



MEMORANDUM OF UNDERSTANDING



Between

Dr. Abhishek Basu & Debjani Mondal

**Mina Aghababaei, Sadhan Kr Das,
Santanu Majumder, Debashis
Chatterjee**

Memorandum of Understanding

First Party:

Debjani Mandal & Abhishek Basu

Second Party:

Mina Aghababaei, Sadhan Kr Das, Santanu Majumder, Debashis Chatterjee

Abstract:

The soil and groundwater of the Bhagobangola I block of Murshidabad district, West Bengal, India, are severely contaminated with arsenic. A bacterium was isolated from the garden soil of Mahishasthali village that can tolerate 36.49 mM arsenic (III), 280.44 mM arsenic (V), and 63 mM chromium (III), making it hyper-tolerant to these substances. The bacterium's growth pattern remains relatively unaffected in the presence of 10 mM arsenic (III) and chromium (III), indicating strong resistance to these heavy metals. Scanning electron microscopic analysis revealed that the bacterium is rod-shaped with a size of approximately 1.45 μm . 16S rDNA sequencing and subsequent phylogenetic analysis identified the bacterium as **Microbacterium paraoxydans**. This bacterium is capable of bioremediation of arsenic, showing 30.8% and 35.2% bioremediation for 1 mM arsenite, and 22.6% and 30.5% for 4 mM arsenite over 24 and 48 hours, respectively. Additionally, **Microbacterium paraoxydans** demonstrates potential plant growth-promoting properties, including nitrogen fixation, phosphate solubilization, indole-3-acetic acid production, and siderophore production. Thus, the bacterium's heavy metal resistance, bioremediation potential, and plant growth-promoting capabilities could be harnessed to reduce arsenic toxicity in soil and groundwater while promoting plant growth.

Clauses of MoU

1. Research Collaboration: Both parties agree to collaborate on research related to the isolation and characterization of *Microbacterium paraoxydans* for bioremediation and plant growth promotion.
2. Research Ethics: Both parties will adhere to strict research ethics, share ideas, and avoid any conflict of interest while publishing documents or research articles.
3. Resource Utilization: Both parties will utilize research grants from any source for the fulfillment of the project.

Time Period of Collaboration

This MoU will remain in effect until one of the signing parties wishes to withdraw from the agreement.

Signed:

First Party: _____

Second Party: _____

Functionality of the MoU

Within the scope of this MoU, the following outcomes are anticipated:

- Detailed study and publication of the bacterium's bioremediation capabilities.
- Exploration of the bacterium's plant growth-promoting properties.
- Application of the bacterium for reducing arsenic toxicity in soil and groundwater, and enhancing plant growth.

Signatures:

First Party:

Debjani Mandal _____

Abhishek Basu _____

Second Party:

Mina Aghababaei _____

Sadhan Kr Das _____

Santanu Majumder _____

Debashis Chatterjee _____

Date: