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BIOFILM FORMATION BY ENDOPHYTIC BACTERIA

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Abstract

Azospirillum brasilense, *Burkholderia ambifaria*, *Gluconacetobacter diazotrophicus* and *Herbaspirillum seropedicae* are autoinducers producing endophytes. *Herbaspirillum seropedicae*, in particular, produces large amount of AI-2.
Endophytes are microorganisms that spend most of their life cycle inside plants, in particular they live on roots and in the rhizosphere. They have beneficial effect on the host plant such as growth promotion, production of auxines, cytochinines, gibberellins, induction of increased resistance to pathogens, as well as supply of fixed nitrogen to the host plant.
Bacteria physically interact with surfaces to form complex multicellular and often multispecies assemblies, including biofilms and small aggregates. There is growing recognition that intensity, duration and outcome of plant-microbe interactions are significantly influenced by the conformation of adherent microbial populations. Biofilms are a normal common existence in bacterial ecosystems. Within the biofilms bacteria have cooperative behavior and they may be susceptible to harsh environmental conditions, such as drying, osmotic shock and antibiotics.
Biofilms can be defined as structured communities of sessile microbial aggregates, enclosed in a self-produced polymeric matrix, attached to an abiotic or biotic surface.
Their development and resulting deep interactions with plants, often require cell-to-cell communication between colonizing bacteria. This cell-to-cell communication is a regulatory mechanism, called Quorum Sensing (QS). Quorum sensing is achieved through the production, release, and subsequent detection and response of signal molecules called autoinducers. HSL (*N*-acyl-l-homoserine lactones) and AI-2 are autoinducers and their concentration increase as function of cell density. Quorum sensing controls several processes, including symbiosis, virulence, competence, conjugation, antibiotic production, motility, sporulation and biofilm formation.
The four bacteria mentioned above were tested for biofilm formation in pure culture, dual-strain and multistrain at different concentration.
The results obtained show that gene expression encoding for biofilm formation is not universal at the same cell densities. The main producer is *H. seropedicae* which induces biofilm formation in all the tested strains.
All strains were able to form pure culture biofilm within 24h. In dual-strain and multistrain cultures, we found both antagonistic and synergistic effects among the different bacteria.