Acta Scientific Agriculture (ISSN: 2581-365X)

Volume 2 Issue 2 February 2018

Opinion

N_2O Emissions from Agriculture

Luca Vitale*

National Research Council, Department of Biology, Agriculture and Food Sciences, Institute for Agricultural and Forestry Systems in the Mediterranean, Ercolano, Italy

***Corresponding Author:** Luca Vitale, National Research Council, Department of Biology, Agriculture and Food Sciences, Institute for Agricultural and Forestry Systems in the Mediterranean, Ercolano, Italy.

Received: January 11, 2017; **Published:** January 25, 2018

Nitrous oxide (N_2O) represents one of the major greenhouse gases and its concentration in the atmosphere increased up to 340 ppb from pre-industrial period due to human activities. Arable soils contribute significantly (about 60%) to N_2O emission in the atmosphere, resulting the most important source of N_2O due to the large use of nitrogen fertilizers in order to increase crop yields [1].

In soils, N_2O emissions derive from two microbial processes: nitrification and denitrification. Nitrification, performed by chemoautotrophic bacteria, is the oxidation of NH_4^+ to NO_3- whereas denitrification, performed by heterotrophic bacteria and fungi, is the conversion of NO_3- to N_2O and N_2.

Nitrification and denitrification are affected not only by NH_4^+ and NO3- concentration, but also by other soil characteristics such as aeration, temperature, moisture, organic matter content and quality, and C/N ratio.

The oxidation of NH_4^+ to NO_3- by nitrification is an aerobic process: it increases under well soil aeration conditions and diminishes when the O_2 concentration is low; on the contrary, denitrification is an anaerobic process. Thus, N_2O is produced mainly by nitrification under aerobic or semi aerobic conditions whereas under anaerobic conditions N_2O is produced by denitrification.

Temperature and moisture affect soil N_2O emission by affecting microorganism's activity: N_2O emission increase with increasing soil temperature and moisture. For this latter, N_2O emission is mainly due to nitrification for water filled pore space (WFPS) values below 60%. For WFPS values ranging from 60 - 80%, denitrification represents the mainly process producing N_2O being small the number of soil pores filled with air.

Organic matter content and quality, as well as the C/N ratio in the soil also influence N_2O production. The supply to soil of labile carbon stimulates microbial growth and O_2 consumption generating anaerobic condition and promoting denitrification. Soils characterized by small C/N ratio produce higher N_2O emission than soil with high C/N ratio. This because low C/N ratio promotes mineralization of organic nitrogen to NH_4^+ making more nitrogen available for nitrifying and denitrifying microorganisms.

In addition to environmental conditions, management practices affect N_2O emission from arable soils. Soil tillage decreases N_2O emission as consequence of lower soil moisture and improved soil aeration. Nitrogen fertilization and fertilizer type significantly affect N_2O emission. Dried organic manure promotes lower nitrous oxide production than mineral fertilizer likely due to the reduced C and N availability in the soil, as a consequence of slow mineralization of organic component that limit available N for biological transformations leading to N_2O evolution [2,3]. The addition to fertilizers of nitrification inhibitors mitigates soil N_2O emission by suppressing microbial activity for a period of time depending on soil type, moisture and temperature [2-4].

Bibliography

1. Bell MJ., *et al*. "Nitrous oxide emissions from fertilized UK arable soils: Fluxes, emission factors and mitigation". *Agricultural, Ecosystems and Environment* 212 (2015): 134-147.

2. Vitale L., *et al*. "Fertilizer type influences tomato yield and soil N2O emissions". *Plant, Soil and Environment* 63.3 (2017): 105-110.

3. Vitale L., *et al*. "Water regime affects soil N_2O emission and tomato yield grown under different types of fertilizers". *Italian Journal of Agronomy* (2017).

4. Vitale L., *et al*. "Effects of 3,4-dimethylphyrazole phosphate-added nitrogen fertilizers on crop growth and N_2O emissions in Southern Italy". *Plant, Soil and Environment* 59.11 (2013): 517-523.

Volume 2 Issue 2 February 2018