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抑制剂对铬铅复合污染小白菜氧化代谢及根组织结构的影响

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Effects of inhibitor on oxidative metabolism and root tissue structure of *Brassica Chinensis* under the stress of Cr-Pb pollution

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摘要

盆栽试验研究了硅酸盐、腐植酸对Cr、Pb单一污染及Cr-Pb复合污染土壤中小白菜(*Brassica Chinensis*)的生物量、Cr和Pb积累量、抗氧化酶系统和根尖细胞形态的影响。结果表明，Cr-Pb污染极大地影响了小白菜根部的生长，使根部组织细胞氧化溃解；施用硅酸盐对降低Cr-Pb污染的生物有效性效果较好，其中1.0g/kg质量分数的硅酸盐施用效果最佳，在土壤未受污染时能促进小白菜生长；在土壤受Cr-Pb污染后虽对促进小白菜生长作用不明显，但能有效减轻Cr-Pb污染对小白菜体内超氧化物歧化酶（SOD）活性的抑制，缓解小白菜根部细胞受到的过氧化损伤，加强根部细胞壁和细胞膜对Cr、Pb的隔离作用，使其沉淀在皮层细胞中，从而降低Cr、Pb的生物有效性。施硅量过高（2.0 g/kg）或当土壤中存在Pb污染时施用1.5g/kg以上质量分数的硅酸盐则对小白菜生长产生抑制。腐植酸也能在一定程度上提高超氧化物歧化酶（SOD）、过氧化物酶（POD）的活性，但是对小白菜受到过氧化胁迫的缓解效果不如硅酸盐明显，对小白菜生长的促进作用不显著。结果还表明，在缓解氧化毒害的过程中，过氧化物酶（POD）不是起缓解作用的主要酶类；而超氧化物歧化酶（SOD）活性的提高在缓解氧化胁迫中起到关键作用。

关键词： 小白菜 硅酸盐 腐植酸 Cr-Pb复合污染 氧化代谢 小白菜 硅酸盐 腐植酸 Cr-Pb复合污染 氧化代谢

Abstract：

The soil heavy metal pollution is threatenning the quality and safety of vegetable production in Guangdong. Aiming at optimization of the application levels of silicates and humic acid, pot experiments were carried out to study the effects of silicates and humic acid on growth and physiology of *Brassica Chinensis* which were growing up in Cr, Pb and Cr-Pb contaminated soils, respectively. The results indicate that root cells are disintegrated under the Cr-Pb pollution. The inhibitory effect of silicates on toxicity of Cr-Pb pollution is better than that of humic acid, and 1.0 g/kg silicate has the best effect. That mass fraction of silicate could improve the growth of unpolluted *Brassica Chinensis*, promote the SOD activity of *Brassica Chinensis* polluted by Cr-Pb, alleviate the damage of membrane lipid peroxidation of root plasma membrane, enhance the buffer function of cell wall and membrane, precipitate the heavy metals in cortical cell, and reduce the amount of heavy metal ions which could entry into cells. Thus, the bioavailabilities of heavy metal ions are decreased, the toxic effects of the heavy metals on plant are alleviated. While high level silicate(2.0 g/kg) or interaction between Pb and high level silicate(above 1.5 g/kg) would inhibit the growth. Humic acid could also promote SOD and POD activities at a certain degree, but its detoxification and promoting effects on growth are not significant. These results also indicate that SOD plays a key role to alleviate the peroxide stress, not POD.

Keywords：

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