# MICROBIOLOGICAL AND BIOCHEMICAL ATTRIBUTES IN LOW-FERTILIY SOIL THAT RECEIVED LIMING AND P-FERTILIZATION

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Microorganisms and soil enzymes play essential roles in biogeochemical cycles and are sensitive to changes in land use, what make them useful tools as bioindicators. The aim of this work was to assess the effect of liming and phosphate manuring on microbiological and biochemical attributes of a low-fertility soil originally under native vegetation that has been cropped with soybean in summer and black oat in winter. The experimental design was randomized blocks, in 3 × 3 factorial arrangement (3 levels of liming: control, surface or incorporated), in combination with three levels of P fertilization (control, natural reactive phosphate, and triple superphosphate), in three repetitions. The soil sampling was made during the oat cropping season. In each parcel, 9 sub-samples were taken at two soil depths: 0-5 cm and 5-10 cm. The dataset was submitted to two-way Anova and Tukey´s test for means comparisons. Liming and phosphate manuring affected the soil basal respiration only at 0-5 cm soil depth, in which the surface liming increased this attribute compared to the incorporated liming. By turn, the fertilization with reactive phosphate increased the soil basal respiration compared to the control. Dehydrogenase activity was more sensitive to liming than basal respiration and increased due to liming in relation to the non-limed control, irrespectively the incorporation, in both soil depths. Nevertheless, the phosphate fertilization did not change the dehydrogenase activity. P fertilization did not change the microbial biomass C, but liming reduced it at 0-5 cm of soil depth, irrespectively the incorporation. At 5-10 cm, only the incorporated liming decreased the microbial biomass C compared to the control. The microbial biomass N had interaction with the factors at 5-10 cm of soil depth, in which the highest value was observed in the combination with no-liming and triple superphosphate as P source. Liming and P-fertilization affected the glutaminase activity only at 0-5 cm of soil depth. In this case, the surface liming stimulated the activity in relation to the incorporated liming, but both did not differ from the control. Regarding the P source, triple superphosphate stimulated the glutaminase activity. The biochemical attributes showed to be more sensitive and consistent than the microbiological ones as bioindicators for assessment of changes in land use.

**Keywords:** Bioindicators; soil enzymes; land-use; phosphorus.

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