



Asian Journal of Chemistry; Vol. 37, No. 6 (2025), 1501-1508

ASIAN JOURNAL OF CHEMISTRY

<https://doi.org/10.14233/ajchem.2025.33903>



Soil Microbial Community Structure and Dynamic Enzyme Activity in the Degraded Soils of Paradeep Industrial Area

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Received: 15 April 2025;

Accepted: 23 May 2025;

Published online: 27 May 2025;

AJC-22024

The surrounding land and waters are polluted by the industrial effluents of Paradeep. In this work, soil samples from seven locations around the Paradeep industrial area were investigated. The results found the overall average values of Fe, Cu, Zn, Cr, Ni and Pb were 149.24, 4.38, 4.69, 20.97, 2.98 and 7.41 mg/kg, which was lower than WHO guidelines except Mn (79.31 mg/kg). The soils under examination exhibit a pH range of 4.23-7.00, indicating the acidity to neutrality. The organic carbon content ranges from extremely low to high (0.17-1.76%). These soils have low to medium N, P and K values. High levels of hazardous Fe, Cr, Ni, Pb and Zn occur in the soils. Near Paradeep Phosphate Limited ash pond, the soil contains the highest amount of Cu (9.4 mg/kg). Heavy metals and low pH decreased the biological activities of several enzymes such as dehydrogenase, fluorescein diacetate and alkaline phosphatase, as shown by correlation studies (negative association). Industrialization has significantly contaminated the soil of the study region, requiring immediate restoration.

Keywords: Soil contamination, Soil nutrients, Microbes, Correlation, Industrial pollution.

INTRODUCTION

Throughout history, human beings have coexisted with the natural world. Unfortunately, surface and sub-surface soils of ecosystems now contain harmful trace metals from anthropogenic sources due to unregulated industrial and human activities. It is possible for these chemical compounds and hazardous trace metals to build up in water and soil. Hence, soil can be seen as a permanent repository for contaminants, from which these substances can enter food webs or seep into underground water sources [1]. Industrial waste is a common source of pollution due to irresponsible disposal practices. Non-point sources, such as pesticide residues or excessive use of fertilizers and specific sources, such as industrial emissions, effluents and solid waste disposal, vehicle exhaust and metal smelting or mining, are both contributors to pollution [2]. Although all these sources pose risks to humans, animals and plant health, the ones that

leach heavy metal into soils are particularly worrisome because of how long these elements remain in the environment. They are immutable-all that can change is their state [3]. Soil environmental hazards are escalating due to causes such as heightened economic activity, rapid industrialization and negligent waste management, compounded by a lack of adequate knowledge regarding dangerous pollutants and their prevention [4,5].

The physico-chemical characteristics of soils are influenced by a combination of natural and human-caused variables that operate on time factors and space scales. The parent material, local geomorphology, vegetation, weather and other environmental factors all have a role in natural pedological processes including rock weathering and organic matter decomposition [6,7]. The intricate structure of soils reveals the consequences of these processes, which are time dependent. By contrast, the pedological properties are considerably impacted by soil management methods, which alter soil structure mechanically due