

Development of an artificial neural network utilizing particle swarm optimization for modeling the spray drying of coconut milk

ABSTRACT

Spray drying techniques are one of the methods to preserve and extend the shelf-life of coconut milk. The objective of this research was to create a particle swarm optimization-enhanced artificial neural network (PSO-ANN) that could predict the coconut milk spray drying process. The parameters for PSO tuning were selected as the number of particles and acceleration constant, respectively, for both global and personal best using a 2k factorial design. The optimal PSO settings were recorded as global best, $C1 = 4.0$; personal best, $C2 = 0$; and number of particles = 100. When comparing different types of spray drying models, PSO-ANN had an MSE value of 0.077, GA-ANN had an MSE of 0.033, while ANN had an MSE of 0.082. Sensitivity analysis was conducted on all three models to evaluate the significance level of each parameter on the model, and it was discovered that inlet temperature had the most significant influence on the model performance. In conclusion, the PSO-ANN was found to be more effective than ANN but less effective than GA-ANN in predicting the quality of coconut milk powder.

Keyword: Spray drying; Coconut milk; Artificial neural network; Particle swarm optimization; Processes