

Gaseous nitrogen losses from pig slurry fertilisation: can they be reduced with additives in a wheat crop?

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Abstract

Aim of the study: The use of pig slurry as fertiliser is associated with gaseous nitrogen (N) losses, especially ammonia (NH₃) and nitrous oxide (N₂O), leading to environmental problems and a reduction of its fertiliser value. This study evaluates, in an irrigated wheat crop, the effect of different additives mixed with pig slurry to decrease NH₃ and N₂O losses.

Area of study: Middle Ebro valley, Spain

Materials and methods: The treatments were: i) non-N-fertilised control, ii) pig slurry (PS), iii) pig slurry with the urease inhibitor monocarbamide dihydrogen sulphate (PS-UI), iv) pig slurry with a microbial activator in development (PS-A), and v) pig slurry with the nitrification inhibitor 3,4-dimethylpyrazole phosphate (PS-NI). Pig slurry was applied at a target rate of 120 kg NH₄⁺-N ha⁻¹. Ammonia volatilisation was measured using semi-opened static chambers after treatments application at presowing 2016 and side-dressing 2017. Nitrous oxide emissions were measured using static closed chambers after treatments application at the 2017 and 2018 side-dressing.

Main results: Ammonia volatilisation was estimated to be 7-9% and 19-23% of NH₄⁺-N applied after presowing and side-dressing applications, respectively. Additives were not able to reduce NH₃ emissions in any application moment. PS-NI was the only treatment being effective in reducing N₂O emissions, 70% respect to those in PS treatment. Crop yield parameters were not affected by the application of the additives because of the no effect of additives controlling NH₃ losses and the low contribution of N₂O losses to the N balance (<1 kg N₂O-N ha⁻¹).

Research highlights: The use of 3,4-dimethylpyrazole phosphate would be recommended from an environmental perspective, although without grain yield benefits.