



# Leaf photosynthetic capacity and nitrogen content adjustment to canopy openness in tropical forest tree seedlings

GRÉGOIRE VINCENT<sup>1</sup>

ICRAF South East Asia Program, PO Box 161, 16001 Bogor Indonesia

(Accepted 21st November 2000)

**ABSTRACT.** Maximum assimilation rate under saturating light level, leaf nitrogen and chlorophyll content and specific leaf mass were measured in forest plants grown under a range of canopy openness. Seedlings from three tree species co-occurring in damar agroforest (Sumatra) were examined: *Shorea javanica*, *Lansium domesticum* and *Cinnamomum porrectum*. A shrub species, *Piper hispidum*, growing in a different location was also investigated. All species showed pronounced differences in maximum photosynthetic potential when grown under different canopy openness. All tree seedlings showed an increase in maximum assimilation rate ( $A_{\max}$ ) with canopy openness (CO) until a certain threshold was reached. This saturation threshold varied between species. A steady increase in the maximum assimilation rate over the entire range of canopy openness explored was found only for *Piper*. Correlation between leaf nitrogen content and  $A_{\max}$  was usually highest when expressed on a per unit area basis. However the overall correlation was poor whether expressed per unit mass or per unit area when all species were pooled together questioning the universality of the relationship between both quantities. Potential photosynthetic nitrogen use efficiency, defined as the amount of CO<sub>2</sub> uptake per unit leaf nitrogen under saturating light level, was highest in *Cinnamomum*, supposedly the most light-demanding species, and lowest in *Lansium*, the understorey specialist.

**KEY WORDS:** acclimation, canopy openness, leaf nitrogen content, light environment

## INTRODUCTION

Damar agroforests are cultivated dipterocarp forests (Michon *et al.* 1995). These uneven-aged multi-species forests show relatively high species richness (c. 50 species of trees more than 5 cm diameter at breast height in our permanent 1-ha sample plots). One major species usually accounts for the bulk of the

<sup>1</sup> Grégoire Vincent is a visiting scientist from Institut de Recherche pour le Développement (IRD) at International Center for Research in Agroforestry (ICRAF). Email: G. Vincent@cgiar.org