研究报告

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商品氯氰菊酯农药对蛋白核小球藻的毒性效应研究

Toxicological effects of commercial cypermethrin on *Chlorella pyrenoidosa*

关键词：氯氰菊酯 毒性 蛋白核小球藻 生长 超氧化物歧化酶 丙二醛

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摘要：研究了氯氰菊酯对蛋白核小球藻(*Chlorella pyrenoidosa*)生长、细胞内含物(可溶性蛋白、可溶性糖)及抗氧化酶类(超氧化物歧化酶,SOD)、膜脂氧化产物(丙二醛,MDA)的影响.结果表明,在氯氰菊酯暴露下,藻细胞的生长受到不同程度的抑制,且抑制程度随氯氰菊酯浓度的增大而增大,氯氰菊酯对蛋白核小球藻生长的72 h半效应浓度(EC_{50})为4.89 mg·L^{-1}.藻细胞所有生理生化指标对氯氰菊酯响应迅速,在暴露初期较为敏感,24 h后趋于平稳.其中,可溶性糖和可溶性蛋白含量上升,中等浓度组(3.2, 5.6 mg·L^{-1})上升趋势最为显著.SOD活性则呈现出低浓度(1.0, 1.8 mg·L^{-1})促进、高浓度(>3.2 mg·L^{-1})抑制效应.氯氰菊酯可使藻体内丙二醛(MDA)含量升高,氯氰菊酯浓度越高,藻体内MDA含量越高.研究结果表明,对藻细胞SOD活性的抑制及膜脂过氧化可能是氯氰菊酯对蛋白核小球藻产生毒害作用的重要原因.

Abstract: The effects of commercial cypermethrin on growth, cell inclusions (soluble protein and sugar), antioxidant enzyme (superoxide dismutase, SOD) and cytotoxic product of lipid peroxidation (malondialdehyde, MDA) of *Chlorella pyrenoidosa* were investigated by 72 h growth tests in a batch-culture system. The growth of algal cells was inhibited by cypermethrin in a dose-dependent manner. The 72 h median effect concentration (EC_{50}) was 4.89 mg·L^{-1}. All biochemical parameters varied significantly within 12 h exposure, and became stable after 24 h exposure. Cellular contents of soluble protein and sugar were enhanced under the stress of cypermethrin, and the maximum magnification occurred at the moderate concentrations (3.2, 5.6 mg·L^{-1}). SOD activity was stimulated at low concentrations (1.0, 1.8 mg·L^{-1}) and inhibited at high concentrations (>3.2 mg·L^{-1}). However, MDA content increased significantly with the increase of concentration. The results suggested that the inactivation of SOD and lipid peroxidation may be crucial to the growth inhibition of algal cells by cypermethrin.

Key words: cypermethrin toxicity *Chlorella pyrenoidosa* growth superoxide dismutase (SOD) malondialdehyde (MDA)