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## Upland Rice Development as Affected by Nitrogen Rates and Rhizobacteria

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### Abstract

Rice is a staple food in many countries of the world. To meet the increasing worldwide demand for this grain, in the following 30 years we will have to increase the current rice grain production by more than 50 %. Therefore, it is important to develop technologies to increase rice grain yield. Among the nutrients, nitrogen (N) is an important compound for rice production. The use of alternative technologies to reduce N fertilisers in rice crops includes the use of bacteria from the soil. Plant growth promoting rhizobacteria are soil bacteria that inhabit areas around crop root surfaces and are directly or indirectly involved in promoting plant growth and development. The use of diazotrophic rhizobacteria with an ability to fix nitrogen could provide increases of the content of this nutrient in the leaves and grains of crops. The objective was to determine the effect of *Serratia* spp. isolated R-235 and doses of N at topdressing fertilisation on the production of biomass, gas exchange, nutrient content in leaves and grain, yield components and grain yield of upland rice. The field experiments were conducted in two growing seasons, 2015/16 and 2016/17, under no-tillage system conditions in the Brazilian Cerrado. The experimental design was a complete randomised block in a  $4 \times 2$  factorial scheme, with four replications. The treatments consisted of combining four nitrogen doses (0, 40, 80 and  $120 \text{ kg ha}^{-1}$ ) with or without rhizobacteria seed inoculation. The use of bacteria R-235 provides increases in the N, K and Mn contents in rice plants leaves and in grain yield ( $2893 \text{ kg ha}^{-1}$  with bacteria and  $2422 \text{ kg ha}^{-1}$  without). The increased levels of N provided increases in plant biomass, number of panicles per plant, number of grains per panicle and grain yield of rice plants. The use of diazotrophic rhizobacteria showed promising to be used in rice crop and can bring numerous benefits of rice, such as improving nutrient uptake, biomass production, yield components and grain yield.

**Keywords:** Bioagent, growth promoter, nitrogen fixing, *oryza sativa*, rhizobacteria, sustainable development