Week 9 soil recap

Soil organic matter:

* Provides cation exchange capacity
* Increases water-holding capacity
* Improves soil structure
* Creates a Reservoir of plant nutrients
* Food source for soil organisms

Types of SOM

Living organisms: Biomass

Dead tissues and wastes: Detritus

Non-living, non tissue: Humus

Decomposition is key to movement of carbon amount plant, soil, and atmosphere. It involves co2 being absorbed by plants, which decomposes into detritus. It then goes into microbes or humus, which ends up in microbes anyways. Microbes emit the CO2 which then gets absorbed again by plants.

Rate of decomposition depends on :

\*physical and chemical nature of the litter material

\*temperature and moisture of the soil environment

Aeration

The kinds and numbers of soil organisms

Fungi

Heterotrophs – energy and carbon from living or dead organisms. Include yeasts, molds, mushrooms.

Mushrooms are the fruits.

Hyphae are the underground vegetative growths (cluster in visible threads or mats called mycelium)

Saprotrophic (decomposer fungi)

The major agent of decay in acid environments, forests. Network of hyphae improves soil structure. Decomposition of cellulose and lignin. Can compete with plants for Nitrogen.

Mycorrhizae – symbiotic relationship between fungi and roots. They provide N, P, and water acquisition for plants. Strengthens soil structure and producing food for organisms.

Actinobacteria are fungus-like, filamentous bacteria. They decompose soil OM and produce antibiotic compounds. The smell of rain is due to these guys

Bacteria exist in the billions everywhere and are extremely small.

The Rhizosphere is the zone of plant-microbe interactions. Plants release carbon-rich substances from their roots to attract and feed microbes for symbiosis. Some microorganisms perfrom nitrogen fixation which captures N2 gas from atmosphere and converts it to plant usable form.

Microbes alter nutrient availability in soil, via mineralization and Immobilization.

Lecture 2:

Chemical composition of plant matter = “litter quality”

Simple sugars – first thing to break down and the fastest to do so. Cellulose and starch are also easy to decompose.

Slow to break down however are Lignin, which are complex, non repeating structures. Lots of enzymes are required to break it down and needs “community decomposition” from many different organisms. White rot fungus is able to decompose lignin.

As a rule of thumb, organic matter is 45-50% carbon. SOM = 2 x SOC

SOC = soil organic carbon SOM = soil organic matter

Carbon to nitrogen ratios (C:N)

Determine rate of decomposition!

Indicates:

* How fast a substance will decompose
* Whether it will release nutrients or take them away
* Whether your mulch will kill weeds or encourage them
* Whether your compost will stink and attract rats or not

Higher C:N = SLOW decomposition! Low C:N + aeration = fast decomp.

If detritus has low C:N then microbes release excess N to soil which helps with decomp and plant growth.