ID: 336

Combine Activated Carbon and Calcium Hydroxide to Lower the Salinity of Irrigation Water

Elbar Djenette[1], Rekis Abdelkrime[1], Elbar Chaima Yasmin[2]

[1]Center for Scientific and Technical Research for Arid Regions Biskra (CRSTRA) ALGERIA
[2]University Of Biskra ALGERIA
** Corresponding author: elbardjenette@gmailom*

Abstract

High salt concentrations in irrigation water in arid regions can lead to significant nutritional imbalances, adversely affecting plant growth and productivity. The use of such water can also cause sodium fixation in soil, contributing to salinization that degrades soil quality, resulting in clay dispersion, structural deterioration, reduced permeability, and plant asphyxiation. Our treatment method combines activated carbon and calcium hydroxide, leveraging activated carbon's high adsorption capacity for chemical compounds. Calcium hydroxide ($Ca(OH)_2$) is an effective, cost-efficient alkaline product that enhances water quality by neutralizing acidity, softening, purifying, and removing turbidity and impurities. In our methodology, we activate charcoal from palm residues with citric acid and mix it with calcium hydroxide to reduce chloride levels, resulting in clean water that meets salinity standards. The application of this mixture to saline irrigation water yielded a 20-40% reduction in ion levels (calcium, magnesium, sodium, potassium, carbonate, and bicarbonate), demonstrating the treatment's effectiveness. These results support the design considerations for using activated carbon from palm residues alongside calcium hydroxide to lower salinity levels. Given these promising findings, further research is necessary to assess the long-term stability of the treated water and its suitability for various agricultural applications. We plan to conduct field trials to evaluate the treatment's performance under different environmental conditions and its effects on soil health and crop yield. Additionally, we will analyze the economic feasibility of scaling up the process, taking into account raw material costs and potential benefits for farmers facing salinity challenges.

In conclusion, our initial findings indicate that utilizing activated charcoal derived from palm residues in combination with calcium hydroxide presents a viable solution for salinity remediation in irrigation. This eco-friendly approach not only helps manage saline water but also promotes agricultural waste recycling, contributing to a more sustainable farming future.

Keywords: salinity, irrigation water, activated charcoal, citric acid, Calcium hydroxide.