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Microclimate dynamics in simple and integrated production systems

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Introduction

Different arrangements have been deployed in integrated systems aiming higher return than simple systems. The microclimate is among the factors of great importance, suffering changes caused by integration. It is considered as of fundamental understanding to have right decisions in the development of crops. This study relates temperature (T) and relative humidity (RH) measured in different production systems.

Materials and Methods

The study was conducted in an experimental area of Embrapa, located at Ponta Porã, MS, Brazil (22°32'55" S; 55°38'53" W). Eight large plots were evaluated from 20 March to 24 June 2014: corn in no-till system (NT) and in conventional system (CS); eucalyptus forest (5 years old and spaced 2x3 m) (F); crop-livestock integration with pasture of *Brachiaria brizantha* cv. Xaraés (ILP Pasture) and with corn (ILP Corn); crop-livestock-forest integration with spacing between eucalyptus trees of 25 m and intercropping of Xaraés pasture (ILPF Pasture 25m); crop-livestock-forest integration with spacing between eucalyptus trees of 12.5 and 25 m, with intercropping of corn (ILPF Corn 12.5m and ILPF Corn 25m, respectively). One termohigrometer was installed in the center of each plot to measure air T and RH. They were regulated to stay about 50 cm above the interim crop, and on the forest plot it stayed 2 m above the ground. Measurements were taken every 30 minutes. Reference weather data were obtained from a National Institute of Meteorology (INMET) station near to the experimental area.

Results and Conclusions

On systems with corn, in situations of maximum T, ILPF Corn 12.5m and 25m maintained 0.8 and 0.4 °C lower than NT, respectively. When INMET recorded T equal to or higher than 30 °C, ILPF Corn 12.5m showed 1.5 °C lower than ILP Corn. Minimum T were 0.4 °C higher in ILPF Corn 12.5m and 0.2 °C in ILPF Corn 25m, relating them with NT. It was also observed that when the lowest T was recorded in INMET (6.5 °C), only the systems with forestry component did not exceed this T, while all the others were below 6 °C. ILPF Corn 12.5m showed 0.5 °C lower amplitude than ILPF Corn 25m. CS, NT and ILP Corn had close amplitudes with each other. The average of minimum RH was 2.6% higher on ILPF Corn 25m, when compared to ILP Corn. When INMET recorded RH lower than or equal to 45%, ILPF Corn 25m was 2% higher compared to the NT and 3.3% compared to the ILP Corn. ILPF Corn 12.5m showed 2.8% higher RH as compared to NT and 4% higher than ILP Corn. In critical times the difference between ILPF Corn 12.5m and ILP Corn reached 6.6%. In pasture treatments, ILPF Pasture 25m showed average of maximum T 0.6 °C lower than ILP Pasture and similar minimum. When INMET registered daily average of 25 °C, ILP Pasture had average amplitude of 11.9 °C, while ILPF Pasture 25m don't pass from 11.4 °C. In this same consideration, on cold days, with average of 11.3 °C in INMET, ILP Pasture had amplitude of 7.5 °C and ILPF Pasture 25m of 7.2 °C. The average of minimum RH was 1.1% greater in ILPF Pasture 25m, reaching up to 5.7%. All ILPF systems proved to be capable of improving the microclimate over the interim crop as compared to ILP and simple systems.

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