



Role of Earthworms in Soil Fertility

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Abstract

Earthworms form a major component of the soil system and these organism have been efficiently ploughing the land for many years and assisting in the recycling of organic nutrients for the efficient growth of plants. Earthworms, the soil invertebrates along with soil microorganism degrade organic waste materials and thus maintain the nutrient flux in the system. This Economically important worms are artificially reared and utilized for the production of Vermicompost (Vermi-compost is the method of making compost with the use of Earthworms). Which is known as Vermi-Technology which has many advantages. Soil structure improvement, Nutrient cycling, Enhanced nutrient availability, Microbial activity stimulation and Soil fertility.

Keywords: Soil texture, soil fertility, Nutrition cycle, Plant growth.

Introduction

Earthworms are generally called as biological indicators of soil fertility. Soil fertility is referred as the maintenance of soil condition (decomposition processes) operating at a level adequate to release plant nutrients from the rate that will sustain optimum growth. Earthworms, are the major secondary decomposer Macro fauna, have a important role in hastening up the rate of decomposition, in turn improving the structural properties of soil. Earthworms serve as an agent to control soil pollution. Roles of earthworm in soil fertility are very high basically, due to life activities of earthworms in soil, and their utilization for human welfare (via Vermiculture and Vermicomposting. Activities of different types of earthworm.

Lumbricid Earthworms: Dominantly distributed in the temperate soil

Megascolecid Earthworms: Distributed in tropical and sub tropical soil

Perionyx sansibaricus

Very fast breeding species. Voracious feeder on organic waste and produce very fine homogenous compost. *Perionyx scalex*, *Perionyx excavatus* helps in conversion of organic wastes. Earthworms by composting decreases the stabilization time of the waste, produces efficient organic pool with energy reserves as vermicompost Earthworm promotes infiltration of water in ground (by making soil porous and promote drainage). Reduces the use of chemical fertilizer. 1kg Earthworm will decompose 4-5kg of organic waste for every 24 hours.

Effects caused by Earthworm

- Direct effects
- Indirect effects

Direct effects

Table 1: Soil Properties

Earthworm Activity	Action
1. Earthworm eats soil + Organic humus keeps body moist, hence passes out urine	Add micro qualities of humidity and nitrogen
2. Earthworm Continuously Burrows	Tillage of soil upto 3 meters without affecting plants
3. Digestion Occurs Vermicast deposited	Breakdown of soil particles mixing of nutrients
4. Decomposition	Conversion of organic wastes
5. Vermi Cast Production	Nutrients Supply

Significance to Soil

- 1) Micronization of soil particles.
- 2) Increase of particle surface area.
- 3) Increased moisture absorption, holding and air circulation.
- 4) Increase microbial action.

- 5) Increased porosity leads to percolation of water (ie) Charging of sub-soil water occurs
Maintenance of soil temperature.
- 6) Add toleration in soil fauna, floral components.

II. Soil Texture

- 1) Earthworms incorporate plant residues, organic wastes and dung with soil from surface.
- 2) Different soil layers organic matter is mixed.
- 3) Rearrangement of nutrients occurs leads to placing near of nutrients to the roots of plants for absorption.
- 4) Loss of nutrients is prevented.
- 5) Reduce pesticide residue from top soil layers.
- 6) Earthworms by breaking the complex organic matters in soil helps them to convert into forms, that is readily absorbed by plants.
- 7) The casts produced after feeding are having aggregates of mineral granules
Provides high degree of soil conditioning.
- 8) Casts make the soil resistance towards water and wind erosion.
- 9) Earthworm activities like feeding, burrowing, excretion favor growth of soil micro organisms
The enzymes present in the cast facilitate humification.
- 10) All these activities lead to maintenance of sustainable soil fertility and agriculture
Humification also enhances water holding capacity of soil, improves soil structure, increases ionic activity.
- 11) During respiration, and excretion activities, earthworm lowers C/N Ratio and makes nitrogen available to plants, which also adds to soil fertility.

III. Soil Aeration

- 1) Burrowing earthworm makes pore which improves soil aeration.
- 2) These aeration pores have important role in total decomposition process.
- 3) Aeration is effected in soil by mixing turning over this is done by earthworm in vermi composting.
- 4) This soil aeration helps in better root penetration Medium sized pores improves water holding capacity.

IV. Water Transmission Properties

- 1) Water transmission property is aided by earthworms which depends upon size distributional stability and applied stress (i.e) rain drops, soil compaction.
- 2) Earthworm increases soil air volume from 8-67%.
- 3) Drainage is 4-10 times faster than the soil without worms.
- 4) Earthworms maintains favorable cover conditions so vegetation grow luxuriantly.
- 5) Earthworm activities in soil increased the amount of water stable aggregates.
- 6) Earthworms make the soil congenial for extensive root ramification for better plant growth.
- 7) Earthworm physically mix the contents of the deeper layers and make the soil loose and porous, their body exudates improves water holding capacity of soil.

Soil Aeration Control

Earthworm burrows and structural aggregation due to their casting activity promote water entry into the soil and reduce surface runoff in turn soil erosion.

Indirectly its influences may be

1. Chemical composition of vermicompost effect.
2. Mineralization of nutrients.
3. Vermicomposting via soil fertility.
4. Nutrient recycling.

Nutrient Recycle

Nitrogen

The role of excreted nitrogen, nitrogen content in mucus, is highly significant. The earthworm species uses mucus secreted from the gut epithelium as an energy source to fix atmospheric nitrogen, which is a nitrogen source for plant growth. The earthworm helps to promote the availability of nitrogen to plants by means of its excretory processes through its burrowing, feeding activities on physico-chemical regulation of microbial processes, water balance of soil helps in nitrogen uptake.

Phosphorus

Phosphorus in the soil is bound to organic matter so they are unavailable to plants. When the earthworm consumer the soil and passes through the gut, it converts the phosphorus

into a form that is easily absorbed by plants. So, micro organism injected by earth worm and its digestive process help the plant to get the phosphorus.

Summary

Earthworms improve soil structure, maximum plant height, number of leaves, high yield fertility, nutrient availability and plant health. Their presence is a strong indicator of healthy and productive soil. Enhancement of microbes activity in the soil system.

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