

Abstract

Mimosa Wattle tree bark (MWTB) is a rich source of bioactive compounds known for their corrosion inhibition, medicinal properties, and use in leather tanning. The current study focuses on optimization of process parameters for extraction of these phytochemicals using ultrasound-assisted extraction (UAE), with the help of response surface methodology (RSM) and artificial neural network (ANN). The extraction process was optimized by varying three key factors: temperature (30–70 °C), extraction time (10–60 min), and solvent-to-solid ratio (0.075–0.125 mL/g). These parameters were evaluated based on extraction yield (EY) and total phenolic content (TPC). The optimum extraction conditions were determined to be 50 °C, 35 min, and a solvent-to-solid ratio of 0.1. Under these conditions, the RSM predicted an extraction yield (EY) of 27.61 % with a TPC of value of 81.84 mg GAE/g, while the Artificial Neural Network (ANN) model predicted a yield of 26.88 % and a TPC of 83.33 mg GAE/g. A multilayer perceptron (MLP) ANN model was developed and trained using the back propagation algorithm, and the predicted values from the ANN model showed closer agreement with experimental data compared to the RSM model. Phytochemical profiling was carried out using UV–Vis and FTIR spectroscopy.