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Element and Heavy Metal Concentrations of Some Fern Species at Phu-Soi-Dao National Park, Thailand

SUPAPORN PONGTHORNPRUEK¹, SAVENT PAMPASIT², NIMIT SRIPRANG³, KONGSAKDI PROMTEP⁴,
PENSIRI NABHEERONG⁴

¹Naresuan University, Graduate School, Thailand

²Naresuan University, Faculty of Agriculture, Department of Natural Resources Management and Environment, Thailand

³Naresuan University, Faculty of Science, Department of Chemistry, Thailand

⁴Naresuan University, Faculty of Science, Department of Biology, Thailand

Abstract

Ferns are naturally abundant in the forests of Thailand. Some of the fern species have a good possibility for use in phytoremediation process. The objectives of this study were to determine the accumulation of heavy metals in various fern species and to study the ecological effects of this heavy metals absorption. The study was conducted at Phu-Soi-Dao National Park (17° 41' -18° 04'N and 100° 56' -101° 09'E, elevation 600–1633 m above sea level) in Phitsanulok Province, Thailand. The soil and fern samples (193 plots and 330 samples) were taken in December 2005. Line transects method along the pathway and applied square plot of 1 × 1 m² were used for sampling. Soil properties, concentration of elements and heavy metal accumulation in ferns were analysed. The element Ca showed the highest mean concentration in root, stem and leaves. The element concentrations in the leaves decreased in the following sequence: Ca > Fe > P > Mg > N > K > Na > Mn > Zn > Ni > Pb > Cu > Cr > Co > Cd. Some ferns had a high potential for absorbing heavy metals from the soil. Among 19 terrestrial fern species, five species had high concentrations of heavy metal in leaves. *Adiantum caudatum* L. accumulated more Fe and Co than other species, while high Cu and Pb concentration were found in *Adiantum philippense* L. Zn, Mn and Cd were largely collected in *Pteris ensiformis* Burm.f., *Lindsaea ensifolia* Sw. and *Lygodium* sp., respectively. Different factors influenced the heavy metal accumulation in the plants. Heavy metal uptake was decreased when soil CEC was increased and accelerated organic matter in soil. The uptake rate of all these elements was promoted by low pH values that might be an explanation for their different accumulation. The result from this study shows the potential of using ferns in bioremediation to reduce the concentration of heavy metal from the environment.

Keywords: Fern, heavy metal, Phu-Soi-Dao, Thailand