Application of an artificial neural network model for the supercritical fluid extraction of seed oil from Argemone mexicana (L.) seeds.

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Abstract

In this study, a three-layer artificial neural network (ANN) was investigated to predict the cumulative extraction yield (CEY) of seed oil during the supercritical carbon dioxide extraction of Argemone mexicana (L.) (AM) seeds. The impact of five extraction parameters (Temperature, Pressure, Particle size, Flow rate- CO_2 and Co-solvent %) on the CEY of AM seed oil were investigated. The experimental CEY data were used to generate an artificial neural network (ANN), model. A trainable cascade-forward back-propagation network (CFBPN) was used to correlate the CEY of AM seed oil with an acceptable level of accuracy. In this regard, by changing, the number of neurons in the hidden layer and the algorithms, different networks were formed and compared with the evaluation of networks accuracy in CEY. Finally, the ten neurons in the hidden layer with the Levenberg-Marquardt algorithm found to be the most suitable network. The value of mean square error (MSE) ($4.7916*10^{-3}$) and coefficient of determination (R^2 = 0.9785) showed that the ANN model is a better option for predicting the CEY. Furthermore, the fatty acids analysis was done by using gas chromatography (GC) showed that leading fatty acids compositions as (C18:2n6c (39.44%), C18:1n9c (31.08%), C16:0 (17.84%), C18:0 (4.60%), C20:5n3 (1.08%), C16:1 (1.40%), C17:1 (1.32%) and C22:0 (97%) of the oil of AM seeds.

Keywords:

Supercritical fluid extraction
Argemone mexicana (L.) seeds
Artificial neural network
Fatty acids
Optimization