Biomass partitioning and gas exchange parameters in different *Musa* cultivars as influenced by natural shade

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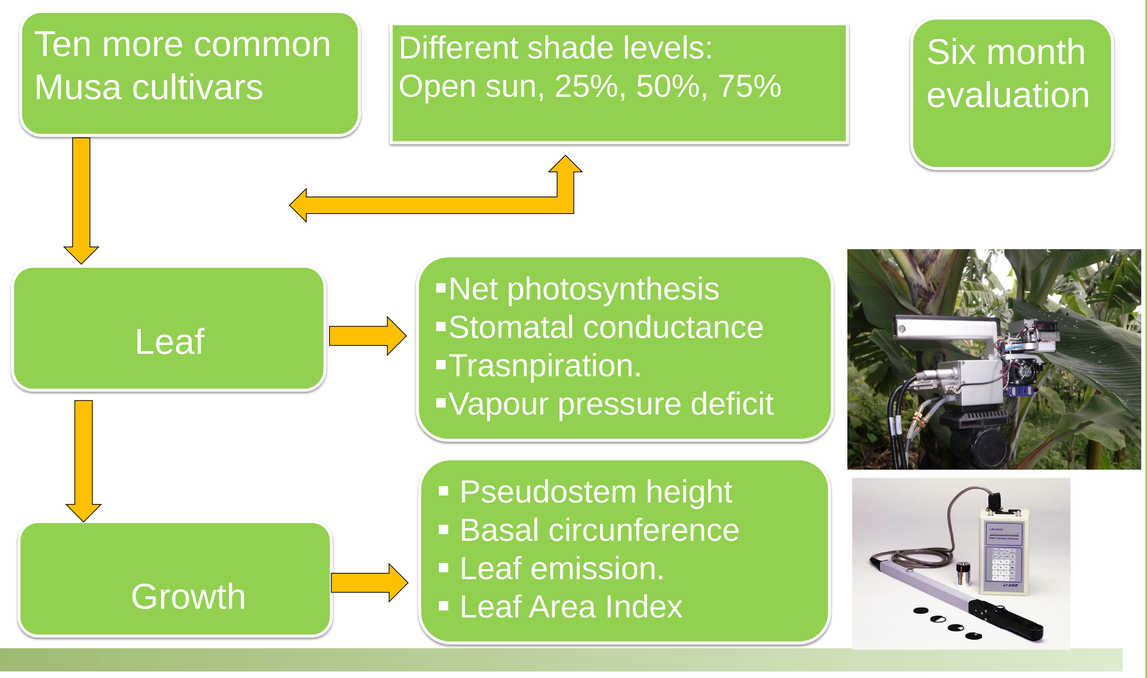
Introduction:

Banana are a major food crop globally and are grown and consumed in more than 100 countries (INIBAP 2000). About 85% of world production comes from small growers in the tropics and sub-tropics who produce dozens of different types of banana and plantain for home consumption and market using low inputs of labour and materials in mixed cropping systems. Research and development efforts to improve the productivity of *Musa* have emphasized monocropping, atlhough many smallholders grow bananas in plots where trees also grow. This includes shaded coffee and cocoa, dooryard gardens. To begin to understand how banana agroforestry can be more productive, we studied the response of different 9 Musa cultivars from 4 cultivar groups (AAA, AAB, ABB, AA) in open sun and with 25, 50 and 75% natural shade of Erythrina poeppigiana in Turrialba, Costa Rica (700 m above sea level, average monthly precipitation 225 mm, 25 C).

Material and methods



Results

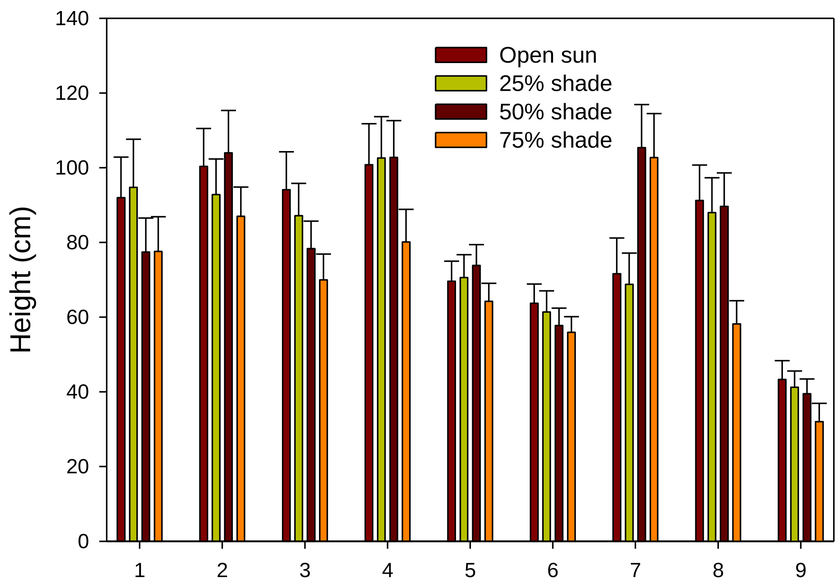


***Figure 1**: Height of different banana cultivars under four shade levels (Open sun, 25%, 50% and 75%., evaluated six months after planting.*

1-Sucrier -2-Bluggoe -3- Dwarf Plantain -4- Filipita 5- Gros Michel -6- Plátano kuraré -7- Apple -8- Red 9- Williams

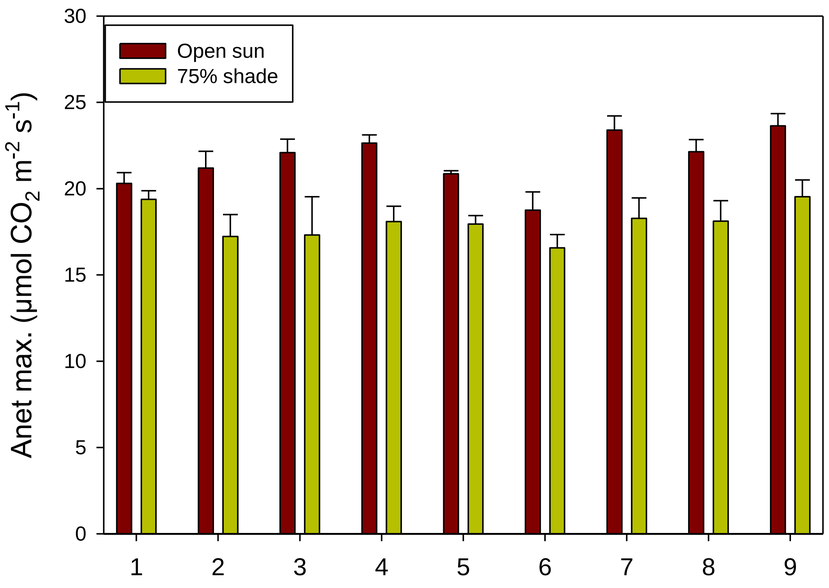


***Figure 2**: Net Photosynthesis of different banana cultivars under open sun and 75% shade at 2000 µmol CO_2 m^{-2} s^{-1} Photosynthesis Active Radiation.*

❑ Plants in 75% shade (except Apple) were in average 20% shorter compared to the plants in open sun (figure 1) with no differences between 25 and 50% shade.

❑ Photosynthesis (*An)* decreased with increasing shade (figure 2). Cultivars in 75% shade showed 15% lower *An* than the cultivars in open sun

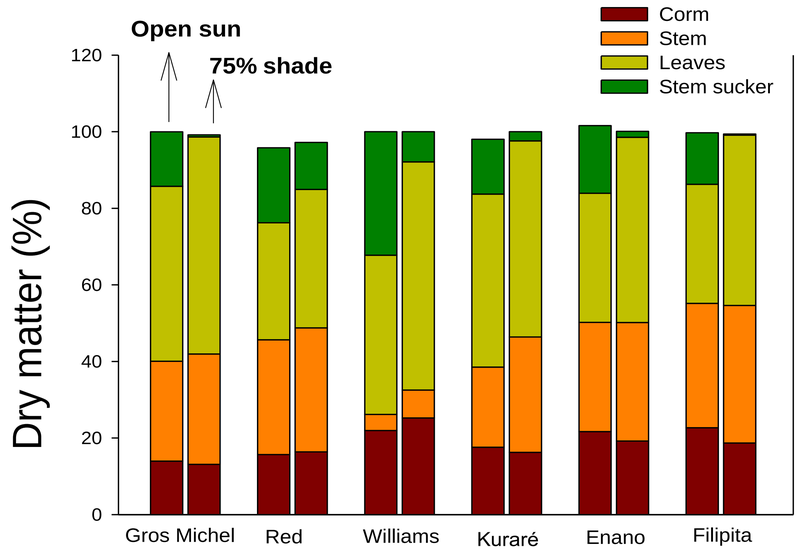


***Figure 3**: Dry matter partitioning in different banana cultivars under open sun and 75% shade.*

❑ The level of shade affected partitioning of biomass where : leaves>stem>corm> corm sucker> with values of 1.32>1.19> 0.97>0.19> Although total biomass declined with increasing shade, a greater portion of the biomass was in the leaves and stem (figure 3). The accelerated rate of leaf emission and development of the plant also led to greater biomass in suckers with lower levels of shade.

❑ Leaf emission rates in all cultivars were reduced with increasing shade from 6 days in open sun to 8 days in 75% shade, resulting in a greater total leaf emission in open sun and probably a shorter time from planting to flowering.

Table 1. Total Leaf emited in different banana cultivars under different shade levels in ±152 days .

Variety	Open sun	25% shade	50% shade	75% shade
Datil (AA Sucrier)	20	19	16	15
Cuadrado (ABB Bluggoe)	19	18	17	14
Dwarf plantain (AAB)	24	20	20	18
Filipita (ABB Bluggoe)	22	22	20	17
Gros Michel (AAA)	20	21	20	18
Horn Plantain (AAB)	21	21	19	16
Manzano (AAB Silk)	20	20	18	17
Red (AAA Red Subgroup)	19	18	18	14
Williams	20	17	17	15

Conclusions:

Grower cultivar preference for Gros Michel appears to be influenced not only by market preference, but also by cultivar shade response parameters. Gros Michel rate of development least affected by higher levels of shade. Data will be collected on bunch parameters and ratoon cycle length, as a basis for proposing more productive light management strategies.

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