



**Effect of *Moringa oleifera* Lam. Seeds Extract on
Uptake of Heavy Metals in Micropropagated
Oryza sativa L.**

THESIS

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In

**Environmental Sciences
(Basic Environmental Science)**

By

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ABSTRACT

Effect of *Moringa oleifera* Lam. Seeds Extract on Uptake of Heavy Metals in Micropropagated *Oryza sativa* L.

Heavy metals have passive effects on plant growth and some physiological parameters in plant. The present investigation was done to investigate the effect of lead (Pb) and cadmium (Cd) on *in vitro* and *ex vitro* grown rice plantlets. A promising phytoremediation technique was used to remediate the negative effect of heavy metals. *Moringa oleifera* seed was used as natural and low cost phytoremediator, effective in heavy metals remediation in agriculture. Growth parameters were affected by the coagulation effect of *Moringa oleifera*. In addition, the physiological parameters as chlorophyll content, antioxidant activity, ascorbic acid, flavonoids content, indoles content were affected positively by *Moringa* seed extract under heavy metals effect. Also, glutelin bands of rice became denser under the effect of heavy metals and *Moringa* seed extract. Polyphenol oxidase, catalase and peroxidase activities exhibited increases in plants exposed to heavy metals and *Moringa* seed extract. The effect of

Moringa seed powder on growth parameters, carbohydrates content and heavy metals content of greenhouse grown rice under Pb and Cd stress were studied. In conclusion, the present investigation confirms the suitability and effectiveness of *Moringa* seed extract and powder as simple and cheap phytoremediation agents.

Keywords: *Moringa oleifera*, phytoremediation, rice, cadmium, lead, coagulants, antioxidants, polyphenol oxidase, catalase, peroxidase, ascorbic acid, flavonoids

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LIST OF ABBREVIATIONS

BA	Benzyl Adenine
CAT	Catalase
Cd	Cadmium
CPE	Crude Protein Extract
DPPH	α - α – diphenyl – β – picryl - hydrazyl
HgCl ₂	Mercuric chloride
2iP	Iso pentenyladenine
Kin	Kinetin
MS	Murashige and Skoog
NaOCl	Sodium hypochlorite
SDS	Sodium Dodecyl Sulphate
Pb	Lead
PGRs	Plant Growth Regulators
POD	Peroxidase
PPO	Polyphenol oxidase