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Variations in Some Extracellular Enzyme Activities During Degradation of Lignocellulose by *Phanerochaete chrysosporium*

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ABSTRACT

The white-rot fungus *Phanerochaete chrysosporium* is able to degrade lignin only when its primary growth phase is completed. We have recently shown that the organism is able to establish new growth at 10–15 d intervals by recycling its own nitrogen (*1*). We have now further characterized this growth–rest cycle by measuring changes in extracellular protease, cellulase, and xylanase activities together with total extracellular protein during growth on different carbon sources.

1. When *P. chrysosporium* is grown on a N-limited glucose medium, the cessation of primary growth is closely connected to the increase in extracellular proteolytic activity. When the culture is not O_2-limited (*2*) it becomes ligninolytically active after about 2 d with a simultaneous decrease in proteolytic activity and an increase in extracellular protein. In O_2-limited cultures, the proteolytic activity remains on a high level for up to 6–7 d. During the second growth phase, the proteolytic activity again increases.

2. When *P. chrysosporium* is grown on a N-limited glucose medium supplemented with lignocellulosic materials the cellulase and xylanase activities are suppressed and the growth is again connected to an increase in extracellular proteolytic activity. Lignin is not degraded during the growth phases.

3. When *P. chrysosporium* is grown on a N-limited medium with lignocellulose as the only energy source, the growth phases are connected with increased cellulolytic, xylanolytic, and proteolytic activities. Again during the growth phase, lignin is not degraded. During the ligninolytic phase the level of measured extracellular enzyme activities decreases. A simultaneous increase in total extracellular protein seems to indicate that these enzymes are partly reused for

synthesis of the ligninolytic system. Proteins associated with the ligninolytic system appear to be partly reused to synthesize the hydrolytic enzymes for the next growth phase.

REFERENCES

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