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Pellet Morphology and Lactic Acid Production of A Locally Isolated Filamentous Fungus

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L-(+)-lactic acid is widely used as a flavour enhancer, preservative and is a component in many cosmetic and pharmaceutical products. However a high degree of optical purity is needed in order for these products to be safe for human consumption. Biological fermentations is a widely used method to attain lactic acid with high purity. Lactic acid bacteria has long been utilized to produce lactic acid however filamentous fungi has gathered increasing attention as an alternative organism due to their less fastidious nutritional requirements.

A locally isolated fungal strain (TPH1) is known to produce L-(+)-lactic acid with high purity during simultaneous saccharification of starch. The morphology of TPH1 is complex, forming filamentous, clumps, and pellet mycelia. The morphological configuration of growth has significant effects on lactic acid production. During fermentation, filamentous growth could increase the viscosity of the medium, entangle impellers and create significant mass transfer limitations, leading to reduced yield and productivity. Pelleted cultures provide significant improvement in fermentation performance. In this study, factors that affect lactic acid production in shake-flask cultures using TPH1 were investigated at shake flask level. A fractional factorial design consisting of five factors at two levels each was selected for study. The factors were: Temperature (30°C vs. 35°C), C/N ratio (1 vs. 4), inoculation size (1000 spores/ml vs. 5000 spores/ml), Saccharification value (0% vs 100%) and initial amount of carbon (0.185M vs. 0.555M). A rsolution III design was generated by the MINITAB software with default generators. Results from experiments showed that C/N ratio and amount of carbon played a large role in governing morphology although other factors have also shown to play a role. Only inoculation size did not have a statistically significant effect on morphology.