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Greenhouse gases: Nitrogen fertilization and CO_2 emissions in a soil cultivated with wheat (Triticum aestivum L.) under conventional farming in Mexicali Valley, Baja California, Mexico.

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Introduction

Greenhouse gases emissions in agricultural soils are associated with the type of soil management, properties, land cover and use of nitrogen fertilizers, which impact on crop yields. Conventional tillage systems in the production of agricultural crops often, use excessive application of nitrogen fertilizer, which is a source of generation of greenhouse gases (N_2O and CO_2).

There is not information regarding the assessment of greenhouse gases emissions in conventional tillage systems most widely used in the Mexicali Valley. The aim of this study was to evaluate the CO_2 emission related to the application of nitrogen fertilizer in a soil cultivated with wheat under conventional tillage in the Mexicali Valley, Baja California.

Materials and Methods

This study was conducted at Institute of Agricultural Science, UABC, located in Ejido Nuevo León, Mexicali Valley, BC, México (32º 20´29" N y 115º 11´81" O).

The experimental plot, with a soil Typic Haplotorrert was cultivated with wheat (*Triticum aestivum*) from November 2013 to June 2014, with application of three doses of nitrogen fertilizer (0, 200 and 400 kg ha^{-1}).

Soil samples from each treatment were taken, at a depth of 30 cm, before fertilization (November), after each fertilization (January, February, March) and at the end of crop cycle (June). Soil samples were incubated under 65% of field capacity at a temperature of 30°C. CO_2 emanated from the treatments was measured after 4, 22, 46 and 142 hours of incubation.

The tendency was described by a lineal function (y = ax + b), with the values of b determined from linear regression, a statistical means trial test was carried out (Tukey α=0.05) to determine if there were significant CO_2 emission rate related to doses of nitrogen applied to the soil.

Results and Discussion

The magnitude of the emission of CO_2 obtained was 194, 247 and 238 mg/g/h for doses 0, 200 and 400 Kg N ha^{-1} respectively, and there was not significantly different (p> 0.05) (Table 1).

Table 1. Nitrogen fertilization and CO_2 emissions in a soil cultivated with wheat under (*Triticum aestivum*) conventional farming.

N Doses Kg ha^{-1}	CO_2 emission mg/g/h
0	194 a
200	247 a
400	238 a

Mean values with different letters are statistically different, Tukey (α = 0.05). Least Significant Difference= 78.7

Table 2. Average CO_2 emission rate by applying different doses of nitrogen fertilizer in a soil under conventional farming.

N Doses Kg ha^{-1}	Average CO_2 emission rate (value of b=rate) mg/g/h	MSD
0	32.638 a	
200	46.515 ab	
400	48.464 c	15.592

Mean values with different letters are statistically different, Tukey (α = 0.05). DMS=Least Significant Difference

A higher dose of nitrogen not necessary correspond a higher magnitude of emission of CO_2, at less for soil condition in this experiment. However, the emission rate of CO_2 was significantly faster in the application of 400 kg ha^{-1} of nitrogen, with an emission rate of 48.464 mg CO_2/g/h.

Conclusions

There were not significant differences in CO_2 emissions by the doses of nitrogen fertilizer applied to soil under conventional farming.

The emission rate of CO_2 was significantly faster in the application of 400 kg ha^{-1} of nitrogen, with an emission rate of 48.464 mg CO_2/g/h.

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