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Lignin Degrading Ability of Selected Aspergillus Spp.

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ABSTRACT

Most lignin research has been on wood-rot fungi and not on other lignolytic organisms. Members of the genus *Aspergillus* inhabit lignin-rich environments, and we have studied their relative lignin-degrading potential. *Aspergillus fumigatus, A. japonicus, A. niger,* and *A. terreus* were tested for their ability to metabolize ^{14}C-labeled aromatic compounds. The species tested decarboxylated, demethoxylated, and cleaved the rings of coumaric, ferulic, vanillic, veratric, and anisic acids. More than 90% of ^{14}C-ring-labeled ferulic and vanillic acids disappeared from the medium in 96 h of cultivation. More than half of the above was respired, the rest was incorporated in unknown form into the mycelium. Mycelia were homogenized and about 3% of the initial label was found in TCA precipitate of the cell-free supernatant. Protocatechuic acid 3,4-dioxygenase (EC 1.13.11.3) and catechol 1,2-dioxygenase (EC 1.13.11.1) activities were detected in the mycelial extracts of the *Aspergillus* spp.

All the *Aspergillus* spp. were capable of degrading both aromatic and carbohydrate components of water-soluble lignocarbohydrate complexes (LCC) from wheat straw. The degradation of the aromatic moiety of soluble LCC with apparent molecular mass more than 100,000 daltons was far more active in the *Aspergillus* spp. than in the white-rot fungi tested; i.e. *Polyporus versicolor, Pleurotus ostreatus,* and *Fomes annosus.* The aromatics present in the soluble LCC, as well as a variety of lignin-related compounds tested, did not affect the production of hemicellulases by *A. japonicus.*

Aspergillus spp. degraded ^{14}C-dehydrogenative polymerizates, converting carbon from the ring as well as from the $-O^{14}CH_3$ groups to $^{14}CO_2$. $^{14}CO_2$ release after 21 d did not exceed 10% of the total ^{14}C input. This situation is comparable to some white-rot fungi. Lignosulfonate was poorly degraded by *A. japonicus,* but clearly modified. *Fomes annosus* was able to grow much better on

lignosulfonate when *A. japonicus* had previously grown on it. *Aspergillus* spp. grew efficiently on wheat straw, utilizing lignin and some carbohydrates, and rendering the remaining carbohydrates more available to attack of carbohydrases.

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