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"Development on the margin"

Heat Treatment of Tropical Multipurpose Legume Grains Affects *in-vitro* Digestion and Fermentation in Pigs

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Abstract

Tropical multipurpose legumes are interesting protein sources in pig nutrition. However, the digestion of the nutrients of some of them in raw form is often poor. Thus, an *in-vitro* study was conducted to test the effect of thermal treatment (raw, boiling and autoclaving for 5 or 20 min [B5, B20, A5 and A20 respectively]) on *Canavalia brasiliensis* (CB), *Lablab purpureus* (LP) and *Vigna unguiculata* (white WVU, pink PVU, red RVU) grains (factorial design 5 legumes × 5 thermal treatments). An *in vitro* enzymatic digestion of dry matter, protein and starch was determined after pepsin (120 min) and pancreatin (240 min) digestion. Finally, the undigested residue of the in-vitro digestion was fermented with a faecal inoculum for 72 h and gas and volatile fatty acids (VFA) production measured. Protein digestibility of raw ingredients ranged from 42 (PVU) to 54 % (WVU). In general, this digestibility as well as dry matter, and starch digestibilities increased after the thermal treatment. However, they were significantly influenced by a "legume type × thermal treatment" interaction ($p < 0.001$). The highest increases on protein digestibility were observed for PVU after A20 (+ 23 %) and B20 (+16 %) and the lowest for WVU after B20 (+2 %) and A20 (+ 6 %). Gas production was also significantly influenced by "legume type × thermal treatment" interaction ($p < 0.05$). The undigested residue of raw material produced between 362 (CB) to 471 (WVU) ml of gas per g DM incubated. Gas production increased or decreased depending on the legume and thermal treatment (*e.g.* +49, +33, -53 and -12 ml of gas/g DM incubated for LP, PVU, WVU and CB after A20). The concentration of VFA was only influenced by the legume type ($p < 0.05$), with CB presenting the lowest values when compared to the other grains (*e.g.* total VFA 49 vs. 60 mmol l^{-1}). In conclusion, thermal treatment affected differently the *in-vitro* foregut digestibilities as well as the hindgut gas production ith each legume. Therefore, the thermal treatment required for improving the foregut digestion or the hindgut fermentation will change depending on the tropical legume used for feeding the pigs.

Keywords: *In-vitro* digestibility, *in-vitro* fermentation, pigs, thermal treatment, tropical legume grains

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