Rice response to inoculation with endophytic diazotrophic *Herbaspirillum seropedicae* strain ZAE94

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Rice has been considered a cereal with an excellent nutritional balance, giving 20 % of energy and 15 % of proteins required for humans. It is an important food supply for almost three billion people in the world that depend mostly on this crop to survive. Rice production is dependent on nitrogen fertilizer which has high costs and high potential to pollute the environment. One possible alternative to reduce nitrogen fertilizer application in rice crops could be the inoculation with endophytic diazotrophic bacteria. Rice cultivars with different BNF potential were tested in greenhouse and field experiments to verify the effects of *H. seropedicae* strain ZAE94 inoculation and nitrogen fertilization on rice productivity and grain quality. The results have shown that the inoculation with *H. seropedicae* can supply up to half of the amount of nitrogen fertilizer required by the rice crop.

Rapid gene transfer in the environment promotes the evolution of a diversity of suboptimal and competitive rhizobia for *Biserrula pelecinus* L.

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The emergence of biodiversity in rhizobia after the introduction of exotic legumes and their respective rhizobia to new regions is a challenge for contemporary rhizobiology. *Biserrula pelecinus* L. is a pasture legume species, introduced to Australia from the Mediterranean basin, which is having a substantial impact on agricultural productivity on acidic and sandy soils of Western Australia and New South Wales at present. The deep-rooted nature of this plant is also providing a valuable tool in reducing the development of dry-land salinity. Our research provides evidence for the evolution of a diversity of opportunistic and competitive rhizobia able to nodulate *B. pelecinus*. This is following *in situ* transfer of symbiotic genes, located on a mobile symbiosis island, from the inoculant strain to other soil bacteria. Furthermore, these diverse rhizobia have inferior N_2-fixing ability on *B. pelecinus*. To maximise the value of *B. pelecinus* in farming systems, it is imperative that the nitrogen-fixing symbiosis between this new species and its rhizobia is maintained at the highest level of efficiency. At present we are constructing a genetically stable inoculant strain for *B. pelecinus* by inactivating the genes responsible for symbiosis island transfer and thereby reducing the chances of lateral gene transfer between the inoculant and soil bacteria.