Ecological Significance, Importance and Conservtion: Soil Dwelling Millipedes

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***Abstract*—Living in the soil, millipedes are essential to the health of the soil and the cycling of nutrients.**
They can speed up the breakdown of organic matter in the soil and enhance the availability of phosphorus and nitrogen. However, millipedes can also seriously harm crops, resulting in decreased yields as well as unintended consequences for plant health and soil quality. A mix of chemical and cultural control techniques suited to particular crops and environmental circumstances may be necessary for the effective management of millipedes. Urbanization significantly changes soil life and is a primary factor in the loss of local species and biotic homogeneity. A vital component of soil macrodetritivores, millipedes have a major impact on soil quality due to their crucial function in nitrogen cycling. Because they help provide a number of soil-related ecosystem services in cities, it is imperative to investigate their taxonomic and functional responses to urban disturbance. Variously deteriorated urban, rural, and other wooded areas

***Index Terms*—Ecology, Importance, Millipedes, Significance**

I. INTODUCTION

They are classified as arthropods because of their segmented bodies, jointed legs, and exoskeleton. Commonly found in soil and leaf litter, millipedes are crucial to the health of the soil and the cycling of nutrients. In the soil, millipedes are crucial to the breakdown of organic matter. The class Diplopoda, which translates to "doublefooted" in Greek, includes the interesting millipede. It is estimated that there are between 50,000 and 80,000 species in the world.
Millipedes can harm crops directly, but their presence can also have indirect consequences on plant health and soil quality. It is well known that millipedes raise the amounts of phosphorus and nitrogen in the soil, which can benefit or harm plants. Although more soil fertility can encourage plant growth and development, too much nutrient can cause toxicity and nutrient imbalances, which can harm or even kill plants.
By feeding and digging, soil macrodetritivores greatly aid in the decomposition of litter, which in turn influences the amount of organic matter in soils. given that millipedes (Diplopoda) are regarded as an important taxon in these ecological processes, especially in regions with mild temperatures.

II. ECOLOGY

Millipedes serve crucial functions in ecosystems as decomposers and recyclers of nutrients. They are responsive to variations in environmental factors, such as temperature, moisture levels, and soil characteristics. Certain millipede species tend to display seasonal and daily activity patterns. Millipedes are recognized as significant prey for numerous predators, including birds, mammals, and other invertebrates.
Ecological role: By decomposing dead plant materials and other organic matter, millipedes contribute significantly to the ecosystem's ability to release nutrients into the soil. A study by Snyder et al. revealed that millipedes were the main decomposers of leaf litter in a tropical rainforest, demonstrating the significance of millipedes in supporting decomposition and nutrient cycling in forest ecosystems.
Additionally, a variety of predators depend on millipedes as a food supply. For example, the Eurasian woodcock, a bird species prevalent in European forests, mostly feeds on millipedes, according to research by Blower and Shotbolt. Millipedes serve as vital indicators of soil quality and can function as bioindicators. Of ecological stressors like contamination and habitat disruption. Their presence or nonexistence can offer understanding regarding the

well-being and balance of an ecosystem

III. THE MEDICINAL BENEFITS OF MILLIPEDES

The fact that millipedes are used in some cultures' traditional medicine is an intriguing ecological function. For instance, millipedes have been used for generations in Chinese traditional medicine to cure a range of conditions, such as hemorrhoids, rheumatism, and inflammation. Diplopodin, a substance found in millipedes, has been shown to have analgesic and anti-inflammatory effects.

IV. EFFECTS ON MILLIPEDE POPULATIONS OF SOIL TYPE AND ORGANIC MATTER CONTENT

The distribution of millipedes can also be influenced by soil type; some species may favor particular soil types or moisture content. Certain millipede species, for instance, might be more prevalent in sandy soils, whilst others might favor clay soils. By influencing plant growth and productivity, which may then influence the availability of food resources for millipedes, soil pH and nutrient levels may potentially have an indirect effect on millipede populations.

According to a study done in a tropical rainforest by Kuczynski et al., the most significant factor affecting millipede abundance and distribution was the amount of organic matter in the soil. According to the study, millipedes were more frequently detected in soils that included a lot of organic matter.

V. CONTROL OF MILLIPEDE AGRICULTURAL PESTS

To control millipedes in agricultural crop plants and reduce plant damage, a variety of IPM techniques are available. These consist of:

Mechanical control

In this method, millipedes are physically removed from the afflicted area. Sticky traps, vacuuming, or handpicking can all be used for this. the need of integrated pest management techniques in and around buildings, and suggested that millipedes be physically removed from impacted areas using mechanical control techniques like vacuuming and handpicking. They do point out, though, that these approaches might not work for widespread infestations.

According to a number of studies, vacuum cleaners were not as successful as sticky traps in lowering the number of millipedes in a home. They come to the conclusion that sticky traps are a practical way to keep millipedes out of dwellings. the mechanical management of minor millipede infestations by the use of sticky traps. They point out that while this approach would not be feasible for extensive infestations, it can be helpful for tracking the quantity and presence of millipedes in a certain area.

Cultural dominance

This entails altering the habitat to make it less conducive to millipedes by lowering the soil's organic matter content, enhancing drainage, and clearing the area of waste and leaf litter. Although they might take longer to produce results than chemical control measures, cultural control techniques can be useful in lowering millipede populations.

Keep in mind that while cultural control techniques can be useful in lowering millipede populations, they might not provide results as quickly as chemical control techniques.

Biological control

Birds, small animals, and various arthropods are among the predators that consume millipedes. However, the suitability and accessibility of natural enemies may restrict the efficacy of biological control techniques. According to a study, millipedes' natural enemies include centipedes and spiders, and the presence of co- evolved bacterial and fungal communities affected how well biological control techniques worked. Another study looked at the prey selection of a spider species that eats millipedes among other arthropods. They discovered that the spiders chose millipedes as food, which suggests that in particular habitats, they might be an effective natural enemy of millipedes.As generalist predators, ground beetles consume a variety of soil-dwelling arthropods, such as millipedes. As effective millipede predators, carabus ground beetles, which flourish in temperate climates, have adapted to flourish in vineyards. In both lab and field settings, centipedes—predatory arthropods—have been seen consuming millipedes. It has been discovered that certain nematode species can infect and kill millipedes. For instance, studies conducted in lab settings have

demonstrated the effectiveness of the worm Steinernema carpocapsae against the millipede Ommatoiulus moreletii.

Certain parasitic wasp species deposit their eggs within millipedes, where the developing larvae consume the tissues of their host. For instance, it has been noted that the millipede Apheloria virginiensis is parasitized by the wasp Cylloceria sp. Although biological control can be a useful strategy for controlling pest populations, it is not always a dependable or long-term fix. The possible effects on the environment of bringing non-native natural enemies into a particular ecosystem must also be carefully considered.

Chemical control

This entails killing millipedes with insecticides. It is possible to apply insecticides to the leaves, soil, or both. Chemical control techniques should be used carefully, though, as they may also damage beneficial organisms in the soil environment.

Field tests have demonstrated the efficacy of carbamate insecticides, including carbaryl and methomyl, against millipedes.

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