

Biodegradation of Cotton Straw by *Pleurotus florida*

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ABSTRACT

Cotton straw is an unutilized waste product containing 25% lignin, thus making it unsuitable for use as animal feed.

This material was found to be an excellent substrate for the growth of the edible mushroom *Pleurotus florida*. A growth-promoting flavonoid was isolated from the water-soluble fraction of the straw (Platt et al., 1983).

After 3 wk of fungal growth on native cotton straw, an 18% decrease in dry weight occurred. Lignin (insoluble in 72% H₂SO₄) was degraded from the 8th d of growth up to a total of 65% of the original content after 21 d. Prior to lignin degradation, sugars and other water-soluble materials were removed and laccase activity (substrate, 2,6-dimethoxyphenol) was detected. This activity disappeared after the eighth day of growth. In all our experiments it appears that laccase activity precedes the onset of lignin degradation. Cellulase activity reached a maximum after 8 d of fungal growth and immediately disappeared. Total fungal activity was estimated by measuring hydrolysis of fluorescein diacetate (FDA), which indicated a gradual increase during the first 8 d and then reached a plateau. Release of glucose from the straw by commercial cellulase increased with duration of fungal growth from 28 $\mu\text{g}/\text{g}/\text{h}^{-1}$ to 250 $\mu\text{g}/\text{g}/\text{h}^{-1}$. These results are corroborated by information from artificial rumen experiments showing an increase of in vitro dry matter digestability from 26 to 38%. In comparison, on washed straw, FDA and laccase activity was three-fold smaller. Final dry weight reduction was 10.1%, while total lignin loss was only 33% of the original lignin content. It seems that the water-soluble materials are responsible for the rapid growth, increased enzymatic activity, and total degradation of cotton straw by *P. florida*.

REFERENCE

1. Platt et al. (1983). *Eur. J. Appl Microb. Biotech.* **17**, 140.