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Nitrous oxide emissions from soil amended with 15N-labelled urea with nitrification inhibitor (Nitrapyrin) and mulch

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Nitrous oxide (N2O), one of the key greenhouse and ozone (O_3) depleting gases, constitutes 7% of the anthropogenic greenhouse effect. Its global warming potential is 310 times higher than that of carbon dioxide (CO_2) and 16 times than methane (CH4) over a 100-year period. To develop mitigation tools for N2O emissions, and to investigate the relationship between gross N transformation and N2O emission from soil, it is imperative to understand N2O emission from soils as influenced by N inputs, environmental conditions and farm management practices. The use of nitrification inhibitor such as Nitrapyrin and crop residues (mulch) may have a role in mitigating N2O losses from soil because of their effects on nitrification and denitrification. It prevents hydrolytic action on urea and keeps nitrogen in ammonium form. To determine the effects of urea applied with nitrification inhibitor and mulch on N2O emissions from soil, an incubation experiment was conducted under controlled moisture of 60% water filled pore space (WFPS) and temperature (20±2oC) conditions. Soil samples (0−20 cm soil depth) collected from an arable site were treated with 15N-labelled urea (5 atom %) at 150 kg N/ha rate. The 5 treatments including control, (urea, urea with Nitrapyrin (800 g/100 kg urea), urea with mulch (5 tons/ha) and urea with Nitrapyrin and mulch) were replicated 4 times using 500 ml glass jars. The N2O isotopic signature and the intramolecular distribution of 15N were measured by off-axis integrated cavity output spectroscopy (Los Gatos Research). The preliminary results showed that nitrification inhibitor (Nitrapyrin) can be used to distinguish between different pathways of N2O production from soil. In addition to the site preference of the 15N promises to be a helpful tool to determine the source of the generated N2O.