

Title Postharvest nitrous oxide emissions from a subtropical oxisol as influenced by summer crop residues and their management

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Abstract

Nitrous oxide (N₂O) is the most important non-CO₂ greenhouse gas and soil management systems should be evaluated for their N₂O mitigation potential. This research evaluated a long-term (22 years) experiment testing the effect of soil management systems on N₂O emissions in the postharvest period (autumn) from a subtropical Rhodic Hapludox at the research center FUNDACEP, in Cruz Alta, state of Rio Grande do Sul. Three treatments were evaluated, one under conventional tillage with soybean residues (CTsoybean) and two under no-tillage with soybean (NTsoybean) and maize residues (NTmaize). N₂O emissions were measured eight times within 24 days (May 2007) using closed static chambers. Gas flows were obtained based on the relations between gas concentrations in the chamber at regular intervals (0, 15, 30, 45 min) analyzed by gas chromatography. After soybean harvest, accumulated N₂O emissions in the period were approximately three times higher in the untilled soil (164 mg m⁻² N) than under CT (51 mg m⁻² N), with a short-lived N₂O peak of 670 mg m⁻² h⁻¹ N. In contrast, soil N₂O emissions in NT were lower after maize than after soybean, with a N₂O peak of 127 g m⁻² h⁻¹ N. The multivariate analysis of N₂O fluxes and soil variables, which were determined simultaneously with air sampling, demonstrated that the main driving variables of soil N₂O emissions were soil microbial activity, temperature, water-filled pore space, and NO₃⁻ content. To replace soybean monoculture, crop rotation including maize must be considered as a strategy to decrease soil N₂O emissions from NT soils in Southern Brazil in a Autumn.