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POSTER

ENHANCEMENT OF HEAVY METALS PHYTOREMEDIATION POTENTIAL IN PHRAGMITES AUSTRALIS THROUGH PLANT GROWTH PROMOTAL RHIZOBACTERIA (PGPR)S INOCULATION

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INTRODUCTION

Phytoremediation is defined as the use of plants to reduce or eliminate various contaminants from water and soil, with heavy metals being particularly notable. The plant species *Phragmites australis* can accumulate these metals in its root system, in a process known as rhizofiltration. However, despite this capacity, contaminated environments typically present such high levels of metals that they induce stress in the plant, impeding its proper development and interfering with the phytoremediation process. **Plant growth-promoting rhizobacteria (PGPR)s** can be an effective measure to combat this stress, thus allowing for an efficient phytoremediation of environments contaminated with heavy metals.

OBJECTIVES

- Isolate rhizobacteria that can establish interactions with *Phragmites australis* in environments contaminated by heavy metals.
- Characterize the rhizobacteria as potential PGPRs: synthesis of siderophores, phosphate solubilization, synthesis of IAA, ACC deaminase activity, etc.
- Establish an effective method for inoculating the bacteria of interest into the plant *Phragmites australis*.
- Develop an effective action method to reduce heavy metals in contaminated environments using phytoremediation combined with their inoculation with PGPRs.

METHODOLOGY

- Rhizobacterial species were isolated from the **epiphytic** and **endophytic** parts of the root of *Phragmites australis* plants, which were directly exposed to water contaminated with heavy metals; thereafter they were characterized as potential PGPRs according bacterial traits.
- Different methods were used for inoculating some “potential” PGPRs: in **soil**, on the **roots** of 30-day-old seedlings growing under controlled conditions, and on **seeds**. Changes in height, number of leaves, dry and wet biomass of the inoculated plants were measured.



Figure 1. Experiment with *Phragmites australis* from which endophytic and epiphytic bacteria were isolated.

RESULTS

Bacterial Isolation

Exposure of plants to water with heavy metals	Epiphytic Community	Endophytic Community	Total
Control Exposure	9	8	20
Acute Exposure	3	2	6
Chronic Exposure	5	7	13
Total	17	17	34

Table 1. Number of bacterial isolates according to their origin and method of exposure to contaminated water in *Phragmites australis*.

PGPR Traits

Community	PGPR TRAITS			
	Phosphate Solubilization	Siderophores Production Pyoverdine Production	Total production	IAA Production
Epiphytic	8	3	5	0
Endophytic	9	3	9	0

Table 2. Number of positive results for each of the PGPR tests for the total bacterial isolates obtained.

Inoculation Measurements

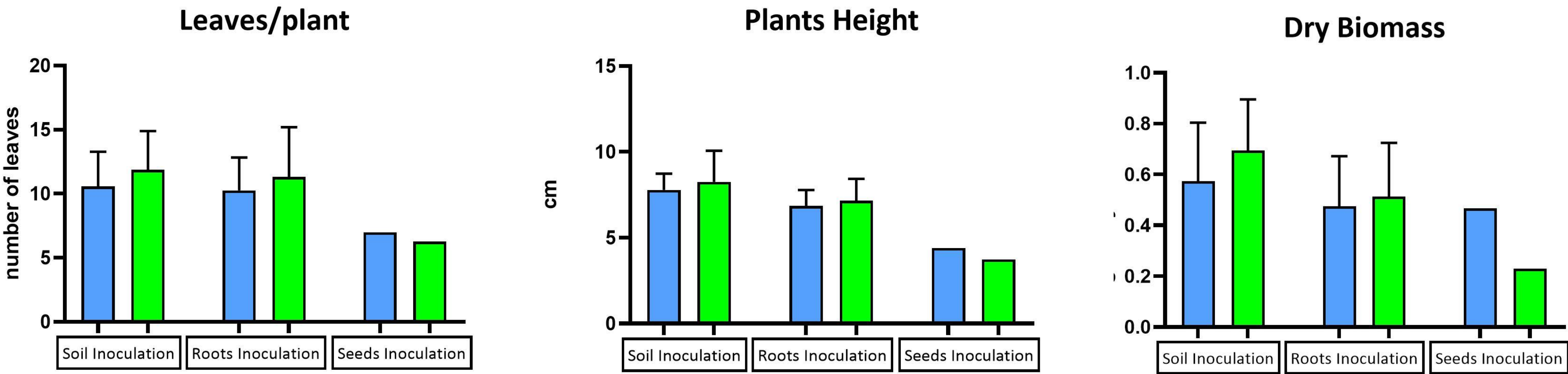
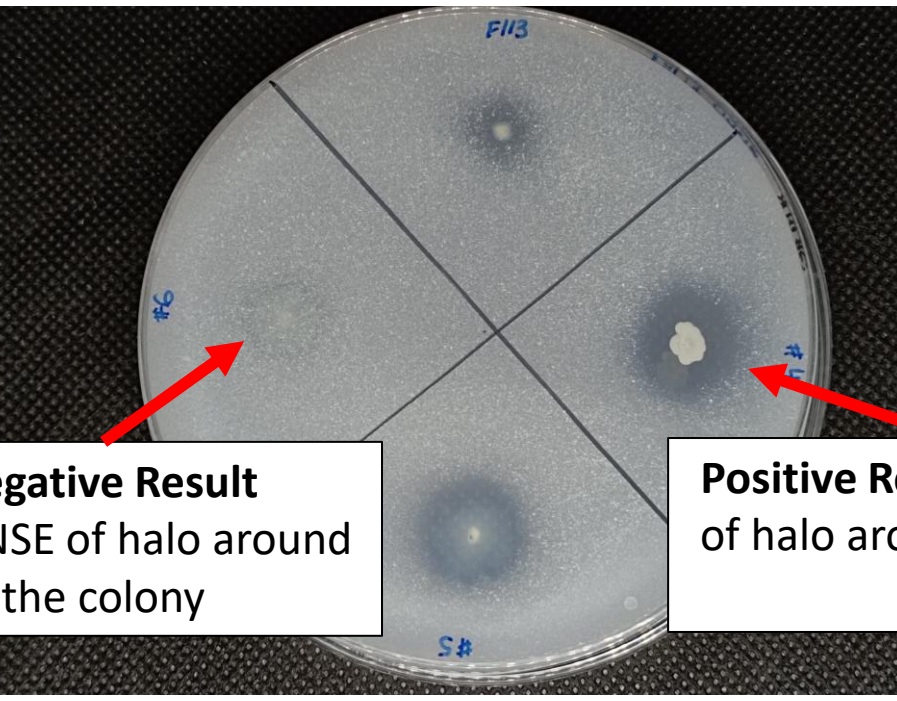


Figure 2. Indicate the results of the number of leaves per plant, height, and dry biomass as a function of each inoculation method used. In each of the graphs, the blue color indicates the results for the control, while the green color indicates the results for each inoculation method.

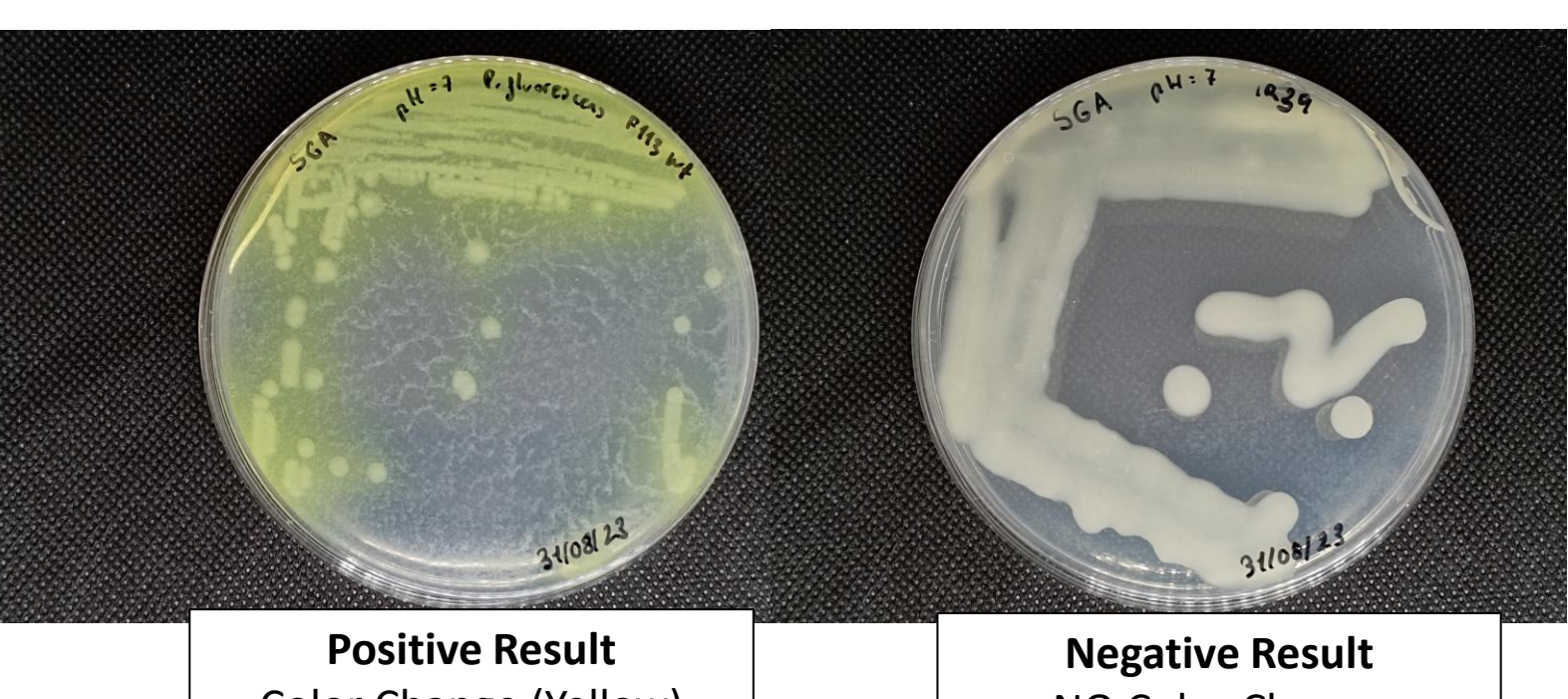
Phosphate solubilization



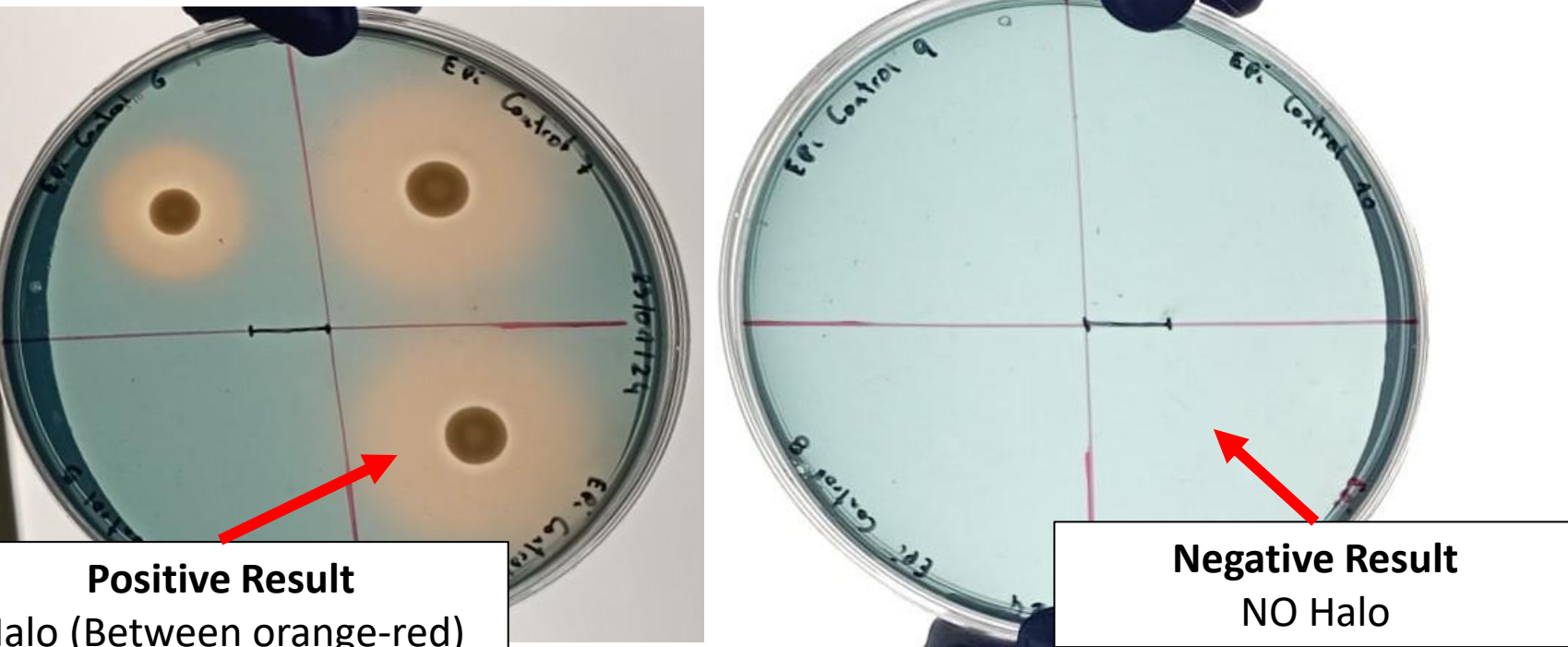
IAA Synthesis



Siderophores Production
Pyoverdine Production



Total Production



CONCLUSIONS

- Positive results for PGPR characteristics were found in at least one of the tests performed in **14 of the 34** bacterial isolates. This implies that they are potentially PGPRs for the plant *Phragmites australis*.
- An increase in **biomass (especially root biomass), height, and the number of leaves** of the plant *Phragmites australis* can be observed when PGPRs are inoculated into its **roots** and particularly into the surrounding **soil**, compared to the control.
- Regarding the inoculation of PGPRs in **seeds**, this mechanism seems to **delay the development** of the plant. This may indicate that the plant requires an initial stage of development (30 days-old-seedlings) under controlled conditions for proper growth and subsequent inoculation.

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