

Exogenous influences of the growth dynamics of plantation grown tree species of the central Amazon

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Within the scientific cooperation between the EMBRAPA Amazônia Ocidental in Manaus and the Institute of Wood Biology, University of Hamburg the relationship of exogenous input and the growth dynamics of eight native tree species was investigated from 1995 until 2000. In this study special attend was given to the important species for high quality wood production *Swietenia macrophylla*, *Carapa guianensis*, and *Cedrela odorata* (*Meliaceae*). During the six years of experiments the influence of light, of the mineral element supply of the soil, and of the water supply on the growth dynamics of the trees was studied in a monoculture and an enrichment plantation installed in 1992 at the research station of the EMBRAPA Amazônia Ocidental located 29 km out of the city of Manaus.

The photoactive radiation (PAR), which entered the plantations was quantified in 10 min. intervals and the net photosynthesis of the trees was calculated from light saturation curves studied under controlled conditions. In addition the content of reserve carbohydrates of the trees was monthly quantified. The mineral element supply of the soil was monthly quantified from the period of site preparation until an age of seven years. The monthly nutrient balance of the soil was calculated from the wet and dry deposition, the litterfall and litter decomposition, the nutrient leaching out of the soil, and the nutrient uptake of the vegetation. The water supply of the trees was investigated in terms of meteorological data, tensiometer measurements, the leaf water potential, and xylem water flux measurements. The growth dynamics of the trees were studied in terms of the tree biomass and the cambial growth determined by means of dendrometer measurements, dating of cambial cell divisions by wounding, and light microscopical studies of the cambial zone.

It was shown that the site preparation and the plantation management had a significant influence on the light conditions, the nutrient supply, and the water supply of the plantation. In comparison in the enrichment plantation the PAR was strongly reduced, whereas the nutrient supply of the soil was better balanced and the seasonal oscillation of the water supply of the trees was reduced compared to the monoculture. A high light demand for growth was detected for *Swietenia*, and *Cedrela*, whereas high biomass production of *Carapa* was still possible at a reduction of the PAR of 50 %. The growth of *Swietenia* and *Cedrela* was strongly limited by the reduced potassium supply of the soil, whereas *Carapa* was better adapted to less fertile soils. The cambial growth dynamics of *Swietenia*, *Carapa*, and *Cedrela* were correlated with the water supply of the soil. Cambial dormancies were induced by dry periods in the cambium of *Swietenia* and *Cedrela*, whereas only extremely dry and extremely wet periods induced cambial dormancies in *Carapa*.