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Short-term soil carbon dioxide emission, organic carbon and nitrogen of soil as affected by N fertilization in an arid wheat field, Northwest of Mexico

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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). The information regarding the assessment of greenhouse gases emissions in conventional fertilization a system, which is most widely used in the Mexicali Valley, is limited. The aim of this study is to evaluate the CO_2 emission, organic carbon and soil nitrogen related to the application of nitrogen fertilizer in a soil cultivated with wheat under conventional tillage in the Mexicali Valley, Baja California. The experimental plot, with a soil Aquic Haplotorrert was cultivated with wheat (*Triticum durum*), with applications of nitrogen fertilizer, urea, at doses of 0, 200 and 400 kg ha^{-1}. Organic carbon was measured by Walkley & Black method. Soil samples were incubated and CO_2 emanated from the treatments was measured after 4, 22, 46 and 142 hours of incubation. Nitrogen mineralization (NO_3-) during the crop cycle was obtained from KCl extraction and Kjeldhal method. The tendency was described by a lineal function (y = ax + b), a statistical means trial test was carried out (Tukey a=0.05). Organic carbon values were between 0.87 to 1.02%, not much difference was found at different doses. The emission of CO_2 was 194, 247 and 238 mg/g/h for doses 0, 200 and 400 Kg N ha^{-1} respectively, and there was not much significant difference ($p>0.05$). The magnitude of the nitrogen mineralization was 753, 942 and 1125 mg N for doses 0, 200 and 400 Kg N ha^{-1} respectively, with differences ($p>0.05$) between them. Highest doses of nitrogen applied to the soil does not necessarily correspond to a higher emission of CO_2 or organic carbon, but increase ($p<0.05$) the nitrogen mineralization, at least under evaluated conditions.

Table 1. CO_2 emissions under conventional fertilization.

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).

Table 2. Nitrogen concentration under conventional fertilization.

N Doses Kg ha^{-1}	NO_3 mg/g/h
0	753 a
200	942 b
400	1125 c

Mean values with different letters are statistically different, Tukey (α = 0.05).

Recent Publications

1. Kader M et al. (2010) Soil organic matter fractionation as a tool for predicting nitrogen mineralization in silty arable soils. Soil Use and Management. 26(4):494-507.
2. Patiño Zúñiga L et al. (2009) The effect of different tillage and residue management practices on soil characteristics, inorganic N dynamics and emissions of N_2O, CO_2 and CH_4 in the central highlands of Mexico: A laboratory study. Plant Soil. 314(1-2):231–241.

Biography

Silvia Monica Avilés has her expertise in soil fertility, Sustainable Use of Soil and Water Research Group. Her evaluation is based on fertility in the soil on agricultural production systems in arid zones that let to get information to improve the management of fertilizers, soil and water, taking in account climate change and greenhouse gases emissions. She has been working for several years in research, evaluation and teaching in diferent universities.

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