Title: Initial growth of Fabaceae species: Combined effects of topsoil and fertilizer application for mineland revegetation

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Initial growth of Fabaceae species: Combined effects of topsoil and fertilizer application for mineland revegetation

HighlightsRehabilitation is required after iron mining in the Carajás Mineral Province (CMP)

- Topsoil application during mineland revegetation may increase the initial growth of Fabaceae
- Fertilization and liming increase initial growth of five legume species used for revegetation
- Putative drought tolerance and metal accumulation qualify examined *canga* species for revegetation
- Although not occurring in the CMP, *Bauhinia forficata* showed the highest growth in all tested substrates

Abstract

The main challenge of mineland revegetation is the establishment of species that rapidly accumulate biomass, organic matter and nutrients. Thus, the selection of promising species requires detailed knowledge of their growth performances in different mineland environments. Four Fabaceae species native to forests or metalliferous savannas, locally termed *cangas,* from the Carajás Mineral Province in the eastern Amazon of Brazil and the exotic *Bauhinia forficata* were cultivated under greenhouse conditions in different non-fertilized and fertilized (including liming) topsoils and mining wastes. After 45 days, the biomasses, specific leaf areas, leaf nutrient contents and nodulating root percentages were measured. Initial biomass accumulation and nodulation was higher in non-fertilized topsoils than in non-fertilized mining wastes; fertilization increased initial growth in all substrates. The *canga* species *Mimosa acutistipula* var. *ferrea* and *Parkia platycephala* showed lower biomass accumulation than other species, but their lower specific leaf areas indicated higher drought tolerance, an important adaptation in seasonal climates. Furthermore, the leaf nutrient contents indicated that both *canga* species might be hyperaccumulators of metal ions. Among the studied species, the highest biomass accumulation was detected in the exotic *B. forficata* in fertilized substrates. The patterns of initial biomass accumulation and nodulation of the examined species indicated that topsoils, fertilizers and lime should be applied whenever possible to enhance overall revegetation success. Putative drought tolerance and leaf metal ion accumulation of both *canga* species qualify them for use in revegetation projects, whereas the large biomass accumulation of the exotic *B. forficata* provides scientific