

通过转录组及形态学分析：多壁碳纳米管及其羧基功能化对幼苗根生长的影响

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摘要：多壁碳纳米管是一种具有广泛应用潜力的新型绿色纳米材料，其暴露于环境中对植物体生长发育的影响在近年来受到广泛关注。为探究多壁碳纳米管在杨树体内的吸收及其对幼苗生长发育的潜在影响。以 0-200mg/L 的多壁碳纳米管悬浊液培育杨树幼苗，幼苗的比根长及根长密度显著提高，根直径降低。通过扫描电镜观察到多壁碳纳米管会被吸附在根表面。为此，我们对多壁碳纳米管进行了羧基化改性以提高其溶解度和稳定性。透射电镜显示在幼苗根内观察到羧基化多壁碳纳米管，且相较于多壁碳纳米管，羧基化的促生长效应更显著。多壁碳纳米管不仅能够影响杨树幼苗生长，并在提高溶解性后进入根细胞内，促进根系生长。

Carboxylation modification promotes the entry of Multi-walled Carbon Nanotubes into poplar and affects seedling root growth

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Abstract: Multi walled carbon nanotubes are a novel green nanomaterial with broad application potential, and their impact on plant growth and development when exposed to the environment has received widespread attention in recent years. To investigate the absorption of multi walled carbon nanotubes in poplar trees and their potential impact on seedling growth and development. Cultivating poplar seedlings with a multi walled carbon nanotube suspension of 0-200mg/L significantly increased the specific root length and root length density of the seedlings, while reducing the root diameter. It was observed through scanning electron microscopy that multi walled carbon nanotubes are adsorbed on the root surface. Therefore, we have carboxylated multi walled carbon nanotubes to improve their solubility and stability. Transmission electron microscopy showed carboxylated multi walled carbon nanotubes observed in the roots of seedlings, and compared to multi walled carbon nanotubes, carboxylation had a more significant growth promoting effect. Multi walled carbon nanotubes can not only affect the growth of poplar seedlings, but also enter root cells after increasing solubility, promoting root growth.

Keyword: Multi walled carbon nanotubes; Root growth; Auxin regulation; Carboxyl functionalization