

学 位 論 文 要 旨

氏 名

WIN MI HTWE

題 目

Studies on lead phytoremediation by tropical pasture grasses and assessment of contaminated pasture products through animal
(暖地型牧草種による鉛ファイトレメディエーションと家畜を通じての汚染された草地生産物の評価に関する研究)

It is generally accepted that phytoremediation is an environment-friendly and cheaper technology for the remediation of metal-polluted environments. For the achievement of phytoremediation, selection of suitable plant species and appropriate soil amendments are greatly important. However, there is limited report regarding whether high-biomass tropical pasture grasses are applicable for the use of lead phytoremediation. Therefore, the present study was conducted to investigate the phytoremediation abilities in tropical pasture grasses, clarify the suitable species for phytoremediation processes and utilize the metal-enriched biomass as animal feed.

In the present study, investigation of the phytoremediation abilities of three tropical pasture grasses (signalgrass, napiergrass and atratum) was firstly conducted by using two types of soils with different soil pH. All experimental grasses resulted in low phytoavailability of lead in alkaline soil (Shimajiri-maji). In acidic soil (Kunigami-maji), signalgrass and atratum showed the higher ability to uptake lead without any marked negative effect on dry biomass, and the capability to accumulate high concentration of lead in their shoots. It became clear that soil pH is one of the most important factors which control the lead uptake by pasture grasses.

The effect of liming on lead uptake of three tropical pasture grasses from lead contaminated acidic soil (Kunigami-maji) was studied. Increased soil pH by liming showed the significant reduction in lead uptake in all pasture grasses, especially in napiergrass. Signalgrass and atratum did not affect much on lead uptake by limed soils.

Then, the effect of chelates (EDTA and citric acid) on lead uptake in signalgrass and atratum was evaluated. Signalgrass had comparative high dry matter with accumulating high lead concentrations in its shoot after the addition of chelates.

The effect of lead contaminated forage added to layer feed on the performance and lead concentration in eggs, blood and feces of laying hens was studied. Three treatments; Diet I with only commercial feed, Diet II and Diet III containing layer feed with 7 % low and high lead contaminated forage (8.94 and 91.47 mg kg⁻¹, respectively) were used. The addition of forage did not change the standard nutrient requirements of layer feed. No measurable quantity of lead was found in the eggs albumen and blood. Lead concentrations in feces and egg yolk increased with an increase in lead levels in diets. In diet II treated with 7 % low lead contaminated forage, lead concentration in egg yolk was within permissible limit for lead during experiment and it showed the normal range as the control 4 weeks after experiment. It could be suggested as a safe level in the addition of layer feed. Then, available forage ingredients in poultry feeding could be eco-efficient to incorporate livestock.

In conclusion, it is clear from the present study that tropical pasture grasses are applicable for the use of lead phytoremediation process in combination with suitable soil amendments and low amount of lead contaminated forage can be safely utilized in the addition of poultry feed.