OPTIMIZATION OF EXTRACTION CONDITIONS FOR PHENOLIC ANTIOXIDANTS FROM STAR FRUIT (*AVERRHOA CARAMBOLA*. L) RESIDUES

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ABSTRACT

Star fruit (*Averrhoa carambola* L.) residues are important by-product during juice processing, which is rich in potentially health-promoting phenolic antioxidants. This study was conducted to optimize the extraction conditions on total phenolic contents (TPC) and total antioxidant capacities of star fruit residues using response surface methodology (RSM). A five-level, three-factor central composite rotatable design (CCRD) was employed to investigate the effects of three independent variables including solvent concentration (40-80%), extraction temperature (25-55°C), and extraction time (90-270 mins) on the responses, that were TPC, 2-2-diphenyl-1-picryhydrazyl (DPPH) free radical scavenging capacity and ferric ion reducing power. The independent variables were coded at three levels and their natural values chosen according to preliminary experimental results. In single factor experiments, 60% acetone, 180 mins extraction time, and 40°C extraction temperature were set as middle points due to their greatest TPC value, which were 2366.71, 2436.03, and 2510.95 mg GAE/100 g dry weight (DW) of star fruit residues, accordingly. The CCRD comprised 20 experimental points with six replications at the center point. Data were analyzed using Design Expert (Version 6.0.10, Stat-Ease Inc., Minneapolis) statistical software. A second-order polynomial model was applied for predicting the response. The result suggested that the acetone concentration was statistically the most significant factor ($p<0.05$) and the optimal extraction conditions obtained were: acetone concentration, 65.34%; extraction temperature, 43.18°C; and extraction time, 233.51 mins. Under the above-mentioned conditions, the experimental TPC was 965.65 ± 30.87 mg GAE/ 100g DW; % DPPH scavenging effect was 88.55 ± 0.65%; and reducing power was 1443.16 ± 22.05 mg GAE/ 100g DW; which are well matched with those predicted, that are 965.52 mg GAE/ 100g DW, 89.88%, and 1507.10 mg GAE/ 100 g DW correspondingly, demonstrating the appropriateness of the model adopted and the success of RSM in optimizing the extraction conditions.