

Abstract

Effects of Pesticides on Nitrous Oxide Production in Sugarcane Cropping Soil †

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Abstract: This study aimed to assess the non-target impacts of pesticides on soil biological processes, particularly N₂O emissions and improve understanding of the contributions of nitrification and denitrification to N₂O production in sugarcane soils. We conducted a laboratory incubation experiment, in which a herbicide Roundup®, an insecticide Confidor®, a fungicide Shirtan®, and a fumigant metam sodium were added to a Ferrosol and then incubated at 25°C for 38 days at 2 moisture regimes (55 % and 90% water holding capacity (WHC)). At day 28, soil water contents in the 55% WHC treatments were also increased to 90% WHC to create a condition to favour denitrification. The 55% and 90% WHC treatments received NH₄SO₄ at 40 μg N g⁻¹ dry soil and KNO₃ at 40 μg N g⁻¹ dry soil, respectively, with K¹⁵NO₃ added at 2 μg N g⁻¹ of dry soil in all treatments. Compared with the control treatment, Confidor application significantly increased net nitrification rates and N₂O emissions at 55% WHC. After increasing water content from 55% to 90% WHC at day 28, net denitrification occurred in the metam sodium treatment; N₂O emissions increased in the order: metam sodium > Shirtan > Glyphosate treatment, with little changes in the Confidor and control treatments. During the 38-day incubation at 90% WHC, the metam sodium treatment emitted more N₂O emissions than other treatments in the first 15 days of the incubation but no significant differences were observed among the other treatments at the end of the incubation.

Keywords: N₂O production; pesticides; sugarcane cropping soil

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