TITLE: MULTI-KINGDOM IMPACT OF FERTILIZER AND BIOINOCULANTS OVER THE RHIZOSPHERE OF *EUCALYPTUS UROGRANDIS*

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ABSTRACT:

The genus *Eucalyptus* is the world's most widely planted hardwood trees. Despite that, little is known about the rhizosphere microbiome associated with it. In recent decades, the interest in rhizospheric microorganisms has increased, mainly due to their potential use in sustainable agriculture as plant growth-promoters. Studies have shown that the use of bacteria can improve nutrient cycling, reduce plant stress and induce plant development among others. However, there were very few works addressing the impact of fertilization and bacterial inoculation over the general biodiversity associated with the plant rhizosphere. In this study, we evaluate how the use of a fertilizer with and without association with a bacterial consortium can impact the rhizosphere microbiome, compared with no soil amendment. We used shotgun metagenome and evaluated simultaneously the impact over the three domains Archaea, Bacteria and Eukarya. The treatments were applied in monoclonal *Eucalyptus* seedlings and monitored in greenhouse condition for 10 weeks. Our results show significant impact of the fertilizer application over the bacterial, archaeal and fungal community, but no additional effect caused by the bacterial inoculation, showing that it is safe to inoculate. The most abundant genera of Bacteria found were *Streptomyces, Mycobacterium, Bradyrhizobium, Rhodopseudomonas, Acidobacterium, Burkholderia* and *Frankia*. The main differences caused by the fertilizer were increases in the relative abundance of *Mycobacterium*, *Streptomyces* and *Acidobacterium*, and decrease in the relative abundance of *Burkholderia* and *Opitutus* genera. In relation to fungal community, it was dominated by *Neosartorya, Aspergillus, Penicillium, Gibberella* and *Neurospora,* and major differences were observed in the first two genera. The archaeal community was dominated by members of methane cycle, such as *Methanosarcina* and *Methanoregula,* which suffer reduction with fertilizer application. Despite greenhouse data show great improvement in plant develop by bacterial inoculation (data not shown), it did not produce measurable changes in the bacterial community, showing that the effects are direct to the plant and not by rhizosphere modulation.

Keywords: bacterial consortium, bioinoculant, *Eucalyptus*, fertilizer, rhizosphere

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