DISINTEGRATION OF CROP RESIDUES AS INFLUENCED BY SUBTILLAGE AND PLOWING

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The recent use of crop residues as mulching material for purpose of soil and water conservation (2, 3) has emphasized the need for determining the speed of decomposition of various plant materials when left on the surface of soil as compared with the conventional method of incorporation. As soon as plant residues are returned to the soil, either on the surface or incorporated, they begin to decay. The factors affecting the rapidity of decomposition (7, 8, 9) are (a) the chemical nature of the residues, (b) soil and climatic conditions, and (c) types of microorganisms.

The rate of decomposition of plant residues at the surface of the soil is of direct concern, because the amount of protection the residues afford the land is inversely related to decomposition, while the release of nutrients from plant material is directly proportional to this process. From the standpoint of land protection, plant residues highly resistant to decomposition are most desirable. However, the type of residue available is determined largely by agronomic practice.

The return of crop residues to the surface rather than their direct incorporation into the soil is nature's method of handling residues under all conditions. Plant residues left on the surface of the soil offer better opportunity for aerobic rather than anaerobic decomposition to take place at the soil-residue contact zone. However, the speed of decomposition may be slow. The plant residue mulch as a medium for microorganisms is subjected to rapid fluctuations in temperature and moisture conditions. In the summer, moisture conditions in plant material left on the surface usually remain favorable for microbial activity for only a short time. In the spring and fall the residues at the surface may remain moist a much greater portion of the time. The incorporated residues remain at a more even temperature and are subjected to less rapid drying.

When the mulch is on the surface, the soil does not have much opportunity to supply nutrients to the organisms decomposing the organic material, so they must depend largely upon the plant residues for their nitrogen and other mineral needs. When the plant material is intimately mixed with the soil, the nutrients needed by the organisms may be supplied directly by the soil in case there is an insufficient amount from the decomposing material.

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3 Figures in parenthesis refer to "Literature Cited", p. 315.