



Tropentag, October 5-7, 2011, Bonn

“Development on the margin”

Biomass Partitioning and Gas Exchange Parameters in Different *Musa* Cultivars as Influenced by Natural Shade

ERWID PEREZ VALDIVIA¹, CHARLES STAVER², PABLO SILES³, OSCAR BUSTAMANTE³, JÜRGEN BURKHARDT⁴

¹*CATIE, Costa Rica*

²*Biodiversity International, France*

³*Biodiversity International, Costa Rica*

⁴*University of Bonn, Institute of Crop Science and Resource Conservation, Germany*

Abstract

Small coffee growers throughout Latin America intercrop Gros Michel dessert banana and a few other cultivars in small proportions with shaded coffee. We studied the effect of natural shade levels on biomass production and partitioning and gas exchange parameters (photosynthesis (A_n), stomatal conductance (g_s), transpiration rate) to determine if biological performance related to grower cultivar preference. Small corms of 9 *Musa* cultivars grown for 1–2 months in a nursery were planted into an existing coffee plantation with three levels of natural shade (75 %, 50 %, 25 %) generated by *Erythrina poeppigiana* compared to open sun in Turrialba, Costa Rica (685 masl, 2700 mm precipitation). Total biomass production and partitioning were measured at 5–6 months after planting through destructive harvesting in 6 cultivars. Light response curves were measured using a Li-cor 6400XT.

Plants in 75 %, 50 % and 25 % shade were 62 %, 40 % and 11 % shorter and 52 %, 27 % and 4 % thinner compared with plants in open sun. Dry matter accumulation showed similar patterns. Leaf emission rates in all cultivars were also reduced with increasing shade from 6 days in open sun to 8 days in 75 % shade. The level of shade affected partitioning of biomass where leaves > stem > corm > corm sucker > stem sucker with values of 1.32 > 1.19 > 0.97 > 0.19 > 0.04. Although total biomass declined with increasing shade, a greater portion of the biomass was in the leaves and stem. The accelerated rate of leaf emission and development of the plant also lead to greater biomass in suckers with lower levels of shade. Photosynthesis (A_n) decreased with increasing shade. Cultivars in 75 % shade showed 15 % lower A_n than the cultivars in open sun. Gros michel was the cultivar least affected by shade showing similar values of A_n in open sun and 75 % shade with 18.61 and 18.07 ($\mu\text{mol CO}_2 \text{ m}^{-1} \text{ s}^{-1}$), respectively.

Grower cultivar preference appears to be influenced more by market and consumption preferences than by cultivar shade response parameters. Additional data will be collected, including bunch parameters and ratoon cycle length, as a basis for proposing more productive light management strategies.

Keywords: Agroforestry, banana, coffee, plantain, resource partitioning

Contact Address: Oscar Bustamante, Biodiversity International, Turrialba, Costa Rica, e-mail: o.bustamante@cgiar.org