

Identifying and Counting Soil Micro-Organisms

Land Stewardship Project

6-22-18

Bacteria

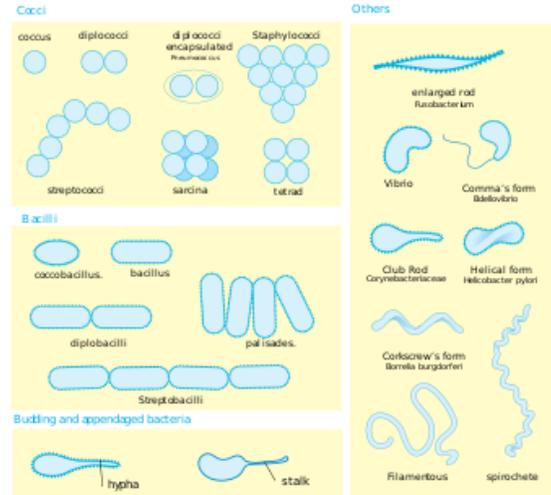
Count at 400X with a dilution rate of 10, 100, or 1000

Can be motile or stationary

Same size as clay particles, smallest is about 1 micrometer

Shapes:

- Round (cocci) and rod (bacilli) are what you'll find the most
- Corkscrew, comma, and spiral shaped bacteria usually indicate that pathogens are present



Fungi

Count at 400X with a dilution rate of 5

Width measured with smallest bacterium

Length measured by what percentage of the field of view a particular piece takes up

Beneficial fungi generally meet these characteristics:

- Uniform diameter > 3 micrometers (measure using smallest bacterium as your ruler)
- Color - various shades of brown, tan, reddish
- Uniformly spaced septa: cross walls at equal distances throughout the length of the hypha

Spores - sometimes look like bunches of grapes, perfect circles, or elongated pods

Oomycetes

Count at 400X with a dilution rate of 5

Can look similar to fungi, but can be distinguished by these general rules:

- Uneven diameter < 3 micrometers (1.5-2.5 most common)
- Colorless, clear
- Non-uniform septa or no septa

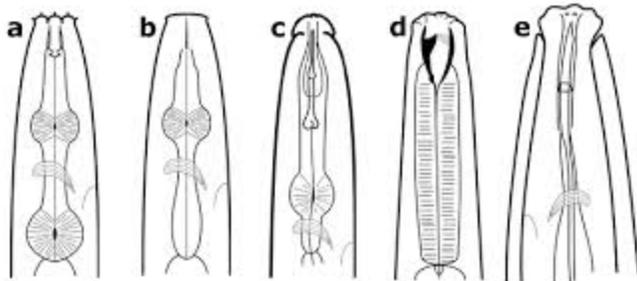
Measure the same way as fungi

Organisms that meet most of the characteristics of an oomycete are probable plant pathogens



Nematodes

Scan the whole slide at the lowest magnification to get a nematode count (dilution ratio of 5)



- Fancy lips, two digestive bulbs = bacterial-feeder
- Thin spear = fungi-feeder
- Knob and spear = root-feeder
- Large size, big mouth with tooth = predatory
- Omnivore (depends on food source availability)

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Protozoa

Count protozoa at 400X with a dilution rate of 5

Huge diversity, three main groups found most commonly in soils:

- 1) Ciliates
 - a) Have many *cilia*, or hairs along part or all of their body
 - b) Very fast moving!
 - c) Usually larger than any other protozoa
 - d) Exist mostly in conditions without enough oxygen for other types of protozoa to thrive
- 2) Flagellates
 - a) Single *flagellum*, or tail (can have up to 2 tails), used either for propelling or pulling the body of the protozoan
 - b) Slow, bumbling motion
 - c) Usually circular but can have many different shapes
 - d) Indicate aerobic conditions
- 3) Amoebae
 - a) Commonly found in *test* form (looks like a space capsule with organic debris inside) = testate amoeba
 - b) When conditions are stable, amoeba will push a pseudopod out of the test and begin moving around to find food
 - c) Active amoeba look like The Blob - move around in an oozing fashion
 - d) Indicate aerobic conditions

Actinobacteria

Extremely thin diameter around 1 micrometer

Like a thin pencil line

When count is really high, indicates reduced oxygen conditions

Measure length the same way as fungi (% of field of view)

Other Organisms/Materials

Spores - come in many colors, usually circular

Pollen - crazy shapes usually with jagged edges

Eggs - look like spores, usually circular

Insect Larvae - Really big, fast moving critters with distinct body compartments

Micro-arthropods - Mites and others that look gigantic under the microscope

Organic Matter - brown colored globs

Algae - usually green in color (chlorophyll)

For more ID help - <https://www.soilmicrobelibrary.com/>