Microbiological bioindicators in the evaluation of soil affected by tailings from iron mining in Minas Gerais

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After the rupture of the dam in Brumadinho, around 11.7 million m^3 of tailings from iron mining were spilled along the ribeirão Ferro-Carvão e Paraopeba River, affecting approximately 297.28 ha. Since then, many studies have been conducted in the area due to the need to follow the environmental recovery processes for decision-making. In this sense, microbiological bioindicators of soil quality can be an important tool for monitoring the recovery of these areas. Thus, this work aimed to monitor the process of environmental recovery of an area affected by the spill of mining waste, resulting from the rupture of a dam in Brumadinho, using the bioindicators: Carbon from Microbial Biomass (CBM), Microbial Basal Respiration (RBM) and Metabolic Coefficient (qCO_2). For this purpose, 21 soil samples were collected from 0 to 20 cm in three collections, in March and September 2022 and March 2023, with samples belonging to an area affected by the tailings and an area of unaffected forest adopted as a reference. Samples were promptly processed for CBM and RBM analyses, with CBM being quantified by the microwave irradiation method established by Islam & Weil (1998), Brooks et al. (1982) and Tedesco (1995), based on the extraction of Carbon by Potassium Sulfate. The RBM analysis was performed using the method of CO_2 capture by NaOH proposed by Jenkinson & Powlson (1976) and the qCO_2 obtained by the RBM/CBM ratio. The results were submitted to statistical analysis for non-parametric Kruskal Wallis data with Fisher's test at 0.05 of significance, using the Agricolae package of the R software, comparing the affected area group (AA) with the Reference group (REF) between the collections and within each collection. The results showed a significant difference for all bioindicators in all collections, in which the REF group had the highest values, except for qCO_2 in the September 2022 collection, which did not show a significant difference between the groups. When comparing the AA group, in the three collections, except for qCO_2, both CBM and RBM differed statistically with lower values in March 2022 and higher values in September 2022 within each group, indicating a recovery of this area in this period. The REF Group maintained stability over the three collections for CBM with the highest RBM and qCO_2 value in September 2022 possibly associated with the dry season.

Key words: Mining; Monitoring; Recovery; Bioindicators.

Bioindicadores microbiológicos na avaliação de solos afetados por rejeitos de mineração de ferro em Minas Gerais

O monitoramento da recuperação de uma área atingida por rejeito de mineração pelos índices microbiológicos Carbono da Biomassa Microbiana (CBM), Respiração Basal Microbiana (RBM) e Coeficiente Metabólico (qCO2) mostrou pela comparação dos valores obtidos entre área afetada e referência, que está havendo recuperação da microbiota na área afetada durante o período avaliado.

Palavras-chave: Mineração; Monitoramento; Recuperação; Bioindicadores.

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