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"Development on the margin"

The Response of *Musa* Cultivar Root Systems to a Tree Shade Gradient

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Abstract

Commonly bananas and plantains are grown in mixed agroforestry systems by small farmers for home consumptions and national markets. Throughout Latin America, *Musa* cultivars are grown in association with shade-grown coffee. The cultivar Gros Michel (AAA) is widely planted, although farmers also grow many other cultivars. A research project funded by GIZ through Bioversity International in collaboration with national research organisations and German universities aims to identify approaches to improve farmers returns both in terms of production and income.

In fulfilment of objectives to understand the partitioning of light, water and nutrients in this multi-strata agroforestry system, amongst others, the study of root distribution and aerial biomass in four *Musa* cultivars established in coffee fields with minimal, 25 %, 50 %, 75 % shade of *Erythrina poeppigiana*. Data (roots >1mm diameter) were collected in three replications for each cultivar and shade level with four monoliths (18,000 cm^3). One cultivar was sampled with 20 small samples using a root auger (567.5 cm^3) at 0.4 m, 0.8 m (0–20 cm deep) and 1.2 m (0–10 cm deep) from the pseudostem. Total root biomass was estimated using auger method and transferring it to other cultivar's monolith method.

The plantain Curraré (AAB) and the cooking banana Pelipita (ABB) had higher values for root variables (dry biomass per unit of soil, volume) than Gros Michel and Red (AAA). For all cultivars, except Gros Michel, root dry biomass was highest in 25 % shade, followed by minimal shade with the lowest values for 50 and 75 % shade. The total banana root dry biomass was >1 kg for 25 % shade, 0.2–0.4 kg for minimal and 50 % shade, whereas 75 % shade had <0.2 kg, while no significantly different abundances of other roots occurred. Banana root biomass was reduced less than above-ground biomass for moderate levels of shade with a decline in shoot-root ratios, although ratios increase for >50 % (Red, Pelipita) and >75 % (Gros Michel, Curraré) again. The studies' results do not indicate whether differences are due to light reduction or increased root competition, but tree and coffee roots were not significantly more under increasing shade.

Keywords: Agroforestry, banana, Costa Rica, Curraré, Gros Michel, *Musa*, Pelipita, roots, shade trees

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