

## **Abstract**

Cation Exchange Capacity (CEC) is one of the most important chemical properties of soil which represents its ability to maintain nutrient and water in the soil and also managing the soil pollution. It's difficult, time-consuming and costly to measure CEC. So, it's desirable to estimate it through early-found properties of soil. The present research was accomplished aiming to predict the soil cation exchange capacity using regression, gene expression planning and artificial neural network methods in Qorqori Area, of Sistan and Balouchestan province. Therefore, it was collected 130 samples of soil from (0-30 cm) surface of soils of Qorqori Area, Hermand County and it was transferred to the laboratories to do experiment and analyses in the present research. Systematic sampling was performed in an ordered network in dimensions of  $1500 \times 1500$ . In the following, they were accomplished modeling and estimating Cation exchange capacity utilizing properties of soil including (percentage of clay, percentage of sand, percentage of silt, organic materials, acidity, electrical conductivity and calcium carbonate) using regression, MLP artificial neural network and GEP gene expression planning methods. And it was used  $R^2$  explanation coefficient and root-mean-square error (RMSE) criteria in order to evaluate the models.

$R^2$  and RMSE from artificial neural network model for Cation exchange capacity (CEC) were obtained 0/96 and 0/068, respectively, while the parameters for gene expression planning and regression models were obtained ( $R^2$ -0/82, RMSE-0/04) and ( $R^2$ -0/77, RMSE-1/57), respectively. The research results represent that MLP neural network used in the research with 10 neurons in hidden layers to predict the soil cation exchange capacity can justify CEC changes in considered area with a much better performance than gene expression planning and regression methods. Also, the results of data sensitivity analysis using developed model of artificial neural network represented that percentage of clay, organic materials, percentage of silt, acidity and electrical conductivity are considered the most important factors affecting on the soil cation exchange capacity in the Qorqori Area, Hermand County respectively.

**Keywords:** CEC, Artificial neural network, Qorqori Area, gene expression planning



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# **CEC Prediction Using Artificial Neural Network in the Qorqori Area, Hermand County**

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