Abstract

Soil salinity and sodicity are two main factor limiting the production plants at irrigated agricultural flat land. Generally, Exchangeable sodium percentage (ESP) is the most reliable index in the assessment soil salinity and Sodium hazard. Recognition of and awareness of the the numerical value of the ESP variations in sodicity or saline and sodic soils for land management, estimating the amendments and Targeted programs designed to prevent and overcome their problem of salinity and Sodium hazard order to improve soil quality and achieve sustainable agricultural development is essential. Experimental error is accompanied with the ESP measurement. As well as, because the CEC measurement is difficult and time consuming, is costly. Hence, the offer approach can be using the easy index another, indirectly acquire the ESP is much optimized and more economical. For this purpose, in the present study using Arc-GIS 10.1 software based on a regular the grid with dimensions of 1500×1500 mm, and find the location of soil samples collected at each node of the the grid in the study area with the GPS, 301 soil samples from the surface (30-0 Cm), Sistan plain sediments were collected and for experiments and analysis, was transferred to the laboratory. Modeling and ESP estimates using soil characteristics by calibration of Robbins and Myers coefficients with the aid of linear and unlinear regression methods and artificial neural networks (MLP and RBFN) were performed. Appropriate regression model to predict the ESP, in the study area are the logarithmic model was $ESP=8.86\ln SAR_{1:5}+14.78$ with R^2 and RMSE values, respectively, 0.81 and 4.9, logarithmic model include: $ESP=8.73\ln SAR_{1:1}+14.14$ with R^2 and RMSE values, respectively, 0.87 and 3.79, and the linear regression model include: $ESP=0.7EC_{1:5}+1.155Clay+1.76pH-2.16OC-4.199$ with R^2 and RMSE values 0.56 and 4.34, respectively. Generally obtained Results indicate that the pedotransfer function estimate ESP haven't desired performance useing readily obtainable soil properties ($R2\leq0.58$ and $RMSE\geq4.34$). While the pedotransfer function calculated using the sodium absorption ratio (SAR) and high performance had optimal results. Also, for modeling the ESP using artificial neural networks (RBF and MLP) using readily obtainable soil properties, generally two models was considered (model 1: EC+pH and Model 2: EC+pH+Clay+OC+Silt+Sand+Bd+ CCE). The results suggested that network capacity and better performance the MLP and RBFN compared to regression models, in the meantime, RBFN2 model by increasing the number of inputs and control the number of neurons in the hidden layer, indicate capability and high performance ($R^2=0.83$ and $RMSE=2.85$) compared to the MLP neural network. However, you can recommended also RBFN1 model to ESP prediction ($R^2=0.77$ and $RMSE=3.55$), because the obtained parameters of the RBFN2 need more time and costly. Whereas, measuring the electrical conductivity and soil acidity access features as input to the model is easier RBFN1. The results of the sensitivity analysis for the variables used in order to estimate ESP at RBFN2 model suggests the importance of electrical conductivity (EC), acidity (pH), the percentages of clay (Caly) and bulk density (Bd), respectively, was in the soil of Sistan Plain.

Keywords: Soil salinity and sodicity, ESP, SAR, PTFs, Artificial Intelligence

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Predicting Exchangeable Sodium Percentage (ESP) using readily obtainable soil properties with the aid of Artificial Neural Network models in the Plain of Sistan

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