

# Impacts of urbanization on soil and its microbes: a comparative analysis in urban and agricultural environments in the Municipality of Rio Paranaíba-MG

Caroline Yuri Sano Yamanaka <sup>1,2\*</sup>, Yanna Cristina Reis Monteiro <sup>1,2</sup>, Marlon Corrêa Pereira <sup>1,2</sup>, Leandro Junio Sousa da Silva <sup>1,2</sup>, Rodrigo Lucindo Resende <sup>1,2</sup>

<sup>1</sup> Universidade Federal de Viçosa – Campus Rio Paranaíba, Biological Science and Health Institute, MG-230 Km 7, Zona Rural, Rio Paranaíba, 38810-000, MG, Brazil.

<sup>2</sup> Laboratório de Biotecnologia do Sistema Planta-Microrganismo, Universidade Federal de Viçosa – Campus Rio Paranaíba, MG, Brazil

\*Corresponding author. E-mail: caroline.yamanaka@ufv.br

Population growth leads to the increase of cities and for a higher food demand. As a consequence, native areas are replaced by pavements and constructions in urban areas and plantations on farms, which changes soil features and its microorganisms. Soil sealing, caused by paving and also by agricultural machinery, and different land uses can deplete the soil functions, affecting the ecosystem services. Therefore, the objective of this work was to evaluate the impact of urbanization on some physical, chemical and microbial soil features. The study took place in the municipality of Rio Paranaíba, where nine soil samples were collected from rural, urban and forest areas. Single soil samples were collected from 0-20 cm deep, mixed to form composite samples and sift. Sub-samples were used to determine the soil features moisture (M), density (D), pH and organic carbon (OC). The CFU/g of total bacteria (TB) and fungi (TF) were counted in Nutrient Agar with Nystatin and Martin Medium with Streptomycin, respectively. The bacterial colonies were evaluated as Gram-positive and Gram-negative. Microbial respiration (MR) and biomass (MB) were evaluated and metabolic (qCO<sub>2</sub>) and microbial (qMIC) quotients were also determined. Statistics tests were performed using the Speed Stat Spreadsheet v.3.0 software. Soil features were influenced by the land use, such as: lower OC in urban soils and higher pH in impermeable soils. TB had a significant difference between paved and unpaved areas, and TF did not present a significant difference. Changes in microbial attributes, as MR, were observed that native soil has higher emissions of carbon dioxide, indicating a significant decrease in the microbial activity; and the unsealed urban soils and agricultural soils were higher because of the disponibility of water and decomposition of organic material. Changes also were seen in qCO<sub>2</sub> that were higher in unsealed urban soils probably because of the stress occasioned by the loss of OM caused by the paving; and the MB were lower in sealed soils than others since it is influenced by humidity, temperature, pH and by disponibility of OM. This suggests that lower soil quality in paved urban soils is recurrent when compared to unpaved and agricultural soils in the analysis. Therefore, the greenspaces can mitigate the impact of urbanization and improve the soil functions in cities.

**Key words:** ecosystem services, concrete, microbial diversity.

## Impactos da pavimentação e urbanização sobre os microrganismos do solo: uma análise comparativa entre ambientes urbanos e agrícolas no Município de Rio Paranaíba-MG

A urbanização e agricultura, tomam espaços verdes. Assim, foi feito um estudo com o objetivo de avaliar seus efeitos sobre a comunidade microbiana e suas funções. Foram feitas análises físico-químicas, carbono orgânico, bactérias e fungos totais, taxas de respiração, metabolismo e biomassa microbiana. Observou-se que há diferença entre as análises abióticas e bióticas a depender do uso do solo, como: o qCO<sub>2</sub> ser afetado pelo estresse causado pela perda de MO devido a pavimentação de solos urbanos; além da sua MB ser menor. Espaços urbanos abertos permitem a manutenção do solo e serviços ecossistêmicos, além de melhorias comparado aos pavimentados.

**Palavras-chave:** serviços ecossistêmicos, concreto, diversidade microbiana.