PHYSIOLOGICAL TOLERANCE OF PERENNIAL GRASSES TO HEAVY METAL CONTAMINATED SOILS

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[2]Consiglio Nazionale delle Ricerche, Istituto per la valorizzazione del legno e delle specie arboree (CNR-IVALSA), via Gaifami 18, 95126 – Catania
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Introduction

This work reports the adaptability of two perennial grasses, *Saccharum spontaneum* L. ssp. *aegyptiacum* (Willd.) Hackel and *Arundo donax* L., to the cultivation in heavy metals (Cd, Pb Zn and Ni) contaminated soil.

Materials and methods

- 2 species : *Saccharum spontaneum* L. ssp. *aegyptiacum* (Willd.) Hackel and *Arundo donax* L.
- 4 heavy metal
- 2 controls (Untreated soil (Control) and a Fertilized Control (F-Control) N: 6 g/pot
- 12 kg of soil in each pot
- Completely Randomized experimental design with 3 replications
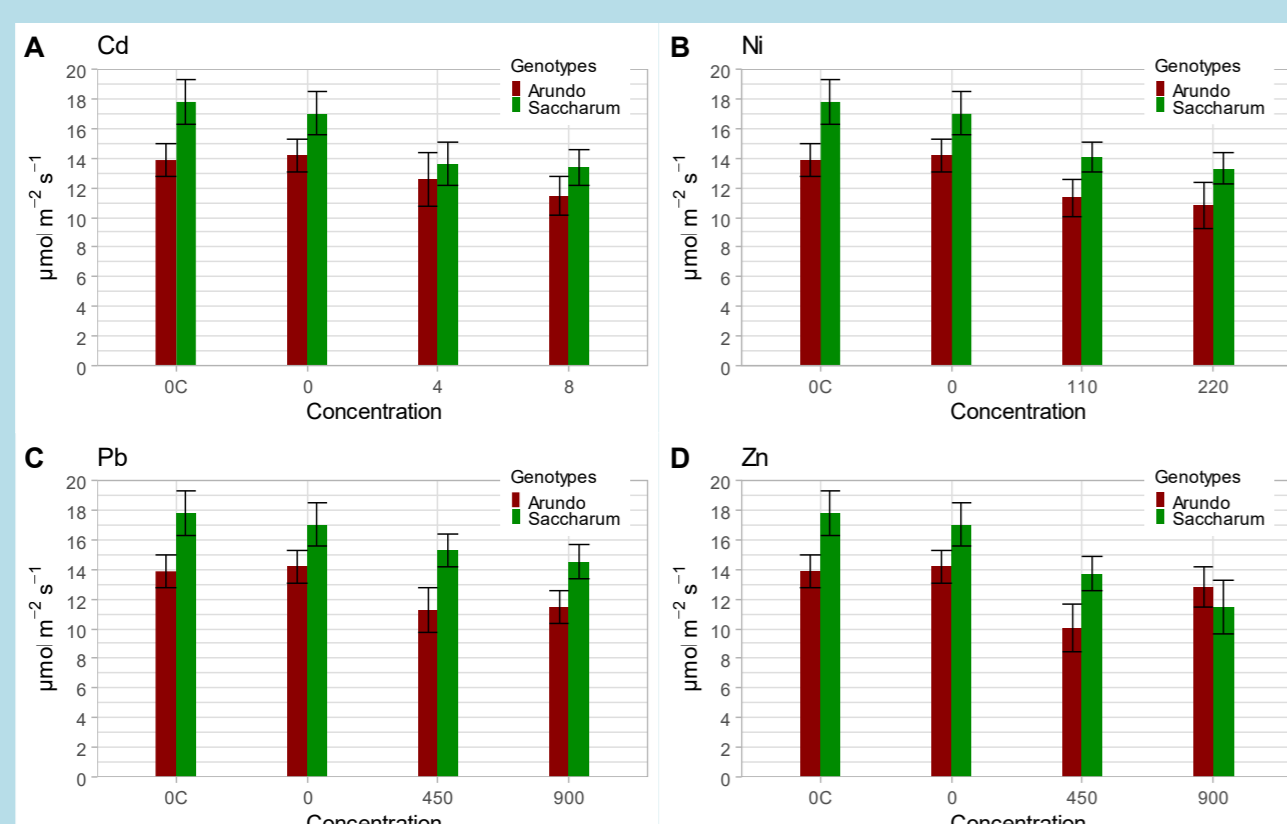
During the experiment the plants were maintained in well water condition
Gas exchange was measured every 15 day by means of LCi-SD, ADC BioScientific, Great Amwell, Hertfordshire, UK.

➢ **Cadmium: 4 mg kg^{-1} and 8 mg kg^{-1}**
➢ **Lead: 450 mg kg^{-1} and 900 mg kg^{-1}**
➢ **Nickel: 110 mg kg^{-1}and 220 mg kg^{-1}**
➢ **Zinc: 450 mg kg^{-1} and 900 mg kg^{-1}**

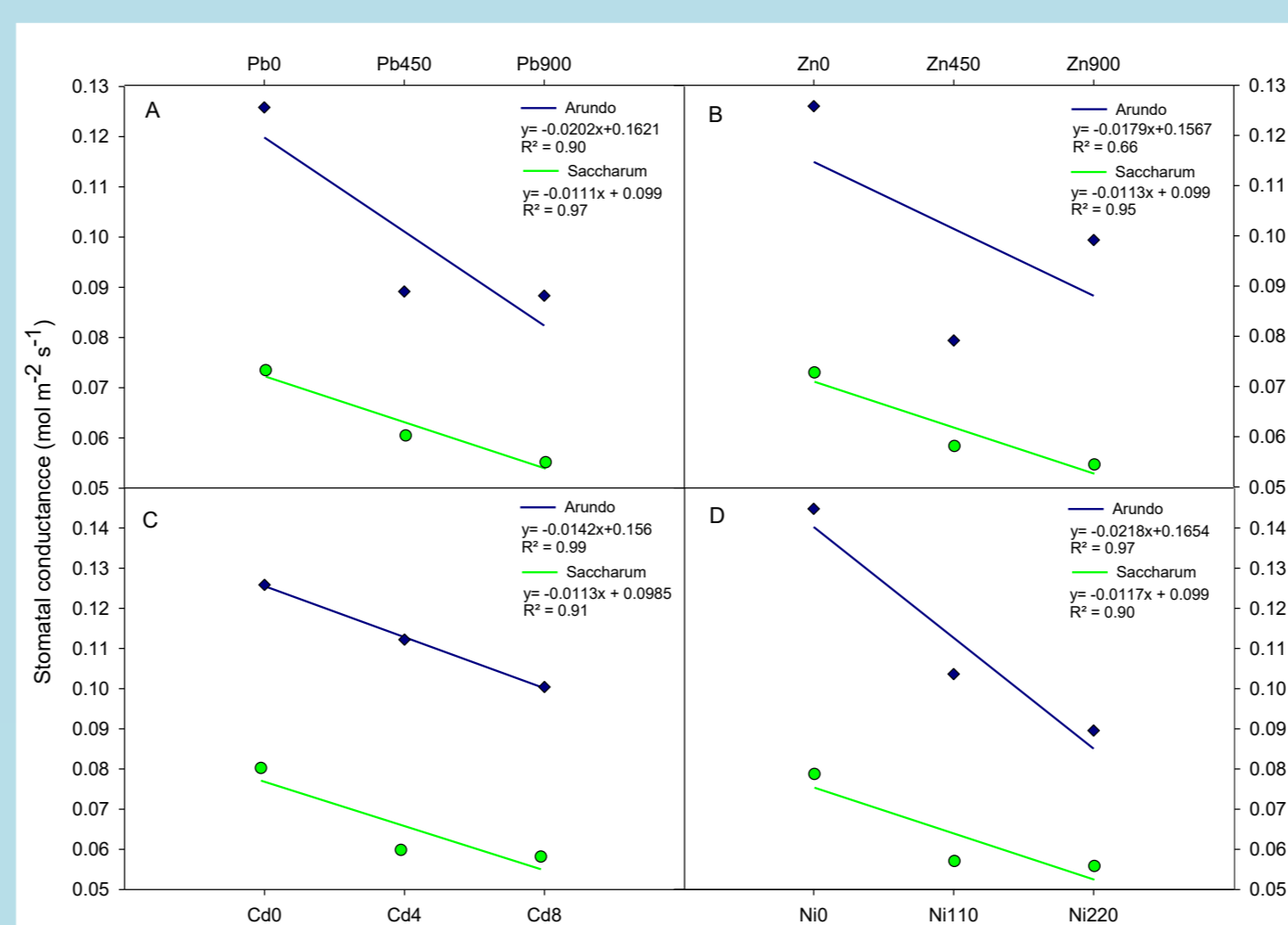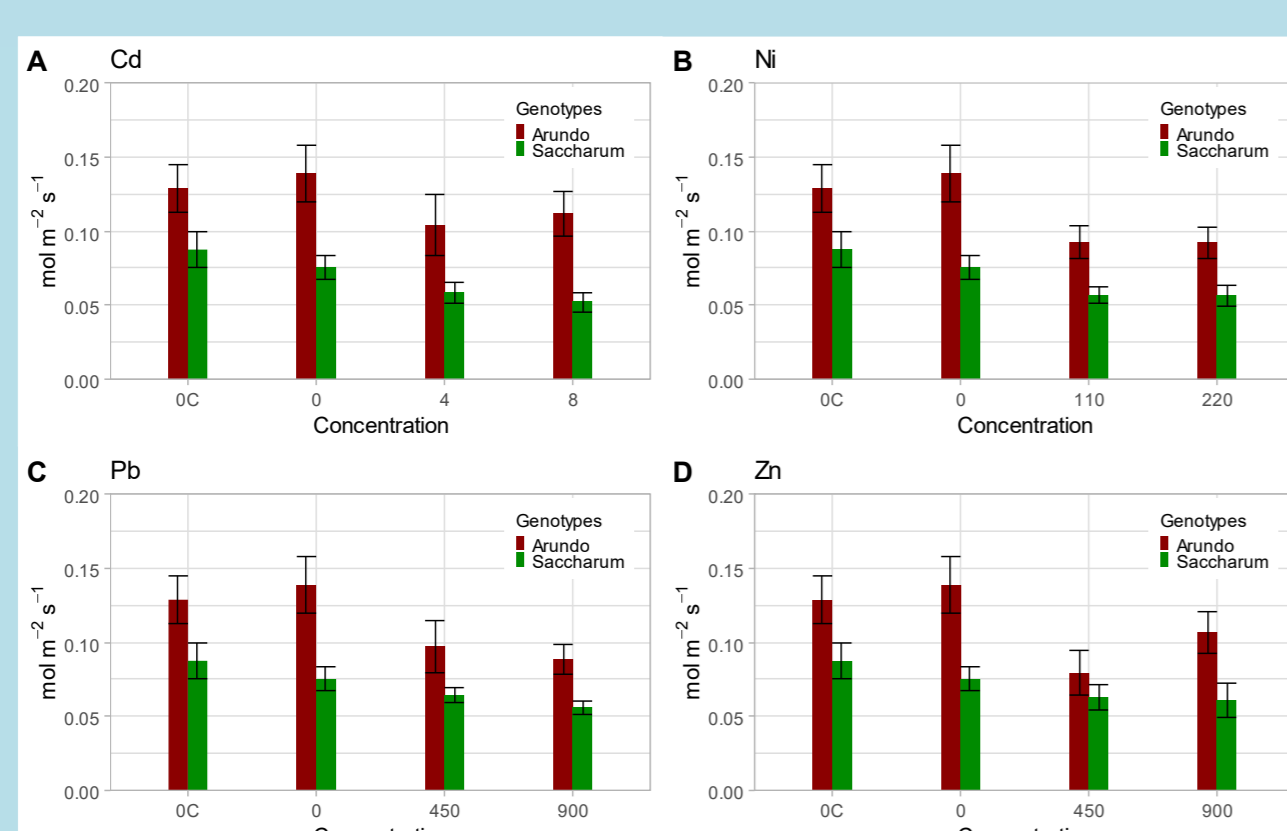## Results

Photosynthesis rate

➢*Arundo* reduced the photosynthesis rate at the highest level of Cd and Ni.
➢*Saccharum* reduced the photosynthesis rate in Zn.

Stomatal conductance

➢ *Arundo* showed reduction of stomatal conductance in Ni and Pb.
➢ *Saccharum* did not show difference between the level of Pb, Zn and Cd

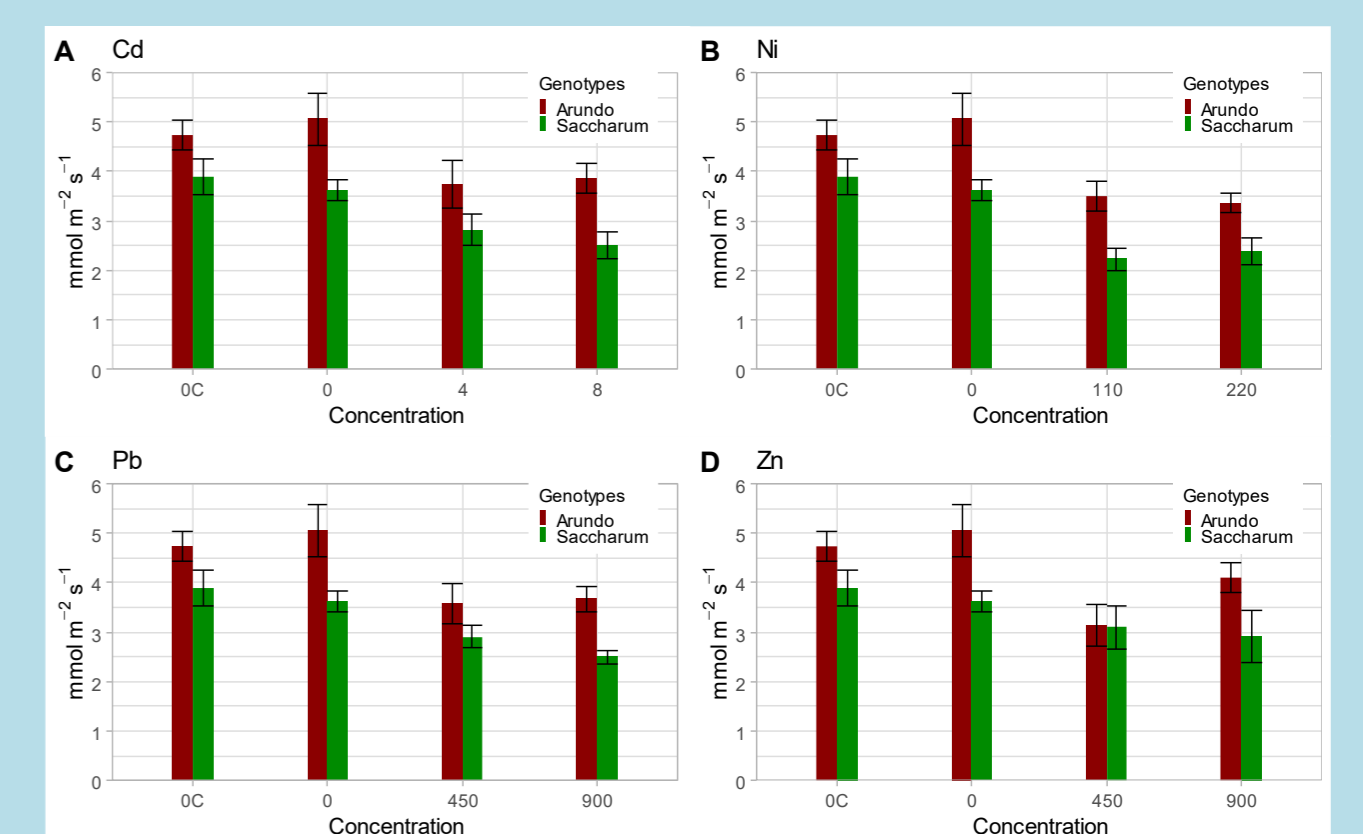### Stomatal conductance in relationship with the level of soil contaminant

➢*Saccharum* showed lower stomatal conductance than *Arundo*
➢*Arundo* showed the greatest decrease in stomatal conductance in Ni and Pb
➢Saccharum decreased stomatal conductance in Ni 220 mg Kg^{-1}

Traspiration rate

➢ *Arundo*, C3 plant, showed higher transpiration rate than *Saccharum*, C4 plant
➢ *Arundo* reduced the transpiration rate in the highest level of Ni
➢ *Saccharum* reduced the transpiration rate in the highest level of Pb

IWUE
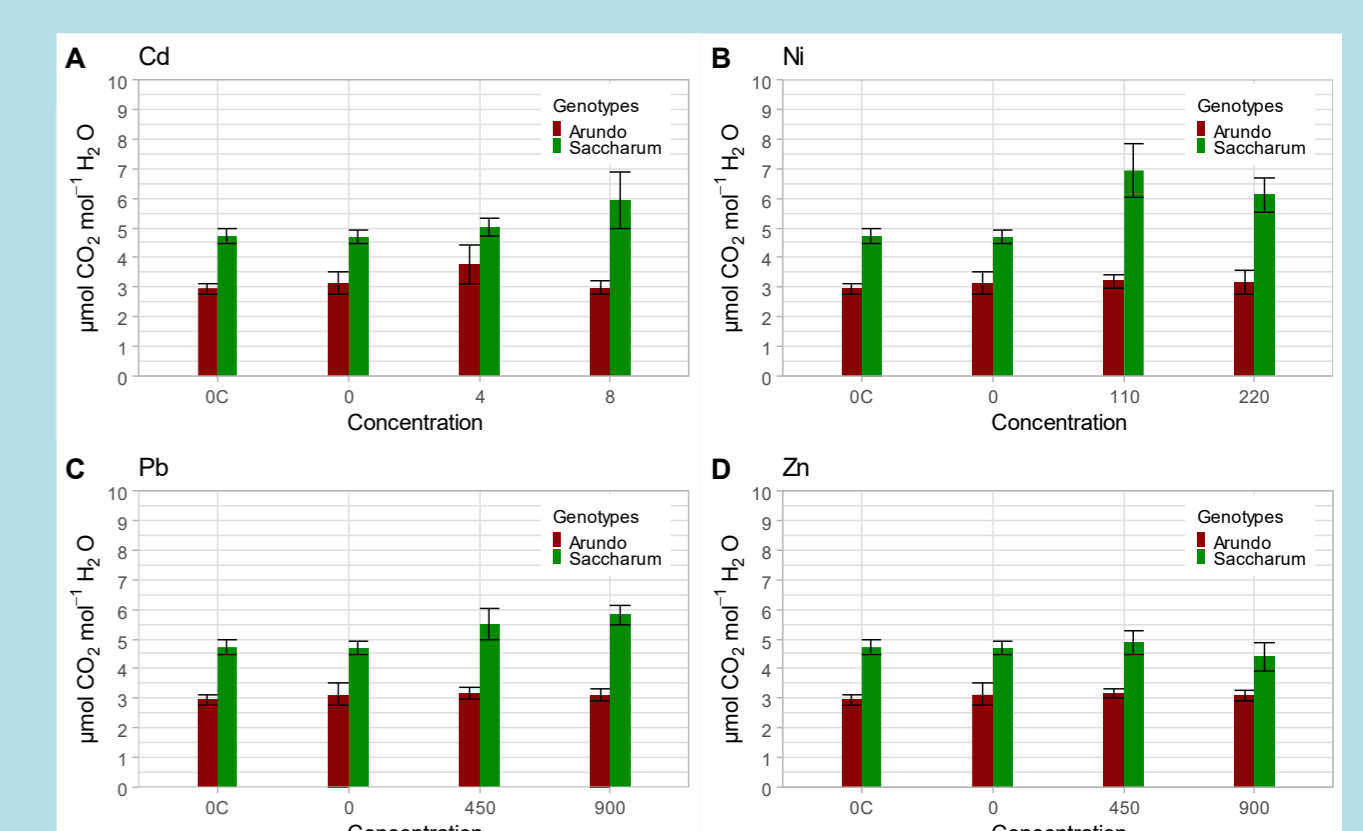
➢*Saccharum*, C4 pathway, showed higher iWUE than *Arundo*
➢*Arundo* reduced the iWUE in Cd 8 mg kg^{-1}
➢*Saccharum* reduced the IWUE in Zn 900 mg kg^{-1}

Conclusions

The relationships between the increasing levels of soil pollutants and the stomatal conductance provide an insight of the stress condition of the plant in relation to the adopted treatment. There was a linear and decreasing trend of the stomatal conductance at the increasing concentration of contaminant, indicating that the plants which are subject to increasing levels of soil pollutant suffer gradually increasing stress, tending to close the stomata. This is one of the mechanism of resistance that the plant adopted, showing the tolerance to the heavy metal of the two species. The smaller "b value" in all linear regressions suggests *Saccharum* more tolerant than *Arundo* to increasing soil contaminants.