

蓝藻水华优势藻高效防控铜制剂的筛选

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Screening of Copper-Algaecide to Suppress Dominant Algae of Cyanobacteria Algal Bloom

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摘要

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摘要 在对比络合铜、有机铜和无机铜3类5种典型铜制剂对蓝藻水华优势藻——铜绿微囊藻(*Microcystis aeruginosa*)和2种非靶藻种——普通小球藻(*Chlorella vulgaris*)和斜生栅藻(*Scenedesmus obliquus*)的96 h生长抑制效果的基础上,进一步开展了3类铜制剂抑制铜绿微囊藻生长的15 d延长效应研究。试验结果表明,质量分数为25%的络氨铜水剂、30%琥胶肥酸铜可湿性粉剂和20%乙酸铜可湿性粉剂对蓝藻水华优势种有较好的生长抑制效果,其对初始密度为 $2 \times 10^5 \sim 4 \times 10^5 \text{ mL}^{-1}$ 铜绿微囊藻的96 h半抑制浓度(以下均以有效成分的质量计)分别为0.03、0.06和0.05 $\text{mg} \cdot \text{L}^{-1}$,且初始藻密度对抑藻效果并无明显影响。试验质量浓度为0.25 $\text{mg} \cdot \text{L}^{-1}$ 的25%络氨铜水剂、0.30 $\text{mg} \cdot \text{L}^{-1}$ 的30%琥胶肥酸铜可湿性粉剂或0.20 $\text{mg} \cdot \text{L}^{-1}$ 的20%乙酸铜可湿性粉剂均能抑制铜绿微囊藻增长,且在0~15 d内都不会出现藻细胞再次复苏和增长。此外,由于铜制剂对铜绿微囊藻的96 h半抑制浓度远低于其对普通小球藻和斜生栅藻的96 h半抑制浓度,因此可在有效控制靶藻种的同时不对非靶藻种的生长造成严重威胁。络氨铜、琥胶肥酸铜、乙酸铜有望被开发成为高效、绿色的蓝藻水华控制剂。

关键词: 铜制剂藻剂 水华 铜绿微囊藻 普通小球藻 斜生栅藻 靶藻种

Abstract: Comparative studies were conducted on algaecidal properties of inorganic, organic and chelated copper-preparations by growth inhibition test of the target algae, *Microcystis aeruginosa* (the dominant algae of Cyanobacteria algal bloom), and non-target algae, *Chlorella vulgaris* and *Scenedesmus obliquus*, and a subsequent 15-d extension of growth inhibition test on *Microcystis aeruginosa*. Results show that for *Microcystis aeruginosa* with a initial concentration of $2 \times 10^5 \sim 4 \times 10^5 \text{ mL}^{-1}$, the 96-h- EC_{50} of cupric-amminium complex, copper(succinate+glutarate+adipate) and copper acetate was 0.03, 0.06 and 0.05 $\text{mg} \cdot \text{L}^{-1}$, respectively, which did not change much when the initial concentration of algal cells was increased to $2 \times 10^6 \sim 4 \times 10^6 \text{ mL}^{-1}$. It was found that 0.25 $\text{mg} \cdot \text{L}^{-1}$ cupric-amminium complex (aqueous solutions, 25%), 0.30 $\text{mg} \cdot \text{L}^{-1}$ copper(succinate+glutarate+adipate) (W.P., 30%) or 0.20 $\text{mg} \cdot \text{L}^{-1}$ copper acetate (W.P., 20%) is adequate to completely prohibit the growth of *Microcystis aeruginosa*, which will not recover and reproduce within 15 days after the application. Besides, being lower in 96-h- EC_{50} to *Microcystis aeruginosa* than to *Chlorella vulgaris* and *Scenedesmus obliquus*, these copper-algaecides would not pose any significant threat to non-target algae, while inhibiting the growth of Cyanobacteria. It is, therefore, held that cupric-amminium complex, copper and copper acetate are promising substances that can be developed into highly effective and environmental friendly inhibitors of Cyanobacteria algal bloom.

Keywords: copper-algaecide algal bloom *Microcystis aeruginosa* *Chlorella vulgaris* *Scenedesmus obliquus* targeted algae

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