Saline-alkali land amelioration by cultivating Melia azedarach and characterization of underlying mechanisms via metabolome analysis

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Abstract

Soil salinization leading to ecological degradation and *Melia azedarach* can be effective in improving soil characteristics, such as reducing soil salinity. However, the mechanisms underlying the adaptation of *Melia azedarach* to saline-alkali land are unknown. In this study, we analyzed the soil properties and metabolome of *Melia azedarach* roots grown in high-salt (11.5 g/kg), medium-salt (7.5 g/kg), and low-salt soils (0.37 g/kg) to explore the mechanisms of adaptation of *Melia azedarach* to salt stress. Soil Na^+ was decreased, while soil organic matter, alkaline phosphatase and urease activities were increased when *Melia azedarach* was planted in low-, medium- and high- saline alkali soil. The metabolome analysis showed that the number of differential metabolites (DEMs), especially the up-regulated DEMs rose with the soil salinity increased. The sugar, amino acid and flavonoid DEMs produced by *Melia azedarach* were mostly up-regulated with the increase of soil salinity. The results demonstrated *Melia azedarach* was able to alleviate saline stress and reduce soil salinity. We propose that in situ bioremediation with *Melia azedarach* could be considered to ameliorate the coastal saline-alkali soil.

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