DEGRADATION OF WOODY MULCHING MATERIALS BY MINESOIL MICROORGANISMS[1]

by

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Abstract. Mulch materials such as hardwood bark have a high content of polymerized lignin, and are relatively resistant to microbial degradation. The initial stage in decomposition of this complex polymer is generally attributed to the metabolic activities of white rot Basidiomycete fungi. A member of this group of fungi was isolated from hardwood bark materials used as a mulch on minesoil plots. The isolate was laccase positive with syringaldazine and demonstrated a positive Bavendamm reaction when grown on tannic acid plates; such reactions are characteristic of white rot fungi. During the early stages of lignin degradation, low molecular weight intermediates and aromatic compounds gradually are released and incorporated into the soil humus fraction or utilized as growth substrates by a wide range of soil bacteria and fungi. To determine this for representative minesoil microorganisms, cultures of Pseudomonas, Streptomyces, and Fusarium were isolated from a reforested minesoil rich in decomposing forest litter or from bark mulched minesoils. Cultures were grown in liquid basal medium containing aromatic compounds with the guaiacyl and syringyl structural units characteristically present in hardwood lignins. Utilization of aromatic compounds by the isolates was demonstrated by following the reduction in UV absorption spectra and production of aliphatic organic acids. These results suggest that in addition to the effectiveness of hardwood bark as a temporary aid in stabilizing the surface and improving soil microclimatic conditions for establishing revegetation, it also may represent an important long-term source of structural units for humus formation.

ADDITIONAL KEY WORDS: Aromatic compounds, hardwood bark mulch, humus formation, lignin, minesoil microorganisms, UV absorption spectra, white rot fungi.

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