

Greenhouse gas emissions from solid and liquid organic fertilizers applied to lettuce

ABSTRACT

Improper application of nitrogen (N) fertilizer and environmental factors can cause the loss of nitrous oxide (N₂O) to the environment. Different types of fertilizers with different C/N ratios may have different effects on the environment. The focus of this study was to evaluate the effects of environmental factors and four organic fertilizers (feather meal, blood meal, fish emulsion, and cyano-fertilizer) applied at different rates (0, 28, 56, and 112 kg N ha⁻¹) on N₂O emissions and to track CO₂ emissions from a lettuce field (*Lactuca sativa* L.). The study was conducted in 2013 and 2014 and compared preplant-applied solid fertilizers (feather meal and blood meal) and multiple applications of liquid fertilizers (fish emulsion and cyano-fertilizer). Three days a week, N₂O and CO₂ emissions were measured twice per day in 2013 and once per day in 2014 using a closed-static chamber, and gas samples were analyzed by gas chromatography. Preplant-applied solid fertilizers significantly increased cumulative N₂O emissions as compared with control, but multiple applications of liquid fertilizers did not. Emission factors for N₂O ranged from 0 to 0.1% for multiple applications of liquid fertilizers and 0.6 to 11% for preplant-applied solid fertilizers, which could be overestimated due to chamber placement over fertilizer bands. In 2014, solid fertilizers with higher C/N ratios (3.3–3.5) resulted in higher CO₂ emissions than liquid fertilizers (C/N ratio, 0.9–1.5). Therefore, organic farmers should consider the use of multiple applications of liquid fertilizers as a means to reduce soil greenhouse gas emissions while maintaining high yields.

Keyword: Greenhouse gas emissions; Solid organic fertilizers; Liquid organic fertilizers; Lettuce