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CAN STAPLE CROPS CLEAN CONTAMINATED SOIL? A PERCEPTION FROM THE PHYTOREMEDIATION POTENTIAL OF OGBOMOSO SOYBEAN LANDRACE, SOUTHWEST NIGERIA

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INTRODUCTION & AIM

Industrialization contributes largely to the non-availability of arable lands targeted for growing staple crops, increasing the trend of soil contamination.

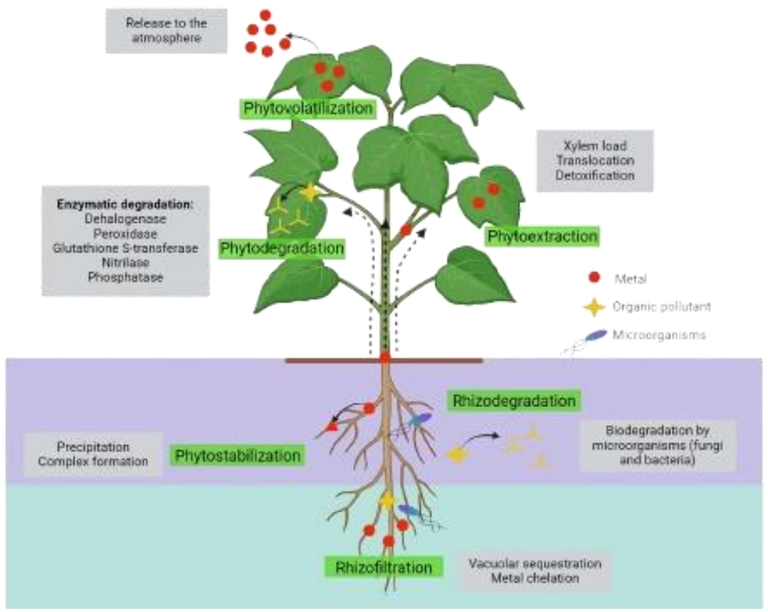

Figure 1. Phytoremediation Mechanism (Rosales, 2025)

Hyperaccumulator plants has the innate ability to absorb high dose of heavy metals in their tissues without adverse effects. This makes them optimal for phytoremediation, as they can extract heavy metals from polluted soil (Park & Oh, 2023). Staple crops such as *O*. *sativum*, and *P*. *sativum*, have been studied in this regards, there are limited studies on high profile crops such as soybean. Hence, the need to assess the phytoremediation potential of a locally used soybean landrace, known to farmers in Ogbomoso as “ewa bimpe.”

METHOD

“ewa bimpe,”

Collected from the farmers market, Sabo, Ogbomoso, Oyo state

Top soil collected at a depth of 0-20cm

Effluent was collected from 7UP bottling Company, Asa dam, Ilorin

Presence of heavy metals in the soil and effluents

Pb^{2+}, Zn^{2+}

Cd^{2+}, Mn^{2+}

100ml

Atomic Absorption Spectrometer

Inoculation

The experiment was carried out at the Botanical Gardens of the Department of Pure and Applied Biology, Ladoke Akintola University of Technology, Ogbomoso. The experiment was laid out in a completely randomized design (CRD), replicated four times. The soil was contaminated with industrial effluent at different concentrations (C0: 0%, C1: 50%, and C2: 100%)

RESULTS & DISCUSSION

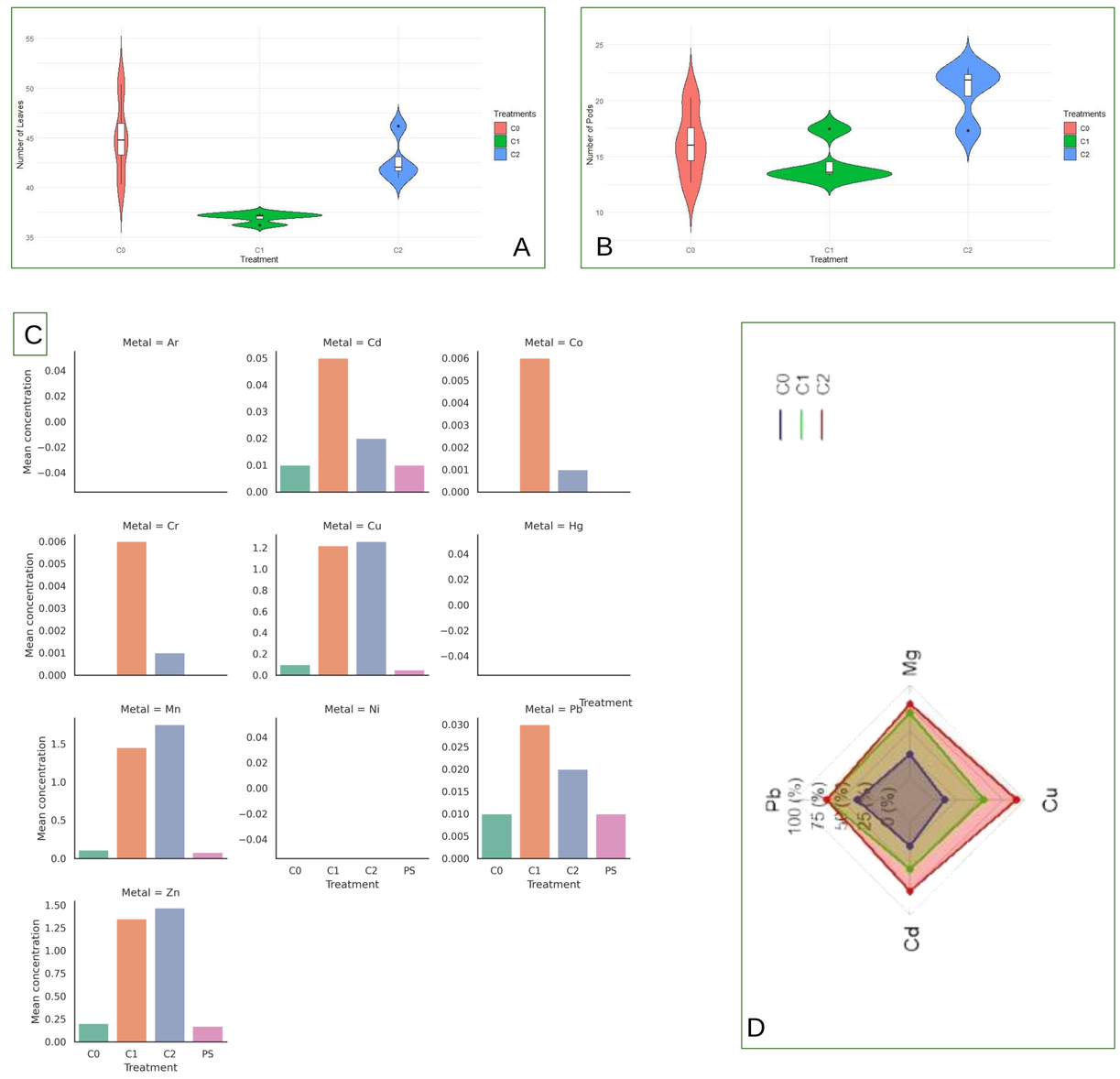

Figure 2. (A) Dose-Response of Number of Leaves at 16 WAP to different concentrations of Effluents (B) Dose-Response of Number of Pods at 16 WAP to different concentrations of Effluents © Residual heavy metals in the soil (D) Soybean leaf uptake of heavy metals at different level, C0- Control; C1- 50% concentration; C2- 100% concentration

The level of Cd (0.05 $mgkg^{-1}$) and Pb (0.04 $mgkg^{-1}$) uptake by the plant was higher, reducing its concentration in the soil, suggesting the hyperaccumulating ability of the plant. The response of both the number of leaves and pods to the different dose of effluent is evidence to this ability. This could be attributed to the pH of the soil which was less acidic. This agrees with the findings of Nagajyoti *et a*l. (2010) who noted that increased pH increases heavy metal uptake.

Skuza *et a*l. (2022) also mentioned that the ability to uptake heavy metals could be due to the presence of a gene that is tolerant to the metals. Shaffique *et al*. (2023) suggested that the plant-microbe interaction could also enhance soybean growth planted on heavy metal contaminated soil.

CONCLUSION

The study concludes that there are potential innate ability that lies in commonly staple crops. Landraces of other staple crops, such as "ewa bimpe," exhibit significant pollution tolerance and potential for phytoremediation through absorption. Given their nutritional and economic significance, they could be optimal for low-resource environment. This study recommends the use of staple legumes as effective precursors for the restoration of arable soils. Molecular techniques should also be explored in identifying genes linked to heavy metal tolerance in staple crops, especially for accessions that might not fit to breeding objectives.

SELECTED REFERENCES

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Skuza, L., Szućko-Kociuba, I., Filip, E., & Bożek, I. (2022). Natural Molecular Mechanisms of Plant Hyperaccumulation and Hypertolerance towards Heavy Metals. *International Journal of Molecular Sciences*, *23*(16), 9335. https://doi.org/10.3390/ijms23169335