



## pH 和缓冲作用对香菇菌丝生长的影响

段应策, 胡姿仪, 杨帆, 李金涛, 邬向丽, 张瑞颖

(中国农业科学院农业资源与农业区划研究所/农业部农业微生物资源收集与保藏重点实验室, 北京 100081)

**摘要:** 【背景】香菇是我国栽培规模最大的食用菌, 随着栽培规模的不断扩大, 栽培模式也在发生转变。菌棒的工厂化生产和液体菌种技术开始广泛应用, 对栽培原料、生产工艺和培养条件的要求越来越高。pH 是决定香菇菌丝生长和菌种质量的一个重要因素, 香菇虽然能在 pH 3.0—7.0 的范围内生长, 但香菇生长的最适 pH 以及培养料中的缓冲系统对菌丝生长的影响机制尚不清楚。【目的】检测香菇菌丝生长的最适 pH, 并分析培养料中的缓冲系统对菌丝生长的影响, 为香菇生产提供理论依据。【方法】在 PDA 培养基上, 利用 HCL 和 NaOH 调节 pH, 分析香菇生长的最适 pH; 利用 GC-MS 和 HPLC 检测木屑尤其是发酵酸化的木屑中有机酸的种类和含量, 在 PDA 培养基上分别检测有机酸、有机酸钙及其缓冲液对香菇菌丝生长速度的影响; 通过测定香菇菌丝生长代谢对 PDA 培养基 pH 的调节, 最终揭示 pH 和缓冲作用抑制香菇菌丝生长的机制。【结果】香菇能够在 pH 3.0—7.0 的范围内生长, 但生长最适 pH 为 4.0。当培养基 pH > 4.0 时, 香菇菌丝生长过程中通过代谢降低培养基的 pH, 最终降低至 4.0, 以有利于菌丝的生长。当培养基 pH > 4.0, 并且含有缓冲系统, 阻碍香菇对培养基 pH 的调节时, 则抑制香菇菌丝的生长。当缓冲作用达到一定的阈值, 可完全抑制菌丝的生长, 导致菌种不萌发, 如 25 mmol·L<sup>-1</sup> 的柠檬酸-柠檬酸钠缓冲液在 pH 6.0 和 7.0 时可完全抑制香菇菌丝的萌发。【结论】香菇生长最适 pH 为 4.0, 当 pH > 4.0 时, 香菇菌丝通过代谢调节培养基 pH, 缓冲液通过阻碍菌丝对环境 pH 的调节而抑制菌丝生长。

**关键词:** 香菇; 有机酸; pH; 缓冲作用; 菌丝生长

## Effects of pH and Buffering on the Growth of *Lentinula edodes* Mycelium

DUAN YingCe, HU ZiYi, YANG Fan, LI JinTao, WU XiangLi, ZHANG RuiYing

(Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences / Key Laboratory of Agricultural Microbial Resources Collection and Preservation, Ministry of Agriculture, Beijing 100081)

**Abstract:** 【Background】*Lentinula edodes*, known as Xianggu, is one of the most important commercial edible mushrooms in China. With Xianggu cultivation scale increasing, new technology and process such as liquid spawn were developed, and many factories for artificial logs were built in past several years. The requirements for substrates and culture conditions are more stringent in factory. The pH is one important factor for cultivation of Xianggu, and *L. edodes* is able to grow at pH 3.0-7.0, but the optimum pH and influence of buffering remained unclear. 【Objective】The optimum pH was determined and the effects of buffers in substrates on mycelial growth of *L. edodes* were evaluated in this study, and the mechanism for inhibition of buffer to mycelia was elucidated. 【Method】The optimum pH was investigated according to mycelial growth rate on PDA media, which were adjusted with HCL and NaOH. The organic acids in sawdust especially acidified sawdust were identified with GC-MS and HPLC. The effects of organic acids, calcium salts and the buffers on mycelial growth were researched. The change of media pH during mycelial growing was

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联系方式: 段应策, Tel: 18210633620; E-mail: yingceduan@163.com. 通信作者张瑞颖, E-mail: zhangruiying@caas.cn