Quantifying Soil Uptake of Oxygen As a Predictor of Carbon Dioxide Emission

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INTRODUCTION

The measurement of soil oxygen uptake (FO2) is important, because it can elucidate processes driving the carbon dioxide flux (FCO2) (Stern et al., 1999). Thereby, could be very useful in determining soil GHG (Greenhouse Gases) impacts under different agricultural managements. These gaseous exchange rates (FO2 and FCO2) are intimately related to the global carbon cycle, considering the FO2 as a mirror of the carbon cycle (Keeling; Shertz, 1992; Manning; Keeling, 2006).

We hypothesize that the FCO2 and FO2 could be used to characterize differences in microbial activity and GHG emissions under different field managements.

OBJECTIVE

The objective of this study was to examine the correlation of FCO2 and FO2 with the soil porosity and moisture content with sugarcane under different managements in the state of Mato Grosso do Sul, Brazil.

MATERIAL AND METHODS

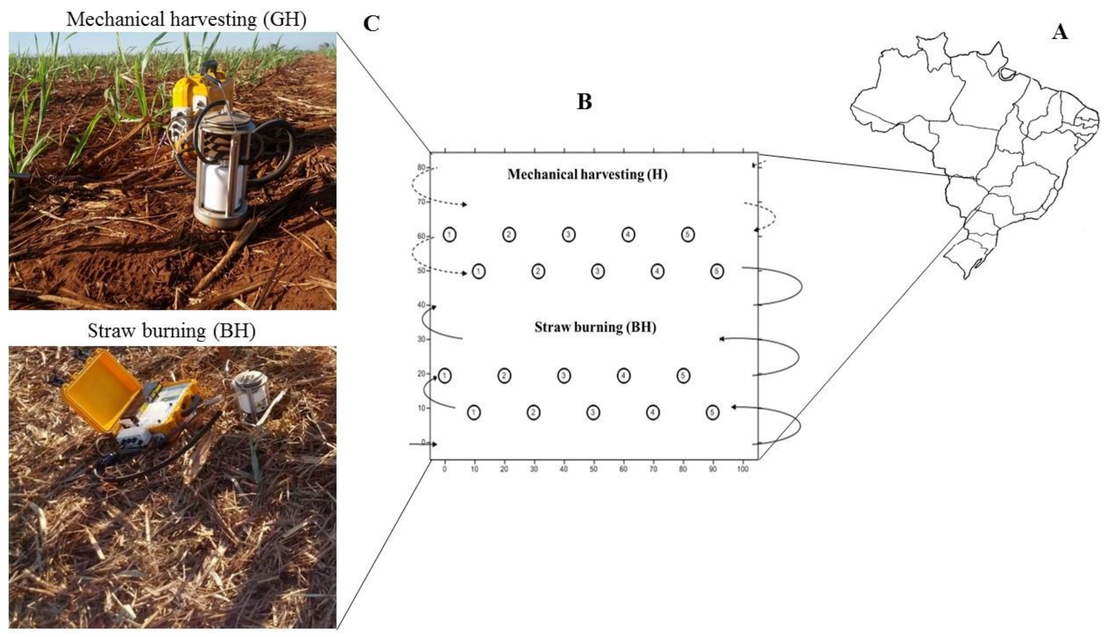

Figure 1. Map showing the site location Brazil (A), in Mato Grosso do Sul, near the municipality of Aparecida do Taboado (B) and area 1: with mechanical harvesting (GH) and area 2: straw burning (BH).

RESULTS AND DISCUSSION

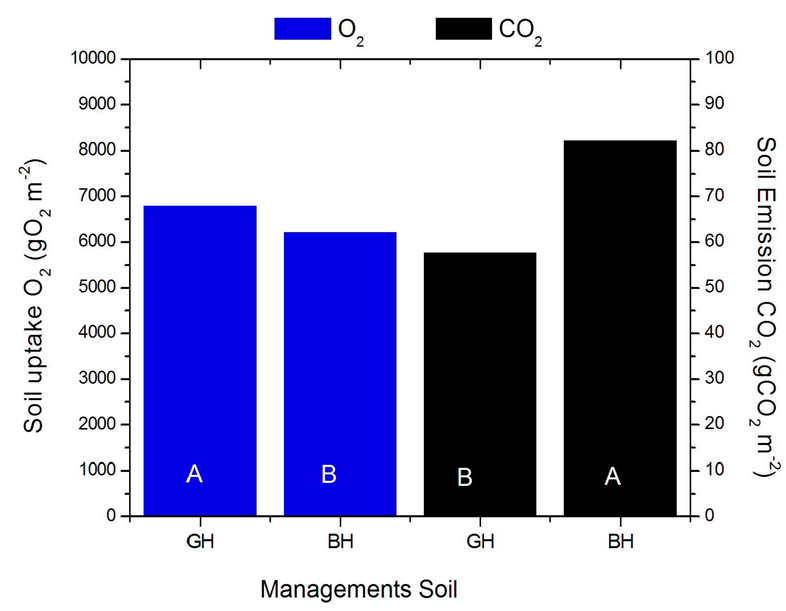

Figure 2. FCO2 cumulative emission flow (g CO2 m^{-2}) and FO2 uptake (g O_2 m^{-2}) in the ground with sugarcane managements with mechanized harvesting with the presence of straw on the soil surface (GH) and burned straw (BH), in Mato Grosso do Sul, near the municipality of Aparecida do Taboado, Brazil.

CONCLUSIONS

The FCO2 was larger from the B treatment during this study, with an average increase of 30% compared to the green harvest field and inversely correlated to the O2 (r=-0.35). On the other hand, the largest observed FO2 occurs in the G management.

Additionally, the FO2 was inversely correlated with soil moisture across both management treatments. These observations will also be compared to laboratory incubation data across different soil types examining the temperature, moisture, and sensitivity of FO2 as a co-variant for FCO2.

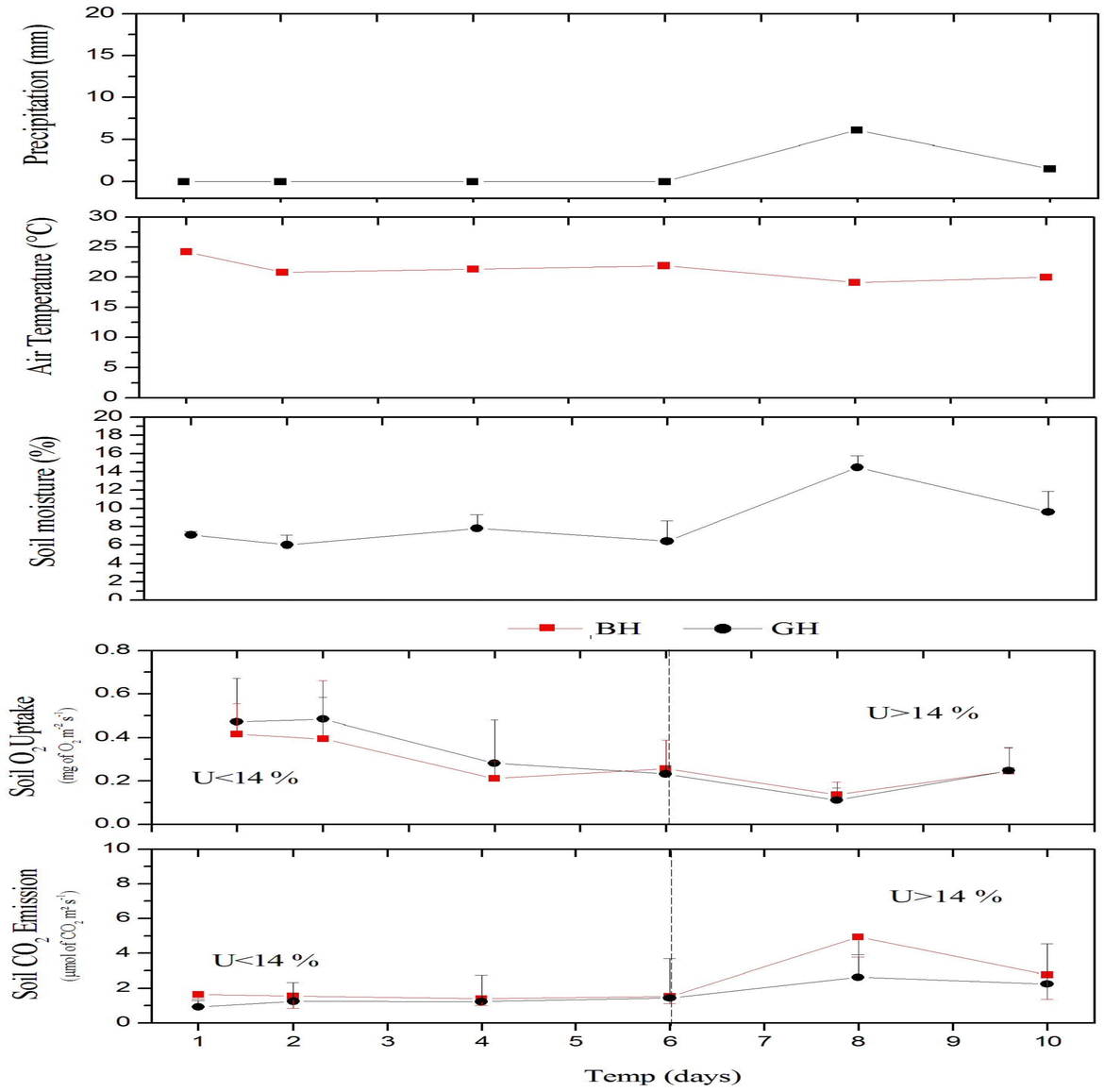

Figure 3. Precipitation (mm), air temperature (°C), soil moisture (%), monitoring of FCO2 emission (µmol m^2 s^{-1}) and FO2 uptake (mg of O2 m^{-2} s^{-1}) in the soil with sugarcane managements with mechanized harvesting with the presence of straw on the soil surface (GH) and burned straw (BH), in Mato Grosso do Sul, near the municipality of Aparecida do Taboado, Brazil.

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