

## Contents

<b>Abstract .....</b>	<b>1</b>
<b>Acknowledgments.....</b>	<b>3</b>
<b>Contents.....</b>	<b>4</b>
<b>List of Table.....</b>	<b>8</b>
<b>List of Figures.....</b>	<b>9</b>
<b>1 Introduction.....</b>	<b>12</b>
<b>1.1 Problem statement.....</b>	<b>12</b>
<b>1.2 Research Objectives .....</b>	<b>12</b>
<b>1.3 Research Motivation .....</b>	<b>13</b>
<b>1.4 Location and Site History .....</b>	<b>13</b>
<b>1.5 Literature Review.....</b>	<b>15</b>
1.5.1 Phytoremediation.....	15
1.5.2 Selected Plants .....	16
1.5.2.1 Corn.....	16
1.5.2.2 Tobacco .....	17
1.5.3 Heavy metals.....	17
1.5.4 Plant Stress and Tolerant.....	18
1.5.5 Industrial and Municipal Wastewater .....	19

1.5.6	Impact of wastewater on soil properties.....	20
<b>2</b>	<b>Experiment.....</b>	<b>22</b>
2.1	Site selection and location.....	22
2.2	Plant material.....	24
2.3	Experiment layout.....	24
2.4	Statistical Analysis.....	24
<b>3</b>	<b>Treatments and Sample Collection.....</b>	<b>26</b>
3.1	Soil sampling.....	26
3.2	Plant sampling.....	26
<b>4</b>	<b>Parameters.....</b>	<b>26</b>
4.1	Soil Parameter.....	27
4.1.1	Heavy Metals.....	27
4.1.2	Soil pH.....	27
4.1.3	Soil EC.....	28
4.2	Plant parameter.....	28
4.2.1	Plant Height.....	28
4.2.2	Leaf Area Index (LAI).....	28
4.2.3	Biomass.....	28
4.2.4	Heavy metals.....	29
<b>5</b>	<b>Results.....</b>	<b>30</b>

<b>5.1</b>	<b>Soil pH</b> .....	<b>30</b>
5.2	Soil Electrical Conductivity (EC) .....	32
<b>5.3</b>	<b>Plant Height</b> .....	<b>34</b>
<b>5.4</b>	<b>Plant Biomass</b> .....	<b>35</b>
<b>5.5</b>	<b>Leaf Area Index (LAI)</b> .....	<b>37</b>
<b>5.6</b>	<b>Heavy Metals Content in Soil before Planting</b> .....	<b>38</b>
<b>5.7</b>	<b>Heavy Metals Content in Soil after Planting</b> .....	<b>40</b>
<b>5.8</b>	<b>Heavy metals content in plant</b> .....	<b>42</b>
5.8.1	Heavy metals content in whole corn plant .....	42
5.8.2	Heavy metals content in corn plant parts .....	45
5.8.3	Heavy metals content in whole Tobacco plant .....	53
5.8.3.1	Heavy metals content in Tobacco plant parts.....	56
<b>5.9</b>	<b>Bioaccumulation Factor (<i>f</i>)</b> .....	<b>64</b>
<b>6</b>	<b>Discussion</b> .....	<b>67</b>
<b>6.1</b>	<b>Soil pH</b> .....	<b>67</b>
<b>6.2</b>	<b>Soil Electrical Conductivity</b> .....	<b>67</b>
<b>6.3</b>	<b>Plant Height</b> .....	<b>68</b>
<b>6.4</b>	<b>Heavy Metal Content in Soil before Planting</b> .....	<b>69</b>
<b>6.5</b>	<b>Heavy Metal Content in Plant</b> .....	<b>71</b>
<b>6.6</b>	<b>Assessing the Efficiency of Phytoextraction with Plant</b> .....	<b>72</b>

<b>7 Conclusion .....</b>	<b>74</b>
<b>References.....</b>	<b>75</b>
<b>Annexes.....</b>	<b>88</b>
<b>Abstract (Arabic).....</b>	<b>117</b>