

# Selected bacteria can reduce synthetic N fertilization dependence in sorghum.

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With the increasing population, the demand for food, fiber, and energy is also on the rise. As a result, there is an expected increase in the demand for fertilizers such as nitrogen (N), which would result in increased production costs and environmental problems. Hence, it is crucial to develop sustainable technologies that can reduce the use of chemical fertilizers in crop cultivation. The study aimed to test selected diazotrophic bacteria and evaluate their potential as an inoculant for sorghum crops in field conditions. Forage sorghum seeds were inoculated with nitrogen-fixing bacteria and combined with increasing doses of synthetic nitrogen fertilizer, that way two bacteria isolates (SB5 - *Rhizobium* sp. and SF4 - *Sphingomonas* sp.) and their mixture (MIX) were tested with different doses of synthetic N applied to the soil (0, 50, 75 and 100 % of N the recommended dose, 160 kg ha<sup>-1</sup>), for 120 days, in field conditions. This way, the experimental design was a randomized block with three replications per treatment, following a subdivided parcel (5 x 4) in which five top-dressing nitrogen fertilizers doses were used, and four inoculant formulations (without inoculation, each bacterium inoculated separately, and a MIX). An increase in the dose of synthetic fertilizer and inoculation with the MIX resulted in a significant ( $p < 0.05$ ) increase in stem diameter, shoot dry mass, shoot N content, and sorghum crop yield under field conditions. Compared to plants that received 100% of the recommended synthetic N dose ( $p < 0.1$ ), inoculation with the MIX combined with mineral fertilization showed the potential to reduce N fertilization by 25 % during the cultivation of forage sorghum, leading to the maximum crop productivity. The MIX containing all tested bacteria (SB5 - *Rhizobium* sp. and SF4 - *Sphingomonas* sp.) isolates can reduce the use of N fertilizer in forage sorghum, leading to cost savings and environmental conservation.

**Key words:** Fertilizers; Synthetic nitrogen; Cost reduction, Diazotrophic bacteria.

## Bactérias selecionadas podem reduzir a dependência da fertilização nitrogenada no cultivo de sorgo

Com o aumento populacional, a demanda por alimentos, fibras e energia está em constante crescimento. Isso resulta em maior necessidade de fertilizantes, como os nitrogenados, o que aumenta o custo de produção e problemas ambientais. Portanto, é crucial desenvolver tecnologias sustentáveis que reduzam o uso de fertilizantes químicos na agricultura. Neste estudo, testamos bactérias diazotróficas selecionadas como inoculantes para cultivos de sorgo em condições de campo. A inoculação combinada com doses crescentes de fertilizante nitrogenado mostrou aumentos na produção de sorgo, indicando potencial para reduzir o uso de fertilizantes químicos entre 25 %, reduzindo custos e danos ao meio ambiente.

**Palavras-chave:** Fertilizantes; Nitrogênio sintético; Redução de custos, Bactérias diazotróficas.

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