

APPLICATION OF AUTOMATION SYSTEMS IN ACTINOMYCETES BIOTECHNOLOGY

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Cultivation of mycelial mushrooms is a complex and multi-stage process that requires constant control and management in compliance with the parameters of the technological process. Automation tools allow better control over the flow of reactions, as well as rapid optimization with increased accuracy [1]. Creating bioprocesses with monitoring capabilities using smart sensors and actuators is an effective way to improve overall process performance and will be very useful for problem solving [2].

One of the main objectives of process control is to create repeatable conditions that guarantee the reliable production of the desired product. Indeed, the maintenance of optimal metabolic activity of filamentous fungi requires that specific process conditions, such as dissolved oxygen, pH, temperature, pressure, and composition of the medium, are kept within certain favorable limits [2].

In recent years, significant progress has been made in the automation of microbial growth measurements. In particular, the automation of image analysis allows to quickly obtain data on specific parameters that are evaluated and at specific desired moments of the fermentation process. Advances in microscopy have facilitated imaging-based monitoring, control, and in-depth evaluation of mushroom cultivation systems using various types of instruments. Microscopy is also an effective tool for evaluating the biosynthesis of materials by fungi. Several programs have been created to evaluate images of filamentous fungi. For example, ImageJ is successfully used for automated analysis of biotechnological processes [2]. MATLAB software was also used to quantify fungal morphology in conjunction with a fully automated microscopy approach. In addition, the Fungal Feature Tracker (FFT) software was developed for automatic image analysis to map key features of filamentous fungi, such as hyphal tip number, spore number, and spore morphology [1]. This tool also helped describe fungal phenotypes in an accurate and objective manner.

Thus, the use of automation tools contributes to better control and monitoring of bioprocesses using actinomycetes, namely, speeding up the speed of data generation, minimizing inconsistencies caused by human errors, increasing process productivity and improving product quality.

References:

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