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Research Article

Bacteria population in Industrially Polluted Soils in Kallur, Khammam

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ABSTRACT

In the present study on microbial and plant diversification in polluted soil system and soils were assessed. Bacteria are most numerous of the microorganisms present in the soil and form about 25% of the total microbial biomass(range 10-40%) with variable populations estimates to be 2 * 10 8 cells g -1 soil (range 10 6 to 10 9). The bacteria are nutritionally and physiologically diverse and dominant group of microorganisms in soil and their biomass is generally exceeds the fungal biomass in soil. The diversity of bacterial community in soil as revealed by using DNA re association analysis technique is as much as 170 folds greater than reveled by the bacterial isolates from soil.

1. Introduction

Biodiversity is indeed one of the India's important resource and is the bedrock of all bio industrial development in the unusually large rural sector of the country. However, the real value of biodiversity lies in the genes and the macromolecules. India has over 1,08,276 species of bacteria, fungi, plants and animals already identified and described (NCC, 1994). Of these over 84% species constitute fungi (1.2%), flowering plants (13.9%) and insects (19.3%). Biodiversity is a good measurement to establish environmental degradation. Wide the biological diversity, narrower the pollution loads and vice-versa. As the soil is vital to human existence, it forms the basis for much of our food productivity. The indiscriminate release of waste materials and industrial effluents into the soils and it reused causes heavy damage to the soil systems (Agarwal and Chauhan, 1990; Gupta and Garg, 1991; Rajeshwari, 1993).

Bacteria are the most numerous of all soil microorganisms which reproduce rapidly and adopt to new environmental situations are important to the decomposition and transformation of both natural and anthropogenic products. Some of the functions performed either entirely or in part by bacteria include nutrient cycling, decomposition of organic materials, N fixation, pesticide detoxification and oxidation-reduction reactions. and individual bacterial cells are the smallest and most difficult to see under the microscope. A handful of soil contain several billion bacterial cells.

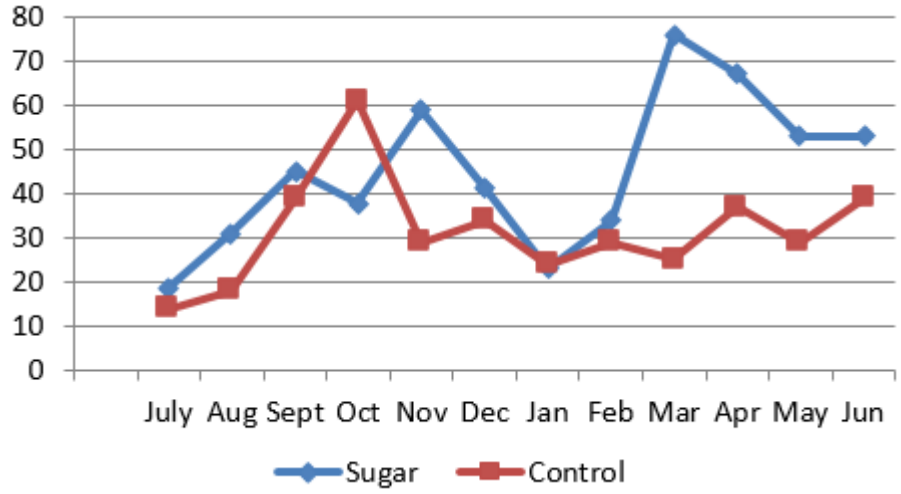
Therefore, the present study on microbial and plant diversification in polluted soil system and soils were assessed and discussed. Therefore, impact of effluents of two industries on biological diversity was investigated.
The soil acts as 'biological fire'. A leaf falling from a tree is consumed by this 'fire' as its organic matter is metabolized by microbes in the soil. Elements in the leaf enter the biogeochemical cycle for carbon, nitrogen and sulphur, and elements are oxidized and reduced by microorganisms to meet their metabolic needs.

Soil Biological communities vary from soil to soil and range plant roots, rodents, worms, and insects. Which are usually visible to the eye, to microorganisms (bacteria, actinomycetes, fungi, algae and protozoa) that are so small they require a microscope to see them. Factors such as rainfall, temperature, vegetation and physical and chemical properties of soils influence the type and number of living organisms in soil community.

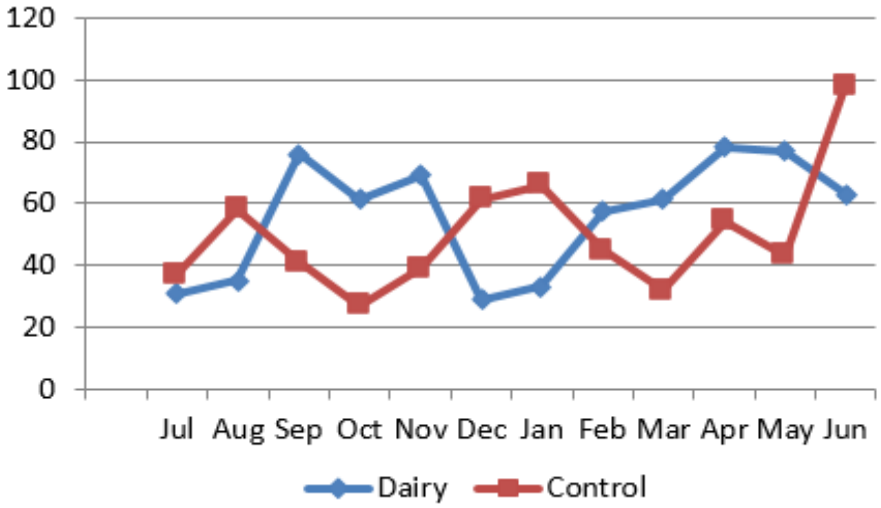
2. Material and Methods

2.1 Microbial Enumeration

Microorganisms bacteria was isolated and enumerated by following standard serial dilution plate technique.



Figure–1. Bacterial populations Sugar industry effluents flooded soils and control soils.



Figure–2. Bacterial populations Dairy industry effluents flooded soils and control soils

Procedure: Six test tubes with nine ml of distilled water was taken and sterilized. One gram fresh soil sample was added in first test tube in aseptic condition. Contents were thoroughly shaken and one ml sit was transferred into the second test tube and like this all the test tubes were prepared. From these tubes fifth dilution was used for fungi isolation and sixth dilution for bacteria.

2.2 Nutrient Agar medium:

Beaf extract –three gram, peptone –five gram, sodium chloride –five gram, agar –agar –fifteen grams and one liter distilled water was taken in a conical flask and sterilized at fifteen lbs for fifteen minutes. This was used for bacterial isolation and enumeration.

3. Results and Discussion

Bacteria, prokaryotes, differ from eukaryotes structurally as well as in their biochemical constituents. The single celled, simplest and smallest bacterial forms are important in soil by virtue of their ability to increase rapidly in numbers, their capacity for rapid reproduction and their capacity to adjust their activities quickly in response to changes in the environment.

Bacteria are most numerous of the microorganisms present in the soil and form about 25% of the total microbial biomass(range 10-40%) with variable populations estimates to be 2 * 10^{8} cells g^{-1} soil (range 10^{6} to 10^{9}). The bacteria are nutritionally and physiologically diverse and dominant group of microorganisms in soil and their biomass is generally exceeds the fungal biomass in soil. The diversity of bacterial community in soil as revealed by using DNA re association analysis technique is as much as 170 folds greater than reveled by the bacterial isolates from soil. About 4000-7000 different genomic equivalents are estimated to be present in a gram of soil. Bacteria are present in all types of soils but their number / population decreases as soil depth increases, especially being maximum in ' A ' horizon of soil. A single soil sample possesses over 4000 genetically diverse bacterial species but hardly 1% are culturable species. Bacteria along with fungi are able to degrade and remove f hydrocarbons by their efficient enzyme system (Tabatabai., 1994, Sarala et al., 2011;; Genovese et al., 2008). Environmental factors like pH, salinity and psycho-chemical characteristics of soil such as inorganic (heavy metals) and organic substances (cyclic aromatic compounds) are known to affect the growth and activities of bacteria (McGrath et al., 1988; Chaudhary et al., 1996). Soil bacteria and fungi play pivotal roles in various bio geochemical cycles (BGC) and are responsible for the cycling of organic compounds (Trevors,

1998b; Wall and Virginia, 1999). In soils bacteria, yeast's and filamentous fungi appear to be important hydrocarbon degraders (Atlas et al., 1992 and M. Alexander., 1961). Scientific understanding of microbial biogeography is particularly weak for soil bacteria, even though the diversity and composition of soil bacterial communities is thought to have a direct influence on a wide range of ecosystem processes (Schimel, 1995). The diversity of soil bacterial communities are influenced by a wide range of biotic and abiotic factors The bacterial population in polluted and unpolluted soils was analyzed at monthly intervals for one consequent year (2017 and 2018) and the results are précised in Figure 1 and 2.

Persual of Figures reveals that bacterial population increased significantly in the polluted soils, which further increased during the second year. The increased activity of bacterial population may be due to availability of organic substances in the effluents. Kanazawa et al.(1988) observed a variation in the total number of bacteria and fungi isolated from soils treated with chemical and organic fertilizers. Lima et al. (1996) reported higher number of bacteria in unfertilized soil as compared to soil fertilized with superphosphate. Kizilkaya et al., 2008, Sridevi et al., 2007, Martyniuk and Wagner (1978) found that microbial populations were greater in fertilized soil than in unfertilized soil. Under anaerobic condition , bacteria dominate the scene and carry microbiological activities in soil when fungi and actinomycetes do not grow in the absence of oxygen (Ros et al., 2006, Subba Rao, 2002,Burns 1983.). Industrial waste water can bring about changes in the community composition of soil inhabiting organisms (Odum, 1969). Some available information indicate that some species have the potentiality to be used as bio-indicator of the soil pollution (Lalitha Kumari B., 2014, Nagaraju et al., 2007, Wick et al.,1998, Reddy et al., 1981). Talashilkar (1989) working on recycling of urban waste and relation to agriculture reviewed the application of sewage effluent, industrial waste water and sludge compost on agricultural land.

Competing Interests

The authors have declared that no competing interests exist.

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