Optimization of enzymatic hydrolysis of palm kernel cake protein (PKCP) for producing hydrolysates with antiradical capacity

ABSTRACT

The enzymatic hydrolysis of palm kernel cake protein (PKCP) with trypsin to obtain PKCP hydrolysates (PKCPH) was optimized using response surface methodology (RSM). A central composite design (CCD) was used to study the influence of four independent variables, namely pH, hydrolysis temperature (°C), substrate concentration (w/v) and enzyme/substrate (w/w) ratio on the degree of hydrolysis (DH%). The hydrolysis was carried out using different combinations of four hydrolytic parameters at five levels for 6h. The CCD consisted of 24 experimental points and six replicates of the central points. The data were analyzed using Design-Expert Software. The results showed that all of the variables evaluated significantly influenced the DH% in a second polynomial model, and different combinations of parameters were generated to obtain three different levels of DH (30%, 40% and 50%), namely PKCPH 30, PKCPH 40 and PKCPH 50. The PKCPH with different DH% showed significantly different antiradical properties ($p<0.05$). The PKCPH 50 preparation had the lowest EC 50 value for DPPH radical scavenging capacity (0.14mg/ml). In the ABTS + radical scavenging capacity and PCL-ACW (photo chemiluminescence-antiradical capacity of water soluble substances) assays, PKCPH 50 showed the highest Trolox equivalent antioxidant capacity value (326.67±5.77µmol TEAC/g) and ascorbic acid equivalent value (11.43±0.03µg AAE/mg) of the preparations tested. Moreover, the protein hydrolysates also exhibited a notable reducing effect in a dose-dependent manner. Optimum conditions for enzymatic hydrolysis of PKCP were established in this study to produce an antiradical agent.

Keyword: Antioxidant; Antiradical; Hydrolysate; Optimization; PKCP (palm kernel cake protein); Trypsin