

**The halotolerant rhizobacterium *Glutamicibacter* sp. alleviates salt impact on *Phragmites australis* by producing exopolysaccharides and limiting plant sodium uptake**

Rabaa Hidri<sup>1</sup> | Ouissal Metoui-Ben Mahmoud<sup>1</sup> | Walid Zorrig<sup>1</sup> | Rozario Azcon<sup>2</sup> | Chedly Abdelly<sup>1</sup> | Ahmed Debez<sup>1</sup>

**DECISION LETTER – Round 1**

January 2, 2023

Rabaa Hidri  
Biotechnology Centre of Borj Cedria, BP 901, Hammam Lif 2050 Tunisia.  
Borj Cedria, Tunis, Tunisia  
Borj cedria 901  
Tunisia

RE: The halotolerant microbe *Glutamicibacter* sp. alleviates salt impact on *Phragmites australis* (Cav.) Trin. ex Steud. by limiting sodium transport to shoots and increasing leaf polyphenol content

Dear Dr. Hidri:

Thank you for submitting to Plant Direct. All required reviews have been returned and we have now finished our evaluation of your manuscript. In light of the reviewers' and editor's comments, further revisions are needed before the paper can be accepted for publication in Plant Direct.

Please view the editors' and reviewers' comments below and use their suggestions as a guide while you work on your revision.

When uploading the revised version of this article, please be sure to include the following:

- A word document that contains your response to the reviewers. You should respond to each reviewer comment and note the changes made to the manuscript. If you do not agree with a reviewer's comment and choose not to make a suggested revision, please explain why. Please try to provide as complete an answer as possible to each reviewer's criticisms.
- A tracked changes document with each change highlighted
- A clean version of the latest version of the manuscript

Both reviewers addressed concerns that should be addressed/ justified.

To upload your revision, please click the link below.

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In order to provide as timely a service as possible, we ask that your revision is resubmitted within three months after receipt of this request. If an extension is needed, please send a request, along with a brief explanation, to the editorial office at [plantdirect@wiley.com](mailto:plantdirect@wiley.com).

Please note that, in addition to publishing reviewer comments, the author's responses to review comments will also be published alongside the final version of the paper. If you would not like the author's responses to be published, please contact the editorial office at [plantdirect@wiley.com](mailto:plantdirect@wiley.com).

Thank you very much for giving us an opportunity to review your work. I look forward to receiving the next version.

Sincerely,

Ana Fortes

Ana Fortes

Editor, Plant Direct

----- Editor comments:

Both reviewers mentioned concerns that should be addressed/ justified. English must be improved. Rationale behind experiments clearly explained ( see reviewer 2).

----- Reviewer comments:

Reviewer #1:

Dear Authors,

I reviewed the manuscript titled "The halotolerant microbe *Glutamicibacter* sp. alleviates salt impact on *Phragmites australis* (Cav.) Trin. ex Steud. by limiting sodium transport to shoots and increasing leaf polyphenol content" and found interesting. In summary, while the objectives of the research work are clear and the experimental approach appropriate, the MS in its current form is premature. Extensive revision is needed before paper is accepted for publication. The quality of English language writing is very weak and many sentences are difficult to understand. I would suggest to revise the whole manuscript through native english speaking person. The Title of the manuscript is very lengthy and should be shortened.

Please add plants photos showing the observable phenotypic difference between non-treated and treated plants.

Reviewer #2:

Manuscript by Hidri et al., 'The halotolerant microbe *Glutamicibacter* sp. alleviates salt impact on *Phragmites australis* (Cav.) Trin. ex Steud. by limiting sodium transport to shoots and increasing leaf

polyphenol content'

General comments:

This study investigates the stress-mitigating effects of a *Glutamicibacter* strain on common reed grown under high salinity conditions. The authors analyze both the bacterium's tolerance to salt and the plant's response to high salt levels with and without inoculation. This is achieved by measuring several plant parameters such as growth, ion content and the levels of metabolites such as polyphenols, sugars, proline and malondialdehyde. The bacterium demonstrates the capacity to significantly improve plant growth when exposed to high levels of salt and reduce the accumulation of stress-related molecules. The study was overall well conducted and presents interesting results regarding the improvement of plant-tolerance towards the ever-increasing salinization of soils. I would have expected more analyses on bacterial traits that are directly related to stress mitigation (i.e., EPS production, root colonization patterns, salt sequestration) rather than auxin and siderophore synthesis which are tested here but not correlated to their effect on salt tolerance in the discussion. There is also no mention of the existing studies having found a role of other *Glutamicibacter* spp. in halotolerance. This would be especially useful given the proximity of the present strain's 16S sequence to *Glutamicibacter halophytocola*. I would also welcome more details on the bacterium's environment of isolation in the methods section. Please also explain why the observed polyphenol increase is interpreted as a bacteria-induced tolerance trait while proline reduction is interpreted as a sign of reduced stress when both metabolites are markers of plant stress, with increased levels under high salinity.

Specific comments:

L85: Correct 'specifics' to 'specific'

L97: The use of 'friendly' is very colloquial

L112: To the best of my knowledge, induced systemic resistance is a phenomenon promoting plant protection against biotic stresses. Consider using 'induced systemic tolerance'.

L117: Superfluous mention of 'Na<sup>+</sup>'

L119: Correct 'induct' to 'induction'

L121: Correct 'exopolysaccharides (EPS) producing-halotolerant PGPRs' to 'exopolysaccharide (EPS)-producing halotolerant PGPRs'.

L141-143: Consider using GPS coordinates to locate sampling sites.

L143: Correct 'saltine' to 'saline'

L146: Correct 'Lauria-Bertani' to 'Luria-Bertani'

L171: Correct to 'sprouted *P. australis* rhizomes were transferred'

L177: Please detail the gradual increase in NaCl concentration

L179 and 180: Unnecessary use of '(O<sub>2</sub>)'

L205: use commas as thousands separator

L243: Figure 1E and 1F are mentioned before 1A

L252: Correct 'salt-chllgend' to 'salt-challenged'

L270: Discuss the importance of lipid peroxidation in relation with stress tolerance

L329-330: Include a reference to the paper which is referred to.

Figure 4: the legend does not correspond to the PCA plot. When the legend is updated, please take care to include all the abbreviation's meanings. Also, remove the figure's title.

Table 1: No need for a table with only two parameters. Include the results directly in the appropriate section of the manuscript.

Table 2: Consider converting this table to a line chart with the tolerance levels on the y-axis and the NaCl concentrations on the x-axis.

## DECISION LETTER- Round 2

July 14, 2023

Rabaa Hidri  
Biotechnology Centre of Borj Cedria, BP 901, Hammam Lif 2050 Tunisia.  
Borj Cedria, Tunis, Tunisia  
Borj cedria 901  
Tunisia

RE: The Halotolerant rhizobacteria *Glutamicibacter* sp. alleviates salt impact on *Phragmites australis* by producing exopolysaccharides and limiting plant sodium uptake

Dear Dr. Hidri:

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Please view the editors' and reviewers' comments below and use their suggestions as a guide while you work on your revision.

When uploading the revised version of this article, please be sure to include the following:

- A word document that contains your response to the reviewers. You should respond to each reviewer comment and note the changes made to the manuscript. If you do not agree with a reviewer's comment and choose not to make a suggested revision, please explain why. Please try to provide as complete an answer as possible to each reviewer's criticisms.
- A tracked changes document with each change highlighted
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To upload your revision, please click the link below.

<https://plantdirect.msubmit.net/cgi-bin/main.plex?el=A6Lr3XW1B5nnZ5I7A9ftdigr88nGh2NEz2uVmOBH7MwZ>

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Please note that, in addition to publishing reviewer comments, the author's responses to review comments will also be published alongside the final version of the paper. If you would not like the author's responses to be published, please contact the editorial office at [plantdirect@wiley.com](mailto:plantdirect@wiley.com).

Thank you very much for giving us an opportunity to review your work. I look forward to receiving the next version.

Sincerely,

Ana Fortes

Ana Fortes

Editor, Plant Direct

----- Editor comments:

English should still be improved.

----- Reviewer comments:

Reviewer #3:

The MS presents clear objectives, and the experimental approach is appropriate. However, even after the first revision, the MS continues to show English writing limitations affecting the readability and comprehension of the content.

Except for a few cases, the authors talked about the *Glutamicibacter* sp. strain. It is a singular entity (rhizobacterium), not plural (rhizobacteria). Change in the whole text, including in the title.

The EPS content reduces significantly with the increase of the salt content, I could not find a sentence that motivates a discussion on that matter in the Discussion session.

The authors answered to the 2nd Reviewer with valuable information regarding the bacterium.

Please, incorporate them in the body of the MS.

Synderophore and auxin results are not shown and not approached in the Discussion, why did you wrote the methods used to analyze them?

L84 The sentence can be improved. Also, "functions" instead of "intrests".

L115 "... balance, due to the competition of Na<sup>+</sup> and Cl<sup>-</sup> with nutrients, ..." The sentence should be improved for better understanding the content.

L119 Delete semi-column ";"

L131 Improve the English writing

L133 The sentence is difficult to read

L137 "identify some OF the physiological"

L144 "(20 km TO THE East ...)" remove the capital words

L146 "semi-arid bioclimatic stage" -> semi-arid bioclimate

L242 A space is missing after the full stop

L300 "increase" -> increased

L302 "amounting" -> amounted

L346 "rhizobacteria" -> "rhizobacterium"

L364 After Cl<sup>-</sup> "." Should not be superscript

L384 "under salinity" should be salinity stress

L390 The sentence is hard to understand

L406 "is in good correlation" -> can be substituted by "positively correlated"?

L427 "this deterioration of growth conditions", do you mean "reduced growth"?

L700 There is not corresponding figure

"Atouei et al., 2019" is missing from the reference list. Double check all the others.

## AUTHOR RESPONSE

Editor comments:  
Both reviewers mentioned concerns that should be addressed/ justified. English must be improved.  
Rationale behind experiments clearly explained (see reviewer 2).

Dear Editor and Reviewers:

Thank you very much for the critical assessment of our manuscript and for the valuable comments provided.

We did our best to address all the comments when preparing the new version of our manuscript. We have also performed a rigorous editing and reorganization according to the comments.

We do sincerely hope that we fulfilled all your requests and that our work is now suitable for publication in the Journal of Plant Direct Editorial Office.

Best regards,

Authors

----- Reviewer comments:

### Reviewer #1:

Dear Authors, I reviewed the manuscript titled "The halotolerant microbe *Glutamicibacter* sp. alleviates salt impact on *Phragmites australis* (Cav.) Trin. ex Steud. by limiting sodium transport to shoots and increasing leaf polyphenol content" and found interesting. In summary, while the objectives of the research work are clear and the experimental approach appropriate, the MS in its current form is premature. Extensive revision is needed before paper is accepted for publication. The quality of English language writing is very weak and many sentences are difficult to understand. I would suggest to revise the whole manuscript through native english speaking person.

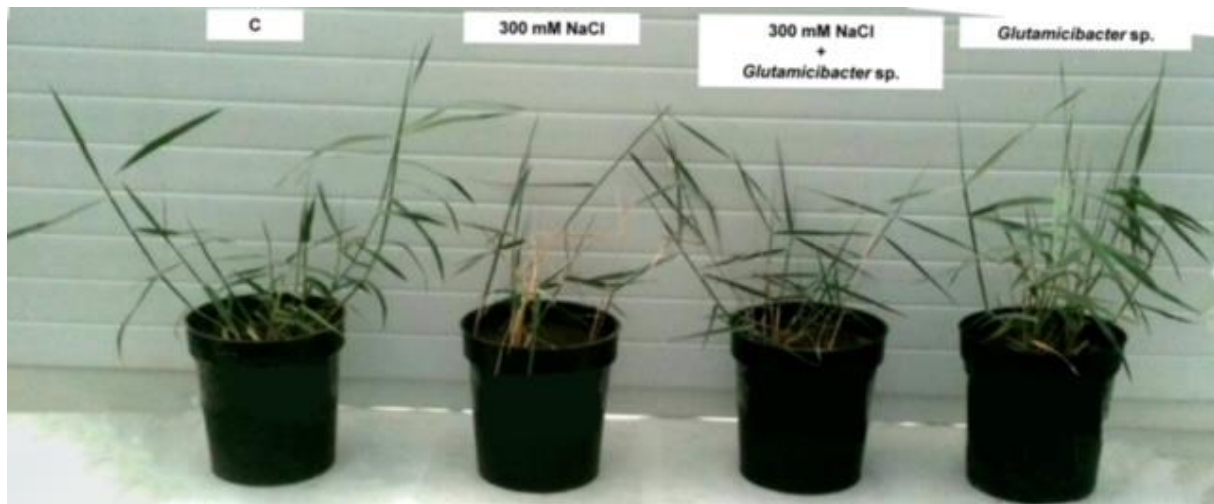
*Response: The language was checked and revised according to the referee request.*

The Title of the manuscript is very lengthy and should be shortened.

*Response: The title was changed to be more focused in the new version.*

Please add plants photos showing the observable phenotypic difference between non-treated and treated plants.

*Response: Please find above the requested photo. It is mentioned in the Results section concerning plant growth and was added as a supplementary material.*



## Reviewer #2:

Manuscript by Hidri et al., 'The halotolerant microbe *Glutamicibacter* sp. alleviates salt impact on *Phragmites australis* (Cav.) Trin. ex Steud. by limiting sodium transport to shoots and increasing leaf polyphenol content'.

### General comments:

This study investigates the stress-mitigating effects of a *Glutamicibacter* strain on common reed grown under high salinity conditions. The authors analyze both the bacterium's tolerance to salt and the plant's response to high salt levels with and without inoculation. This is achieved by measuring several plant parameters such as growth, ion content and the levels of metabolites such as polyphenols, sugars, proline and malondialdehyde. The bacterium demonstrates the capacity to significantly improve plant growth when exposed to high levels of salt and reduce the accumulation of stress-related molecules. The study was overall well conducted and presents interesting results regarding the improvement of plant-tolerance towards the ever-increasing salinization of soils. I would have expected more analyses on bacterial traits that are directly related to stress mitigation (i.e., EPS production, root colonization patterns, salt sequestration) rather than auxin and siderophore synthesis which are tested here but not correlated to their effect on salt tolerance in the discussion.

There is also no mention of the existing studies having found a role of other *Glutamicibacter* spp. in halotolerance. This would be especially useful given the proximity of the present strain's 16S sequence to *Glutamicibacter halophytocola*. I would also welcome more details on the bacterium's environment of isolation in the methods section.

*Response: Thank you for these pertinent comments.*

*- We have determined EPS production during the growth of a batch culture with increasing gradients of NaCl concentrations (0–1M) in this version).*

*- When investigating salt tolerance of this strain, we have measured the electrical conductivity (EC) of different mediums under increasing salinity and we compared them to other medium without bacteria. For your information, we provide below a table highlighting EC values. Overall, EC was higher in medium containing bacteria under saline conditions, suggesting that the strain used in our study would not be able to sequester sodium within its cell-biomass. EPS produced by *Glutamicibacter* sp. would rather bind to sodium in the culture medium. This is consistent with a recent study (Mukherjee et al.,*

2019) highlighting that the amount of EPS-bound Na<sup>+</sup> increased in a halotolerant strain with the increase in NaCl concentration in the solution. Therefore EPS play a key role in NaCl sequestration.

Table: Determination of electrical conductivity (EC) in LB medium with different levels of salinity I (0.1-0.6M NaCl).

		(+)Glutamicibacter sp.	(-)Glutamicibacter sp.
NaCl	0 M	3.85	2.24
	0.1 M	10.68	9.25
	0.2 M	15.4	14.48
	0.4 M	29.22	28.94
	0.6 M	52.1	50.3

- Unfortunately, we did not analyse the CFU in roots of plants after bacterial inoculation, but plant growth results (*Glutamicibacter sp.* inoculation significantly mitigated the adverse effect of salinity on plant growth, compared to non-inoculated stressed plants) are strongly in favour of an efficient inoculation with rhizobacteria under salt conditions.

- *Glutamicibacter* species as an endophyte has also been reported by various studies on different plants including tomato, potato, maize (Afzal et al., 2019), and from halophytic species including the coastal halophytes *Limonium sinense*, *Cakile maritima*, *Matthiola tricuspidata*, and *Crithmum maritimum* (Presta et al., 2016; Xiong et al., 2019; Christakis et al., 2021).

- Finally, several studies have found a co-occurrence of *Glutamicibacter* species in endophytic and rhizospheric strain (Khan et al., 2022). This could be due to the possible colonization of endophytes originating from the rhizospheric soil and later the colonization of roots and aerial parts of plants.

#### REFERENCES:

- Mukherjee, P.; Mitra, A.; Roy, M. *Halomonas* Rhizobacteria of *Avicennia marina* of Indian Sundarbans Promote Rice Growth Under Saline and Heavy Metal Stresses Through Exopolysaccharide Production. *Front. Microbiol.* 2019, 10, 1207.
- Afzal, I., Shinwari, Z. K., Sikandar, S., & Shahzad, S. (2019). Plant beneficial endophytic bacteria: Mechanisms, diversity, host range and genetic determinants. *Microbiological research*, 221, 36-49.
- Christakis, C. A., Daskalogiannis, G., Chatzaki, A., Markakis, E. A., Mermigka, G., Sagia, A., & Sarris, P. F. (2021). Endophytic bacterial isolates from halophytes demonstrate phytopathogen biocontrol and plant growth promotion under high salinity. *Frontiers in Microbiology*, 1001.
- Khan, T., Alzahrani, O. M., Sohail, M., Hasan, K. A., Gulzar, S., Rehman, A. U., ... & Abdel-Gawad, S. A. (2022). Enzyme Profiling and Identification of Endophytic and Rhizospheric Bacteria Isolated from *Arthrocnemum macrostachyum*. *Microorganisms*, 10(11), 2112.
- Presta, L., Fondi, M., Perrin, E., Maida, I., Miceli, E., Chiellini, C., ... & Fani, R. (2016). *Arthrobacter sp.* EpRS66 and *Arthrobacter sp.* EpRS71: Draft Genome Sequences from Two Bacteria Isolated from *Echinacea purpurea* Rhizospheric Soil. *Frontiers in Microbiology*, 7, 1417.
- Xiong, Y. W., Gong, Y., Li, X. W., Chen, P., Ju, X. Y., Zhang, C. M., ... & Qin, S. (2019). Enhancement of growth and salt tolerance of tomato seedlings by a natural halotolerant actinobacterium *Glutamicibacter halophytocola* KLBMP 5180 isolated from a coastal halophyte. *Plant and Soil*, 445, 307-322.



Please also explain why the observed polyphenol increase is interpreted as a bacteria-induced tolerance trait while proline reduction is interpreted as a sign of reduced stress when both metabolites are markers of plant stress, with increased levels under high salinity.

*Response: Thank you for this pertinent comment.*

*- There is conflicting literature with regard to proline significance (whether as a marker of sensitivity or tolerance to salinity). Depending on the species, stress intensity and duration, some reports suggest that proline accumulation could be associated with tolerance, whereas other studies suggest that the accumulation of proline is an indicator of injury, rather than being a tolerance signal.*

*In P. australis plants, it seems that proline accumulation is rather a sign of plant ability to deal with salinity and using this osmotic compound as an osmoticum (Hartzendorf, et al., 2001; Pagtger et al., 2009; Gorai et al., 2010).*

*In our case, the reduction of proline in inoculated plants may be due to the formation of EPS and biofilm on plant root surfaces that prevented plants from excessive-uptake  $\text{Na}^+$ , thereby attenuating the harmful effects of toxic ions on plants. Thus, it could be hypothesized that since inoculated plants showed a limited uptake of sodium, there was a lower need to synthesize proline to use it as an osmoticum for osmotic adjustment.*

*With regard to polyphenols, the reduction of  $\text{Na}^+$  and proline content in inoculated P. australis under saline conditions could not avoid the induction of oxidative stress.*

*The amount of polyphenol increased in P. australis leaves and the content of MDA decreased, indicating the scavenging activity of polyphenol against free radicals.*

*Polyphenols are known as potent antioxidants can eliminate radical species, thus preventing chain propagation of peroxy lipid radical.*

#### REFERNCES:

*- Hartzendorf, Thomas, and Hardy Rolletschek. "Effects of NaCl-salinity on amino acid and carbohydrate contents of Phragmites australis." Aquatic Botany 69.2-4 (2001): 195-208.*

*- Pagter, M., Bragato, C., Malagoli, M., & Brix, H. (2009). Osmotic and ionic effects of NaCl and  $\text{Na}_2\text{SO}_4$  salinity on Phragmites australis. Aquatic Botany, 90(1), 43-51.*

*- Gorai, M., Ennajeh, M., Khemira, H., & Neffati, M. (2010). Combined effect of NaCl-salinity and hypoxia on growth, photosynthesis, water relations and solute accumulation in Phragmites australis plants. Flora-Morphology, Distribution, Functional Ecology of Plants, 205(7), 462-470.*

Specific comments:

L85: Correct 'specifics' to 'specific'

*Response: "specifics" was replaced by "specific" in the revised version.*

L97: The use of 'friendly' is very colloquial

*Response: Text was amended.*

L112: To the best of my knowledge, induced systemic resistance is a phenomenon promoting plant protection against biotic stresses. Consider using 'induced systemic tolerance'.

*Response: We have removed this sentence in the revised version.*

L117: Superfluous mention of ' $\text{Na}^+$ '

*Text was amended.*

L119: Correct 'induct' to 'induction'

*Response: Text was amended*

L121: Correct 'exopolysaccharides (EPS) producing-halotolerant PGPRs' to 'exopolysaccharide (EPS)-producing halotolerant PGPRs'.

*Response: As proposed by reviewer, required modification was performed in the revised version.*

L141-143: Consider using GPS coordinates to locate sampling sites.

*Response: We have now added a GPS location.*

L143: Correct 'saltine' to 'saline'

*Response: Correction was performed accordingly.*

L146: Correct 'Lauria-Bertani' to 'Luria-Bertani'

*Response: Correction was performed accordingly.*

L171: Correct to 'sprouted *P. australis* rhizomes were transferred'

*Response: Correction was performed accordingly.*

L177: Please detail the gradual increase in NaCl concentration

*Response: As proposed by reviewer, the gradual increase in NaCl was detailed in the revised version.*

L179 and 180: Unnecessary use of '(O2)'

*Response: Required modification was performed accordingly.*

L205: use commas as thousands separator

*Response: Required modification was performed accordingly.*

L243: Figure 1E and 1F are mentioned before 1A

*Response: More attention was given to the numbering of figures in the revised version.*

L252: Correct 'salt-chllgend' to 'salt-challenged'

*Response: Correction was performed accordingly.*

L270: Discuss the importance of lipid peroxidation in relation with stress tolerance.

*Response: The importance of lipid peroxidation in relation with stress tolerance was discussed in the revised version.*

L329-330: Include a reference to the paper which is referred to.

*Response: Reference was added for the mentioned paragraph.*

Figure 4: the legend does not correspond to the PCA plot. When the legend is updated, please take care to include all the abbreviation's meanings. Also, remove the figure's title.

*Response: As proposed by reviewer, required modifications were made in the revised version.*

Table 1: No need for a table with only two parameters. Include the results directly in the appropriate section of the manuscript.

*Response: Changes were performed.*

Table 2: Consider converting this table to a line chart with the tolerance levels on the y-axis and the NaCl concentrations on the x-axis.

*Response: Required modification was performed accordingly.*

### **DECISION LETTER- Round 3**

September 20, 2023

Rabaa Hidri

Biotechnology Centre of Borj Cedria, BP 901, Hammam Lif 2050 Tunisia.

Borj Cedria, Tunis, Tunisia

Borj cedria 901

Tunisia

MSID: 2022-01032R2

MS TITLE: The halotolerant rizhobacterium *Glutamicibacter* sp. alleviates salt impact on *Phragmites australis* by producing exopolysaccharides and limiting plant sodium uptake

Dear Dr. Rabaa Hidri:

I am pleased to inform you that your manuscript "The halotolerant rizhobacterium *Glutamicibacter* sp. alleviates salt impact on *Phragmites australis* by producing exopolysaccharides and limiting plant sodium uptake" has been accepted for publication in Plant Direct.

Your article will appear online in the next available issue of Plant Direct. To ensure your article gets published as quickly as possible, please pay attention to the steps detailed below. We have found that most of the delays happen at this stage, especially at the payment stage, so please respond as quickly as possible when prompted.

License Agreement: Once your article has been accepted it will move to Production and undergo admin and file checking - you may receive an email with any queries we have at this stage. When all required items are received by the publisher and queries resolved, the corresponding author will receive an email from Wiley's Author Services system which will ask them to log on at <https://authorservices.wiley.com/bauthor> and will present them with the appropriate license for completion. Your article cannot be published until both the signed license agreement and payment of the article fee have been received.

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Proofs: You will have the opportunity to look over your paper once more when you receive the author proofs for your article. The proofs will be with you in approximately two weeks. Please note

that, in addition to publishing reviewer comments, the author's responses to review comments will also be published alongside the final version of the paper. If you would not like the author's responses to be published, please contact the editorial office at [plantdirect@wiley.com](mailto:plantdirect@wiley.com) .

Promotion of your article: You can help your research get the attention it deserves! Check out Wiley's free Promotion Guide for best-practice recommendations for promoting your work at [www.wileyauthors.com/eeo/guide](http://www.wileyauthors.com/eeo/guide). And learn more about Wiley Editing Services which offers professional video, design, and writing services to create shareable video abstracts, infographics, conference posters, lay summaries, and research news stories for your research at [www.wileyauthors.com/eeo/promotion](http://www.wileyauthors.com/eeo/promotion).

Thank you again for your contribution to Plant Direct. If you have any questions, feel free to contact the editorial office at [plantdirect@wiley.com](mailto:plantdirect@wiley.com) .

Sincerely,

Ana Fortes

Ana Fortes

Editor, Plant Direct

----- Editor comments

----- Reviewer comments:

Reviewer #3:

Dear Authors,

I have appreciated the effort that you profuse in modifying the manuscript. The MS improved in readability and comprehension of the content.

I have found just 3 more notes:

Line 160: "Turbidity ..." sentence is a repetition of the previous one

Line 203: "coefficient 155 mM-1 cm-1" -> coefficient of mM+1 cm-1

Line 287: "amounted" is written with a different style

## **AUTHORS' RESPONSE**

*Dear Editor and Reviewer:*

*Thank you very much for the critical assessment of our manuscript and for the valuable comments provided.*

*We did our best to address all the comments when preparing the new version of our manuscript, Plant Direct: 2022-01032R1 "The Halotolerant rhizobacterium Glutamicibacter sp. alleviates salt impact on Phragmites australis by producing exopolysaccharides and limiting plant sodium uptake". We have also performed a rigorous editing and reorganization according to the comments. We do sincerely hope that we fulfilled all your requests and that our work is now suitable for publication in the Journal of Plant Direct.*

*Best regards,*

*Authors*

Editor comments:

English should still be improved.

*Response: The revised manuscript was again carefully checked for the English correction according to the editor and referee request.*

Reviewer comments:

Reviewer #3:

The MS presents clear objectives, and the experimental approach is appropriate. However, even after the first revision, the MS continues to show English writing limitations affecting the readability and comprehension of the content.

Except for a few cases, the authors talked about the *Glutamicibacter* sp. strain. It is a singular entity (rhizobacterium), not plural (rhizobacteria). Change in the whole text, including in the title.

*Response:*

*We would like to thank Reviewer for taking the time and effort necessary to review the manuscript. Required modification was performed accordingly.*

The EPS content reduces significantly with the increase of the salt content, I could not find a sentence that motivates a discussion on that matter in the Discussion session.

*Response: The reduction of EPS is discussed in this revised version.*

The authors answered to the 2nd Reviewer with valuable information regarding the bacterium. Please, incorporate them in the body of the MS.

*Response: Text amended.*

Synderophore and auxin results are not shown and not approached in the Discussion, why did you wrote the methods used to analyze them?

*Response: We have removed the methods used to analyse synderophore and auxin in the revised version.*

L84 The sentence can be improved. Also, "functions" instead of "intrests".

*Response: The corresponding sentence was amended as suggested. "intrests" was replaced by "functions" in the revised version.*

L115 "... balance, due to the competition of Na<sup>+</sup> and Cl<sup>-</sup> with nutrients, ..." The sentence should be improved for better understanding the content.

*Response: Correction was performed accordingly.*

L119 Delete semi-column ";"

*Response: Text was amended.*

L131 Improve the English writing

*Response: The English was checked.*

L133 The sentence is difficult to read

*Response: The sentence was rewritten.*

L137 "identify some OF the physiological"

*Response: Correction was performed accordingly.*

L144 "(20 km TO THE East ...)" remove the capital words

*Response: As proposed by reviewer, required modification was made in the revised version.*

L146 "semi-arid bioclimatic stage" -> semi-arid bioclimate

*Response: "semi-arid bioclimatic stage" was replaced by "semi-arid bioclimate" in the revised version.*

L242 A space is missing after the full stop

*Response: Correction was performed accordingly.*

L300 "increase" -> increased

*Response: "increase" was replaced by "increased" in the revised version.*

L302 "amounting" -> amounted

*Response: "amounting" was replaced by "amounted" in the revised version.*

L346 "rhizobacteria" -> "rhizobacterium"

*Response: "rhizobacteria" was replaced by "rhizobacterium" in the revised version.*

L364 After Cl<sup>-</sup> "." Should not be superscript

*Response: Correction was performed accordingly.*

L384 "under salinity" should be salinity stress

*Response: As requested by the reviewer, the modification was performed in the revised version.*

L390 The sentence is hard to understand

*Response: The sentence was improved.*

L406 "is in good correlation" -> can be substituted by "positively correlated"?

*Response: "is in good correlation" was replaced by "is associated with increased".*

L427 "this deterioration of growth conditions", do you mean "reduced growth"?

*Response: Yes, we would mean "reduced growth".*

*The sentence was rewritten.*

L700 There is not corresponding figure

*Response: Thank you for this pertinent comment. This figure legend was deleted in the revised version.*

"Atouei et al., 2019" is missing from the reference list. Double check all the others.

*Response: The missing reference is added in the new version.*