Optimization of ultrasound-assisted extraction of phenolic-saponin content from *Carthamus caeruleus* L. rhizome and predictive model based on support vector regression optimized by dragonfly algorith

Abstract

Box-Behnken design and support vector regression optimized using dragonfly algorithm as chemometrics techniques were employed to optimize and predict total phenolic (TPC) and saponin content (TSC) from *Carthamus caeruleus* L. rhizome using ultrasound-assisted extraction. Moreover, the comparative study of the antioxidant activity of rhizomes and leaves parts was also performed using different assays including scavenging free radical (ABTS·, DPPH·) activity, FRAP, and phosphomolybdenum assays. The results confirmed that the Box-Behnken design was achieved and the optimal conditions for the recovery of maximum TPC and TSC were obtained with 87.66 % methanol concentration, a solvent to solid ratio of 23 mL.g−1, a temperature of 50 °C, and 26 min sonication time. The established SVR-DA model has been successfully predicted the extraction of TPC and TSC from *C. caeruleus* L. rhizome with a higher R^2 = 0.99 and low error. Matlab graphical user interface of optimized SVR-DA model was developed to predict TPC and TSC that could be used in pharmaceutical purposes. Furthermore, the optimal extract of rhizome and leaves extract showed high capacity of antioxidants, thus the *C. caeruleus* L. can be a promising candidate for the cosmetic and pharmaceutical industry.