

Integrated use of saline water and rootzone matric potential control for saline soil reclamation and shrub growth

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March 8, 2021

Abstract

A four-year field experiment was carried out to evaluate an integrated use of saline water for the saline soil reclamation in Hebei Province of North China. A landscape shrub (*Caryopteris × clandonensis* ‘Worcester Gold’) was cultivated using drip irrigation scheduled by rootzone soil matric potential control at five levels of water salinity (ECi): 0.8, 3.1, 4.7, 6.3, and 7.8 dS·m⁻¹. Soil matric potential control was applied using a threshold of -5, -10, -15, and -20 kPa in the first, second, third, and fourth year, respectively. After four growing seasons, the saline soil (initial ECe value of 27.8 dS·m⁻¹) was reclaimed to slightly saline soil for 0–1 m depth (4.1–7.2 dS·m⁻¹) under drip irrigation with saline water of ECi < 7.8 dS·m⁻¹. The salt leaching efficiency of root zone soil was highest in the first year and lowered year-by-year. The plants strongly responded to the different soil water and salinity regime. Significant decreases in survival rate, plant growth, and shoot dry weight in response to increasing ECi were found. To achieve a relative survival rate of >50%, the threshold salinity of irrigation water for ‘Worcester Gold’ cultivation was 7.8, 7.0, 5.6, and 5.3 dS·m⁻¹, for the first, second, third, and fourth growing season, respectively. It is recommended to use an inter-seasonal evolving matric potential threshold of -10 kPa for dry season of the third year, -15 kPa for rainy season of the third year and dry season of the fourth year, and -20 kPa for rainy season of the fourth year.

Dear Editor:

We would like to submit the enclosed manuscript entitled “Integrated use of saline water and rootzone soil matric potential control for saline soil reclamation and shrub growth” which we wish to be considered for publication in *Land Degradation & Development*.

Large-scale greening and landscaping are greatly demanded to preserve ecological the environment and improve the residential environment as the rapid growth of industrialization and urbanization in coastal regions of China. Limited by local hydrogeological conditions, the project of greening and landscaping is developing on saline-sodic soils and requires massive freshwater resources to leaching salt and irrigation. Also, limited by the shortage of freshwater resources, alternative water sources, such as saline water, have to be used for greening and landscaping purposes in these regions. The present study shows the result of integrated use of saline water for saline soil reclamation and woody plant cultivation in North China around Bohai Bay. The integrated approach consists of saline water drip-irrigation scheduled by soil matric potential threshold, dynamic matric potential thresholds, and gravel-sand layer as the subsurface drainage. Our team previously reported the results about some herbaceous plants under the similar experimental design. In this manuscript, we show the change of soil salinity and response of a shrub, *Caryopteris × clandonensis* ‘Worcester Gold’, to the five salinity levels of irrigatin water and yearly-lowered soil matric potential threshold. Moreover,

the temporal evolution of salinity distribution in the soil profile was shown, and the salt leaching efficiency of rootzone soil was estimated and compared with the results of other leaching methods. The response of plant on different soil water and salinity regime was evaluated, the factors affecting survival and growth of plant were uncovered, and suggestions for water and salinity management were proposed. On the basis of the results, the applied integrated solution of utilizing of saline water was highly recommended.

The authors declare that the work described has not been published with any other forms previously and is not under consideration for publication elsewhere. All the authors have seen the manuscript and approved to submit to your journal.

We deeply appreciate your consideration of our manuscript, and we look forward to receiving comments from the reviewers. If you have any queries, please do not hesitate to contact me at the address below.

Kind regards.

Yours sincerely,

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