N2O production, a widespread trait in fungi

Laurent Philippot

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Laurent Philippot * [1]

[1] UMR1347 Agroécologie – Institut national de la recherche agronomique (INRA) : UMR1347 – 17 rue Sully 21065 Dijon, France

N2O is a powerful greenhouse gas contributing both to global warming and ozone depletion. While fungi have been identified as a putative source of N2O, little is known about their production of this greenhouse gas. Here we investigated the N2O-producing ability of a collection of 207 fungal isolates. Seventy strains producing N2O in pure culture were identified. They were mostly species from the order Hypocreales order-particularly Fusarium oxysporum and Trichoderma spp.-and to a lesser extent species from the orders Eurotiales, Sordariales, and Chaetosphaeriales. The N2O 15N site preference (SP) values of the fungal strains ranged from 15.8‰ to 36.7‰, and we observed a significant taxa effect, with Penicillium strains displaying lower SP values than the other fungal genera. Inoculation of 15 N2O-producing strains into pre-sterilized arable, forest and grassland soils confirmed the ability of the strains to produce N2O in soil with a significant strain-by-soil effect. The copper-containing nitrite reductase gene (nirK) was amplified from 45 N2O-producing strains, and its genetic variability showed a strong congruence with the ITS phylogeny, indicating vertical inheritance of this trait. Taken together, this comprehensive set of findings should enhance our knowledge of fungi as a source of N2O in the environment.

Mots-Clés: N2O, greenhouse gas, fungi, soil

*Intervenant