Bourles A et al., Appli Micro Open Access 2017, 3:2(Suppl)
DOI: 10.4172/2471-9315-C1-005

New *Burkholderia* sp. isolated from pioneer plants roots of ultramafic soils, play a key role in the plant adaptation to harsh edaphic conditions

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New Caledonia is a tropical archipelago located in the south Pacific and covered with ultramafic soils for one third. These soils are characterized by a lack of major plant nutrients (N, P and K), a strong unbalanced ratio of Ca/Mg and high levels of heavy metals (Co, Cr, Fe, Mn and Ni). Such geochemical constraints lead to the development of specific biological endemic ecosystems ranking New Caledonia among the world biodiversity hotspots. These ultramafic massifs are exploited as nickel's ores sources which impact strongly the ecosystems that must be restored after mining activities. In this work, we present data about two new *Burkholderia* species isolated from roots of *Costularia* (Cyperacae), a tropical herbaceous pioneer plants growing on ultramafic soils and actively used in post mining ecological restoration strategies. Results indicated noteworthy bacterial specific ecological traits such as the tolerance to heavy metals. For example, the tolerance of these *Burkholderia* reached concentrations of nickel from 5 to 25 mM, metal tolerance supported by presence of specific markers such as *nreB* and *Cnr* genes. Moreover, these bacteria showed the ability to produce plant growth promoting molecules such as 1-aminocyclopropane-1-carboxylate deaminase (ACC), indol-3-acetic acid (IAA), NH_3 and siderophores. These two *Burkholderia* species were named *B. ultramafica* (STM10279^T) and *B. novacaledonica* (STM10272^T). Physiological nickel tolerance mechanisms and interactions with the plant were investigated such as (1) the capacity to produce exo-polysaccharides in planktonic mode, and (2) the ability to produce a biofilm in contact with plant root. *B. ultramafica* showed a production of a polysaccharide constituted of neutral (75%) and acid sugars (25%). Moreover *B. ultramafica* inoculated to *Costularia comosa* (Cyperaceae) grown on ultramafic substrate (Ni=78 mg.kg^{-1}) enhanced the shoot biomass compared to the non-inoculated plants (more than 40%). The two *Burkholderia* showed the ability to form biofilm (Fig. 1). The bacterial capacity to tolerate the nickel and to produce of both biofilm and polysaccharides suggest a key role of these bacteria in plant growth and adaptation to the ultramafic constraints with a view to using these strains as inoculum for ecological restoration of degraded mining sites program.

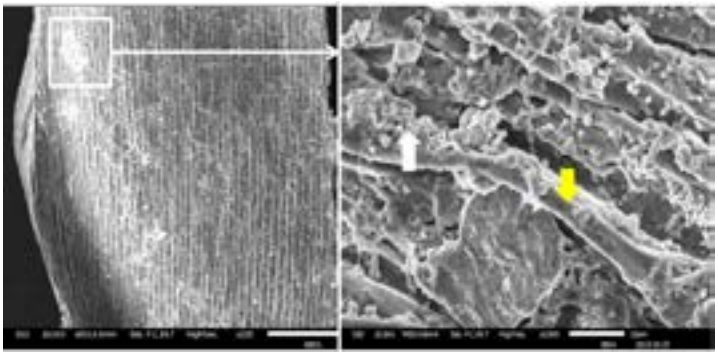

Figure 1: SEM photography of *Burkholderia novacaledonica* biofilm on *Costularia comosa* developed during seven days after inoculation. Biofilm and matrix were fixed by glutaraldehyde and stained by ruthenium red and L-Lysine. White arrow: biofilm; yellow arrow: root tissue.

Biography

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