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CONSERVATION OF SOIL ORGANISMS: THE NEED OF THE HOUR

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There is a wonderful world of organisms in the soil. These organisms range from microscopic to macroscopic in structure and size. These organisms affect the biological, physical and chemical composition of the soil directly and indirectly. These soil organisms, most of which are invertebrates, act as biological indicators of soil type and its fertility. These organisms consume dead and useless substances like rotten leaves, other parts of plants, dung, garbage etc and produce odourless and nutritions manure.

Based on size and structure, they are divided into the following three categories:

1. **Microfauna:** Organisms less than 2 millimeters in size such as protozoans, nematodes etc., which constitute about 96% of the total microfauna biomass in the soil, are mostly fungivorous and bacterial feeders.
2. **Mesofauna:** Organisms whose size is between 2 to 10 millimeters such as small arthropods, oligochaetes, collembola etc. They mainly feed on rotten leaves, fungal webs, nematodes etc.
3. **Macrofauna:** These are large invertebrates whose size is more than 10 millimeters. They are also called engineers of soil biological systems. These mainly include termites, ants, millipedes, other large joint - legged animals, snails and earthworms. They eat all types of rotten things. Apart from these three classes of organisms, the soil also contains a vast repository of microscopic organisms. These micro organisms not only form the micro soil food chain but also live as symbiotes with other larger soil organisms and enhance their efficiency. The distribution and type of these soil organisms depend on the ecosystem of a particular area. These soil organisms directly and indirectly affect soil metabolism, biomass, recharge, carbon, nitrogen and other nutrients, soil water, soil evaporation, soil erosion, soil water flow capacity, soil disease resistance, soil bearing capacity and soil microbial structure.

The following are soil useful organisms:

1. **Roundworms or Nematodes:** These are found in abundance in the soil. Their distribution, type and number depend on environmental conditions and type of vegetation. Their number can range from 1 lakh to 10 crore per square meter. Most roundworms are parasites and disease - causing on plants and animals. Despite all this, their contribution to soil respiration is not underestimated, which amounts to approximately one per cent of total soil respiration. Roundworms help in soil nutrition by eating harmful and disease - causing bacteria, protozoans and fungi etc. present in the soil.

2. **Protozoans or Primogenital:** They consume microorganisms in the soil such as bacteria and fungi etc. and directly affect the number and distribution of bacteria. Under normal conditions, they are found in the range of 1 to 10 lakhs per gram of soil. Indirectly they live as symbiotes in the gut of soil and other larger organisms such as termites, earthworms etc. and form a microbial food chain.

3. **Collembola and Mites:** These are small arthropods. Their quantity can range from 10 lakh to 10 crore per square meter. They mainly feed on decayed matter, fungi, lichens, nematodes and primitive organisms and play an important role in the decomposition of organic matter in the soil.

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4. Enchytraeids: These are microscopic oligochaetes and are found in abundance in the soil. There are around 600 species found all over the world. They feed on decaying plant matter, fungal growths, and the wastes of other soil organisms such as collembola, which contain traces of cellulose urea, and protein. The faeces of Enchytraeids contain about 2.5% nitrogen, 0.3 % phosphorus and about 1.0% calcium. In this way, the calcium present in organic waste is made accessible to plants.

5. Termites and Ants: Symbiotic bacteria found in the alimentary canal of termites perform nitrogen fixation and some uricolytic bacteria convert the useless uric acid into ammonia. In termite mounds, 2 to 2.5 times more phosphorus, 8 to 9 times more organic carbon (44 - 52%) has been found compared to normal soil. Similarly, ants not only change the physical form of the soil, but also bring about radical changes in its biological and chemical composition. They make the soil clean and rich in nutrients by eating rotten leaves, food pieces, grains, seeds and other dead organisms.

6. Beetle and Ladybug: Both beetles and ladybugs are large arthropods whose bodies are covered with a hard coitine covering. White grubs, by their daily reactions, make the soil loose and airy. Beetle or ladybug lives in faeces or dung and by eating it, it produces manure containing simple organic matter.

7. Earthworms: They are known by many names like friend of farmers, intestine of the earth, etc. Their role in soil fertility is well known. About 385 species of earthworms are found in India. There are many types of these depending upon the accommodation and food arrangements- Epigeic, Endogeic and Anecic. Epigeics are found on the upper layer of the soil and feed on decaying plant parts, dung, garbage and soil rich in organic matter. Endogeics are found in the upper organic matter - rich layer of the soil. Anecics are found at deeper depths. They mainly feed on organic soil. The contribution of earthworms to soil biomass range from approximately 2 grams to 300 grams per square meter and their number can range from 10 to 2000 per square meter. It is estimated that they constitute 50-80% of the total biomass of the soil. Useful nutrients are found in high quantities in the mucus, urine and feces secreted by earthworms. Eathworms make the soil loose and control soil ph, soil carbon etc. They consume agricultural waste, domestic waste, cow dung, garbage, grass, weeds, paper and other organic matter to make useful vermicompost, which contains about 9.15-18% organic carbon, 2-3% nitrogen, 1-1.5% phosphorus and up to 1.5% potassium. Earthworms also act as biological indicators of soil pollution and soil fertility.

8. Other micro-organisms: Apart from all these, many micro-organisms are also found in the soil whose importance is no less than these big organisms. These micro-organisms form the basic unit of the soil food chain. These mainly include bacteria, actinomyces, fungi etc. Many types of bacteria are found in the soil. According to an estimate, the number of bacteria per gram can range from 10 lakh to 10 billion. But under favourable soil conditions and abundance of organic matter, fungi constitute about 70% of the total soil biomass. Bacteria play an important role in soil respiration, nitrogen fixation and soil chemical cycling. Some bacteria like Bradyrhizobium, Azospirillium perform nitrogen fixation. Many other fungal species decompose cellulose and lignin, and the basic organic matter obtained from them is used by other organisms to synthesize new substances. The presence of these micro-organisms in the soil indicates the health of the soil.

Thus, these amazing creatures:

- These organisms, through their biological decomposition activities, clean the environment by eating dead and decayed parts of plants and animals, dung, garbage and also produce manure rich in nutrients.
- Through daily activities, the soil is made airy and friable. By penetrating the soil deeply, the water holding capacity of the soil is increased.
- These soil organisms make the soil healthy and pollution free by absorbing, decomposing and degrading the harmful toxic agricultural chemicals.

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- These organisms regulate and control various biogeochemical cycles of the soil.
- These organisms secrete saliva, mucus and excretory substances which stick together soil particles and reduce the rate of the erosion.
- Some beneficial soil organisms maintain the disease resistance capacity of the soil by destroying many harmful and disease causing organisms.

Conclusion: At present, due to falling soil fertility and indiscriminate use of pesticides and other agricultural chemicals, soil pollution has increased to dangerous levels. Some of these agro chemicals have entered the food chain due to lack of complete natural decomposition and have caused serious diseases in humans and other organisms. Hence, it has become necessary to get rid of them in time. Excessive agriculture, indiscriminate use of chemical fertilizers, artificial farming, gardening, construction of cattle sheds and destruction of natural habitats such as forests and pastures have endangered exotic species. Therefore, keeping in view the present needs, agricultural scientists, experts and intellectuals have turned towards traditional and environmentally safe agricultural methods, in which organic farming is the main one. Conservation, development and use of beneficial soil organisms are the basic principles of organic farming. Thus, conservation of these wonderful and environment friendly creatures of nature is the need of the hour.