

# Nutrient digestibility of mash, steam pelleted, and extruded barley and faba bean in growing pigs

U.S. Ruiz<sup>1,2</sup>, G. C. Luna<sup>1,3</sup>, L.F. Wang<sup>1</sup>, E. Beltranena<sup>1,4</sup>, R. T. Zijlstra<sup>1,5</sup>

<sup>1</sup>University of Alberta, Edmonton, AB, Canada, <sup>2</sup>University of São Paulo, Piracicaba, SP, Brazil <sup>3</sup>Universidad Autónoma de Baja California, Mexicali, Mexico, <sup>4</sup>Alberta Agriculture and Forestry, Edmonton, AB, Canada. <sup>5</sup>Email: ruurd.zijlstra@ualberta.ca

The objective of the present study was to evaluate the nutritional quality of barley and faba bean in mash, steam pelleted, and extruded forms in a 2 × 3 factorial arrangement in growing pigs. The apparent ileal digestibility (AID) of gross energy (GE), starch, crude protein (CP), and amino acid (AA), the standardized ileal digestibility (SID) of AA and CP, and the apparent total tract digestibility (ATTD) of GE were measured in a 7 × 7 Latin square. The 2 feedstuffs were prepared in forms of mash (2.8-mm hammer mill screen), steam pelleted (California Pellet Mill, Crawfordsville, IN), or extruded (X115, Wenger, Sabetha, KS). Seven crossbred ileal-cannulated barrows (54.3 ± 3.9 kg) were fed diets containing 96.5% of each of the 2 test feedstuffs in 3 forms and a N-free diet. Pigs were fed at 2.8 × maintenance energy (110 kcal of digestible energy (DE) per kg of body weight<sup>0.75</sup>) for seven 9-day periods (sequentially 5 day adaptation and 2 day collections of feces and digesta). Data were analyzed using the mixed procedure in SAS. The 3 faba bean and 3 barley samples contained (dry matter basis) 28.2–29.7% and 12.0–12.3% CP, 8.62–9.90% and 4.66–5.73% acid detergent fiber, and 4.37–4.39 Mcal/kg and 4.44–4.46 Mcal/kg GE, respectively. Feedstuffs and processing interacted on AID and SID of AA, AID of starch, ATTD of GE, DE and predicted net energy (NE) value. Steam-pelleting of faba bean increased the AID of CP, Ile, Leu, Met, Val, and starch by 3–12%, the SID of these AA and Phe by 3–9%, and the predicted NE value by 4%, and tended to increase the AID of GE, compared to mash. Extrusion of faba bean increased the AID of Ile, Leu, Met, Phe, Thr, Val and starch by 3–10%, and the SID of these AA by 3–9%, and tended to increase the AID of GE, compared to mash. Steam-pelleting of barley increased the ATTD of GE by 2.0%, DE and predicted NE value compared to mash. Extrusion of barley increased the ATTD of GE by 2.4%, DE and predicted NE value compared to mash. The greater efficacy of heat processing for faba bean than barley indicates that the protein and starch matrix in faba bean is more resistant to digestion than that in barley.

**Implications:** Steam pelleting and extrusion are processing technologies capable to enhance nutritional quality of faba bean and barley by increasing digestibility of amino acid and energy of faba bean, and digestibility of energy of barley in growing pigs.