

ASSESSMENT OF THE USE OF TREATED WASTEWATER FROM OIL REFINERY IN IRRIGATION, KHARTOUM-SUDAN

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Problem Statement

- Sudan is currently facing a serious problem of disposal and reuse of waste water from different sources.
- In the **oil industry**, refinery waste water was estimated to be **20 million cubic meter /annum**.
- Evaporation ponds were established in order to treat the waste water for further use, mainly irrigating trees as shelter belts and wind breaks around the refinery area.



● The ongoing tree planting efforts ($\approx 500,000$ trees) using the refinery waste water for irrigation, seemed to be based on inadequate information regarding the use of the most suitable tree species in terms of both site **adaptability** and **tolerance** to the waste water quality and to study the hazardous effects of waste water on the environment, mainly on.... **soil characteristics**.



Methodology

- Six tree species (*Acacia tortili*, *Eucalyptus camadulensis*, *Azadirachta indica*, *Grewia tennax*, *Eugenia jambolana*, and *Conocarpus erectus*) were selected and used in a completely randomized block design in a field trial using refinery waste water for irrigation.
- Data were collected concerning plant growth parameters and performance throughout the experimentation period of 15 months.
- Soil samples were analyzed after the application of waste water for quality assessment

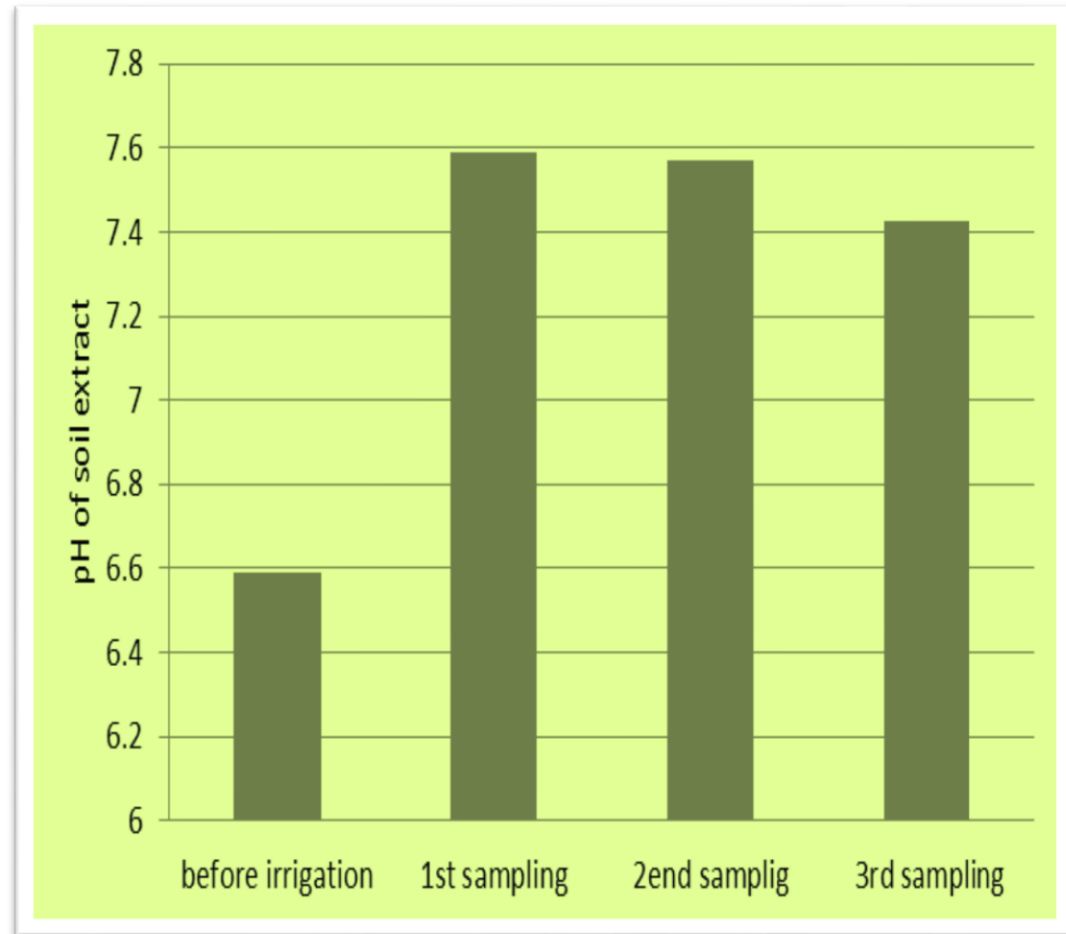
Results

- The results of the experiment revealed the following:
 - A significant difference between all six tree species in their tolerance to waste water. These differences included number of leaves, number of branches, plant height and stem diameter.
 - The most suitable tree species found were *Conocarpus erecta* and *Acacia tortilis*, while the least tolerant tree was *Grewia tenax*.
 - Soil analysis results revealed a remarkable change in some soil characteristics after waste water application, mainly electric conductivity, pH and minerals concentrations

Soil Samples Analysis

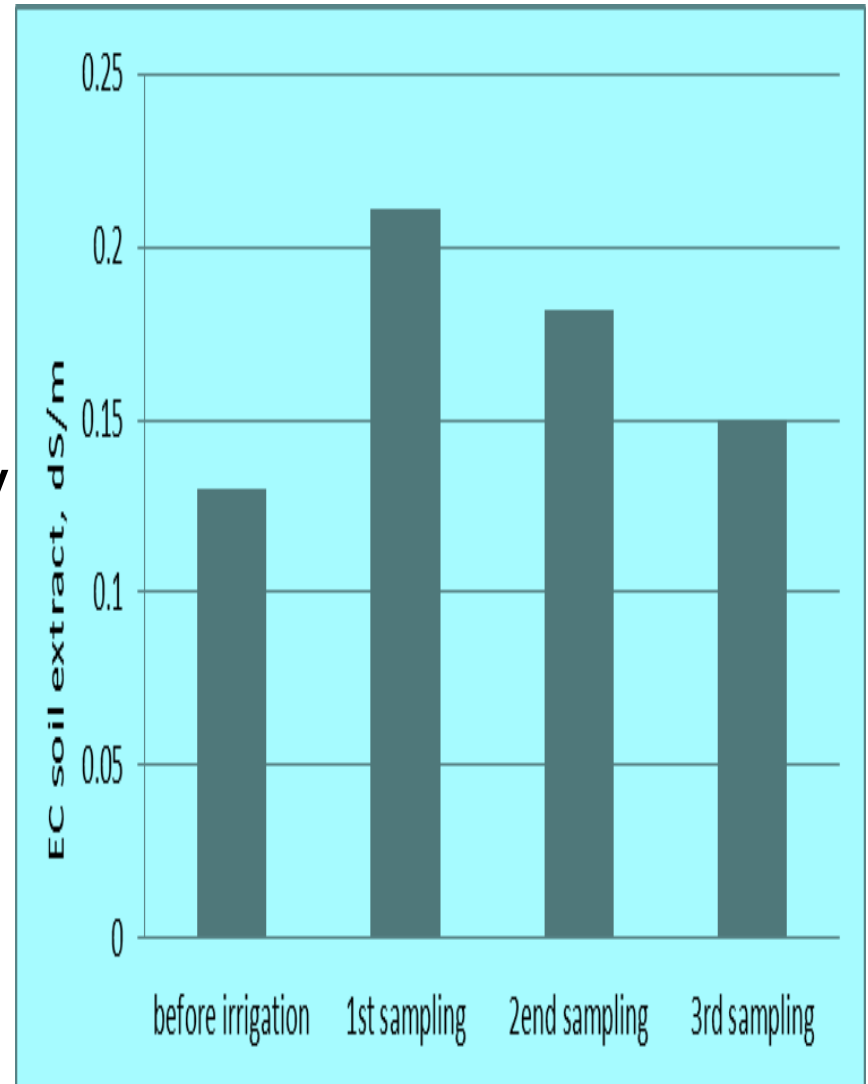
Soil pH:

An increase in Soil-pH values (5 months interval of sampling) was observed after application of wastewater.



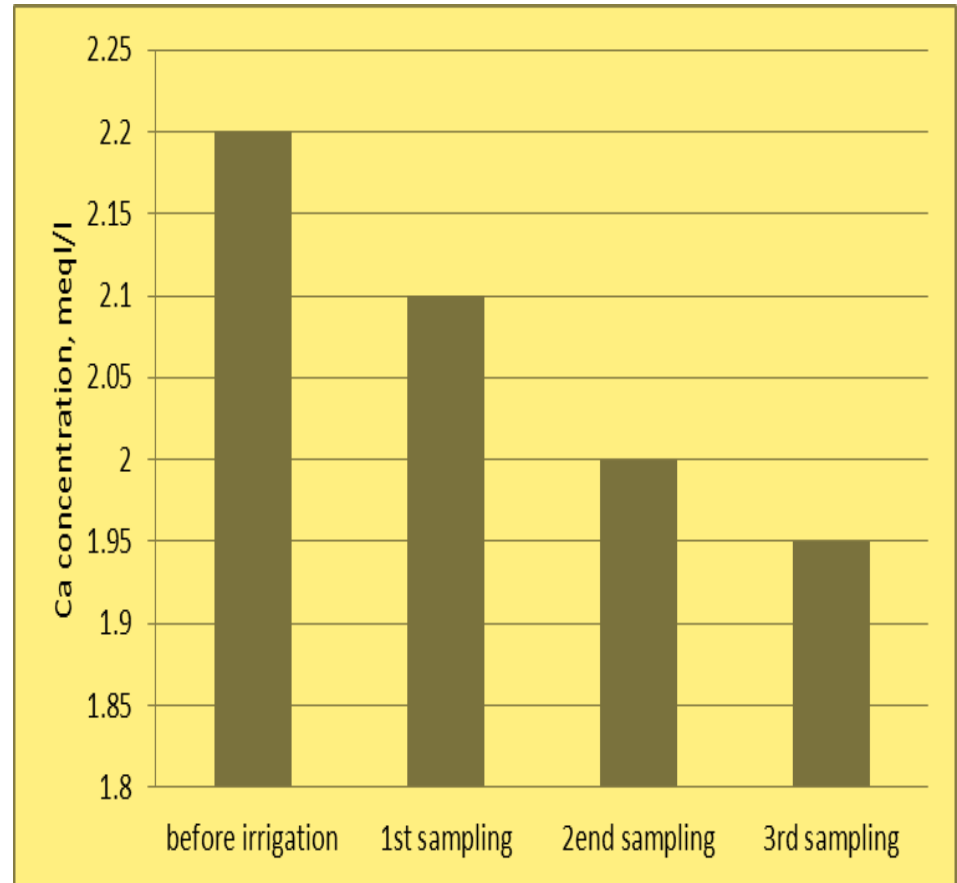
Soil Salinity:

EC values were also changed on wastewater application, which affected soil quality by increasing soil salinity levels



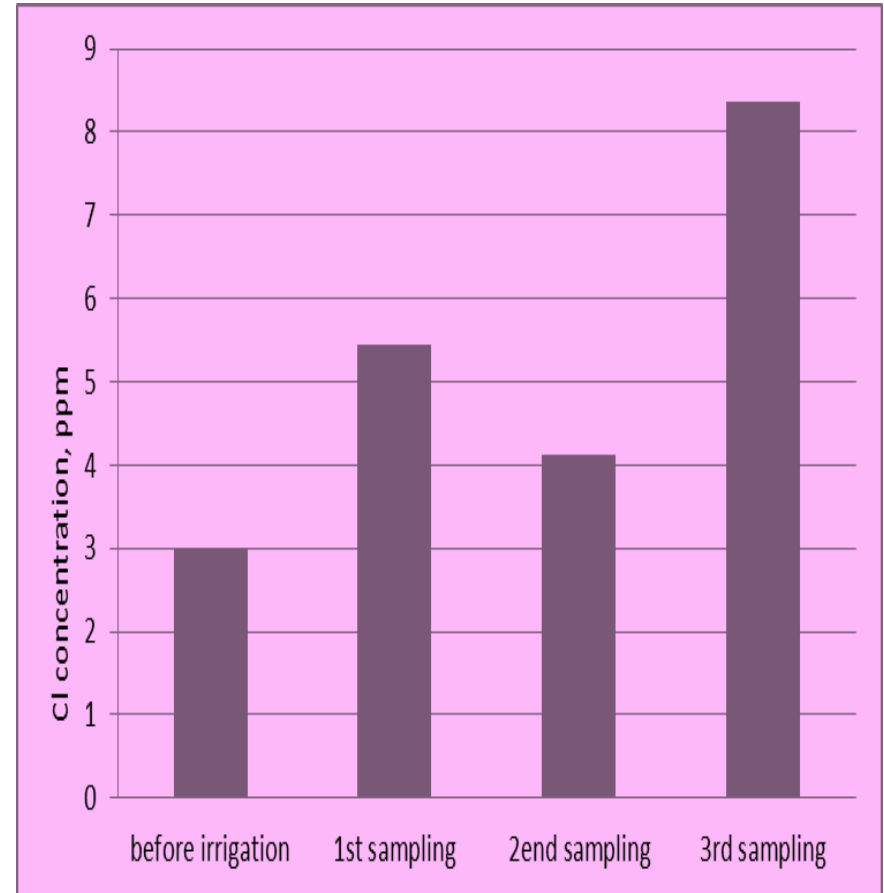
Calcium (Ca⁺⁺) concentration:

A significant decrease in Ca⁺⁺ concentration in soil extract was observed after the application of wastewater. This could be attributed to leaching of Ca⁺⁺ downward after subsequent irrigation.



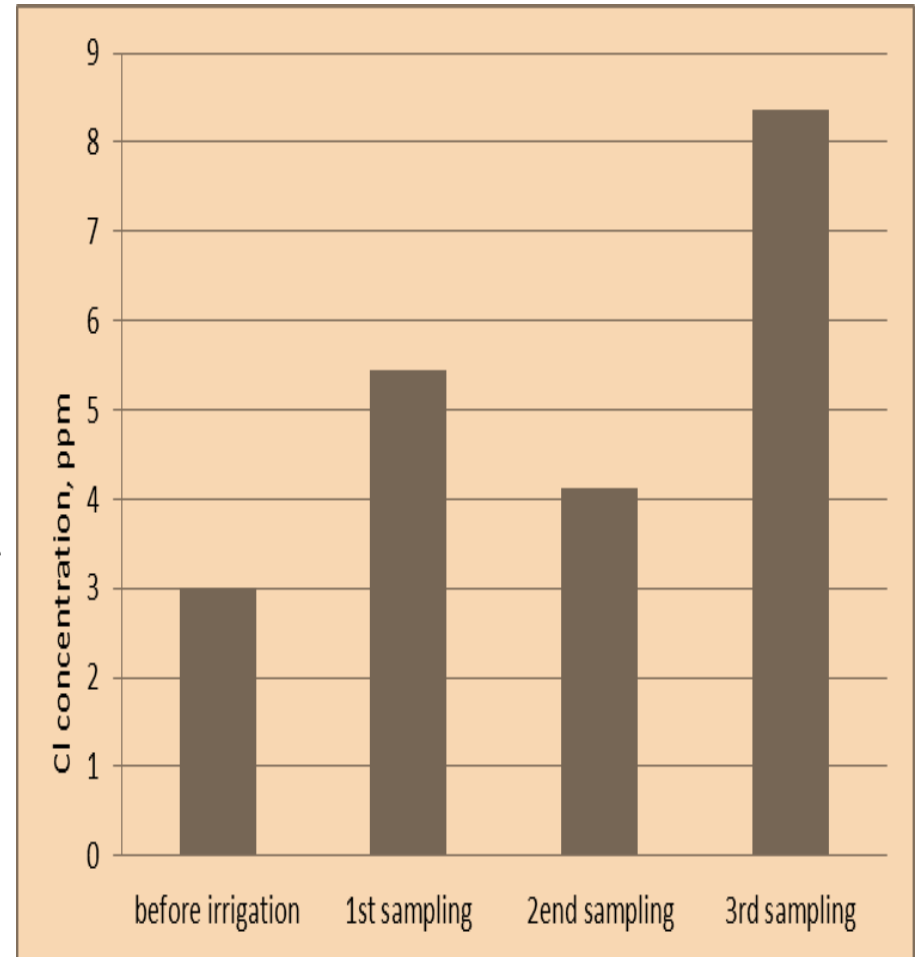
Chloride (Cl-) concentration:

Chloride concentration in soil extracts increases after irrigation with wastewater.



Sodium (Na⁺) concentration:

A significant increase of Na⁺ concentration was observed in the soil extract after wastewater application. This affected soil quality, and *sodic* condition will prevail.



Conclusion

- The results of the experiment revealed a significant difference between all six tree species in their tolerance to wastewater with respect to number of leaves, number of branches, plant height and stem diameter.
- The most suitable tree species found were *Conocarpus erecta* and *Acacia tortilis*, while the least tolerant tree was *Grewia tenax*.
- Soil analysis results revealed a remarkable change in some soil characteristics after wastewater application mainly, electric conductivity, pH and minerals concentrations.
- Refinery waste water could be used for irrigation purposes only under certain circumstances. Proper treatment measures should be introduced before wastewater use.
- Soil quality was also important and certain precautions should be implemented before irrigation.

Thank You

