

Perspective

Importance of nematology in agriculture

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DESCRIPTION

Although nematodes are frequently linked with negative impacts on crops, several nematode groups play important roles in the functioning of soil systems. Understanding and improving beneficial nematode functions might thus be a useful tool for ensuring food security in the face of environmental concerns in the future.

The developing field of parasitology and its implications

Because of changing environmental circumstances, greater predominance of monocultures, and the development of pesticide-resistant strains, the presence of pests and diseases, as well as the severity of their impacts on agriculture, is expected to rise in the future.

Parasites are regarded a serious threat to agricultural output among pests and diseases. Parasites are diverse taxonomic groupings that cause considerable crop harm, but they are also essential components of healthy soil systems. Parasites are important bioremediators and agents in the management of other pests and infections. As a result, research has concentrated on the benefits and drawbacks of parasitology in food systems. This is especially true for nematodes, with the subject of nematology gaining traction in recent years as a result of the prospective implications for food production protection and enhancement.

Nematology is the study of roundworms and nematodes, and it was established as a separate science in the nineteenth century. From ecosystem functioning to plant-parasite gene interactions, the field is now overlapping with other disciplines in which these taxonomic groupings operate and effect. Nematodes are the world's most common multicellular organism. They range in size from 1 mm to 40 cm and may be found in practically all habitats and settings. Furthermore, nematodes are parasitic organisms that infect vertebrates, invertebrates, and plants. Nematodes are known to inflict substantial economic harm to cultivated plants due to their parasitic nature, and may be found in the hundreds within just a few grams of soil.

The role of nematodes, on the other hand, is multifaceted, and they provide several important advantages to plants. Author Keith Davies discusses the relevance of nematodes for plants in a study of plant nematology. The most frequent nematodes in soil systems include

bacterial-feeders, fungal-feeders, plant parasites, predators, and omnivores, according to the research. Each of these functional groups performs a variety of tasks in order to maintain healthy soil systems, resulting in a variety of benefits for agricultural food production.

Nematology in agriculture: Benefits and practices

According to current nematology research, nematodes provide a variety of ecosystem services that influence the nitrogen cycle, decomposition capability, and pest control in soil systems. To begin with, nematode's beneficial effects on soil nitrogen concentration have piqued curiosity because to their impact on the nitrogen cycle. Soil disruption during operations like tillage, for example, increases nitrogen availability as well as the number of bacteria competing for nitrogen. Bacterial feeding nematodes increase in number in response to additional bacteria, stabilising nitrogen availability and increasing nitrogen mineralization in soil, which is important for crop development and soil fertility.

Nematodes also have a role in the breakdown of organic substances in the soil. Free-living nematodes are essential because they recycle nutrients in the soil, but bacteria and fungus-feeding nematodes have an indirect impact because they feed on bacteria and fungi that breakdown organic matter. These worms' feeding activity speeds up the breakdown process and makes minerals and nutrients more available to developing plant roots.

Finally, nematodes are important biological pest control agents. Predatory nematodes, which feed on protozoa, insects, and other nematode species, manage the populations of other creatures in soil. As a result, nematodes help to keep the population of other nematodes in check, and studies have shown that nematodes like the Steinernematidae and Heterorhabditidae may eradicate soil-based insect pests hardly at 48 hours.

Finally, nematodes have established themselves as important biological markers of soil health. The diversity and richness of nematode populations are particularly interesting because they serve as proxies for revealing information about soil nutrient levels, fungal availability, and bacteria. Overall, nematode populations give a wealth of information about soil health and aid food production systems in a variety of ways.

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