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# Two years monitoring of soil $N_2O$ emissions on durum wheat in a Mediterranean area: the effect of tillage intensity and N-fertilizer rate.

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Evaluating the magnitude and the key factors affecting $N_2O$ emissions from agriculture has a scientific and practical relevance, in fact emissions from agricultural and natural soils account for 56-70% of all global $N_2O$ sources (Syakila and Kroeze, 2011). Moreover, the necessity to increase the food production rate minimizing greenhouse gas emissions require a deeper understanding of the effect of the agricultural practices on direct soil emissions. Therefore, the aim of this work is to assess the effect of tillage intensity and nitrogen rate on soil $N_2O$ emissions on durum wheat.

A two years monitoring campaign was carried out using a high-sensibility transportable instrument developed within the LIFE+ "Improved flux Prototypes for $N_2O$ emission from Agriculture" IPNOA project (Bosco et al., 2015; Laville et al., 2015). The project aims at improving the measurement technique of $N_2O$ flux directly in field using the flow-through non-steady state chamber technique. The monitoring campaign on durum wheat lasted for two growing seasons and two fallow periods (2013-14 and 2014-15). Treatment on the main plot was tillage intensity with two levels, ploughing and minimum tillage, and three different nitrogen rates were distributed to the subplots (N0: 0 kg $ha^{-1}$, N1: 110 kg $ha^{-1}$, N2: 170 kg $ha^{-1}$). Ancillary measurements concerned meteorological data, soil temperature and moisture, $NO_3^-$, $NH_4^+$ soil concentration.

Main results of the two years highlighted N rate as the main driver for both $N_2O$ daily flux and cumulative emissions during the growing season, while in the fallow period treatments did not affect the emission magnitude. Tillage intensity was not a key factor for $N_2O$ emissions. $N_2O$ emissions were significantly different in the two years. In particular, cumulative emissions of 2013-14 were about five times higher than in 2014-15, respectively on average 2885$\pm$260 g N-$N_2O$ $ha^{-1}$ and 534$\pm$53 g N-$N_2O$ $ha^{-1}$ for a similar monitoring period of about 300 days. Differences could be partially attributed to a huge difference in the rainfall amount during the two growing seasons, equal to 810 mm in the 2013-14 growing season and 441 mm in 2014-15. Emission factors for each N rate was calculated through the whole monitoring period and resulted to be in the range of 0.5-0.9% in 2013-14, while between 0.2-0.3% in 2014-15, considerably lower than the IPCC Tier 1 EF (1%).

References:

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