

## Effect of biochar and nitrogen management on nitrous oxide emissions in the Brazilian savanna (cerrado)

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The increase in nitrogen prices and demand for sustainable production gave importance to studies on strategies that increase nitrogen use efficiency. Two experiments were conducted aiming to test the effect of *Eucalyptus sp* charcoal on nitrous oxide (N<sub>2</sub>O) emissions and N use efficiency. One in 2008/2009 (N doses 0 and 110 kg/ha; charcoal doses 0, 8, 16, 32 Mg/ha) on a sandy Dystric Plinthosol. Another in 2009/2010 (N doses 0, 30, 60, 90 kg/ha; charcoal doses 0, 8, 16, 32 Mg/ha) on a clayey Rhodic Ferralsol. The cultivated plant was *Oryza sativa*. The charcoal was incorporated to 15 cm into the soil before sowing. Each plot in both experiments had a static chamber to measure total N<sub>2</sub>O fluxes (full rice cycle). For both experiments, the highest N<sub>2</sub>O emission was observed for the treatment with the highest doses of N and charcoal, being 133.53 g/ha in the Ferralsol and 1,199.67 g/ha in the Plinthosol. Besides the dose 0 of N, the lowest total emission was observed for the treatment 30N/16Charcoal in the Ferralsol (80.99 g/ha), and for the treatment 110N/16Charcoal in the Plinthosol (657.49 g/ha). However, in the Ferralsol there was no statistical difference between emissions at 5%. The average rice yield was 2,600 kg/ha in the Ferralsol and 759 kg/ha in the Plinthosol, where the rice plants faced long periods of drought during the cycle. The agronomic efficiency (AE) in the Ferralsol was higher for the 30N/32Charcoal and the lowest for the 90N/0 Charcoal. In the Cambisol, probably due to the draught stress, the AE showed unexpected behavior, with the charcoal effect on the rice yield being much greater than the N one. The highest emission factor (F) in the Ferralsol was 0.09%, and in the Plinthosol was 1.1%. The precognized F by IPCC (2006) is 1% of N applied. In summary, in the clayey Ferralsol, charcoal had positive effect on rice yield and no effect on N<sub>2</sub>O emission. In the sandy Cambisol, charcoal had positive effect on rice yield and caused higher emission of N<sub>2</sub>O, resulting in greater F than the obtained for grains production systems in Cerrado. Therefore, the pros and contras of charcoal application to soil has to be carefully considered since its overall effect (yield, AE, F, N<sub>2</sub>O emissions) can be positive, however, depend on environmental conditions.

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