



**Bioremediation of heavy metals polluted soil and its
impact on *Phaseolus vulgaris* L.**

Thesis Submitted for partial fulfillment of Master Degree of Science in
Botany

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(2019)



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This thesis has not been previously submitted for any degree at this or any other university.

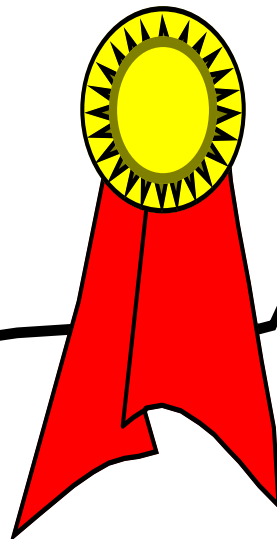
The references in the text will show specifically the extent to which I have availed myself of the work of other authors .

Rabab El-Sayed El-Badawy Ismail

Dedication

*To my husband,
my little daughter,
my brothers and
mysisters.*

*To the soul of my
beloved father and
Mother.*



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List of Abbreviations

| Abb. | Complete name |
|-------------------------|---|
| ABA | Abscisic acid |
| A. O. A. C | Official Methods of Analysis of the association of Official Agricultural Chemists |
| AS | Arsenic |
| ASA | Ascorbic acid |
| APX | Ascorbate peroxidase |
| Ca | Calcium |
| CAT | Catalase |
| Cd | Cadmium |
| Chl a | Chlorophyll a |
| Chl b | Chlorophyllb |
| Co | Cobalt |
| Cr | Chromium |
| Cu | Copper |
| EDTA | Ethylene diamine tetra acetic acid |
| Fe | Iron |
| FW | Fresh weight |
| GPX | Guaiacol peroxidase |
| GSH | Reduced glutathione |
| HCl | Hydrochloric acid |
| HgCl₂ | Mercuric chloride |

| | |
|------------------------------------|-------------------------|
| HMs | Heavy metals |
| H₂O₂ | Hydrogen peroxide |
| H₂SO₄ | Sulphoric acid |
| K⁺ | Potassium |
| MDA | Malondialdehyde |
| Mg | Magnesium |
| Mn | Manganese |
| Na | Sodium |
| Ni | Nickel |
| P | Phosphorus |
| Pb | Lead |
| PPO | Polyphenol oxidase |
| POX | Peroxidase |
| RGR | Relative growth rate |
| ROS | Reactive oxygen species |
| SOD | Superoxide dismutase |
| TBA | Thiobabituric acid |
| TCA | Trichloroacetic acid |
| Zn | Zinc |

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