

## 铜离子胁迫对苦草生长特性及生理指标的影响

陈萍萍, 赵风斌, 王丽卿, 季高华

上海海洋大学水产与生命学院

Effect of Copper Ion Stress on Growth and Physiological Parameters of *Vallisneria natans*

CHEN Ping-Ping, ZHAO Feng-Bin, WANG Li-Qing, JI Gao-Hua

College of Fisheries and Life Science, Shanghai Ocean University

摘要

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摘要 设置0、1、2、4和6 mg·L<sup>-1</sup> 5个Cu<sup>2+</sup>浓度梯度, 研究Cu<sup>2+</sup>胁迫对苦草生长特性和生理指标的影响。结果表明, Cu<sup>2+</sup>对苦草的胁迫作用明显, 当 $\rho$  (Cu<sup>2+</sup>) 为2 mg·L<sup>-1</sup>时, 苦草生长受到抑制, 株高变矮, 鲜质量下降, 但仍能生存; 当 $\rho$  (Cu<sup>2+</sup>) 为4 mg·L<sup>-1</sup>时, 出现明显受抑制现象, 在持续胁迫30 d后, 苦草外侧叶片出现腐烂变黑。微量的Cu<sup>2+</sup>有利于激活过氧化氢酶 (CAT) 活性, 增强植株的抗逆性。CAT活性对逆境响应早于MDA和H<sub>2</sub>O<sub>2</sub>含量, 因此监测CAT活性的变化对苦草的抗逆生理研究更具时效性和准确性。当 $\rho$  (Cu<sup>2+</sup>) 为2 mg·L<sup>-1</sup>时, 苦草生长受到抑制, 高于此浓度的Cu<sup>2+</sup>污染水体不宜建植苦草沉水植被净化系统。

关键词: Cu<sup>2+</sup> 苦草 生长特性 生理指标

Abstract: An experiment was designed to have 5 treatments, i.e. 0, 1, 2, 4 and 6 mg·L<sup>-1</sup> of  $\rho$  (Cu<sup>2+</sup>) to explore effects of Cu<sup>2+</sup> on growth and physiological indices of *Vallisneria natans*. Results show that the effect of Cu<sup>2+</sup> stress on *V. natans* was significant. When  $\rho$  (Cu<sup>2+</sup>) was 2 mg·L<sup>-1</sup>, growth of *V. natans* was inhibited with the plants shortened in plant height and reduced in fresh weight, but they still survived. When  $\rho$  (Cu<sup>2+</sup>) was 4 mg·L<sup>-1</sup>, the phenomena of inhibition became more obvious on the plants, of which the outer leaves began to decay and turn black after 30 days of stress. A trace amount of Cu<sup>2+</sup> was conducive to activation of catalase (CAT) and enhancement of stress resistance of the plants. The experiment found that CAT reacted earlier than MDA and H<sub>2</sub>O<sub>2</sub> did, therefore, it was more accurate and effective to monitor changes in CAT activity for physiological studies of stress resistance of *V. natans*. As 2 mg·L<sup>-1</sup> of  $\rho$  (Cu<sup>2+</sup>) can inhibit the growth of *V. natans*, so that, it is not suitable to build any Cu<sup>2+</sup>-contaminated wastewater purification system with *V. natans* as submerged vegetation when Cu<sup>2+</sup> concentration in the wastewater is higher than 2 mg·L<sup>-1</sup>.

Keywords: Cu<sup>2+</sup> *Vallisneria natans* growth characteristics physiological indicator

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Corresponding Authors: 王丽卿 上海海洋大学水产与生命学院 Email: lqwang@shou.edu.cn

About author: 陈萍萍 (1987-), 女, 山东青岛人, 硕士生, 主要从事水环境与生态修复方面的研究。E-mail: chpp-1212@163.com

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