ABSTRACT

The growth of Black Soldier Fly (BSF) maggots is greatly influenced by environmental temperature conditions, especially during intensive cultivation phases. To maintain a stable temperature within the optimal range, this study designed an automatic temperature monitoring and control system using Artificial Neural Network (ANN) methods. This system is designed to read the temperature of the enclosure in real-time using a DHT22 sensor, then processes the temperature data as input into the neural network to generate Pulse Width Modulation (PWM) signals that control the speed of the cooling fan. Actual temperature data is compared to the target temperature (28°C) to produce a temperature error value, which is then used as input in the training of the ANN model in MATLAB. The ANN model is designed with one input layer, one hidden layer, and one output layer, using the tansig activation function on the hidden layer and purelin on the output layer. After conducting the training and testing process on various configurations. Based on the number of neurons, the results showed that the ANN structure with three hidden layer neurons provided the best performance. This is indicated by a Mean Squared Error (MSE) value of 0.00092 and a regression value (R) close to 1, indicating a very high level of accuracy in mapping temperature errors to PWM output. The results showed that the system was able to respond to temperature fluctuations, including extreme conditions such as a temperature of 41.4°C, which was successfully compensated with a PWM of 225. A comparison was also made with cultivation conditions without automatic control, which showed that the ANN system was superior in maintaining temperature stability and had a positive impact on productivity. The weight of the maggots in the ANN system increased from 540 grams to 590 grams, while in the uncontrolled system, the weight actually decreased to 500 grams at a temperature. This system is assessed to have successfully implemented an ANN as an efficient adaptive control that can be applied in BSF maggot cultivation. This system not only helps maintain temperature stability but also proves to significantly support increased harvest yields.

Keywords: *Magot bSF, Temperature, Artificial Neural Network*