Modeling the Inhibition Zone Diameter of Pathogen Microorganisms via Artificial Neural Networks

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Abstract:

Antibiotics play a crucial role in modern medicine due to their ability to treat bacterial infections. However, due to the rise of antibiotic resistance, there is a renewed interest in the use of new alternatives. In this paper, we present the use of artificial neural networks to predict the inhibition zone diameter in bacteria cultures with the use of three natural extracts (Jamaica, neem, and *Pleurotus* mushroom). The experimental results were collected in a dataset, considering as input variables the source of natural extract, the solvent (water and ethanol), and the extract concentration. On the other hand, the response variable is the measure of the inhibition zone diameter. Four bacteria were analyzed (*Staphylococcus aureus, Salmonella, Listeria monocytogenes,* and *Escherichia coli*), and an artificial neural network (ANN) for each one was created. The coefficient of determination (R^2) obtained was 0.9999, 0.9998, 0.9999 and 1, respectively, and the rootmean-square error was less than 0.07 in all the cases. To sum up, these models can be used to obtain the inhibition zone diameter of natural extracts applied to pathogen microorganisms and identify the most effective natural product to be used as an antibiotic