Optimisation of extrusion for enhancing the nutritive value of palm kernel cake using response surface methodology

ABSTRACT

The palm kernel cake (PKC) inclusion level in poultry diets is limited by the high indigestible polysaccharides content. Hence, PKC was subjected to an extrusion treatment to reduce the content of these components. The effects of extrusion on the total non-starch polysaccharides (T-NSP), fibre, monosaccharides, and mannooligosaccharides contents were evaluated according to the response surface methodology (RSM) with various temperatures, screw speeds, hopper speeds, and moisture contents. The optimum conditions observed according to the RSM were a temperature of 178 °C, screw speed of 100 rpm, hopper speed of 5 Hz, and moisture content of 75%. The T-NSP content was significantly reduced ($p<0.05$), from $63.3 \pm 1.85\%$ to $57.6 \pm 0.89\%$, and the crude fibre content decreased ($p<0.05$) from $16.7 \pm 0.68\%$ to $13.5 \pm 0.99\%$. The mannose, glucose, and fructose contents of the PKC increased ($p<0.05$) 2.9-, 1.9-, and 1.4-fold, respectively. The 1,4- -D-mannobiose, 1,4- -D-mannotriose, 1,4- -D-mannotetraose, and 1,4- -D-mannopentaose increased ($p<0.05$) 3.7-, 3.8-, 3.5-, and 32.8-fold, respectively. This study showed that extrusion enhanced the nutritive value of PKC.

Keyword: Palm kernel cake; Twin-screw extrusion; Response surface methodology; Non-starch polysaccharides; Sugars