Comparison of feed forward neural network training algorithms for intelligent modeling of dielectric properties of oil palm fruitlets

ABSTRACT

Adequate data of the dielectric properties of oil palm fruitlets and the development of appropriate models are central to the quest of quality sensing and characterization in the oil palm industry. In this study, an Artificial Neural Network (ANN) was designed, optimized and deployed to model the dielectric phenomena of microwave interacting with oil palm fruitlets within the frequency range of 2-4GHz. The ANN training data were obtained from Open-ended Coaxial Probe (OCP) microwave measurements and the quasi-static admittance model, the ANN was trained with four different training algorithms: Levenberg Marquardt (LM) algorithm, Gradient Descent with Momentum (GDM) algorithm, Resilient Backpropagation (RP) algorithm and Gradient Descent with Adaptive learning rate (GDA) algorithm. The performance of the ANNs in comparison with measurement data showed that the dielectric properties of the samples under test were accurately modeled, and the LM and RP ANNs can be employed for rapid and accurate determination of the dielectric properties of the oil palm fruitlets.