Dr. Ananya Mondal

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Education

Ph.D. (Life Science & Biotechnology) –Jadavpur University & Indian Statistical Institute, Kolkata (2014-2021)

M.Sc. (Botany) – Calcutta University (2012)

(Specialization – Advanced Mycology and Molecular Plant Pathology)

B.Sc. (Botany)- Calcutta University (2010)

Fellowship

Rajiv Gandhi National Fellowship (UGC), (2014 -2019)

Host Institute

Agricultural and Ecological Research Unit, Biological Sciences Division, Indian Statistical Institute, Kolkata, West Bengal, India
&
Dept. of Environmental Science, Tezpur University, Assam, India

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Experience

Visiting Scientist at Indian Statistical Institute, Giridih (2022)

Guest lecturer at Bangabasi Morning College (2012-2013)

Nationality: Indian

List of publications

Ananya Mondal, Linee Goswami, Nazneen Hussain, Soma Barman, Eshan Kalita, Pradip Bhattacharyya, Satya Sundar Bhattacharya (2020). Detoxification and eco-friendly recycling of brick kiln coal ash using Eisenia fetida : A clean approach through vermitechnology. Chemosphere.244 : (SCI; IF = 8.943)

Ananya Mondal, Subhasish Das, Rajesh Kumar Sah, Pradip Bhattacharyya, Satya Sundar Bhattacharya (2017) Environmental footprints of bick kiln bottom ashes : geostatistical approach for assessment of metal toxicity. Science of the Total Environment 609 : 215-224 (SCI : IF = 10.754)

Oral Presentation

82nd Annual Convention 2017**;** National seminar on **"Development in Soil Science -2017"**
Indian Society of Soil Science, December, 2017-
Title - "Temporal variation of microbial biomass, physic-chemical properties and heavy metal content of brick kiln amended soil"

Poster Presentation

8th International conference on Molecular Signaling & 4th CeSin Symposium. March, 2023
Indian Institute of Chemical Biology & The Society for Molecular Signaling (SMS).
Title- Biosorption of heavy metals and inhibition of mycotoxins production by using lactic acid bacteria : an in-vitro study

6th India Biodiversity Meet 2019 (International Conference) – February,2019
Title – "Stabilization of Brick kiln ash through vermicomposting"

On completion of 91st birth anniversary of Professor L.N. Mondal
National seminar on '**Nutrients and pollutants in soil-plant-animal-human Continuum for sustaining soil, food and nutritional security –way forward'** June 9-10, 2017, Lake Hall, BCKV, Kalyani
Title – 'Environmental concerns of brick kiln ashes in Assam and West Bengal'

Research interest

My research interest is mainly solid and hazardous waste management, soil microbiology, and Bio-fertilizer development for plant growth. Disposal of toxicant rich solid waste material is sensitive issue in densely populated countries like India. My primary objective is reducing adverse impacts of waste materials on human health and our environment.

Thesis title: Characterization, risk evaluation and utilization of brick kiln coal ash in agriculture through vermicomposting.

Summary of my research work

Large number of brick kiln factories has been established in rural areas of Indian subcontinent to meet the ever-increasing demand of bricks in construction sector. As majority of these brick kilns are coal fed, they produce coal ash in considerable amount, which are largely disposed in landfills. Although the brick kiln coal ash (BKCA) is rich in potentially toxic metals, no authentic data was available prior to this research on the environmental impact of such waste material. Therefore, my first objective was to characterize this hitherto unknown coal ash from environmental perspectives . Overall, 32 samples from different brick kiln factories of Assam and West Bengal were collected on the basis of their strategic geographical locations. The research revealed that BKCA can be a good source of essential elements (organic C, N, P, K, Ca, and S). However, high occurrence of potential toxic elements such as Cd, Cr, Pb, Cu, Fe, Mn, and Zn was the major concern. Correspondingly, environmental risk assessment attributes revealed that occurrence of toxic metals in few BKCA samples of Assam were above the admissible limit. Hence, land disposal of BKCA is detrimental for the ecosystems.

In the second phase of the research, the impact of BKCAs on soil health was assessed to interpret the consequences of long-term land deposition of the waste. Soil samples from both the states of Assam and West Bengal were collected and eventually selected BKCA samples were added in various concentrations. The selection of BKCA samples were done on the basis of the metal contents. Assam BKCAs were applied in Assam soils, while the BKCAs generated in West Bengal were incorporated in West Bengal soil. Over the time, substantial reduction in pH of the Assam soil was evidenced due to addition of 0.5-1.5 % BKCA. In contrast, 0.5-1.0 % BKCA incorporation

neutralized the alkaline soil samples of West Bengal. Cation exchange capacity significantly increased due to low dose (0.5%, 1%, and 2.5%) application of BKCA. Slightly high dose (10 % and 5%) BKCA incorporation increased SOC level in soil. However, microbial health of soil was also affected due to BKCA incorporation. In addition, bioavailability of potentially toxic metals (Cd, Cr, and Pb) significantly increased over time in BKCA incubated soils. Therefore, long term use of BKCA in agricultural soil would likely to generate toxicity in soil. On the other hand, BKCAs have potential soil amelioration properties. Hence, remediation of toxic metals through proper technological intervention can transform this waste to useful soil conditioner.

On the basis of the results and understandings of the soil incubation study, the reliance of vermitechnology was taken to remediate the BKCAs. In this experiment, a reliable epigeic earthworm species – *Eisenia fetida* was used. BKCA samples were mixed with cow dung in various proportions and such mixtures were used as feedstocks of the vermireactors. A parallel of aerobic composting reactors were set for purpose of comparison. Although earthworm growth and fecundity rates slightly retarded in Assam BKCA based feedstocks at the initial stage, significant growth recovery was recorded after 30 days of incubation. On the other hand, the rate of earthworm proliferation was highly satisfactory in West Bengal BKCA based feedstocks . Remarkable reduction in bioavailability of toxic metals (Pb, Cd, and Cr) was observed; correspondingly substantial bioaccumulation of these metals in earthworm body was recorded. Such results indicate that *E. fetida* can be a potential agent for remediation of toxic metals in BKCAs. Overall, 1:1 BKCA-cow dung mixture was the most suitable feedstock for *E. fetida.*

In the last phase of the research, large scale vermicomposts were prepared with (1:1) and (1:2) BKCA +CD combinations, which were applied on field as a nutrient source for monsoon rice cultivation. The experiments were conducted in two different locations (Assam and Jharkhand) to evaluate the impacts on agriculture in accomplished manner. Significant increment of NPK and organic carbon was evidenced in the cultivated soil due to BKCA vermicompost application. Among seven different treatment combinations, NPK_{85} + $VC_{BKCA(1:2)}$ and NPK_{85}+$VC_{BKCA(1:1)}$ were most effective for rice cultivation. Overall the research revealed that 15-30% substitution of inorganic fertilizer could be achieved through BKCA vermicompost application without compromising soil health and crop productivity. However, long term field experiments is

warranted in future to establish the potency of vermicomposted BKCAs as an alternative eco-friendly fertilizer.