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Optimizing nursery and plantation methods to grow *Cedrela odorata* seedlings in tropical dry agroecosystems

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Abstract *Cedrela odorata* (Spanish cedar) is a valuable multi-purpose tree which Central American rural communities and farmers give priority to introducing in pastures and home gardens. In order to propose realistic methods for *C. odorata* production in local nurseries in the dry tropical region of Nicaragua, we studied: (a) the ability of locally collected *C. odorata* seeds to germinate, (b) seed response to storage under ambient conditions or under cold storage, (c) the effects of irradiance and watering during cultivation on seedling morphology and post-transplantation survival, and (d) the effects of competition from grasses on *C. odorata* seedlings transplanted to pastures. Seed germination ranged from 55 to 66% and remained constant after 6 months of storage under ambient conditions or cold storage. *C. odorata* seedling morphology was sensitive to irradiation and watering in the nursery growing period. Deep shade reduced seedling biomass and leafiness and increased specific leaf area and root-to-shoot ratio. Water shortage increased root mass ratio

and root-to-shoot ratio and decreased leaf mass ratio. Post-transplantation success was favored by weeding, and was the highest for seedlings grown under deep shade and water restrictions.

Keywords *Cedrela odorata* · Seed germination · Plant hardening · Tropical agroecosystems

Introduction

Cedrela odorata (Meliaceae) naturally occurs in the Neotropics, from 25°N to 28°S (from Mexico to Argentina and Brazil, including the Antilles), in subtropical to tropical and in wet to seasonally dry life-zones (Pennington et al. 1981). The overexploitation of this species, due to its high commercial value, has caused a scarcity of reproductive adults (González-Rivas et al. 2006). In 2006, the Nicaraguan Government enacted Law No. 585, which prohibits cutting, harvesting and selling *C. odorata*, with the aim of putting an end to its uncontrolled exploitation.

Cedrela odorata has been widely used for commercial plantations, whose establishment and success in the dry tropics is often threatened by severe seasonal drought, by competition from grasses and by attacks from the shoot borer *Hypsipyla grandella* (Lepidoptera, Pyralidae) (Navarro et al. 2004; Newton et al. 1993).

H. grandella rarely causes tree death, but significantly reduces the success of commercial plantations,

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