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Physiology and Properties of *Lentinus edodes* (Berk.) Sing. in Submerged Culture

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Lentinus edodes (Berk.) Sing. [=*Lentinula edodes* (Berk.) Pegler] or shiitake is an edible wood rotting fungus. It is known that shiitake has natural antiviral and immunity-boosting properties and is used nutritionally to fight viruses, lower cholesterol, and regulate blood pressure. Tumor-inhibiting and antiviral effects of the mushroom associated with polysaccharides and polysaccharide–protein complexes have been isolated from the fruiting bodies and mycelium.

Submerged cultures of edible fungi have two main applications, as starter cultures (the spawn) for inoculation of growth substrates and as food and flavor components in food products. The aim of this investigation was to study the growth of *L. edodes* mycelium and exopolysaccharides production in submerged culture. The mushroom was cultivated on a glucose–peptone medium with various carbon and nitrogen sources.

It was found that the synthesis of exopolysaccharides depends on the carbon sources in the nutrient medium. From the 15 carbon sources tested maximum mycelial growth (7.0 g/liter) and exopolysaccharide production (3.4 g/liter) was observed in cellobiose. This may be related to the ecological circumstances and the type of nutrition of the species investigated. Cellobiose is the product of fermentative decomposition of cellulose, and the main substrate of nutrition for this species in nature. Therefore, the maximal yield of exopolysaccharides is due to natural adaptation of this mushroom in nature. Good results were obtained on media with glucose, maltose, lactose, starch, and cellulose. Among nitrogen sources, maximum exopolysaccharide production was observed in peptone and ammonium sulfate.

L. edodes growth to a great extent depended on cultivation conditions. Temperature and pH exerted significant effects on the biomass yield. The optimal cultivation temperature was 22–25°C. The mushroom was able to grow in a wide range of pH from 3.0 to 9.0. Optimal mycelia growth and polysaccharide production required pH 5.0–5.5 on synthetic medium and 4.0–4.5 on complex media.

Investigation of the dynamics of biomass accumulation and exopolysaccharide synthesis by *L. edodes* during various growth phases showed that the most active synthesis of exopolymers occurred during the stationary growth phase.

On complex cultivation media the yield of biomass reached 13–15 g/liter and extracellular polysaccharide production was 3 g/liter. The carbohydrate composition of polysaccharides indicated that they were heteroglycans, in which xylose, mannose, and galactose were found in addition to glucose, the main component.

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