



4th World Congress on Agroforestry

20-22 May 2019
Montpellier, France

Book of Abstracts

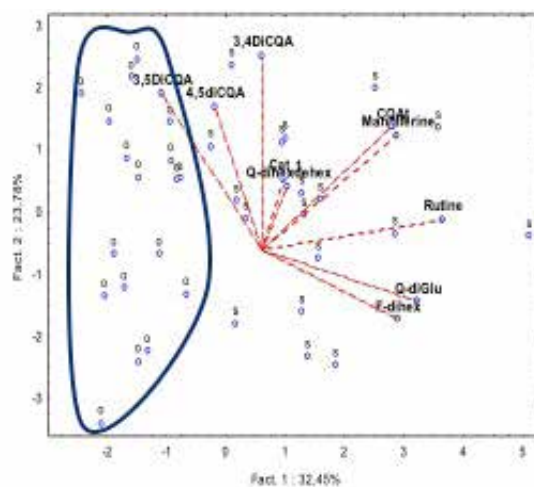


A global approach to decipher molecular basis of coffee tree adaptation to shade

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Culture under shade in AgroForestry Systems (AFS) is proposed to face the predicted negative effects of climate change on coffee plants. To decipher the molecular mechanisms involved in coffee tree adaptation to lower light, cultivars bred for intensive full sun production systems have been grown under shade and full sun, in Mexico and Colombia. Leaves have been harvested for biochemical and transcriptomic comparative analyses. A common biochemical and transcriptomic response is observed in mature leaves of two years-old juvenile trees of *C. arabicavar. Marsellesa* cultivated in Mexico at different altitudes and of six-years old producing trees of eight different Arabica genotypes cultivated in Colombia. HPLC analysis showed a significant decrease in phenolic content under shade, especially glycosylated flavonoids involved in light protection. Transcriptomic analyses showed that 70% of the under-expressed genes under shade are heat shock proteins involved in temperature but also in various abiotic stress responses. Overall, our results show that Arabica culture under shade limits the biological costs for the plant, due to stresses. This energy saving opens new question: are the resources more allocated to primary metabolism, bean production and homeostasis? We are currently testing these genes and metabolites as markers to predict the adaptation to AFS and associated abiotic stresses.



(Left) Full sun and shade culture of Arabica cultivars in Colombia (Manizales, CENICAFE) (Right) PCA ordination of full sun (s) and shaded (o) trees from the 8 genotypes cultivated in Colombia (Manizales, CENICAFE) according to phenolic compounds. Q-diGlu, F-diHex, Rutine and Q-dihehdehex are glycosylated flavonoids.

Keywords: Shade adaptation, *Coffea arabica*, Biochemical, Transcriptomic, AFS markers.

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