

ประสิทธิภาพของบอน *Colocasia esculenta* (L.) Schott ในการกำจัดโคโรเมียม  
ในพื้นที่ชุ่มน้ำที่สร้างขึ้นเพื่อการบำบัดน้ำเสียขั้นสุดท้ายจากโรงฟอกหนัง



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CHROMIUM REMOVAL EFFICIENCY BY *Colocasia esculenta* (L.) Schott  
IN CONSTRUCTED WETLANDS FOR TANNERY POST-TREATMENT WASTEWATER

Mr. Sorawit Ngampromphun

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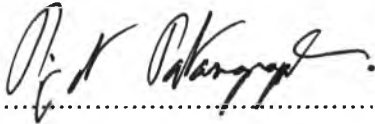
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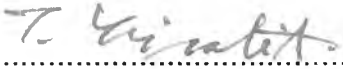
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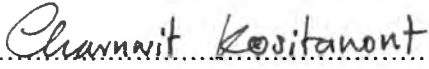
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การวิจัยนี้มีวัตถุประสงค์เพื่อเปรียบเทียบประสิทธิภาพในการกำจัดโครเมียมของบอน 2 ชนิด พันธุ์ คือ บอนเขียวและบอนจินด้า ในพื้นที่ชุ่มน้ำที่สร้างขึ้นเพื่อบำบัดน้ำเสียขั้นสุดท้ายจากโรงฟอกหนังที่ระดับความลึกต่างๆ กัน 3 ระดับ ได้แก่ 0.15, 0.25 และ 0.35 เมตร และเปรียบเทียบการสะสมโครเมียมในส่วนต่างๆ ของบอน ได้แก่ ใบ, ก้านใบ, หัว และราก รวมทั้งศึกษาภาวะการเจริญเติบโตของบอนทั้งสองในสภาวะดังกล่าว โดยทำการก่อสร้างพื้นที่ชุ่มน้ำแบบไหลพื้นผิว (FWS) จำนวน 12 บ่อ เพื่อใช้ศึกษาประสิทธิภาพของระบบ 9 บ่อ และอีก 3 บ่อที่เหลือใช้สำหรับศึกษาภาวะการเจริญเติบโตของพืช

จากการศึกษาพบว่าประสิทธิภาพในการกำจัดโครเมียมของบอนเขียวและบอนจินด้าโดยเฉลี่ยจากทุกระดับน้ำอยู่ที่ 67.01% และ 59.95% ตามลำดับ โดยที่ระดับน้ำไม่มีผลต่อประสิทธิภาพในการกำจัดโครเมียมของบอนทั้งสองพันธุ์ ทั้งนี้เนื่องมาจากพืชตายในระหว่างทำการทดลอง อันอาจเป็นผลมาจากสภาวะความเค็มเกินกว่าที่พืชสามารถทนได้ ในส่วนของการสะสมโครเมียมในวิภาคต่างๆ ของระบบ พบว่า โครเมียมถูกสะสมอยู่ในดินมากที่สุด สำหรับการสะสมโครเมียมในส่วนต่างๆ ของพืชนั้น พบว่าส่วนรากมีการสะสมของโครเมียมสูงที่สุดของพืชทั้งสองชนิดพันธุ์ในทุกๆ ระดับน้ำ โดยมีค่าเฉลี่ยอยู่ที่ 0.2533 มิลลิกรัมต่อกรัม สำหรับบอนเขียว และ 0.2478 มิลลิกรัมต่อกรัม สำหรับบอนจินด้า

จากผลที่ได้ดังกล่าวแสดงให้เห็นว่าบอนทั้งสองชนิดพันธุ์ไม่เหมาะในการนำมาใช้ในการบำบัดโครเมียมในน้ำเสียจากโรงฟอกหนัง แต่ยังอาจสามารถนำไปประยุกต์ใช้ในการกำจัดสารพิษหรือโลหะหนักได้ในสภาวะอื่นๆ ที่ไม่มีความเค็มเข้ามาเกี่ยวข้องได้ เนื่องจากมีความสามารถในการดูดซับสารพิษจำพวกโลหะหนักได้เป็นอย่างดีนั่นเอง

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SORAWIT NGAMPROMPHUN: CHROMIUM REMOVAL EFFICIENCY BY *Colocasia*

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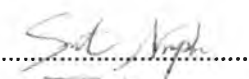
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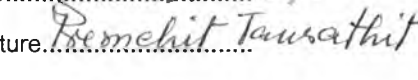
The purposes of this study were to determine and compare the chromium removal efficiency of two types of *Colocasia esculenta* (L.) Schott which was green and violet stems in constructed wetlands for tannery post-treatment wastewater at three wastewater level (0.15, 0.25 and 0.35 m), to compare chromium accumulation in between phases of system and in various parts of emergent plant, i.e lamina, petiole, corm and root. In addition, to investigate the plant growth rate of both plants in condition as mentioned. Twelve FWS constructed wetland units were built for this study. Nine of them were used for study about the chromium removal efficiency and three units for studying the plant growth rate.

From the results, the average chromium removal efficiencies of green and violet *C. esculenta* in every wastewater level were 67.01% and 59.95%, respectively. Wastewater level had no significantly effect on all system efficiencies, resulted from plant dead during experimental run time. It perhaps resulted from phenomenon as called "salt stress effect". For chromium accumulation in wetland systems, soil bed was the most accumulation. Moreover, amount of chromium accumulated in root was more than other parts in every wastewater level units of both plants (average at 0.2533 mg/g (dry weight) for green *C. esculenta* and 0.2478 mg/g (dry weight) for violet *C. esculenta*).

In conclusion, these plants were not suitable for treatment tannery wastewater because they could not tolerate in high salt conditions. However, it was found that they were able to assimilate heavy metal that was chromium at very well. So, they tended to be used for removing other toxic substances especially, heavy metals in the future study.

Department.....Inter-department of Environmental Science..... Student's signature.....

Field of study.....Environmental Science..... Advisor's signature.....

Academic year.....2001..... Co-advisor's signature.....

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## LIST OF ABBREVIATIONS, SYMBOLS AND DEFINITIONS

ANOVA	Analysis of variance
AS	Activated sludge
AWT	Advance Wastewater Treatment
BOD	Biochemical oxygen demand
cm	Centimeter
°C	Degree centigrade
CEC	Cation Exchange Capacity
<i>C. esculenta</i>	<i>Colocasia esculenta</i> (L.) Schott
cmol	Centimole
<i>Colocasia sp.</i>	<i>Colcoasia esculenta</i> (L.) Schott
control unit	Constructed wetland unit with wastewater (plant-free unit)
com	Rhizome of <i>Colocasia esculenta</i> (L.) Schott
conc.	Concentration
Cr	Chromium
d	Day
experimental unit	Constructed wetland unit with plants and wastewater
Fe	The element iron
FWS	Free water surface system
g	Gram
ha	Hectare
HLR	Hydraulic Loading Rate
HNO <sub>3</sub>	Nitric acid
HRT	Hydraulic retention time
kg	Kilogram
l	Liter
lamina	Leaf of <i>Colocasia esculenta</i> (L.) Schott
m	Meter
mg	Milligram

## LIST OF ABBREVIATIONS, SYMBOLS AND DEFINITIONS (CONT)

N.A.	Not Acceptable
OLR	Organic Loading Rate
petiole	stem of <i>Colocasia esculenta</i> (L.) Schott
plant-observed unit	Constructed wetland unit with plant and clean water
ppt	Part per thousand
Q	Flow rate
SF	Subsurface flow system
SS	Suspended Solids
TN	Total Nitrogen
total chromium	Included Cr(III) and Cr(VI)
VSB	Vegetated submerged bed
μg	Microgram
μS	Microsiemens