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สารไตรฮาโลมีเทนในน้ำทิ้งจากฟาร์มกุ้ง

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RELATIONSHIP BETWEEN SALINITY, ORGANIC MOLECULAR STRUCTURE,
AND TRIHALOMETHANE FORMATION POTENTIAL OF SHRIMP FARM
EFFLUENTS

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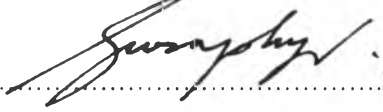
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ชัยชนะ ชัยวัฒน์พงศกร: ความสัมพันธ์ระหว่างระดับความเค็ม, โครงสร้างโมเลกุลของสารอินทรีย์กับการก่อตัวของสารไตรฮาโลมีเทนในน้ำทิ้งจากฟาร์มกุ้ง

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การศึกษานี้แสดงให้เห็นว่าน้ำทิ้งจากฟาร์มกุ้งมีศักยภาพในการก่อให้เกิดสารไตรฮาโลมีเทนในระดับที่สูงมากเมื่อเทียบกับแหล่งน้ำอื่น ๆ ที่ได้ทำการศึกษาก่อนหน้านี้ โดยพบว่าน้ำทิ้งจากฟาร์มกุ้งมีค่าศักยภาพในการก่อให้เกิดสารไตรฮาโลมีเทนในช่วง 864 – 3,346 ไมโครกรัมต่อลิตร ซึ่งสูงมากเมื่อเทียบกับค่ามาตรฐานน้ำดื่มของ USEPA และ EU ซึ่งกำหนดให้มีสารไตรฮาโลมีเทนได้ไม่เกิน 80 และ 100 ไมโครกรัมต่อลิตรตามลำดับเท่านั้น นอกจากนี้ในน้ำทิ้งจากฟาร์มกุ้งที่มีระดับความเค็มต่ำจะก่อให้เกิดสารไตรฮาโลมีเทนประเภทคลอโรฟอร์มได้มากกว่าชนิดอื่น ในขณะที่น้ำทิ้งที่มีความเค็มสูงจะมีผลทำให้เกิดการก่อตัวของสารไตรฮาโลมีเทนประเภทไดโบรโมคลอโรมีเทนและโบรโมฟอร์ม ผลจากการหาโครงสร้างโมเลกุลของสารอินทรีย์ที่เปลี่ยนแปลงในระหว่างการเติมคลอรีนพบว่าหมู่ฟีนอล, หมู่เอมีน, หมู่เบนซีน, สารประกอบโบรมีนแบบสายและสารประกอบคลอรีนแบบสายมีปริมาณลดลง ซึ่งอาจกล่าวได้ว่าโครงสร้างโมเลกุลดังกล่าวมีผลต่อการก่อตัวของสารไตรฮาโลมีเทนในน้ำทิ้งจากฟาร์มกุ้ง

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ลายมือชื่อนิสิต..... *ชัยชนะ ชัยวัฒน์พงศกร*.....

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This work analyzed the characteristics of shrimp farm effluents and determined the potential for the formation of hazardous total trihalomethanes (TTHMs) during the disinfection process. THMFP ranged from 864 – 3346 µg/L. This level was considered very high when compared with the United States Environmental Protection Agency (USEPA) and the European Union (EU)'s regulated standards for THMs in drinking water of only 80 and 100 µg/L, respectively. Furthermore, results revealed that low salinity often led to a higher formation of chloroform while high salinity was observed to result in greater generated quantities of dibromochloromethane and bromoform. FTIR spectrums of the samples before and after chlorination illustrated that the functional groups involved in the THMs formation reaction were the phenol group, amino group, aromatic rings, aliphatic bromo compounds and aliphatic chloro compounds.

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ABBREVIATIONS

AWWA	American Water Works Association
Br ⁻	Bromide
°C	Degree Celsius
CHBr ₃ FP	Bromoform Formation Potential
CHCl ₂ Br FP	Bromodichloromethane Formation Potential
CHCl ₃ FP	Chloroform Formation Potential
CHClBr ₂ FP	Chlorodibromomethane Formation Potential
Cl ₂	Chlorine
Cl ⁻	Chloride
cm	Centimeter
DBPs	Disinfection by-Products
DOC	Dissolved Organic Carbon
DOM	Dissolved Organic Matter
DPD	N, N-diethyl-p-phenylenediamine
ECD	Electron Capture Detector
FTIR	Fourier Transform Infrared Spectroscopy
g/cm ³	Gram/Cubic Centimeter
g/L	Gram/Liter
GC	Gas Chromatograph
h	Hour
HAAs	Haloacetic acids
IC	Ion Chromatograph
KHP	Potassium Hydrogen Phthalate
KOH	Potassium Hydroxide
KI	Potassium Iodine
L/mg-m	Liter/milligram-meter
m	Meter
MCL	Maximum Contaminant Level
NaOCl	Sodium Hypochlorite

µg/L	Microgram/liter
µm	Micrometer
µS	Micro Siemen
mg/L	Milligram/Liter
nm	Nanometer
NOM	Natural Organic Matter
NTU	Nepheo Turbidity Unit
POC	Particulate Organic Matter
ppm.	Part per Million
ppt	Part per thousand
Tc	Critical temperature
THMFP	Trihalomethane Formation Potential
TTHMs	Total trihalomethanes
THMs	Trihalomethanes
TOC	Total Organic Carbon
TOX	Total Organic Halides
USEPA	United States Environmental Protection Agency