Pantanal Editora
Trends in Agricultural and Environmental Sciences
10.46420/TAES.e240001

Impact of applying the biostimulant Seed+ on initial growth of peanut cultivars

Jorge González **Aguilera**[1,*], Ana Carolina Vidal **do Nascimento**[1], Alana Silva **Rocha**[1], Isabella Santos de **Oliveira**[1], João Vitor Ferreira Lima **Guedes**[1], Fábio **Steiner**[1], Alan Mario **Zuffo**[2]

[1] Universidade Estadual de Mato Grosso do Sul (UEMS), Cassilândia (MS), Brasil.
[2] Universidade Estadual do Maranhão (UEMA), Campus Balsas, Balsas (MA), Brasil.
* Correspondence: j51173@yahoo.com

Received: 2024-01-25
Accepted: 2024-02-22
Published: 2024-02-24

Main Editor
Bruno Rodrigues de Oliveira

For citation: Aguilera, J. G.; Nascimento, A. C.; Rocha, A. S.; Oliveira, I. S.; Guedes, J. V.; Steiner, F; Zuffo, A. M. (2024). Impact of applying the biostimulant Seed+ on initial growth of peanut cultivars. Trends in Agricultural and Environmental Sciences, (e240001), DOI: 10.46420/TAES.e240001

Abstract: The use of biostimulants in agriculture has been shown to be suitable for stimulating the initial development of several crops; however, reports on its impact on peanut cultivation are scarce. A study was conducted to investigate the effect of application doses of the biostimulant Seed+ on the initial development of two peanut cultivars under controlled greenhouse conditions. The experiment followed a randomized block design in a 2 × 4 factorial scheme: two peanut cultivars [IAC Tatu ST (upright growth habit) and Runner IAC 886 (prostrate growth habit)] and four doses of the biostimulant Seed+ (0, 3, 6 and 9 mL kg^{-1} of seeds) applied in the seed treatment, with three replications. At 21 days after sowing, plant height (PH), main stem diameter (SD), number of lateral branches (NLB), and main root length (RL) were measured. Our results showed that the use of two improved contrasting cultivars with an erect and prostrate growth habit showed that peanut cultivars have different responses to the doses of biostimulant applied, with crop development, especially for the IAC Tatu ST cultivar. The application of 9 mL kg^{-1} of the biostimulant Seed+ in seed treatment can be an efficient alternative to stimulate the initial development of peanut cultivars grown in sandy soil of the Cerrado Sul-Mato-Grossense under controlled greenhouse conditions. However, these beneficial effects must be confirmed in experimental trials under field conditions.

Keywords: *Arachis hypogaea* L.; seed treatment; sustainability.

---

1. Introduction

Peanut (*Arachis hypogaea* L.) has been one of the main oilseed crops cultivated in Brazil (Souza et al., 2019), especially due to its economic importance and nutritional value. Peanut grains have a high protein content (22 to 30%), which makes this crop an excellent crop option for crop rotation in the Brazilian Cerrado region (Souza et al., 2019).

In recent years, the search for biological technologies and sustainable agricultural practices that improve Brazilian agricultural systems and optimize the use of natural resources has intensified (Bereta et al., 2022). In this context, the use of biostimulants in seed treatment can be an excellent alternative for improve initial plant growth. However, studies that evaluated the effects of the biostimulant Seed+ on the initial development of peanuts are scarce.

Among the practices that contribute to the proper initial establishment of plants in the field is seed treatment (ST), which guarantees the initial health of the plant and its establishment (Wylot et al., 2019). Seed treatments generally use fungicides and insecticides to control pests and diseases that affect most crops from the beginning of their cycle.

In peanuts, ST is mainly used to protect plants, but the use of biostimulants is still rare. Biostimulants may contain organic substances, especially plant growth hormones (auxin, gibberellin, cytokinins, etc.) and/or inorganic substances (key mineral elements for plant growth) that can act to improve numerous physiological, nutritional and morphological processes in plants. (Binsfeld et al., 2014; Almeida & Rodrigues, 2016; Wylot et al., 2019).

In ST, the use of biostimulants can influence root growth and germination speed rate (Wylot et al., 2019). Uniform germination is desirable because it reduces the time the that seeds are exposed to adverse soil conditions, increasing the chances of success in the initial establishment of the peanut crop (Steiner et al., 2019; Wylot et al. 2019). Oliveira et al. (2016) found that the application of 10 to 15 mL kg^{-1} of biostimulant improved the growth of popcorn plants. Similarly, Oliveira et al. (2017) also found that the use of biostimulants increased the initial growth of cowpea seedlings.

This study was conducted to investigate the effects of applying doses of the biostimulant Seed+ on the initial development of two cultivars of peanut (*Arachis hypogaea* L.) grown in sandy soil under controlled greenhouse conditions.

2. Material and Methods

The experiment was carried out under greenhouse conditions at the Agronomic Experimental Station of the State University of Mato Grosso do Sul - UEMS, in Cassilândia (MS). Plastic pots with 8-L capacity were used; these pots were filled with 7.5 dm^3 of sandy soil classified as Neossolo Quartzarênico Órtico latossólico - NQo. After liming, the soil was fertilized with 20 mg dm^{-3} N (urea), 250 mg dm^{-3} P (simple superphosphate), 100 mg dm^{-3} K (potassium chloride), 15 mg dm^{-3} S (agricultural gypsum) and 1 mg dm^{-3} Mo (ammonium molybdate).

The pots were arranged in a randomized block design in a 2 × 4 factorial scheme, with three replications. The treatments consisted of two peanut cultivars [IAC Tatu ST (upright growth habit) and Runner IAC 886 (prostrate growth habit)] and four doses of the biostimulant Seed+ (0, 3, 6 and 9 mL kg^{-1} of seeds)] applied in the seed treatment. Each experimental unit consisted of a pot containing five plants.

Ten peanut seeds were sown in each 8-L pot, and six days after emergence, seedlings were thinned down to five per pot. Soil water content was monitored daily and maintained close to field capacity through daily irrigation using a microsprinkler system.

At 21 days after sowing, plant height (PH), main stem diameter (SD), number of lateral branches (NLB), and main root length (RL) were assessed. Plant height and main root length were measured using a tape measure, while the diameter of the main stem was measured with a digital caliper.

The data were subjected to analysis of variance (ANOVA), and the means were compared using the Tukey test at 5% probability. Statistical analyses were carried out using RBio statistical software (Bhering, 2017).

3. Results and Discussion

Analysis of variance reported that the effect of peanut cultivars was significant on plant height and main stem diameter, while the effect of biostimulant application doses was significant on number of lateral branches. Interaction between peanut cultivar and biostimulant application showed significant effect ($p < 0.05$) on number of lateral branches (Table 1).

The IAC Tatu ST cultivar has a greater plant height and main stem diameter when compared to the Runner IAC 886 cultivar (Table 1). This result is associated with the erect growth habit of the IAC Tatu ST cultivar, which results in peanut plants with greater height when compared to cultivars with a prostrate growth habit, such as Runner IAC 886.

Table 1. Effect of cultivars and biostimulant application doses on the plant height (PH), main stem diameter (SD), number of lateral branches (NLB), and main root length (RL) of peanut plants (*Arachis hypogaea* L.) grown in sandy soil of the Cerrado Sul-Mato-Grossense under controlled greenhouse conditions

Peanut cultivars	**PH (cm)**	**SD (mm)**	**NLB**	**RL (cm)**
IAC Tatu ST	13.8 a	2.88 a	2.30 a	5.41 a
Runner IAC 886	8.7 b	2.60 b	2.25 a	5.32 a
Sources of variation			**F Value**	
Cultivars (C)	139.35 **	1.69 **	0.01 NS	19.20 NS
Biostimulant doses (D)	7.10 NS	1.28 NS	6.04 **	55.09 NS
Interaction (C × D)	67.37 NS	7.70 ***	1.61 NS	4.76 NS
CV (%)	27.58	14.19	24.32	40.83

Means followed by different letters in the columns show significant differences by Tukey's test at significance level of 0.05. NS: not significant. ** and *** Significant at 1% and 0.1% by F test, respectively. CV: coefficient of variation.

The doses of biostimulant applied resulted in significant differences in plant height, with emphasis on the application of 4 mL kg^{-1} with 12.8 cm peanut plants (Figure 1A). The doses of the biostimulant Seed+ resulted in significant differences in the main stem diameter only in the cultivar IAC Tatu ST, with the stem diameter increasing progressively with the biostimulant doses (Figure 1B). The doses of the biostimulant Seed+ resulted in significant differences in the number of lateral branches, with the dose of 9 mL kg^{-1} resulting in the highest number of lateral branches (3.1 branches) (Figure 1C). The doses of the biostimulant Seed+ resulted in significant differences in the main root length, with the dose of 9 mL kg^{-1} resulting in shorter root length (Figure 1D).

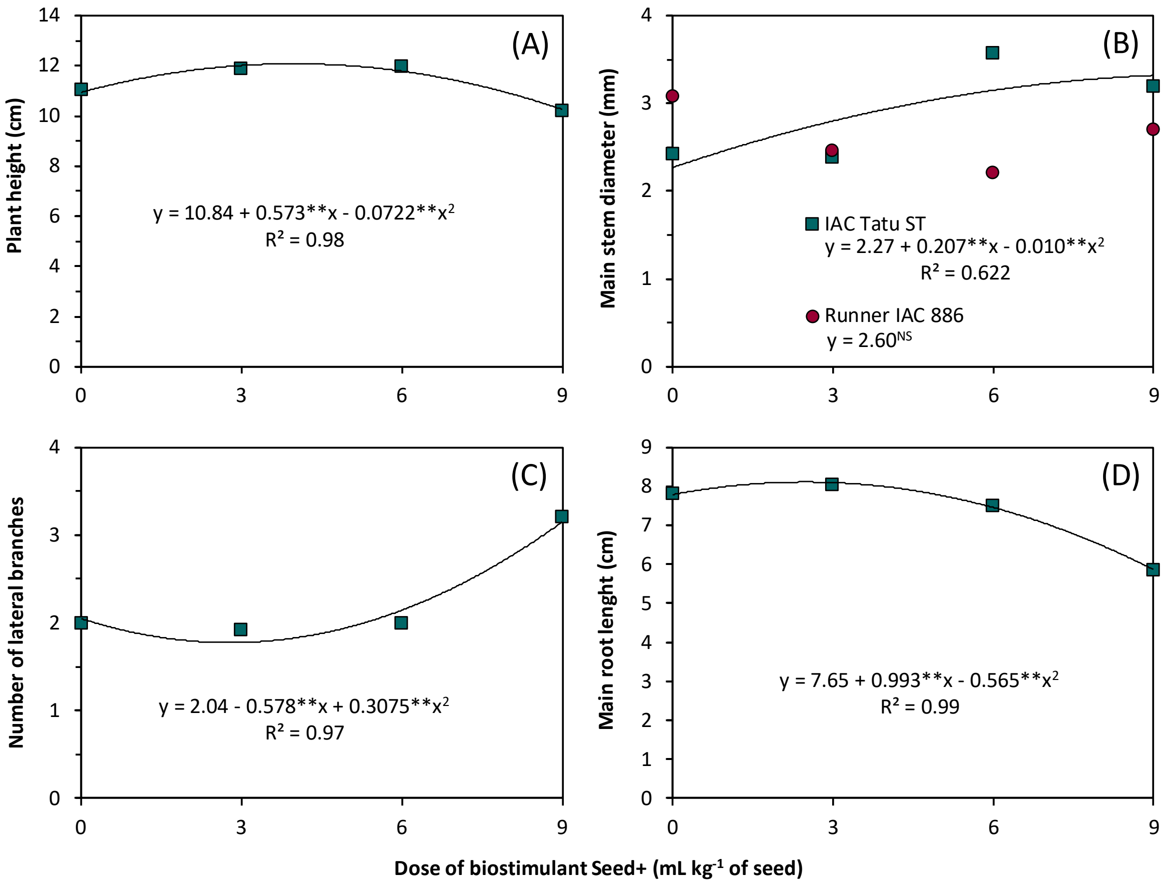

Figure 1. Effect of biostimulant application doses on the plant height (A), main stem diameter (B), number of lateral branches (C), and main root length (D) of peanut plants (*Arachis hypogaea* L.) grown in sandy soil of the Cerrado Sul-Mato-Grossense under controlled greenhouse conditions.

The biostimulant Seed+ has an effect on peanut plants; however, cultivars have different responses to the application of biostimulant in seed treatment. In general, the IAC Tatu ST cultivar is more responsive to the action of the biostimulant when compared to the Runner IAC

886 cultivar (Figure 1). The beneficial action of using biostimulants on peanut seeds was reported by Bezerra et al. (2015), who showed that the application of biostimulant increased the initial development of plants, which improved the initial establishment of the plant stand in the field. Similarly, Wylot et al. (2019) found that the application of a biostimulant increased the initial development of common bean plants.

The use of two contrasting cultivars with an erect and prostrate growth habit showed that peanut cultivars have different responses to the doses of biostimulant applied, with improved crop development, especially for the IAC Tatu ST cultivar.

4. Conclusion

The application of 9 mL kg^{-1} of the biostimulant Seed+ in seed treatment can be an efficient alternative to stimulate the initial development of peanut cultivars grown in sandy soil of the Cerrado Sul-Mato-Grossense under controlled greenhouse conditions.

5. References

Almeida, G. M., & Rodrigues, J. G. L. (2016). Desenvolvimento de plantas através da interferência de auxinas, citocininas, etileno e giberelinas. *Applied Research & Agrotechology*, 9(3), 111-117. DOI: 10.5935/PAeT.V9.N3.13

Bereta, S. F., Rosa, E. F. F., Kaseker, J. F., Nohatto, M. A., & Luz, S. (2022). Coinoculação de produtos biológicos na cultura do amendoim. *Agrarian*, 15(55), e15717. DOI: 10.30612/agrarian.v15i55.15717

Bhering, L. L. (2017). Rbio: A Tool For Biometric And Statistical Analysis Using The R Platform. *Crop Breeding and Applied Biotechnology*, 17, 187-190. DOI: 10.1590/1984-70332017v17n2s29

Binsfeld, J. A., Barbieri, A. P. P., Huth, C., Cabrera, I. C., & Henning, L. M. M. (2014). Uso de bioativador, bioestimulante e complexo de nutrientes em sementes de soja. *Pesquisa Agropecuária Tropical*, 44(1), 88-94. DOI: 10.1590/S1983-40632014000100010

Oliveira, F. A., Medeiros, J. F., Cunha, R. C., Souza, M. W. L., & Lima, L. A. (2016). Uso de bioestimulante como agente amenizador do estresse salino na cultura do milho pipoca. *Revista Ciência Agronômica*, 47(2): 307-315. DOI: 10.5935/1806-6690.20160036

Oliveira, F. A., Oliveira, M. K. T., Alves, L. A., Alves, R. C., Régis, L. R. D., & Santos, S. T. (2017). Estresse salino e biorregulador vegetal em feijão caupi. *Irriga*, 22(2): 314-329. DOI: 10.15809/irriga.2017v22n2p314-329

Souza, F. E. C., Sousa, G. G., Souza, M. V. P., Freire, M. H. C., Luz, L. N., & Silva, F. D. B. (2019). Produtividade de diferentes genótipos de amendoim submetidos a diferentes formas de adubação. *Nativa*, 7(4), 383-388. DOI: 10.31413/nativa.v7i4.6683

Steiner, F., Zuffo, A. M., Busch, A., Sousa, T. O., & Zoz, T. (2019). Does seed size affect the germination rate and seedling growth of peanut under salinity and water stress? *Pesquisa Agropecuária Tropical*, 49: e54353. DOI: 10.1590/1983-40632019v4954353

Wylot, E., Ramos, R. F., Mello, A. M., Sobucki, L., Dossin, M. F., & Pavanelo, A. M. (2019). Germinação de sementes de *Phaseolus vulgaris* L. submetidas a diferentes tratamentos com bioestimulante. *Revista Brasileira Multidisciplinar*, 22(1), 121-130. DOI: 10.25061/2527-2675/ReBraM/2019.v22i1.623

6. Additional Information

6.1 Acknowledgements

We would like to thank the State University of Mato Grosso do Sul (UEMS/Cassilândia) for allowing this research to be carried out in its facilities, contributing to the training of students in the 4th year of the Agronomy Course.

6.2 Conflicts of Interest

The authors declare that there is no conflict of interest.