytes, Academic Press, New York, 1, 51 -174

Wolanski, E. M., Jones, M. & Bunt,   J.S. (1980). Hydrodynamics of a tidal creek - mangrove swamp ecosystem. Australian Journal Marine Freshwater Research, 31, 431-450.

Woodroffe, C. D., Rogers, K., McKee, K. L., Lovelock, C. E., Mendelssohn, I. A., & Saintilan, N. (2016). Mangrove Sedimentation and Response to Relative Sea-Level Rise. *Annual Review of Marine Science*, *8*(1), 243–266.