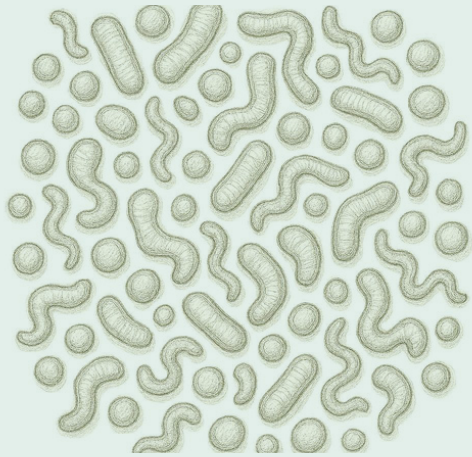


Who are the residents in your soil?

Did you know that a handful of soil may contain more organisms than people on the planet? You need a powerful microscope to see most of them. Microorganisms vary in shape, size and role. Beneficial microorganisms improve soil fertility, nutrient cycling, soil structure and help prevent disease. Some of the major species in your soil are listed below:



Bacteria and archaea

- Single-celled organisms
- Can be round, rod-shaped or spiral-shaped
- 1-3 μm in size

Roles

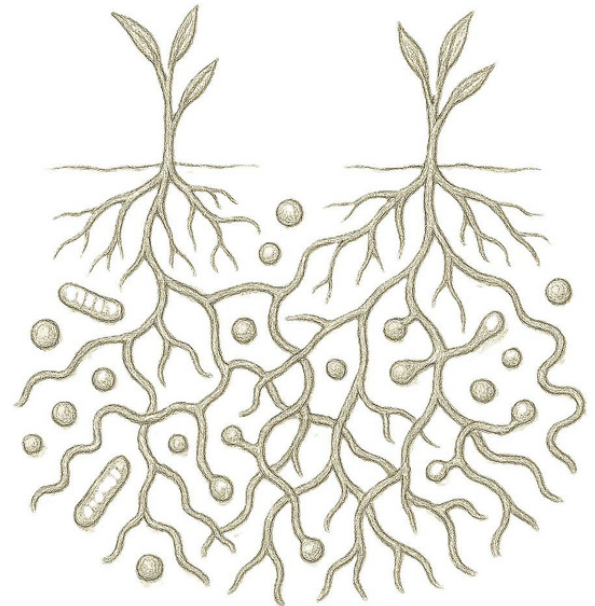
- Mobilise nutrients and fix nitrogen
- Involved in the final stage of breaking down nutrients and making them available for plants
- Bacteria produce sticky organic gums which help bind soil aggregates together, improving soil structure.

Fungi

- Either single-celled (like yeast) or multi-cellular (like mushroom mycelium)
- 2-10 μm in size
- Mycorrhizal fungi form networks together. There can be kilometres of hyphae (long, branching filaments that together are known as mycelium), in just handfuls of soil
- Some fungi is beneficial for plants, some is not, i.e., *Fusarium* sp

Roles

- All fungi break down plant matter into nutrients and carbon
- Mycorrhizal fungi improve plant uptake of phosphorus in many plant species
- Some fungi can fix nitrogen
- Some fungi can help suppress disease by feeding on pathogenic organisms in the soil



Nematodes

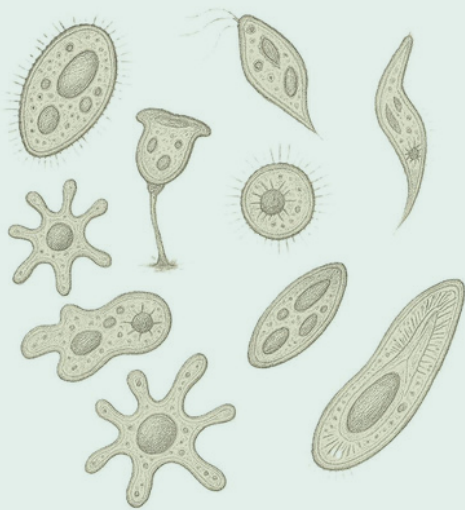
- Microscopic worms
- 20-200 μm
- There are beneficial nematodes and some that harm plants
- Beneficial nematodes feed on bacteria, fungi and other soil organisms

Roles

- Secrete nutrients into soil when they eat bacteria and fungi
- Some nematodes can help suppress disease by feeding on pathogenic organisms in the soil
- Helps in nutrient cycling by physically breaking down organic matter and making it more available to other organisms
- Some nematodes can kill insects and pests such as slugs, borers and thrips

Generally speaking, soils with higher diversity of microorganisms are healthier compared with those with low diversity. Management practices to help improve and maintain diversity include:

1. Keeping ground cover at 100%. This will minimise erosion and plants will provide the energy for microorganisms.
2. Increase diversity in plants (diverse inputs of organic matter = diverse microorganism population)
3. Appropriate use of fertiliser. High rates of fertiliser can inhibit nitrogen fixation by legumes and can suppress mycorrhizal fungi.



Protozoa - microfauna

- Single-celled
- 20-200 µm
- Classified into three main types based on their movement methods. Including:
 - o Flagellates – use flagella (long ‘whips’) to move
 - o Amoebae – move by extending their cell membrane
 - o Ciliates – use cilia, ‘little hairs’, to move

Roles

- Secrete nutrients to soil when they eat bacteria
- Indirectly improving soil structure by stimulating bacterial activity

Collembola (springtail) - mesofauna

- Multicellular
- 0.2-4mm
- Most species feed on fungi, microalgae and bacteria

Roles

- Some species help in nutrient cycling by feeding on dead plant or extra from other organisms
- By consuming microorganisms, some species stimulate the growth of these populations, therefore also aiding in nutrient cycling
- They spread fungal spores and bacteria through digestion or by sticking them to their body hairs



Acaria - mesofauna

- Multicellular
- 0.2-4mm
- Most species feed on fungi, bacteria, decaying organic matter and leaf litter

Roles

- Helps in nutrient cycling by physically breaking down organic matter and making it more available to other organisms
- Adds to soil formation by burrowing, breaking down organic matter and through the production of faeces

This event is supported by the Australian Government through funding from the Natural Heritage Trust under the Climate-Smart Agriculture Program.