

农业资源与环境科学

砷污染土壤中施用光合细菌对烟草生长和砷吸收的影响

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摘要:

采用灭菌以及未灭菌的湖南石门砷(As)污染土壤(145.70 mg kg⁻¹)的盆栽试验, 研究光合细菌(Rhodopseudomonas palustris)的不同施用方式对烟草(Nicotiana tabacum L.)生长和As吸收的影响。结果表明, 种植在未灭菌土壤中的烟草全部染病并死亡。在灭菌土壤中, 菌液接种进入土壤处理的光合细菌数量都显著低于原始接种量。与对照相比, 施用光合细菌对烟草生物量、可溶性糖、叶绿素含量以及净光合速率没有显著影响。但施用光合细菌菌液处理的烟叶净光合速率有升高的趋势; 光合细菌接入土壤中的处理的烟草地上部分干重也出现增加的趋势。此外, 移栽后接种光合细菌菌液处理的烟叶硝态氮含量显著低于其它处理。施用光合细菌菌液处理的土壤pH显著低于对照处理, 但是土壤水溶性As含量以及烟草As含量在各处理间没有表现出显著的差异。可见, 高As污染土壤中, 光合细菌的生长繁殖受到抑制, 光合细菌没有发挥积极的作用, 但其仍然表现出可观的应用前景。

关键词: 土壤pH

The Effects of Photosynthetic Bacteria on Arsenic Uptake and Growth of Tobacco in Arsenic-contaminated Soil

Abstract:

A pot experiment using sterile and unsterile arsenic(As)-contaminated soil was carried out to study effects of different inoculation methods of photosynthetic bacteria (PB) on the growth and As uptake of tobacco. Tobacco planted in unsterile soil was infected by pathogenic fungi and then died. Population of PB declined below the starting density in sterile soil. Inoculation with PB had no significant effects on plant biomass, contents of soluble sugars and chlorophyll and net photosynthetic rate. However, increasing trends of net photosynthetic rate and shoot dry weight were found in all inoculated treatments and those inoculated PB into soil, respectively. Leaf NO₃-N concentration was lower in treatments inoculated with PB after transplanting than in other treatments. Inoculation with PB resulted in decreased soil pH, while no difference in concentrations of soil water-extractable and tobacco As were observed among all treatments. In conclusion, PB did not play an important role in tobacco safety in high As-contaminated soil since the development of PB population was suppressed. Nonetheless, PB in tobacco safety prospect is considerable.

Keywords: soil pH

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