Identification of ACC synthetase genes in *Volvariella volvacea* and analysis of their response to ethephon and 1-methylcyclopropene treatments

Juanqin Chen, Tianci Chen, Mingmeng Qiu, Ling Li, Qiangui Zhong, Qi Wei, Youjin Deng, Baogui Xie, Yuji Jiang and Bingzhi Chen

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Abstract

Straw mushroom (*Volvariella volvacea*) is economically important in China, but after harvest, it can be stored for only 1–2 d, because it rapidly deteriorates. The role of the ethylene signal transduction pathway in the regulation of these processes in higher fungi is unclear. In this study, we aimed to identify and analyze the *acs* genes in the genome of *V. volvacea*. Bioinformatic analyses were performed to identify differences between the *acs* sequences of *V. volvacea* and homolog gene sequences of plants. Furthermore, ethylene production and *acs* expression in *V. volvacea* during storage were measured before and after ethephon and 1-methylcyclopropene (1-MCP) treatments. The results showed that there are four *acs* genes in the genome of *V. volvacea*, and the phylogenetic tree revealed that the proteins encoded by these genes had high homology to the ACS proteins in plants, with some differences. A conserved motif was found in these ACS proteins. Ethephon accelerated endogenous ethylene production and upregulated *acs* expression in *V. volvacea*, whereas 1-MCP inhibited endogenous ethylene production and downregulated *acs* expression in *V. volvacea*. Our study provides valuable data to further investigate the roles of *acs* in the mechanisms of senescence of *V. volvacea*. Further, *acs* could be used to develop molecular markers enabling screening and selective breeding of *V. volvacea* strains with slowed senescence, prolonging the shelf life of the product.