

Microclimate in coffee plantations with rubber trees in Southern Brazil

Heverly MORAIS^{1,2} (heverly@idr.pr.gov.br), Alexandre S. IVANO^{1,3}, Patricia H. SANTORO^{1,2}, Angela B. F. COSTA¹

¹IDR-PARANÁ, Londrina, Paraná, Brazil; ²Brazilian Consortium for Coffee Research; ³State University of Londrina

Introduction

Current climate challenges, such as global warming and the water crisis caused by irregular rainfall, have directly affected coffee productivity and quality. In this scenario, coffee afforestation emerges as a promising alternative to mitigate these impacts, providing a more stable and favorable microclimate for cultivation. Thus, this study aims to evaluate changes in air and soil temperature and humidity in coffee trees intercropped with rubber trees in southern Brazil.

Materials/Methods

The study was conducted in Londrina, Paraná, southern Brazil, where the climate is classified as humid subtropical. The experiment compared two cultivation systems: coffee trees (*Coffea arabica*) afforested with rubber trees (*Hevea brasiliensis*) and coffee trees in monoculture. The rubber trees were planted in rows spaced every 16 meters, parallel to the rows of coffee trees. Between the rows of rubber trees there were six rows of coffee trees.

Results/Discussion

The afforestation significantly reduced the air temperature inside the canopy, which was on average 5.7°C lower compared to the monoculture. Under milder temperatures, the coffee trees maintain their physiological functions at adequate levels, favoring both productivity and coffee quality. The air humidity in the afforested coffee trees was slightly higher, with an average increase of 2%, reflecting the influence of shade in modifying the microclimate around the plants. This cooler and more humid environment can be beneficial for the development of coffee trees, as it reduces water and heat stress, allowing for more stable growth and less water loss. The soil temperature, measured at a depth of 5 cm, was on average 4°C lower in the coffee trees planted with trees. This reduction helps to minimize the risks of dehydration and heat stress, benefiting root growth and nutrient absorption, especially in warmer periods. Soil moisture in the coffee trees planted with trees remained 6% higher, on average, compared to monoculture, ensuring greater water availability in the system, even during periods of water deficit.

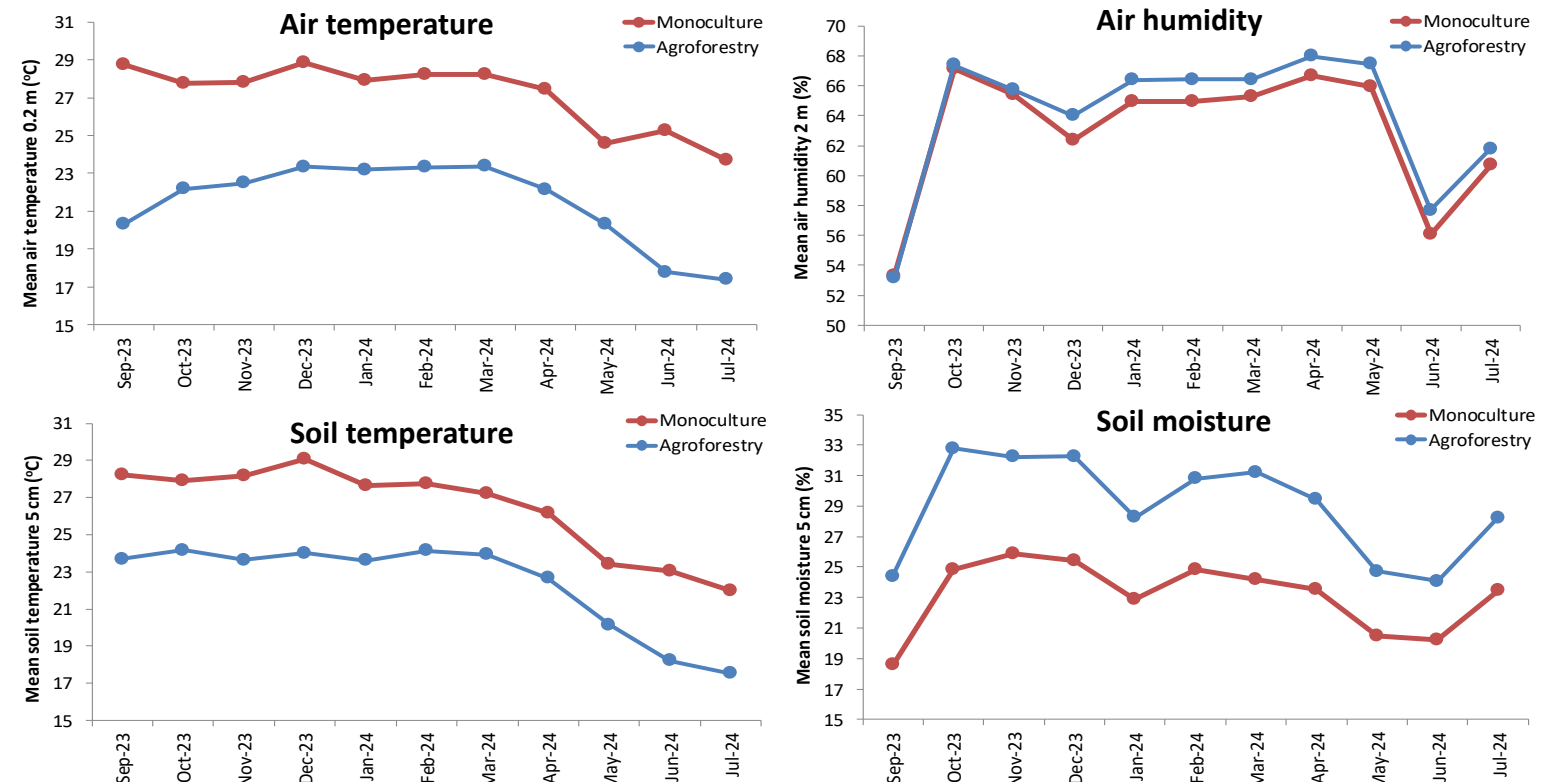


Figure 1. Microclimate of coffee trees shaded by rubber trees and in monoculture. Londrina, Paraná, Southern Brazil, Sep-23 to Jul-24.

Conclusion/Perspectives

The planting of trees with rubber trees causes favorable changes in the microclimate of the trees, reducing air and soil temperatures and increasing humidity in both. This practice stands out as a sustainable strategy for adapting to climate change, helping to mitigate the impacts of rising global temperatures and extreme events, such as drought.