

Modifications in Leaf Anatomical Traits of *Coffea* Spp. Genotypes Induced by Management × Season Interactions

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Introduction

Leaf anatomy is shaped by environmental factors such as light, water availability, and altitude [1], which influence physiological processes like light distribution, CO₂ diffusion, transpiration, and structural integrity [2]. This study examined anatomical variations in *Coffea* spp. genotypes under different managements and seasons.

Materials/Methods

Six genotypes were studied: five *C. canephora* (Conilon: LB1, P2, A1, Clementino, K61) and one *C. arabica* (cv. Arara). They were cultivated under three managements: full-sun monoculture at low altitude (MLA), full-sun monoculture at high altitude (MHA), and low-altitude agroforestry system (AFS), in both winter and summer. Recorded traits included cuticle and epidermis thickness (adaxial/abaxial), palisade and lacunar parenchyma thickness, total leaf thickness, stomatal equatorial and polar diameters, and stomatal density.

Full-sun monoculture at low altitude



Low-altitude agroforestry



Full-sun monoculture at high altitude



Results/Discussion

The genotype influenced all leaf anatomical traits investigated (Fig. 1a). The effects of genotype x management interactions were more intense than those of genotype x season interactions on traits such as leaf thickness, palisade parenchyma thickness, abaxial epidermis and polar and equatorial diameter of the stomata (Fig. 1b). The management AFS was more effective in altering leaf anatomical traits than the altitude differences between MLA and MHA, regardless of the season.

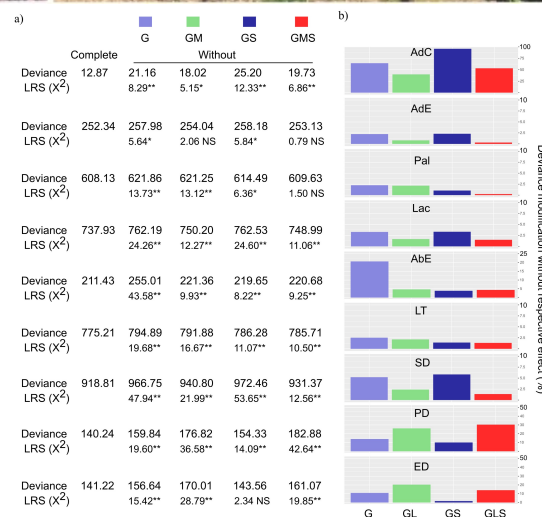


Figure 1: a) Effects of genotype (G), management (M), and season (S) on genetic value prediction; b) Deviance test for *Coffea* spp. under three managements and two seasons, based on leaf traits (AdC, AdE, Pal, Lac, AbE, LT, ED, PD, SD). LRT = deviance difference. * and ** = significant at 5% and 1% (χ^2); NS = not significant.

Conclusion/Perspectives

Coffea spp. plants adjust leaf anatomical structures in response to different environments, defined by managements and seasons. The development of coffee cultivars capable of adapting to different environmental conditions will make the implementation of more sustainable cultivation systems possible

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