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Controlled Composting of Straw

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ABSTRACT

Production of composts on the farm from surplus straw might provide a low-cost biotechnological approach for increasing the value of this lignocellulosic waste. Successful composting depends on the conversion of the polysaccharides (cellulose and hemicelluloses) of straw by inoculated microorganisms to products that can promote plant growth when applied to the land. None of the potentially useful products we have identified are produced by cellulolytic organisms. We have therefore studied mixed populations in which non-cellulolytic bacteria depend for growth on the products of fungal cellulolysis. The nature and yield of bacterial products depends not only on conditions within the compost, but also on the microbial inoculants used.

Under defined laboratory conditions, using pure cellulose, N_2 is fixed by the anaerobic bacterium *Clostridium butyricum* in association with a cellulolytic fungus such as *Trichoderma* sp. A similar association has been achieved on straw with *Penicillium corylophilum* as the cellulolytic fungus.

Cellulolytic fungi can also provide available substrates for the production of bacterial polysaccharides that can improve the structure of unstable soils. The yield of polysaccharide and its efficacy in soil aggregate stabilization again varies with the inoculants used.

Such composts can thus contribute to plant nutrition and to soil structure. The adoption of *Trichoderma* spp. as the cellulolytic inoculants would further extend the potential value of the compost to include the biocontrol of plant pathogens.

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