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Allelopathic Effects of the Babassu Palm on Crops, Pasture-Grasses and Key Soil Fungi

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Abstract

The babassu palm (*Attalea speciosa* Mart.) is prominent throughout large parts of Amazonia, both socioeconomically (palm-oil extractivism provides low-income subsistence to the rural poor) and ecologically (dominant in frequently-burned degraded lands). The association of babassu with annual crops has been hailed as traditional agroforestry and in extensive pastures as traditional silvopastoral systems, and minimum palm density is even regulated by law (120 adult palms per ha). However, very little is known about the ecological properties and effects of this remarkable palm.

We investigate the possibility of allelopathic effects of babassu leaf and root aqueous extracts on (i) germination and initial (5–7 day) growth of five indicator crop species (maize, rice, cowpea, *Brachiaria* and lettuce; microcosm experiments), (ii) *Brachiaria* development, mycorrhizal root-infection and number of mycorrhizal spores in the soil (4-month pot-experiment), and (iii) growth of two further key soil fungi (*Trichoderma* and *Fusarium* in petri-dishes with aqueous and alcoholic extracts).

Effects of babassu extracts were negligible on seed germination, initial shoot and root growth was strongly affected by babassu leaf and root extracts. Contrary to our expectations, both negative (inhibition) and positive (stimulation) reactions occurred in similar frequency and strength. Relationships differed between indicator-species and effects of root extracts tended to be stronger than those of leaf extracts. *Brachiaria* shoot and root growth was significantly reduced by babassu root (but not leaf) extracts, even at its weakest concentration. Root and leaf extracts significantly affected both *Brachiaria* mycorrhizal root-infection and spores in the soil. Relationships tended to be similar with stimulation at mid-concentrations, and depression at highest concentration. Both root and shoot extracts significantly affected *Fusarium* and *Trichoderma mycelia* growth, relationships differed between species and between aqueous and alcoholic extracts. We conclude that babassu leaves and roots exert strong allelopathic effects on a wide range of indicator plants and soil fungi. Relationships are, however, extremely complex, with differences between indicator-species, growth-stages, concentration and type (aqueous/alcoholic) of extractant. Both positive and negative allelopathic impacts of babassu are to be expected. We are at the beginning of an understanding of babassu above- and belowground interactions.

Keywords: Arbuscular mycorrhiza, *Brachiaria*, cowpea, *Fusarium*, maize