The Microbe-Mineral Interactions In The Acidic Podzol Soil

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Iron is a key component of the chemical architecture of the biosphere. Due to the low bioavailability of iron in the environment, microorganisms have developed specific uptake strategies, like siderophores, which are operationally defined as low-molecular-mass biogenic Fe(III)-binding compounds, that can increase iron's bioavailability by promoting the dissolution of iron-bearing minerals. In the present study, we aimed to investigate the composition of hydroxamate siderophores in the soil horizons of the acidic podzol, and study how they are affected by the presence of specific mineral types and microbial communities.

Three different minerals (apatite, biotite and oligioclase) were inserted in the soil horizons (O (organic), E (eluvial), B (upper illuvial), and C (mineral)). After two years, soil samples were collected from both the bulk soil (next to the minerals) and from the soil attached to the mineral surfaces. The concentration of ten different fungal tri-hydroxamates and five bacterial ones were determined by high-performance liquid chromatography coupled to electrospray ionization mass spectrometry (HPLC-ESI-MS). In addition, total microbial composition and diversity were studied.

Our field experiment succeeded in describing the relationship between the presence of siderophores, soil horizon and mineral type, in addition to understanding the interaction between mineral type and soil microbial composition. A wide range of fungal and bacterial hydroxamates were detected throughout the soil profile. On the other hand, the presence of the minerals completely altered the diversity of siderophores. In addition, each mineral had a unique interaction with hydroxamates in the different soil horizons. There were also a good relationship between the microbial diversity and the siderophore distribution.

Keywords: Podzol soil, Siderophores, Weathering

Hydraulic properties and fresh water prospect of the Ganges River Basin, Bangladesh

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Bangladesh is a lower riparian country in the floodplains of three major rivers- the Ganges (Padma), the Bhramaputra and the Meghna and their tributaries and distributaries which forms the largest delta in the world. Ganges River Basin in Bangladesh has been strongly influenced by tectonics, manifested as delta switching and subsidence and shows fluvio/deltaic plains depositional environments. Groundwater development was started in the early sixties and extended rapidly during the late 1976. Presently, 80% of our national water demand fulfill by groundwater. The lean season flow of the Ganges has decreased since the commissioning of the Farakka Barrage in India during 1975. Climatic change is accelerating the siltation and subsequent dry season, and also limitation of the surface water that's why total water demands stressed on the groundwater. Ganges River basin areas of Bangladesh have started facing water problems, including the drying up of wells during peak irrigation period and lowering of water table and chemical(As,Fe,Cl,Mn,Mg^{2+}) problem. The study area shows arsenic contamination in shallow groundwater aquifers which makes the water unfit not only for human consumption but also for agriculture and environment. In some places deep aquifers show saline water. Between these two aquifers fresh water aquifer is found which the main water source of the area. This paper is mainly concerned with the delineation, extension, recharge and discharge areas of the fresh water aquifer and calibrates hydraulic properties of the aquifer. It also throws light on scope of development of the fresh water aquifer without arsenic contamination or saline water intrusion.

Key words: Ganges river Basin, groundwater, water quality.

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