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Valuation of certain remediative amendments in enhancing phytoremediation in various contaminated soil ecosystems

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After building of Grand Ethiopian Renaissance Dam (GERD), significant drastic shortage in Nile water resources in Egypt is predictable. This situation of water shortage would force Egyptian farmers to use low quality water resources impregnated with a variety of contaminants that will inserted in food chain. In a complete randomized plot design greenhouse experiment, soil samples collected from Abou-Rawash, Sinai and Kafr El-Shekh Governorated irrigated with varied types of low quality waters for extended periods were trailed for the sake of valuation of new innovative phytoremediation practices. In the used three soil ecosystems, the Zn equivalent parameter, that indicates the safety of cultivation, ranged between 340 and 630, while the safe level should not exceed 250. Integrated management practices were applied using canola and Indian mustard hyper accumulator plants, in association with Acidithiobacillus thiooxidans and Arbuscular Mycorrhiza (AM) after furnishing the soil ecosystem with the chemical stabilizer of PTE's probentonite. Results indicated that the canola hyper accumulator plant was more efficient than Indian mustard plant especially in Ni uptake compared to Cu or Zn uptakes. In addition, the introduction of Acidithiobacillus thiooxidans and AM to the contaminated soil ecosystems significantly enhanced the uptake of PTE's. The kinetic parameters of both theoretical and empirical models confirmed that the mixture of all remediative amendments was the best in minimizing Zn equivalent value to a save level. The different mechanisms that might take place between the applied remediative amendments and PTE's in the three contaminated soil ecosystems were discussed.

Key words: Zn equivalent, Kinetic models, PTE's, Soil ecosystems, Sewage effluents, Acidithiobacillus, Mycorrhiza.

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Chemical characterization of Sewage Effluent repetitively used in arid soils irrigation

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Sewage effluent samples were monthly collected during the period from January to July 2012 from the main canals of Konbora (Abu-Rawash site) and Zenine (El-Motamadia site) that are frequently used in irrigating different eaten raw field and horticulture crops. Nile water samples were periodically collected from El-Khanater El-Khayria as standard irrigation water. The chemical characterization of sewage effluent and Nile water samples included pH, conductivity, SAR, soluble cations as well as potential toxic elements (PTEs) using standard analytical methods. Results confirmed significant variations in these studied chemical parameters between the two studied sewage effluents. A significant increase in EC, pH and SAR values in both sewage effluents samples compared Nile water, representing save levels for irrigation water according to FAO standards, were noticed. The content of PTE's in both sewage effluents showed that the concentrations of Cd2+, Cu2+, Mn2+ and in some months and those of Zn2+ in certain months far exceeded the safe levels found in Nile water. Despite that the Doneen parameter, that estimates water quality (Cl- + 0.5 SO42) should not exceed 5 in irrigation water, both sewage effluent samples had values higher than the safe level. Special precautions and remediation biotechnologies should be considered to minimize health and environmental hazards for such waters.

Key words: sewage effluent, PTE's, Abu-Rawash and Motamadia sites.

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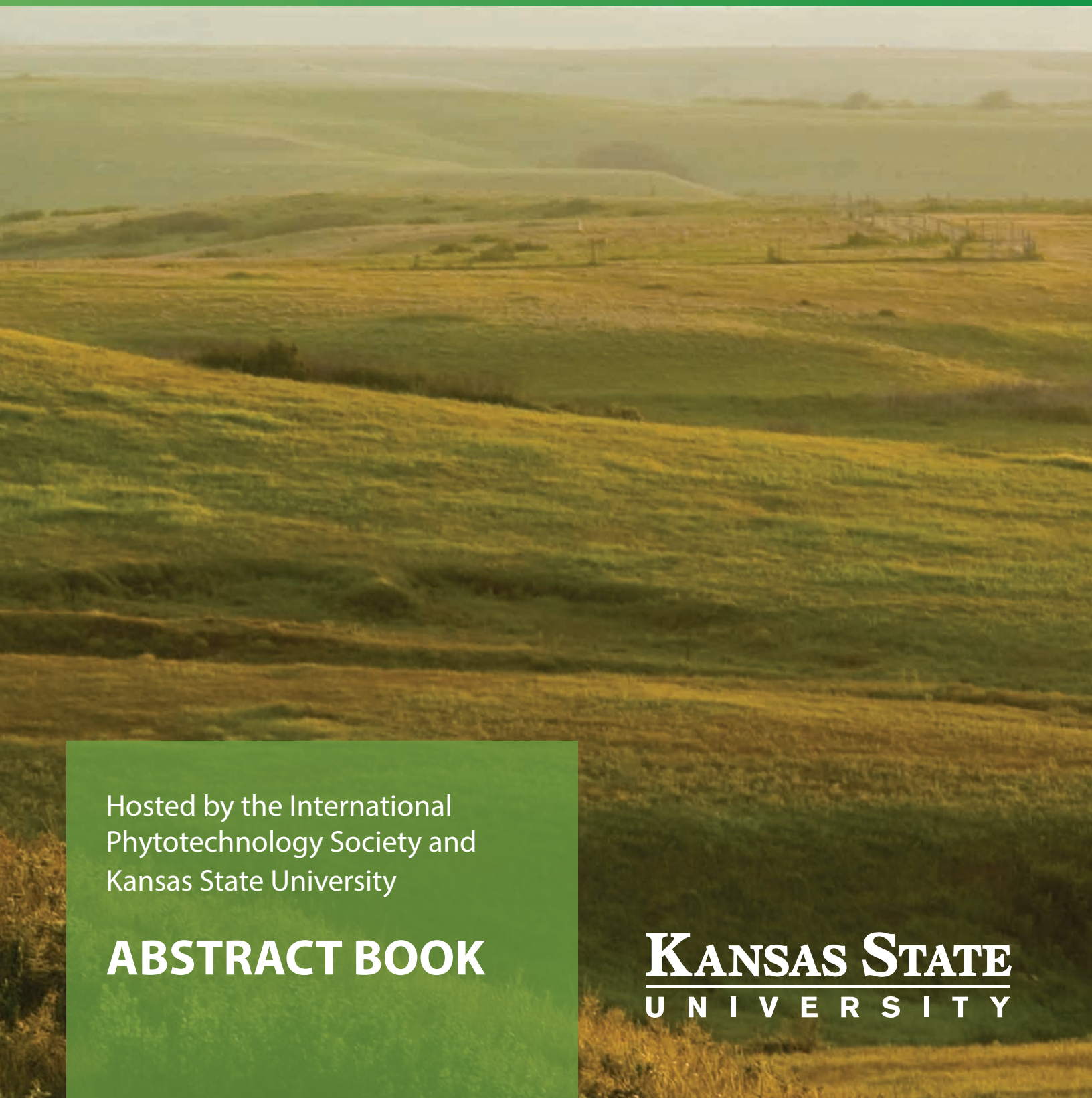

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