

TITLE: IMPACTS OF DESERTIFICATION ON PHOSPHATE SOLUBILIZING BACTERIA IN CAATINGA SOILS

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ABSTRACT:

Caatinga is a Brazilian domain seriously degraded due to intense anthropic actions, low water availability and long periods of drought. In Ceará, the process of desertification is intensified mainly by the practice of overgrazing. Although many studies have characterized the impacts of the desertification on plant and animal diversity, far less is known about the effects on soil microbiome. This is also worrying considering that the microbiome is responsible for fertility, cycling and nutrient uptake such as phosphorus, which are often not readily available in soil. The objective of this study was to analyze the influence of desertification on the phosphate solubilizing bacteria in a Caatinga desertification nucleus. Soil samples collected in January 2017 and May 2018 in the municipality of Irauçuba, Ceará, Brazil were evaluated, divided into natural caatinga forest, a sub-area of fallow, with exclusion of domestic animals for 18 years, and a sub-area of overgrazing by cattle, goat and sheep under desertification. The soil samples were used to isolate heterotrophic bacteria in agar plate count medium diluted 10 times. The morphotypes were used to prepare pure culture for subsequent analysis. 308 bacterial isolates were obtained, which were 106 found in the desertified areas, 87 in the natural areas and 115 in the fallow areas. The phosphate solubilization activity was evaluated using on nutritive agar (glucose, yeast extract and agar) added 50 ml of a 10% solution of K_2HPO_4 and 100 ml of a 10% solution of $CaCl_2$ for each liter of medium and the pH was adjusted to 6.8. After the inoculation the plates were incubated for 5 days at 37°C. Positive test was perceived from the formation of a translucent halo around the colony. The solubilization index (IS) was calculated by the ratio between the diameter of the solubilization halo (mm) and diameter of the colony (mm). Based on the IS, the isolates were classified as low, medium and high solubilizers. A low number of phosphate solubilizing bacteria was observed in the desertified soil (14,15%) compared to the natural (47,12%) and fallow soils (28,68%). Using a two-way Anova multiple comparisons with Turkey's post hoc test, was observed that only in the desertified area was not detect a significant percentage ($p < 0.05$) of high-grade solubilizers, demonstrating the impact of desertification in these bacterial populations, which may compromise the phosphorus uptake by plants in the case of reforestation program.

Keywords: Caatinga, soil microbiome, phosphate solubilization, desertification

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