**Role of Microorganisms in Environment**

**Microorganisms in** **Soil**

The important characterizes of soil microorganisms are:

1. Microorganisms in the soil are important to us in maintaining soil fertility / productivity, cycling of nutrient elements in the biosphere and sources of industrial products such as enzymes, antibiotics, vitamins, hormones, organic acids etc. At the same time certain soil microbes are the causal agents of human and plant diseases.
2. Cultivated soil has relatively more population of microorganisms than the fallow land, and the soils rich in organic matter contain much more population than sandy and eroded soils. Soil fertility depends not only on the presence of inorganic and organic substances, but also on the presence of various species of micro-organisms which influence the qualitative composition of the soil.
3. The number of microorganisms in the soil depends on the extent of contamination with feces and urine, and also on the nature of treating and fertilizing the soil. For example, ploughed soil contains 2.5 times more microbes than forest soil.
4. Saprophytic spores *(B. cereus. B, meguterium,* etc.) survive for long periods in the soil. Pathogenic bacteria which do not produce spores due to lack of essential nutrients, and also as a result of the lethal activity of light, drying, antagonistic microbes, and phages do not live long in the soil (from a few days to a few months).
5. The soil as a factor of transmitting a number of causative agents of infectious diseases is quite a complex substrate. Thus, for example, anthrax bacilli after falling on the soil produce spores which can remain viable for many years. In favourable conditions (in dark brown soil) they pass through the whole cycle of development: during the summer months the spores germinate into the vegetative forms and then this cycle is repeated. As is known, the spores of clostridia causing tetanus, anaerobic infections, and botulism, and of many soil microbes survive for long periods in the soil.
6. The soil is the habitat for various animals (rodents) which are parasitized by the carriers of the causative agents of plague, tularemia, the viruses of mosquito fever, hemorrhagic fever, encephalitis, agricultural leishmaniasis, etc. *The* cysts, of intestinal protozoa (amoeba, balantidium, etc.) spend a certain stage in the soil. The soil plays an important role in transmitting worm invasions (ascarids, hook-worms, nematode worms, etc.). Some fungi live in the soil. Entering the body they cause fusariotoxicosis, ergotism, aspergillosis, penicilliosis mucormycosis, etc.
7. Optimum conditions for microorganisms are temperature (70°-100°F most active microbes), moisture (Field capacity is optimal), aeration (want a nice mix of pores filled with water and air), pH (optimal pH is 6-7), soil organic matter.

**Soil Microorganisms: Bacteria**

1.     Most numerous in soil

2.     Most diverse metabolism

3.     Can be aerobic or anaerobic

4.     Optimal growth at pH 6-8

5.     Examples: *Nitrosomonas* and *Nitrobacter* in nitrification processes and N2 fixers

**Soil Microorganisms: Actinomycetes**

1.     Transitional group between bacteria and fungi

2.     Active in degrading more resistant organic compounds

3.     Optimal growth at alkaline pH

4.     2 important products:

– produce antibiotics such as streptomycin – produce geosmin

5.     Negative impact - potato scab (*Streptomyces scabies*)

**Soil Microorganisms: Fungi**

1.     Dominate the soil biomass

2.     Obligate aerobes

1. Can survive desiccation
2. Dominate in acid soils
3. Negative impacts:

–plants diseases (*Rhizoctonia, Pythium, Fusarium*, and*Phytophtora*)  
Beneficial:– produce antibiotics such as penicillin by  *Penicillium*