Fungal fermentation

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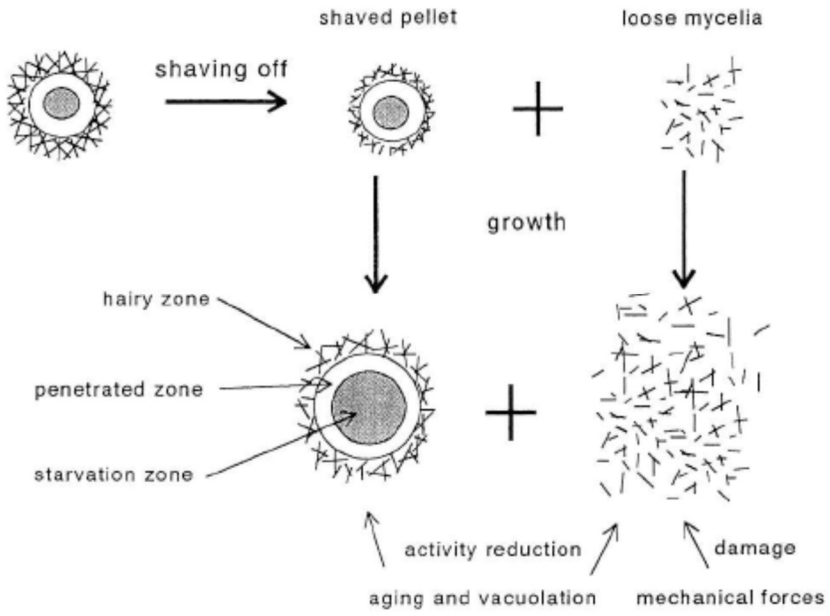
Description

At a small scale, at the laboratory up to 5 litres, the morphology of fungi consists of hyphae. As a result, viscosity is high to very high at a certain biomass concentration, after some time during a batch fermentation producing biomass. This leads to serious inhomogeneity despite high energy input by stirring, which on top of that damages the fungi up to lysis. Moreover, oxygen limitation because of increased bubble coalescence will occur at relative low biomass concentrations. At large scale, already at a customary scale of 30 m^3, mixing and gas-liquid oxygen transfer are sometimes less of a problem, because of a pellet morphology of the fungi. The questions stated in this project are: why does this morphology evolve? Which conditions influence the morphology and how? How do the pellets look like and what are the consequences for oxygen, substrate, and product transport within the pellet? What is the result for the performance? Can we control it?
Submerged fermentation of *Aspergillus awamori* is chosen as model system. A stirred tank with multiple Rushton turbines, as generally used in industry, is used to perform fermentation at lab scale (2 litres), bench scale (80 litres), and pilot scale (2000 litres). Mixing behaviour in a 30 m^3 is measured at various conditions.
An engineering model is developed and evaluated, taking into account: oxygen transport and concentration, power input, morphology phenomena, substrate consumption and growth rate.



Dissertation

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