

STUDIES ON THE PHYSIOLOGY OF HIGHER FUNGI :
X. CELLULOLYTIC ACTIVITIES OF *GANODERMA*
COLOSSUS (FR.) BRES.

Fungi are important causal organisms inciting the decay of wood. Aschan and Norkrans (1953), Norkrans (1950 a&b ; 1957, 1963), Savory (1954), Cowling (1963) and others have worked extensively on the enzymatic activities of the disease complexes.

This paper describes results obtained in an attempt to investigate the cellulolytic activities of *Ganoderma colossus* (Fr.) Bres. which has been found to be growing luxuriantly on a living tree of *Polyalthia longifolia* Benth. & Hook. f.

The basidiocarp of *Ganoderma colossus* was collected from Indian Botanic Garden, Howrah and brought into the laboratory. From the fresh basidiocarp tissue cultures were made following the method of Banerjee (1955), and these tissue cultures were maintained on 2.5% malt agar medium for further studies. Sometimes they were grown in a liquid medium based on Reese and Levinson (1952).

The inoculum of *G. colossus* was prepared by filtering aseptically the mycelium of 10 days old cultures from a liquid medium and homogenizing it after washing in sterile distilled water. 1 ml. (2.5 mg dry wt. per ml.) of this homogenized suspension was used as inoculum.

For the enzymatic analysis, the fungus was cultivated in Leonian and Lilly's (1945) liquid medium with glucose replaced by 10 gm./l of powdered *Polyalthia* wood. 30 ml. aliquotes of this medium were taken in 150 ml. Erlenmeyer flasks and each inoculated with 1 ml. homogenized mycelial suspension. The inoculated flasks were incubated at 30°C in complete darkness for 20 days. The flasks were removed at interval in triplicate for analysis. The mycelia and solids wood residues were removed by filtration through a sintered glass crucible (IG-5) and the filtrates were retained for enzymes assays.

The cellulose decomposing ability of the test-fungus was evaluated following the technique of Norkrans (1950 a&b). All the sets were incubated at 30°C in complete darkness for 20 days. After the required incubation period, the wads of papers along with the mycelium were carefully dried to constant weight at

70°C. The percentage of loss in weight of each wad was calculated after correction for the weight of the salts in the nutrient medium.

Cellulose activities was determined following the methods of Nelson (1944) and Somogyi (1952). β -glucosidase activity was assayed by a modification of the method of Pettersoon, Cowling and Porath (1963) using *p*-nitropheny- β -D-glucoside (Sigma Chemical Company, London) as substrate.

The results obtained during the experimental periods are given in Tables 1 and 2.

Table 1. *Mean loss in dry weight of filter paper wads due to fungal attack at 30°C at different incubation periods.*

Days	Visual Growth	Percentage loss in dry wt.
4	+	0.06 $\pm$ 0.03
8	++	0.67 $\pm$ 0.20
12	++	2.67 $\pm$ 0.48
16	+++	6.70 $\pm$ 0.36
20	+++	7.3 $\pm$ 0.32

The cellulose decomposing ability of the test-fungus was given in Table 1. The data reveal that the decomposing ability is directly related with the vegetative growth of the fungus and also with the incubation periods. These losses in weight, however, represent the fraction of the cellulose substances lost by conversion to soluble substances and not the proportion converted into fungal material (Garett, 1962, 1968).

Table 2. *Data (mean) showing the activities of cellulase and β -glucosidase at different incubation periods.*

Incubation period (Hrs.)	Enzyme activities	
	Cellulase (Z*)	β -glucosidase (units)
4	58	1.2
8	88	1.8
24	122	5.8

*Z = $(e_o - e_v) \times 10^3$, where $(e_o - e_v)$ is the difference between the initial extinction data (e_o) and that measured during the experiment (e_v) .

The data on the enzymatic activities of the test fungus have been given in Table 2. The data reveal that both cellulase and β -glucosidase activities are directly related with the hours of the incubation periods. These data on enzymatic activities correlate with the data of the cellulose decomposing ability of the test-fungus.

Further research works are in progress on the detailed account of the enzymatic activities.

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