

Lignocellulose Degradation by Actinomycetes

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ABSTRACT

A collection of actinomycetes including fresh isolates was initially screened for the ability to degrade ball-milled straw or utilize lignin-related aromatic compounds. Selected strains were tested for ligninolytic activity by measuring the amount of $^{14}\text{CO}_2$ released from [^{14}C -lignin] wheat lignocellulose. Two actinomycetes, *Thermomonospora mesophila* and a *Streptomyces* sp., were particularly effective, degrading up to 8% of the radiolabeled substrate to $^{14}\text{CO}_2$ in 10 d at 37°C. $^{14}\text{CO}_2$ evolution was not significantly affected by flushing flasks with air rather than 100% O_2 , or growing the actinomycetes in shake-flask rather than stationary broth cultures. Solubilization of radioactivity paralleled $^{14}\text{CO}_2$ evolution and was greatest during the first 72 h of growth, after which no further increase in water-soluble ^{14}C was detected although $^{14}\text{CO}_2$ evolution continued at a reduced rate. The regulation of ligninolytic activity in these actinomycetes thus differs from that in white-rot fungi, and HPLC analyses of the degradation products suggest that their mode of attack on grass lignin is distinct.

Xylanolytic strains from four thermophilic actinomycete taxa were also obtained. These strains produced inducible extracellular xylanases that were active over a broad pH and temperature range and were relatively thermostable. TLC analysis suggested that endoxylanases were the predominant components and gel electrophoresis provided further information on the nature of the xylanase complex. The activity of these enzymes against native lignocellulose was also studied.

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