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RESEARCH ARTICLE

INFLUENCE OF PHOSPHATE SOURCES TO PROMOTE MERCURY ACCUMULATION AND ITS DISTRIBUTION ON THE TROPICAL AQUATIC PLANT, *THYPA LATIFOLIA*

[1,*]Suhendrayatna, [1]Muhammad Zaki and [2]Erdiansyah Rahmi

[1]Department of Chemical Engineering, Faculty of Engineering,Syiah Kuala University, Darussalam, Banda Aceh23111, Indonesia
[2]Faculty of Veterinary Medicine, Syiah Kuala University, Darussalam, Banda Aceh23111, Indonesia

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ABSTRACT

Many studie The influence of phosphate to promote mercury biosorptionand its distribution on Tropical Aquatic Plant, *Typha latifolia* was investigated by expose aquatic plant to water containing mercury ion (10 mg-Hg/L) for five weeks in pounds under controlled condition.Each ponds contained five stems of *Typha latifolia* and ammonium phosphate has been added at different concentrations (5; 10; and 15 mmoles PO_4). Control media was also prepared that no phosphate added in the water phase. Shoots biomass samples from every pounds were taken for every fix treatment period and mercury concentration in the shoots were measured by using Atomic Absorption Spectrophotometer Shimadzu AA 630 under standard procedure after digested under Toxicity Characteristic Leaching Procedure.Results showed that the presence of phosphate supported the growth of *Typha latifolia*, but its presence could not promote better mercury biosorption from water phase. When *Typha latifolia* was exposed to water containing mercury, the distribution of accumulated mercury were highest in the roots than in stems and leaves. Furthermore, the presence of both types of phosphate [KH_2PO_4 and $(NH_4)HPO_4$] also did not affect to the distribution of mercury ion in parts of plants.

INTRODUCTION

One of contamination sources of ground water and surface environmental areas are mercury polluted areas. The concentrations of water-soluble mercury compounds are very low for classic chemical or physical remediation methods. Tropical aquatic plants such as *Typhalatifolia* etc. are useful for clean-up of such contamination. *Typhalatifolia* has colonized a wide range of wetland habitats, including heavy metal polluted areas (McNaughton *et al.*, 1974; Taylor *et al.*, 1983; Ye, *et al.*, 1997). The ability of *Typhalatifolia* to absorb heavy metal makes this plant have been used in wastewater treatment process (Ye *et al.*, 1997). These facts conclude that *Typhalatifolia* as tropical aquatic plants growth well in the area of heavy metals contaminated area and has a potential to reduce and absorb heavy metals. This study deals to investigate the influence of phosphate sources to promote mercury biosorption and its distribution on the tropical aquatic plant, *Typha latifolia* in line to find out the capacity of *Typhalatifolia* absorbing mercury from water phase.

Corresponding author: Suhendrayatna,
Department of Chemical Engineering, Faculty of Engineering, Syiah Kuala University, Darussalam, Banda Aceh23111, Indonesia.

MATERIALS AND METHODS

***Preparation of Aquatic Plant*:** *Typha latifolia* with 15 – 25 cm length collected from the estuary area in Banda Aceh was cultivated in laboratory for a couple months to reach acclimatization. The study was conducted at outdoor laboratory under control on temperature, pests, water supply, and diseases.

***Experiment*:** *Typha latifolia* was exposed to water containing mercury in different concentrations (10; 11and12 mg-Hg/L) of mercury ion for five weeks in under controlled condition ponds. Each ponds contained five stems of *Typha latifolia* . Control media was also prepared that containing no mercury ion. Ammonium phosphate have been added at different concentrations (5; 10; and 15 mmoles PO_4) to evaluate the effect of phosphate on the mercury accumulation. Plants were grown for three weeks before adding phosphate. During 14 days of the experiment, the water temperature (29±4 ^oC was optimum) and atmospheric air were maintained and the growth of *Typha latifolia* was observed by measuring the growth of plant in cm scale in every week for five weeks. Shoots biomass samples from every ponds were taken for every fix treatment period. Mercury concentration in the shoot samples

were measured by using Atomic Absorption Spectrophotometer AA 630 under standard procedure (Eaton and Epps, 1995) after digested under Toxicity Characteristic Leaching Procedure (US-EPA, 1989).

RESULTS AND DISCUSSION

Effect of Mercury Ion on Typha latifolia Growth with the present of Phosphate

Effect of mercury ion on *Typha latifolia* growth with the present of phosphate described in Figure 1. Results showed that the presence of phosphate led to the better growth rate of *Typha latifolia* . The presence of phosphate ion actually enhance *Typhalatifolia* growth and it growths well in water contained with phosphate ion.

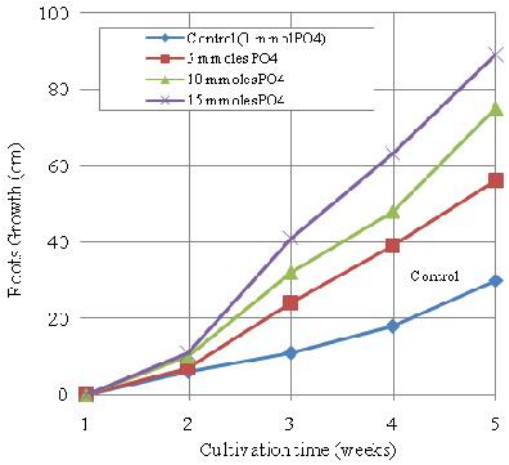

Fig. 1. Effect of phosphate on the growth of *Typha latifolia* in the water phase containing mercury

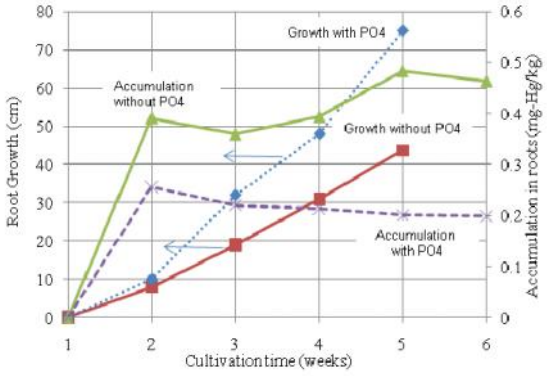

Fig. 2. Effect of phosphate on the mercury biosorption by *Typha latifolia* from the water phase containing mercury ion

Influence of phosphate concentration on the mercury biosorption by *Typha latifolia*

The influence of phosphate concentration on the mercury biosorption by *Typha latifolia* described in Figure 2. Result showed that *Typha latifolia* accumulated mercury higher from media without phosphate compared to media containing phosphate. The presence of phosphate could not promote the increase in the accumulation of mercury by *Typha latifolia* . Although the presences of phosphate ion actually enhance growth of *Typhalatifolia*, it could not promote better sorption of mercury from water phase. The accumulation of mercury by *Typhalatifolia* reached 0.46 mg-Hg/kg after exposed to water containing mercury for five weeks cultivation. These results are different from previous studies for arsenic metal ion (US-EPA, 1989), the presence of phosphate actually enhances the accumulation of arsenic ion by wetland plants, *Lupinus albus* and *Helianthus annus.* The presence of phosphate demonstrates its success in inducing arsenic uptake due to arsenic mobilization in water phase. This is probably due to the competition in specific adsorption sites between arsenate and phosphate (US-EPA, 1989).

Influence of phosphate concentration on the mercury distribution in *Typha latifolia*

The influence of phosphate concentration and its types on the mercury distribution in *Typha latifolia* described in Figure 3. After exposed to water containing mercury for 8 weeks, accumulated mercury in the roots of *Typha latifolia* found higher than in the stems and leaves. Accumulated mercury in *Typha latifolia* was found to be high in the media added ammonium phosphate than in media added potassium phosphate as phosphate sources, but their accumulation in leaves was quite low. The presence of ammonium phosphate was better than potassium phosphate that supported the rate of mercury biosorption in *Typha latifolia*

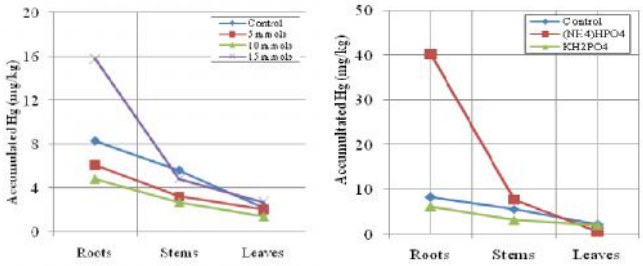

Fig. 3. Effect of phosphate concentration and its types on the mercury distribution in *Typha latifolia* after exposed water phase containing mercury ion

Conclusions

These results reached to conclusion as follows:

- The presence of phosphate led to better growth rate of *Typha latifolia* .
- The presence of phosphate could not promote the accumulated mercury in *Typha latifolia* .
- Accumulated mercury in roots found higher than in the stems and leaves.
- Accumulated mercury in *Typha latifolia* was found to be high in media added ammonium phosphate than in media added potassium phosphate as phosphate sources.

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