IECAG 2024 Conference

The 4th International Electronic Conference on Agronomy

02–05 December 2024 | Online

MDPI

Inoculation of cotton improves plant growth under reduced nitrogen fertilization

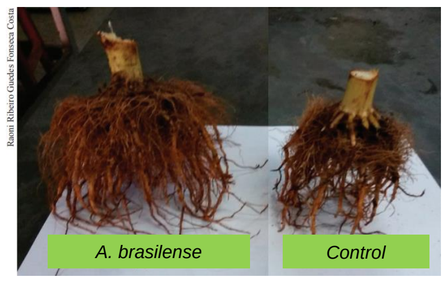
Sonia Purin da Cruz[1*], Grazieli Medeiros[1], Heloisa Delmonego Hess[1], Eduardo de Souza[1], Emerson Gabriel Cardoso dos Passos[1].

[1] Universidade Federal de Santa Catarina – Curitibanos, SC – Brazil. *s.purin@ufsc.br

INTRODUCTION & AIM

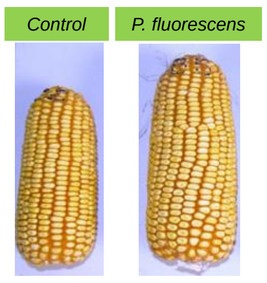
Inoculation with *Azospirillum brasilense* and *Pseudomonas fluorescens* is widely explored in crops such as soybean and corn (Hungria *et al*., 2013; Sandini *et al*., 2019).

Root growth



Costa *et al*. (2015)

Yield



Berta *et al*. (2014)

Nodulation

Prando *et al*. (2022)

Potential application in other crops remains limited known or unexplored, such as cotton (*Gossypium hirsutum*).

Research is important to reduce environmental impacts caused by use of fertilizers, and decrease costs of production.

To evaluate the effects of inoculating cotton plants with A. brasilense and P. fluorescens under reduced N fertilization.

METHOD

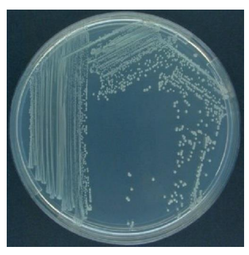
Greenhouse experiment, in a completely randomized design with five replications

T1: 100% N
T2: 75% N
T3: 75% N + *Azospirillum brasilense*
T4: 75% N + *Pseudomonas fluorescens*
T5: 75% N + *A. brasilense* + *P. fluorescens*

Inoculation by imersion of seedlings in suspension with bacteria.

Figure 1. Species of plant growth-promoting bacteria used in the study.

Azospirillum brasilense



Pseudomonas fluorescens

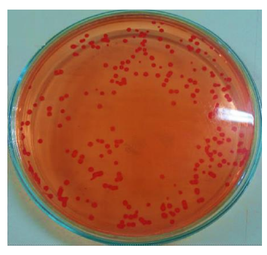


Figure 2. Cotton plants at 30, 60 and 150 days after inoculation.

Evaluations: Height and number of leaves
Root and shoot mass
Root and shoot volume

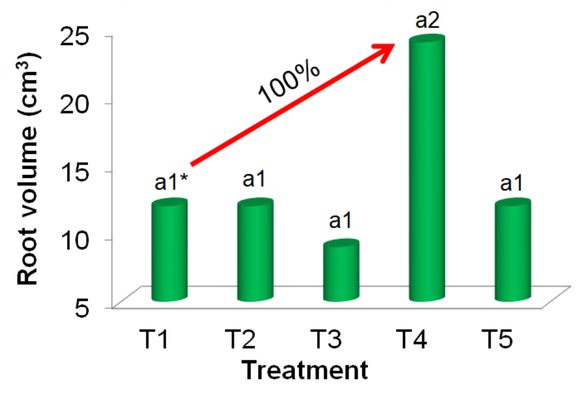
Data analysis: one-way ANOVA + Scott-Knott test (P=0.05).

RESULTS & DISCUSSION

Figure 3. Root mass of cotton plants in response to nitrogen and plant growth-promoting bacteria.

* Means followed by the same letter/number are not significantly different (Scott-Knott, P =0.05).
T1: 100% N; T2: 75% N; T3: 75% N + *Azospirillum brasilense*; T4: 75% N + *Pseudomonas fluorescens*; T5: 75% N + *Azospirillum brasilense* + *Pseudomonas fluorescens.*

Figure 4. Volume of roots of cotton plants in response to nitrogen and plant growth-promoting bacteria.



* Means followed by the same letter/number are not significantly different (Scott-Knott, P =0.05).
T1: 100% N; T2: 75% N; T3: 75% N + *A. brasilense*; T4: 75% N + *P. fluorescens*; T5: 75% N + *A. brasilense* + *P. fluorescens.*

Figure 5. Roots of cotton plants in response to nitrogen and plant growth-promoting bacteria.

100%N | 75%N | 75%N + *P. fluorescens*

Root growth = better development and higher yield
Costs with N are reduced in 25%

Less N loss to atmosphere and water bodies
Reduced risks of eutrophication
Healthier soils and more sustainable agriculture

CONCLUSION

Inoculation with *P. fluorescens* appears to be a promising tool for better rooting of cotton seedlings and reducing fertilization costs, and should be better explored to understand its benefits in field conditions, as well its effects on productivity of this crop.

REFERENCES

Berta, G., Copetta, A., Gamalero, E., Bona, E., Cesaro, P., Scarafoni, A., & D'Agostino, G. (2014). Maize development and grain quality are differentially affected by mycorrhizal fungi and a growth-promoting pseudomonad in the field. Mycorrhiza, 24: 161-170.

Hungria, M., Nogueira, M. A., & Araujo, R. S. (2013). Co-inoculation of soybeans and common beans with rhizobia and azospirilla: strategies to improve sustainability. Biology and Fertility of Soils, 49: 791-801.

Prando, A. M., de Oliveira, A. B., Possamai, E., Reis, E., Nogueira, M., Hungria, M., ... & Conte, O. (2022). Coinoculação da soja com *Bradyrhizobium* e *Azospirillum* na safra 2020/2021 no Paraná. Embrapa Soja, Londrina.

Sandini, I. E., Pacentchuk, F., Hungria, M., Nogueira, M. A., da Cruz, S. P., Nakatani, A. S., & Araujo, R. S. (2019). Seed inoculation with *Pseudomonas fluorescens* promotes growth, yield and reduces nitrogen application in maize. International Journal of Agriculture and Biology, 22: 1369–1375.