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Effect of Inorganic Fertilization on Soil N Dynamics in Agricultural Plots in Central Mexico

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Abstract : Due to food demand production, the use of synthetic nitrogenous fertilizer has increased in agricultural soils to replace the N losses. Nevertheless, the intensive use of synthetic nitrogenous fertilizer in conventional agriculture negatively affects the soil and therefore the environment, so alternatives such as organic agriculture have been proposed for being more environmentally friendly. However, further research in soil is needed to see how agricultural management affects the dynamics of C and N. The objective of this research was to evaluate the C and N dynamics in the soil with three different agricultural management: an agricultural plot with intensive inorganic fertilization, a plot with semi-organic management and an agricultural plot with recent abandonment (2 years). For each plot, the soil C and N dynamics and the enzymatic activity of NAG and β-Glucosidase were characterized. Total C and N concentration of the plant biomass of each site was measured as well. Dissolved organic carbon (DOC) and dissolved organic nitrogen (DON) was higher in abandoned plot, as well as this plot had higher total carbon (TC) and total nitrogen (TN), besides microbial N and microbial C. While the enzymatic activity of NAG and β-Glucosidase was greater in the agricultural plot with inorganic fertilization, as well as nitrate (NO_3) was higher in fertilized plot, in comparison with the other two plots. The aboveground biomass (AB) of maize in the plot with inorganic fertilization presented higher TC and TN concentrations than the maize AB growing in the semiorganic plot, but the C:N ratio was highest in the grass AB in the abandoned plot. The C:N ration in the maize grain was greater in the semi-organic agricultural plot. These results show that the plot under intensive agricultural management favors the loss of soil organic matter and N, degrading the dynamics of soil organic compounds, promoting its fertility depletion.

Keywords : mineralization, nitrogen cycle, soil degradation, soil nutrients
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