

Eco-physiological Variability of Forest Arabica Coffee Populations in Hydraulic Characteristics along Climatic Gradients in Ethiopia: Moisture Dynamics in Soil and Plant Systems Under Field Conditions

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SUMMARY

The study was undertaken in the natural forest coffee populations with the primary objective to investigate the diurnal and seasonal moisture dynamics in the soil-plant systems. Soil moisture was measured using a theta probe and volumetric method. A pump up pressure chamber (Scholander bomb) was used to measure the predawn and mid-day leaf water potentials (LWP). The measurements were made over seasons (between August 2003 and August 2004) in the wet and dry seasons. The results indicated that soil and leaf water contents varied over seasons and locations. Accordingly, soil water content followed the order of summer > autumn > winter season in the south-western sites (Bonga, Sheko and Yayu). In contrast, it was higher in winter than summer season at Bale-DoloMena sites of south-eastern Ethiopia. Similarly, LWP changed with soil moisture patterns, though the values varied among seasons and sites. Consequently, the least and highest LWP were recorded in the dry and wet seasons, respectively. At most sites, the variation between the predawn and mid-day LWP was highly significant in the wet season. In contrast, this was not significant during the dry season, which most probably suggest the isohydric behavior of coffee trees. At all sites, coffee trees did not show symptoms of drought during the course of study. As a whole, the present preliminary findings would provide insights into the variability and influences of climatic patterns, site features and phenotypic growth of coffee populations. Therefore, further studies on the amplitude of drought stress adaptations of wild Arabica coffee populations with the special emphasis on the hydraulic gradients in the soil, plant and atmosphere components should continue with the purpose to identify drought tolerant coffee accessions.