

C:N ratio

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C:N ratio?

It is defined as the ratio of the weight of organic carbon to the weight of total nitrogen in a soil or organic matter. It is the relationship between organic matter and nitrogen content of soils or plants.

Importance of C:N ratio

1. C:N ratio mainly controls decomposition rate in soil

- The wide C:N ratio leads to slow decomposition rate, nutrient immobilization may occur, carbon and energy wastage in large quantities. Activity of microorganisms restricted total amount of N is limited
- In Narrow C:N ratio, Carbon and energy starvation occur. Plant residues decompose quickly and release nitrates readily. Amount of CO₂ released/unit of carbon decomposed is less as more of it is metabolized and converted into microbial tissues. When the residue with high C/N ratio is added to soils, there will be intense competition

among the microorganism for available N. The C/ N ratio in residues helps determine their rate of decay and the rate at which N is made available to plants. Ex : Speed of **decomposition** becomes slow with more/wide C/N ratio residue or low N percentages. On the contrary low/narrow C/N ratio or high N percentages speeds the **decomposition** rate.

2. It is a source of food and energy for plants

- Soil organisms require carbon for building essential organic compounds and to obtain energy for life process, but they must also obtain sufficient N to synthesize N containing cellular components, such as amino acids, enzymes and DNA. (Microbes need to find about 1 g of N for every 24 g of C in their food. Microbes have 8:1 ratio means – microbes must incorporate into their cells about 8 parts of carbon for every 1 part of N.

3. Influence of C/N ratio on N release

- It controls N availability in soils/plants: It controls N availability in soils/plants. If C/N ratio of OM is about 25:1, the soil microbes will have to scavenge the soil solution to obtain enough N. Thus, the incorporation of high C/N residues will deplete the soil native N, causing higher plants to suffer from N deficiency. While low C/N ratio (<20) Organic matter helps in increase in N content of soil for plants and organisms.

4. **The decay of organic matter can be delayed:** if sufficient nitrogen to support microbial growth is neither present in the material nor available in the soil
5. **Influence of C/N ratio on Soil ecology:** The soil ecosystem consists of saprophytic bacteria and fungi and nematodes, protozoa and earthworms that grow rapidly on organic residues as food source.
6. It is related to release of available N, total organic content and accumulation of humus.

C:N ratio's of some of the organic materials

1. Alfalfa 20:1
 2. Microbial population 10:1
 3. Soil organic matter 10-12:1
 4. Maize stalk 40:1
 5. Rice straw 100:1
 6. Rye straw 200:1
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7. Saw dust 400:1
 8. Clovers (mature) 20:1
 9. Soil humus 11:1
- Ratio varies from about 10 for leguminous and young plant materials and >100 for cereal straws.