The Effect of the Addition of Fulvic Acid and Straw Water on the Efficiency of Arsenic Uptake from Groundwater by *Vetiveria zizanioides*

by

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Statement of Originality

The entire work created in this master’s thesis report is a sole work of the author. He has not used any fragment of text from other sources without providing the proper acknowledgement. The theories, results and designs of original work have been appropriately referenced and all sources of assistance have been fully acknowledged.

Zhuang Zhao

24th December 2012
Abstract

The aim of this research project was to investigate the efficiency of fulvic acid or straw water as an amendment to enhance the uptake of arsenic from groundwater by *Vetiveria*. Fulvic acids and straw water were applied to arsenic-contaminated groundwater at different concentrations (0.1% and 0.01%). It was found that when the higher concentration of straw water was added to the groundwater solution, the efficiency of arsenic accumulation by roots was increased 47.8%. Straw water not only enhances the growth of *Vetiveria*, but also improved arsenic accumulation in both shoots and roots. In contrast, the addition of fulvic acids (at high or low concentrations) resulted in the reduction of *Vetiveria* growth. Specifically, a high concentration of fulvic acid reduced arsenic accumulation in roots whilst a low concentration of fulvic acid decreased arsenic accumulation in shoots.
Acknowledgements

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### Abbreviations

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<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADD</td>
<td>Average Daily Dose</td>
</tr>
<tr>
<td>As</td>
<td>Arsenic</td>
</tr>
<tr>
<td>BF</td>
<td>Bio-concentration Factor</td>
</tr>
<tr>
<td>CDTA</td>
<td>Leneditrilotetraacetic Acid</td>
</tr>
<tr>
<td>DTPA</td>
<td>Diethylenetriaminepentaacetic Acid</td>
</tr>
<tr>
<td>EC</td>
<td>Electrical Conductivity</td>
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<td>EDTA</td>
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<td>EESI</td>
<td>Environmental Earth Science International</td>
</tr>
<tr>
<td>EGTA</td>
<td>Ethylene Glycol Tetraacetic Acid</td>
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<tr>
<td>EPA</td>
<td>Environmental Protection Agencies</td>
</tr>
<tr>
<td>FH</td>
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</tr>
<tr>
<td>FL</td>
<td>Low Level of Fulvic Acid 0.01%</td>
</tr>
<tr>
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<td>Frist Trial</td>
</tr>
<tr>
<td>GW</td>
<td>Groundwater</td>
</tr>
<tr>
<td>HEDTA</td>
<td>N-Hydroxyethyl-Ethylendiamine-Triacetic Acid</td>
</tr>
<tr>
<td>HI</td>
<td>Hazard Index</td>
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<tr>
<td>ICP-MS</td>
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<td>NOM</td>
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<td>NTA</td>
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