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Phytoattenuation of lead-contaminated agricultural land using *Miscanthus floridulus*—an *in situ* case study

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ABSTRACT

Phytoremediation is the most environmental friendly and economical technology for restoring agricultural land contaminated by heavy metals. However, it is a slow process, requiring hundreds to thousands of years to reduce pollutant level to meet soil environmental quality standards for highly contaminated soils. Such a long period makes the practice of phytoremediation nearly impossible without economic revenue from crop production. *Miscanthus floridulus* (*M. floridulus*) is characterized by its high dry matter yield and strong vitality. This case study planted *M. floridulus* on fallow land that was contaminated by 6,000 mg/kg of lead to investigate the feasibility of phytoremediation. The case study results show that lead accumulated primarily in the roots of the *M. floridulus*. After one year of growing, the average lead content in the roots and shoots was 806.7 and 50.3 mg/kg, respectively. *M. floridulus* was effective for the phytostabilization of lead-contaminated soil and was a lead-tolerant plant. The cropping produced 22.4 ton/ha/year dry matter weight (shoot part) and removed 1.13 kg/ha/year of lead from the soil. The *M. floridulus* grown on contaminated fields could be used as biofuels, and each hectare of *M. floridulus* dry matter could generate 365.1 GJ of thermal energy per year, which is equivalent to the heat energy from combustion of 13.4 tons of hard coal. Furthermore, replacing hard coal with *M. floridulus* would reduce CO_2 emissions by 33.1 ton/ha per year. The yields, Pb-absorption concentrations, and carbon mitigation of *M. floridulus* may change in subsequent years for different environmental conditions; thus, it needs further planting trials for regionalization.

Keywords: Energy crop; Lead; Phytoremediation; Bioenergy

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