

Thesis Title Method of Reducing Arsenic Mobility in Contaminated Soil Using Natural Materials

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Thesis Advisory Committee

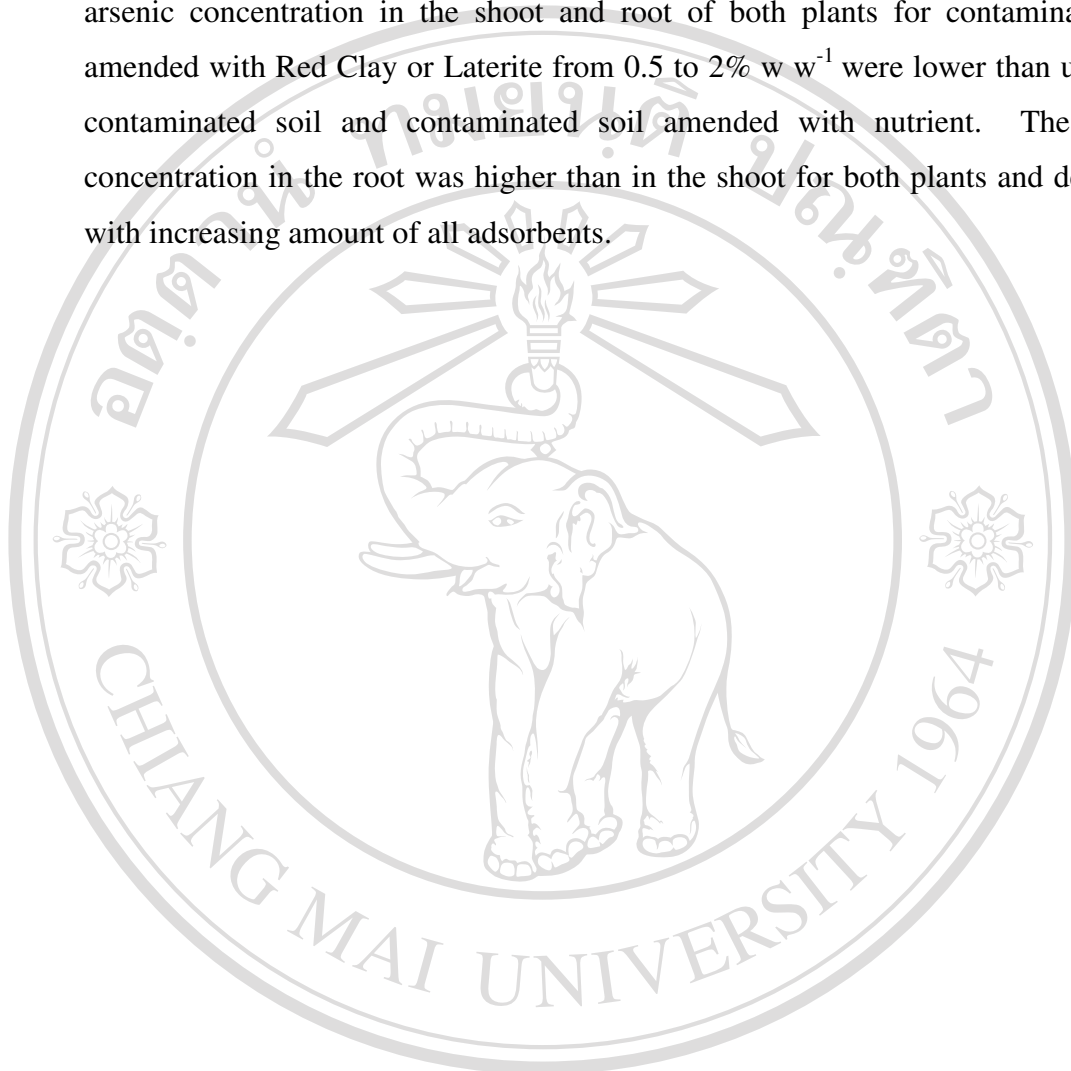
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ABSTRACT

The adsorption of arsenic (arsenate and arsenite) by four natural materials: Mae Rim Clay (Mae Rim, Chiang Mai), Yellow Clay (Hang Dong, Chiang Mai), Red Clay (Doi Saket, Chiang Mai) and Laterite (Pa Sang, Lam Phun) was studied. The rates of arsenic adsorption from solution by four adsorbents were rapid for the first few hours and then approached equilibrium within 24 hours at 100 mg L⁻¹ initial arsenic concentration. The amount of arsenic adsorbed increased with increasing pH and reached a maximum at pH 5 for Mae Rim Clay and Red Clay, at pH 7 for Yellow Clay and at pH 6 for Laterite, then decreased afterward when the arsenic [As(III), As(V)] concentration range from 50 to 200 mg L⁻¹. The Freundlich isotherm equation was successfully used to describe arsenate and arsenite adsorption over an initial concentration range of 25 to 200 mg L⁻¹ arsenate or arsenite for all adsorbents. The arsenate and arsenite sorption capacity of adsorbents increased in the order: Mae Rim Clay < Yellow Clay < Laterite < Red Clay at pH 4 and 9, but increased in the order: Mae Rim Clay < Laterite < Red Clay < Yellow Clay at pH 7. The released arsenic from contaminated soil decreased with increasing amount of adsorbents from 0.5%, 1.0%, and 2.0% w w⁻¹ for all adsorbents.

Arsenic concentrations in the shoot and root of planted mung bean and maize were studied. It was found that arsenic concentration decreased with increasing adsorbents from 0.5 to 2% w w⁻¹. The contaminated soil amended with 0.5% w w⁻¹

of Mae Rim Clay, Yellow Clay and untreated contaminated soil showed no significant difference of the arsenic concentrations in the shoot and root. The arsenic concentration in the shoot and root of both plants for contaminated soil amended with Red Clay or Laterite from 0.5 to 2% w w⁻¹ were lower than untreated contaminated soil and contaminated soil amended with nutrient. The arsenic concentration in the root was higher than in the shoot for both plants and decreased with increasing amount of all adsorbents.



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