

## SIIC058

### Prediction Of Fruit Ripening By Artificial Neural Network Based On Relationship Between Pectin And Image Analysis

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#### **Abstract:**

This research was focuses on the prediction of fruit ripening using artificial neural network. The main purposes of this study are to correlate pectin activity (data) with image analysis (image) of figs and to investigate the compatibility of Artificial Neural Network (ANN) in speculating the figs ripening behaviors (stage). Ripening stages is the stage where the fruit are ready to be harvest. During this phase, every fruit will undergo the weakening of parenchyma cell wall and dissolution of middle lamella. As the result, the figs is sweetening as its reach the final stage of its development which is ripening phase. In order to analyze the changes happened between the figs, the laboratory experiment such as extraction yield (EY), brix of sugar and degree of esterification (DE) were come in handy. Those data represent the statistical input of pectin structure. Later, the information being correlated with the figs resemblance. Those method is quantitative-typed method where it is said to have numerous limitation which would affect the accuracy of the results obtained. The limitations would be time-consuming, expensive and lack of consistency as the volume of chemical and procedure of sampling are changeable since human error are commonly to happen from time to time. Thus, the solution to those limitations is Artificial Neural Network (ANN). The models used is MLP model with back-propagation algorithms with the help of learning function of Bayesian regularization and the transfer function is tangent hyperbolic. It is found that neuron number eight is the most accurate than the others neuron number since it has a high R value which is 0.97194 and low value of MSE, RMSE, MAE and MAPE which are 9.18E-13, 9.58123E-07, 3.04E-04 and 0.03% respectively.

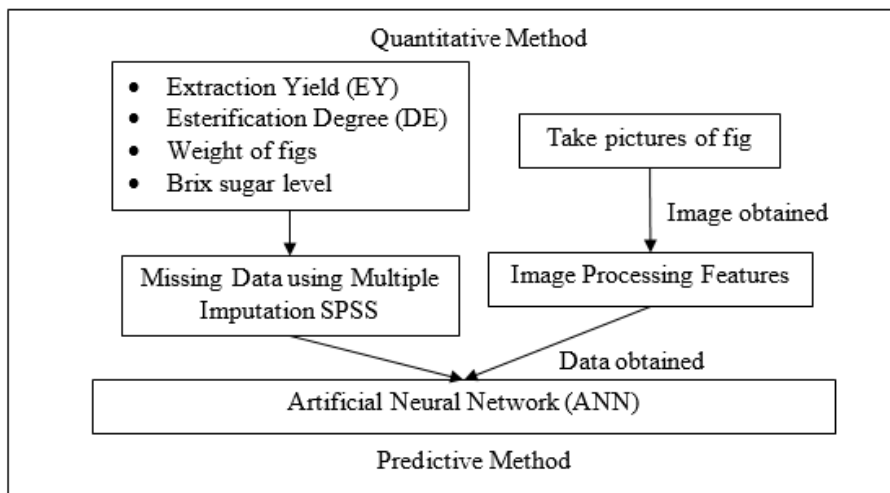
#### **Keywords:**

Artificial Neural Network (ANN), figs, fruit ripening, pectin, image analysis.

#### **Objectives:**

- To correlate pectin activity (data) with image analysis (image) of figs.
- To investigate the compatibility of Artificial Neural Network (ANN) in speculating the figs ripening behaviors (stage).

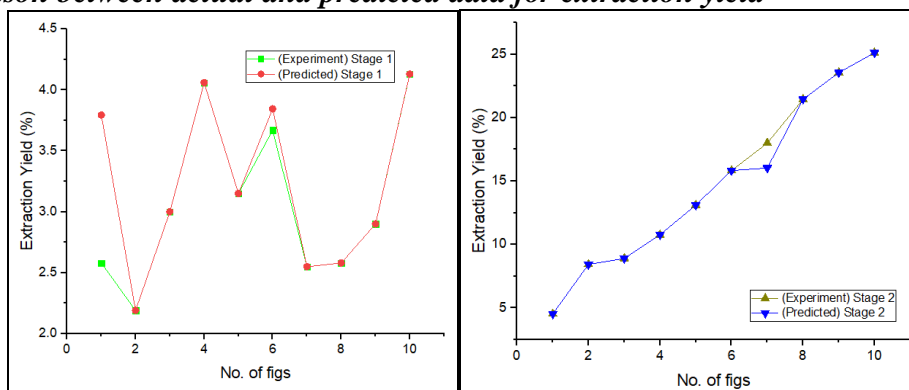
**Methodology:**



Input	Details
ANN models	Multilayer perceptron neural network
Algorithm typed.	Back-propagation
Transfer function	Tangent hyperbolic ( <i>tan-sig</i> )
Learning function	Bayesian Regularization ( <i>trainbr</i> )

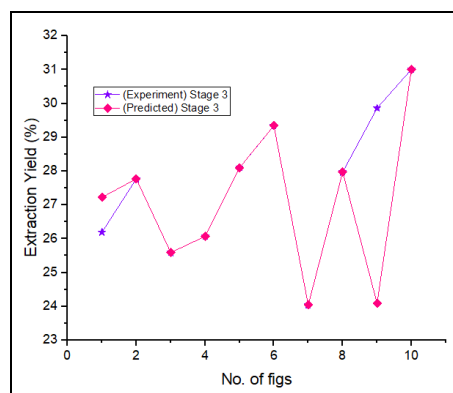
**Results:**

**a) Comparison between actual and predicted data for extraction yield**

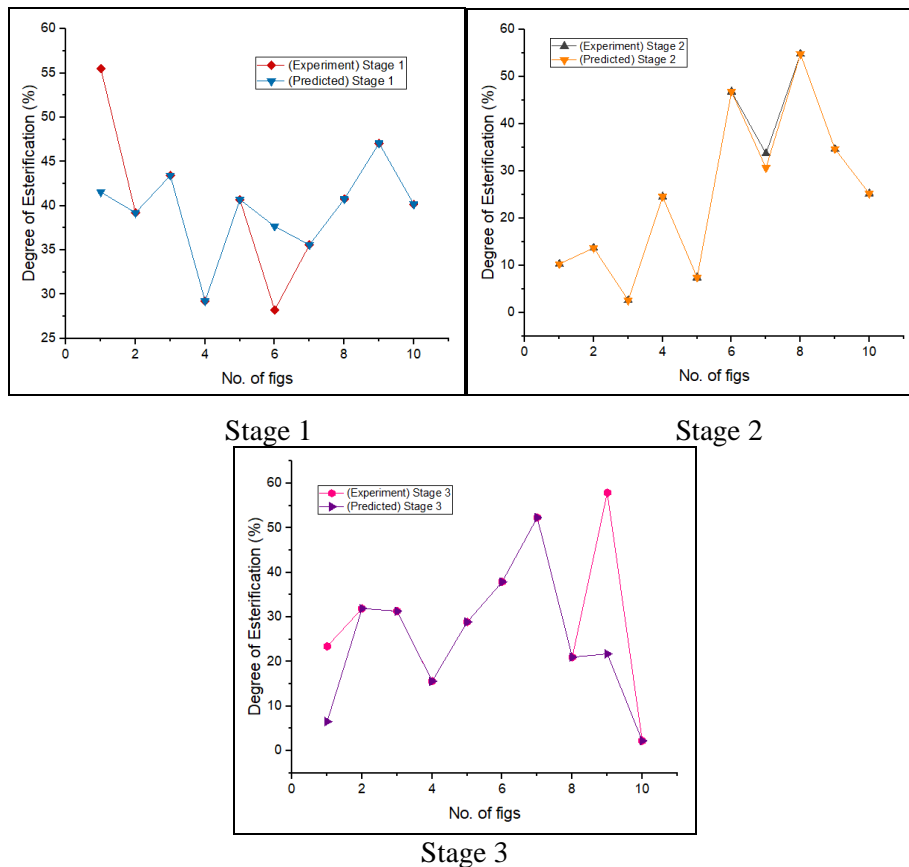


Stage 1

Stage 2



Stage 3

**b) Comparison between actual and predicted data for esterification degree****Conclusion:**

From the experiment data which consist of weight of figs, brix sugar level, extraction yield and degree of esterification, it is found that as the figs keep growing, the pectin content in the figs is raising and the sugar level in Iraqi figs would increasing. Since the extraction yield increasing, the degree of esterification is diminishing as the pectin methylesterases (PME) specific activity decreasing. The image processing by using MATLAB software are able to generate the extracted data from the picture taken from the original Iraqi figs. Both data were combined and this is where the first objectives been demonstrating. It is found that neuron number eight is the most accurate than the others neuron number since it has a high R value which is 0.97194 and low value of MSE, RMSE, MAE and MAPE which are 9.18E-13, 9.58123E-07, 3.04E-04 and 0.03% respectively. This indicates that the pectin activity is able to correlate with the image analysis. Later, the output data obtained from artificial neural network (ANN) simulation was compared with the output data from experiment. The comparison was divided into two categories which are extraction yield and degree of esterification. It is found that all of the predicted data obtained from ANN were highly correspond to the actual data from experiment output although there are slightly number of figs that does not correspond to each other. Hence, the ANN is compatible to speculate the figs ripening behaviors since the ANN is able to predict the data of the actual experiment. Thus, it is strongly believing that this study is positively proven.