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Performance of *Aspergillus oryzae* fermented soybean meal in processing and expansion of extruded dog foods

Youhan Chen[1], Sajid Alavi[1], C. G. Aldrich[1]

[1]Department of Grain Science and Industry, Kansas State University, Manhattan, Kansas, USA

Abstract details:

Fermentation of soybean meal by *Aspergillus oryzae* promotes its utilization in the pet food industry by improving protein quality. However, the impact of *Aspergillus oryzae* fermented soybean meal on the extrusion process compared to different soybean products has yet to be investigated.

The objective of this study was to compare the performances of fermented soybean meal on processing parameters of extruded pet food and kibble characteristics compared to other soybean products commonly utilized in the pet food industry. Four maintenance dog diets were formulated with different soybean meal products aiming to achieve similar crude protein content: SBM, 30% soybean meal; AMF, 30% soybean meal + 1% dried *Aspergillus oryzae* wheat bran fermentation product where the latter served to differentiate the effects of having *Aspergillus oryzae* in the mix on processing conditions; FSBM, 30% *Aspergillus oryzae* fermented soybean meal; and SPI, 18% soy protein isolate. All diets were produced on a single-screw extruder with processing data and samples collected every 30 minutes during production. Results were analyzed by one-way ANOVA and treatment means were separated by Tukey's post hoc test using SAS. Feed rate and extruder water flow rate were not different among treatments. However, extruder shaft speed was lower (P<0.001) for SPI (342 rpm) than SBM, AMF and FSBM (636rpm, 637 rpm and 636 rpm, respectively). Motor power and die temperature were increased (P<0.001) for FSBM and SPI (10.57 kW,117.0℃ and 10.03 kW, 117.33 ℃ respectively) than for SBM and AMF (5.9 kW,100.3 ℃ and 7.57 kW, 104.67 ℃, respectively). The FSBM required the lowest (P<0.001, 28.21%) in-barrel moisture (IBM) content, followed by SPI (33.45%). The specific mechanical energy (SME) for FSBM (207.2 kJ/kg) was similar compared to the other dietary treatments, while SPI required greater (P<0.05) SME compared to SBM (270.2 kJ/kg and 102.43 kJ/kg, respectively). A greater (P<0.001) sectional expansion index was observed for SPI kibbles (2.55) compared to FSBM (1.80), SBM (1.30) and AMF kibbles (1.31). Specific length was the lowest (P<0.001) in SPI (24.26 mm/g) and was not different between AMF (28.60 mm/g) and FSBM (29.19 mm/g). Piece density was different among all diets (P<0.001; SBM,0.74 g/cm^3; AMF, 0.68 g/cm^3; FSBM, 0.49 g/cm^3; SPI, 0.41 g/cm^3). Wet bulk density was greater (P<0.001 for SBM, 520.73 kg/m^3) compared to FSBM and SPI (419.00 and 348.33 kg/m^3, respectively), while that for AMF was only higher than SPI (P<0.001, 484.00 kg/m^3 and 348.33 kg/m^3, respectively).

Replacing soybean meal with *Aspergillus oryzae* fermented SBM at 30% in an extruded dog diet improved expansion, required lower water input and induced higher energy input.

Biography:

Youhan Chen is from Hunan Province, China, and has both a Bachelor of Science degree and a Master of Science degree in Veterinary Medicine from China Agricultural University. She began working on her Ph.D. at Kansas State University in 2021 and expects to graduate in November 2024. Her current research focuses on the evaluation of fermented soybean proteins as pet food ingredients.