

BIOACCUMULATION OF CADMIUM BY SEAGRASS
(*Halodule wrightii*) FROM
ARTIFICIALLY CONTAMINATED SEDIMENT

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**BIOACCUMULATION OF CADMIUM BY SEAGRASS (*Halodule pinifolia*) FROM
ARTIFICIALLY-CONTAMINATED SEDIMENT**

By

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LIST OF ABBREVIATIONS

Cd	Cadmium
$\mu\text{g/g}$	Microgram per gram
wt.	Weight
mg/L	Milligram per liter
‰	Salinity
$^{\circ}\text{C}$	Degree Celsius
rpm	Revolutions per Minute
ppm	Part per million
BOD	Biological Oxygen Demand
DO	Dissolve Oxygen
GFAAS	Graphite Furnace Atomic Absorption Spectrophotometer

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ABSTRACT

Cd is non-essential metal to aquatic plants and is found naturally in aquatic the environment. Bioaccumulation of Cd in seagrass was determined in laboratory experiments. Seagrass species *Halodule pinifolia* was cultured utilizing artificially contaminated sediment. In this experiment, clean sediment was spiked with Cd solution in order to prepare artificially contaminated sediment. Five sediment Cd concentrations were prepared including control. Concentrations of Cd in leaves and root-rhizomes were measured after exposure of the plant to contaminated sediment for 8 week. Cd concentrations in sediment and pore water were also measured. Results from this experiment showed that the concentration of Cd in leaves and root-rhizomes increased as the level of Cd concentration in sediment and pore water increased. Besides that, concentrations of Cd in plant fractions were different. Concentration of Cd in leaves was higher than concentration in root-rhizomes. Indicating that, translocation of metal was occurs from root-rhizomes to leaves. Mortality of seagrass occurred at higher level of Cd concentration (65.05 ug/g dry wt and 32.52 ug/g dry wt) in contaminated sediment. The toxicity impact was observed as the colour of the plant changed from green to dark brown. At lower level of Cd (8.13 ug/g dry wt. and 16.26 ug/g dry wt.), seagrass was able to accumulate Cd from sediment and pore water without incurring mortality. The ability of seagrass to produce dissolved oxygen also decreased because of the Cd effect, but the effect was not significantly correlated to Cd exposure concentration. As a conclusion, *Halodule pinifolia* is suitable as a bioindicator for monitoring aquatic pollution especially in industrial areas due to the dose-dependent responses towards Cd concentration in sediment and pore water.

ABSTRAK

Cd merupakan unsur logam yang tidak diperlukan oleh tumbuhan, ia wujud secara semulajadi dalam persekitaran akuatik. Bioakumulasi Cd dalam rumput laut telah dikaji di makmal. Rumput laut dari spesies *Halodule pinifolia* telah ditanam dalam sedimen tercemar secara buatan. Dalam eksperimen ini, sedimen yang tidak tercemar telah dicampurkan dengan larutan Cd bagi menghasilkan sedimen tercemar buatan. Terdapat lima kepekatan sedimen telah disediakan termasuk pada kepekatan kawalan. Kepekatan Cd dalam daun dan akar- rizom telah diukur selepas mendedahkan rumput laut tersebut kepada sedimen tercemar secara buatan selama 8 minggu. Selain itu, kepekatan Cd dalam sedimen dan 'pore water' juga telah diukur. Berdasarkan kepada keputusan yang diperolehi, didapati kandungan Cd dalam rumput laut (daun dan akar-rizom) meningkat sejajar dengan peningkatan Cd yang telah dicampurkan ke dalam sedimen. Selain itu, kandungan Cd dalam daun dan akar-rizom adalah berbeza. Didapati kandungan Cd dalam daun adalah jauh lebih tinggi berbanding dengan kandungan Cd dalam akar-rizom. Ini menunjukkan Cd yang diserap oleh akar-rizom telah dipindahkan ke daun. Rumput laut mati pada kepekatan Cd yang tinggi (65.05 ug/g dry wt and 32.52 ug/g dry wt) dalam sediment tercemar. Namun yang demikian, rumput laut masih lagi mampu menyerap Cd pada kepekatan Cd yang rendah (8.13 ug/g dry wt. and 16.26 ug/g dry wt.). Selain itu, penghasilan oksigen terlarut juga turut berkurang sebagai akibat kesan daripada tindak balas Cd. Namun begitu, tiada korelasi yang nyata terhadap kesan pendedahan kepekatan Cd. Dengan itu kepekatan Cd dalam tangki akan berkurang. Sehubungan dengan itu, rumput laut dari spesies *Halodule pinifolia* adalah sesuai untuk dijadikan biopenunjuk untuk mengawal tahap

pencemaran akuatik terutamanya dikawasan perindustrian. Ini berikutan kepekatan cd dalam rumput laut adalah sejajar dengan kepekatan Cd dalam sedimen dan 'pore water'.