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Regeneration of mahogany and Spanish cedar in gaps created by railroad tie extraction in Quintana Roo, Mexico

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Abstract

Seeds of mahogany and Spanish cedar were planted in gaps created by harvesting railroad ties at two locations in the Yucatan Peninsula. Gaps averaged 40 m² in area. Germination after 2 months was very low (2%) for Spanish cedar and moderately low (29%) for mahogany at the one location where it was measured, probably due to predation and fungal damage. Annual seedling mortality was 25–40%, and height growth was moderate to normal, with average height equal to 45 cm after 3 or 4 years, depending upon the location. We conclude that gaps from railroad tie harvesting are not adequate for the establishment of either species from seed. If, however, gaps created by harvesting could be concentrated into at least moderately open areas 400 m² in area or larger, they may be useful as sites for regenerating both species.

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1. Introduction

Mahogany (*Swietenia macrophylla* King) and Spanish cedar (*Cedrela odorata* L.) are the two most valuable forest tree species in the Yucatan Peninsula, and hundreds of thousands of mahogany seedlings have been planted there during the last 50 years. Unfortunately, seedling survival has been very poor (Negreros-Castillo and Mize, 2003; Javier Chavelas, personal communication), due to a number of factors, such as poor planting stock, poor planting practices, inadequate knowledge of appropriate site conditions, and planting under forest canopies (Cuevas, 1947; Negreros-Castillo and Mize, 2003). Spanish cedar, another valuable species, is not often planted, but problems encountered with it are similar to those for mahogany.

In Quintana Roo, most forest harvests focus on mahogany, but some other species are harvested. In 1997, 14,000 m³ of wood were harvested to produce railroad ties (Kierman and Freese, 1998; Shoch, 1999). Recently, harvest of small diameter trees (from 15 to 25 cm in diameter) has increased substantially to meet demand for tourism-related construction (Filiberto and Dionisio Yan, personal communication; Victoria Santos Jiménez, personal communication).

Mahogany and Spanish cedar are shade intolerant species (Lamb, 1966), so relatively high light levels are necessary for survival and growth, and mahogany seedlings planted beneath canopies have had poor survival (Negreros-Castillo and Mize, 2003; Negreros-Castillo et al., 2003). Gaps created by harvesting for railroad ties and small diameter trees might create conditions needed for regenerating and growing both species to commercial size (Dupuy and Chazdon, 2006; D'Oliveira, 2000; Bongers et al., 1988). Mahogany has been successfully regenerated from seed and seedlings planted in large gaps, such as 0.5 ha (Negreros-Castillo et al., 2003; Snook and Negreros-Castillo, 2004), but a minimum gap size has not been identified (Dickinson et al., 2000; Whitman et al., 1997). Harvesting smaller trees could double as a tool for regenerating both species if the resultant gaps were larger than the unknown minimum gap size for acceptable growth.

This study was done to evaluate survival and growth of mahogany and Spanish cedar seedlings that arose from seed planted in gaps created by harvesting trees for railroad tie production.

2. Material and methods

The study was conducted near the center of Quintana Roo on land owned by X-Pichil and Naranjal, two communities that are approximately 20 km apart (Negreros-Castillo et al., 2003).

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