# Application of Artificial Neural Network (ANN) for prediction diameter of silver nanoparticles biosynthesized in Curcuma longa extract

## Abstract

In this study silver nanoparticles (Ag-NPs) are biosynthesized from silver nitrate aqueous solution through a simple and eco-friendly route using Curcuma longa (C. longa) tuber powder extracts which acted as a reductant and stabilizer simultaneously. Characterizations of nanoparticles are done using X-ray diffraction (XRD) and transmission electron microscopy (TEM). We present an artificial neural network (ANN) approach is used to model the size of Ag-NPs as a function of the volume of C. Longa extraction, temperature of reaction, stirring time and volume of $AgNO_3$. The suitable ANN model is found to be a network with two layers that first layer has 10 neurons and second layer has 1 neuron. This model is capable for predicting the size of Ag-NPs synthesized by green method for a wide range of conditions with a mean absolute error of less than 0.01 and a regression of about 0.99. Based on the presented model it is possible to design an effective green method for obtain Ag-NPs, while minimum received materials are used and minimum size of Ag-NPs will be obtained. Also simulation of the process is performed using ANN media. According to the model's results, the volume of C. Longa extraction, temperature of reaction, and volume of $AgNO_3$ about 18 mL, 30 °C and 2 mL are chosen as the optimum size of Ag-NPs, respectively. Results obtained reveal the reliability and good predicatively of neural network model for the prediction of the size of Ag-NPs in green method.

**Keyword:** Artificial neural network; Curcuma longa; Silver nanoparticles; Levenberg–marquardt; Green method.