ACCUMULATION OF HEAVY METALS IN SEAGRASSES (*Halodule pinfolia* and *Halophila minor*) IN SETIU WETLAND, TERENGGANU

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BY

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This project is submitted in partial fulfilment of
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PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN ILMIAH TAHUN AKHIR

Adalah ini diakui dan disahkan bahawa laporan penyelidikan ilmiah tahun akhir bertajuk Accumulation of heavy metal in seagrasses (*Halodule pinifolia* and *Halophila minor*) in Setiu Wetland, Terengganu oleh Noraifaa Abdullah Sani, no matrik UK 4506 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperoleh ijazah Sarjana Muda Sains – Sains Biologi, Fakulti Sains dan Teknologi, Kolej Universiti Sains dan Teknologi Malaysia.

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TERIMA KASIH BUAT KALIAN

(Everyday is a magical moment, thank you)

Aku bingkas daripada lelah
Dahimu aku kucup
Lalu tidak betah inginku sampaikan bahawa
Ada sabar betapak,
Alismu ku sentuh
Ada tenang yang terbentuk
Matamu ku pandang
Ada ruang bahagia, jelas, terbentang

Tubuhmu ku peluk
Ada campuran riang bercantum
Bibirmu mengukir senyuman
Kadangkala seakan ketawa perli, masam seakan warna jingga yang aku benci dan tak suka
Namun, masih dan tetap ada bahagia mengharum

Wajahmu ku usap
Ada gelombang laut itu cuak TAPI tenang, aku yakin
Ada angin ribut itu kalut TAPI syahdu, aku yakin
Ada api membakar itu marah TAPI salju, aku pasti
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ABSTRAK

Sampel yang mengandungi dua spesies rumput laut iaitu *Halodule pinifolia* dan *Halophila minor* serta sedimen dikutip daripada empat stesen yang berlainan di kawasan tanah bencah Setiu untuk penganalisaan keatas 5 logam iaitu Cu, Mn dan Zn menggunakan mesin 'atomic absorption spectrophotometer' dan Pb serta Cd menggunakan 'graphic furnace spectrophotometer' . Jumlah keseluruhan kepekatan (µg/g berat kering untuk logam) dalam daun bagi spesies *Halodule pinifolia* diantara julat 8.40-16.25 Cu/g, 102.0-444.59 Mn/g, 20.66-27.28 Zn/g, 0.01-0.11 Pb/g dan 0.05-0.19 Cd/g. Bagi batang-akar spesies *Halodule pinifolia* pula mencatat bacaan jumlah keseluruhan seperti berikut, 7.62-15.48 Cu/g, 91.8-110.05 Mn/g, 21.12-29.98 Zn/g, 0.06-0.20 Pb/g dan 0.04-0.09 Cd/g. Keseluruhan kandungan kepekatan logam berat dalam sedimen pula ialah 1.56-1.92 Cu/g, 9.0-49.94 Mn/g, 7.88-21.43Zn/g, 21.46-27.09 Pb/g dan 1.17-7.49 Cd/g. Jumlah keseluruhan kepekatan dalam daun bagi spesies *Halophila minor* pula ialah 0.1 Cu/g, 99.71 Mn/g, 28.81 Zn/g, 0.07 Pb/g dan 0.12 Cd/g. Kepekatan logam berat dalam spesies sama pada bahagian batang-akar pula adalah 0.11 Cu/g, 97.99 Mn/g, 71.99 Zn/g, 0.06 Pb/g dan 0.14 Cd/g. kepekatan kandungan logam dalam sedimen pula adalah sebanyak 1.73 Cu/g, 33.78 Mn/g, 16.27 Zn/g, 21.46 Pb/g dan 4.83 Cd/g. Didapati kandungan logam berat adalah tinggi di stesen 4 bagi kedua-dua spesies rumput laut yang dikaji. Ini kerana stesen 4 terletak berdekatan dengan jeti dan dalam kawasan akuakultur bagi penternakan tiram. Ia juga merupakan kawasan laluan bot nelayan. Terdapat perkaitan Cu antara stesen. Terdapat juga perbezaan logam Cd dalam sedimen dan daun bagi spesies *Halodule pinifolia* adalah ketara ($P<0.05$). Terdapat juga perbezaan dan perkaitan logam Zn dalam sedimen dan batang-akar bagi spesies *Halophila minor* tetapi tidak ketara. Kajian ini merumuskan bahawa rumput laut tempatan terdiri daripada spesies Halodule pinifolia dan Halophila minor juga berpotensi digunakan sebagai bio-penunjuk untuk logam berat. Kedua-dua spesies rumput laut boleh digunakan bagi memantau logam seperti Zn dan Mn.

ABSTRACT

Seagrass and sediment samples were collected from four stations in Setiu Wetland. A total of two species of seagrass, *Halodule pinifolia* and *Halophila minor* and their sediments were then analyzed for five metals namely Cu, Mn, Zn using the Atomic Absorption Spectrophotometry and Pb, Cd by using the graphic Furnace Spectrophotometry. Total concentration (µg/g metal in dry weight seagrass) of metals in leaves of *Halodule pinifolia* was found within the range 8.40-16.25 Cu/g, 102.0-444.59 Mn/g, 20.66-27.28 Zn/g, 0.01-0.11 Pb/g and 0.05-0.19 Cd/g. In rhizomes-roots of *Halodule pinifolia*, the total concentration was 7.62-15.48 Cu/g, 91.80-110.05 Mn/g, 21.12-29.98 Zn/g, 0.06-0.20 Pb/g and 0.04-0.09Cd/g. In sediment, the total concentration was 1.56-1.92 Cu/g, 9.0-49.94 Mn/g, 7.88-21.43 Zn/g, 21.46-27.09 Pb/g and 1.17-7.49 Cd/g. The total concentration in leaves of *Halophila minor* was 0.1 Cu/g, 199.71 Mn/g, 28.81 Zn/g, 0.07Pb/g and 0.12 Cd/g. In rhizomes-roots *Halophila minor*, the total concentration was 0.11Cu.g, 97.99 Mn/g, 71.99 Zn/g, 0.06 Pb/g and 0.14 Cd/g. While in sediment, the total concentration was 1.73 Cu/g, 33.78 Mn/g, 16.27 Zn/g, 21.46 Pb/g and 4.83 Cd/g. The highest concentration of heavy metals in both species were recorded in Station 4 which was located near the jetty and surrounded by aquaculture activities, where oysters are reared in cages and fishes in pens and floating cages. Station 4 was also the main boat route for the local fishermen. A correlation between heavy metal concentration in leaves and sediment was obtained for Cu. Likewise, a significant correlation between heavy metal concentration in leaves and within the sediment was obtained for Cd in *Halodule pinifolia*. A significant correlation between heavy metal concentration in the rhizomes-roots and sediment was also obtained for Zn in *Halophila minor*. Results indicated that local seagrass species, *Halodule pinifolia* and *Halophila minor* are found to be useful as potential biological indicator for heavy metals in aquatic environment. Both seagrasses species are suitable to be used to monitor heavy metals such as Zn and Mn.