SIIC015

APPLICATION OF ARTIFICIAL NEURAL NETWORK TO SIMULATE PHENOLIC CONTENT AND ANTIOXIDANT ACTIVITY DURING SPONTANEOUS FERMENTATION OF *GARCINIA MANGOSTANA* PERICARP.

[1] *Muhammad Musyedi Mazri*
[2]*Mohamad Sufian So'aib*

**Corresponding author: sufian5129@uitm.edu.my (Supervisor)*

Abstract: In spontaneous fermentation process and antioxidant activity in fruits, there is unpredictable nature of the spontaneous fermentation that cannot be able to predict. While Artificial Neural Network (ANN) is a model for the signal processing modelling which is appropriate for prediction to solve the problem like classification problems and predictions. The ability of the artificial neural network can do as well as human brain such as learn a new thing and adapt to the new changing of environment. ANN architecture modelling is required to solve this critical problem which is the prediction of non-linear pattern of the activities. The network is consisting of three layers which is input layer, the hidden layer and the output layer. The method use in this modelling is Levenberg-Marquardt backpropagation training function of neural network since the method is the simplest among the other artificial neural network modelling. Several trials were made by using different of transfer function which is "tansig", "logsig" and "purelin". The ANN model used NN 2-7-1 neurons in input-hidden-output layers. The model developed which is NN 2-7-1 has an acceptable generalization accuracy and capability. The predictive ability of the ANN methods by assessed the basic of the mean square error (MSE), and coefficient of determination (R^2) between the predicted values of the networks and the actual result from experimental data. the efficiencies of ANN modelling can be concluded by observed the result of MSE, and R^2. The minimum value of mean squared error (MSE) and the regression value (R-value) which is closed to 1 showed that the neural network architecture was performed with high accuracies. For total phenolic content, R= 0.99157 while for antioxidant activity, R= 0.99879 respectively. Mean squared error (MSE) showed a very good result from ANN model which is for phenolic content testing value was equal to 0.0009697 while for antioxidant activity testing value was equal to 6.89e-05. As a result, ANN modelling was effectively simulated and predicted the total phenolic content and antioxidant activity in *Garcinia Mangostana* pericarps.

***Keywords*:** Phenolic content, Antioxidant activity, Mangosteen, Artificial neural network

Methodology:

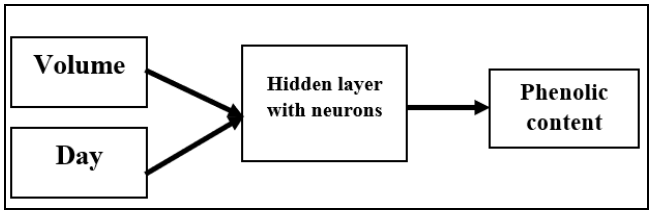

Figure 1: schematic diagram of two layers ANN model with two inputs and one output layer of phenolic content.

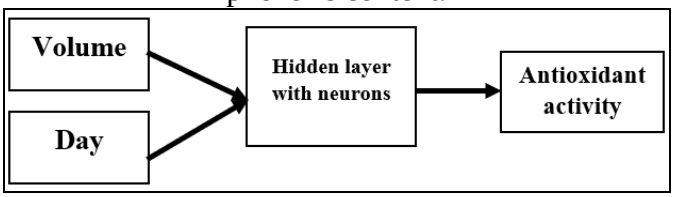

Figure 2: schematic diagram of two layers ANN model with two inputs and one output layer of antioxidant activity.

Results:

Figure 3 and Figure 4 show the experimental data versus ANN predicted data of total phenolic content and antioxidant activity at volume 5-litres.

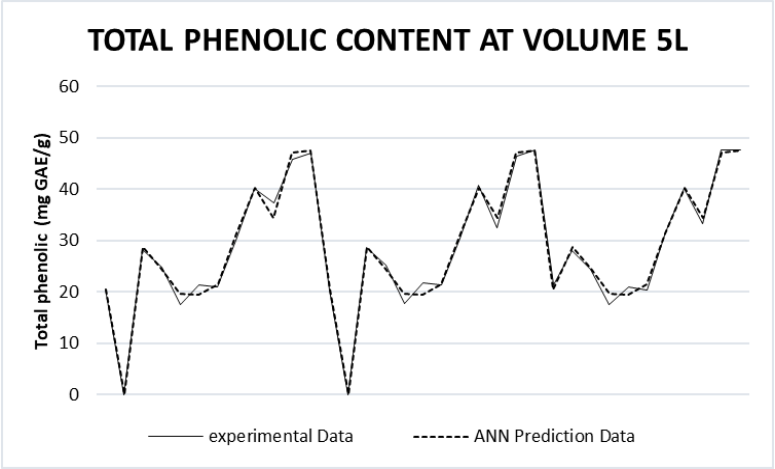

Figure 3: Experimental data versus ANN predicted data of total phenolic content at volume 5-litres.

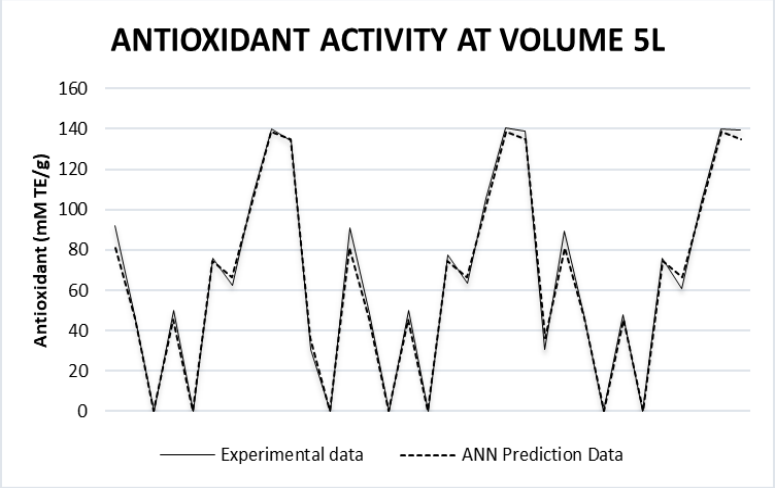

Figure 4: Experimental data versus ANN predicted data of antioxidant activity at volume 5-litres.

Conclusion

In architecture for prediction of total phenolic content and antioxidant activity, the number of hidden layers as 2, while the numbers of neurons and the number of layers did not change. The transfer function used for this prediction was “tansig”, “logsig”, and “purelin”. The transfer function was kept constant as TRAINLM. The best-optimized results were obtained in the model with 2 hidden layers, 7 of neuron numbers and the transfer function was “tansig”. ANN model was called NN 2-7-7-1 since the values of hidden layers and the number of neurons of the neural network. The results of this study were indicated a very high correlation coefficient of regression value (R-value) between experimental data with ANN predicted data. For total phenolic content, R= 0.99157 while for antioxidant activity, R= 0.99879 respectively. Mean squared error (MSE) showed a very good result from the ANN model which is for phenolic content testing value equal to 0.0009697 while for antioxidant activity testing value equal to 6.89e-05. From the observation, the model developed which is NN 2-7-7-1 has an acceptable generalization accuracy and capability. As a result, ANN modelling was effectively simulated and predicted the total phenolic content and antioxidant activity in Garcinia Mangostana pericarps. It is concluded the ANN model provided a very good diagnosing behavior and analysing tool for predicting the results. this model can manage all the data obtained from experimental and learned to understand and simulate this non-linear data from experimental results. Besides, the ANN model indicted to perform with great decision making by providing the best prediction results very closed with the experimental data. This ANN prediction model showed that the developers can manage well all the experiment result with the ANN model without performing a high-cost experiment in the future.