

Effect of lupin oligosaccharides on energy digestion in growing pigs

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In Australia, *Lupinus angustifolius* and *L. albus* are the predominant lupin species available for use in commercial pig diets. Inclusion of *L. albus* in pig diets at levels above 15% results in a significant reduction in feed intake and subsequent growth rates, a phenomenon not observed with *L. angustifolius*. Oligosaccharides have been implicated in the poor performance of pigs fed diets containing *L. albus* due to their comparatively high levels and their indigestible nature in the small intestine. The aim of this experiment was to use ethanol extraction to reduce the levels of oligosaccharides in *L. angustifolius* and *L. albus* and to examine the subsequent digestion of energy in the small intestine and whole digestive tract of pigs fed diets containing these lupins.

Dehulled *L. angustifolius* and *L. albus* were hammer-milled and subjected to an ethanol extraction (1) to remove oligosaccharides. Four sorghum-based diets were formulated to contain 350 g/kg of extracted or unextracted lupin meal, respectively. The ileal and faecal digestibilities of energy were determined using four male pigs (35-40 kg) fitted with simple T-piece ileal cannulas. Diet allocations were based on a 4x4 latin square design. Diets were fed for seven days prior to two 8 h digesta collection periods. Faeces were subsampled during the digesta collection periods.

Treatment.....	Dehulled <i>L. angustifolius</i>		Dehulled <i>L. albus</i>		Statistics	
	Nil	Extracted ¹	Nil	Extracted ¹	Diet	SEM
Oligosaccharides (g/kg DM) ²	40.5	11.1	63.2	20.4	-	-
Gross energy (MJ/kg)	18.73	18.75	17.33	17.34	-	-
Energy digestibility (ileum)	0.63 ^a	0.67 ^a	0.68 ^b	0.76 ^c	*	0.017
Energy digestibility (faeces)	0.85 ^a	0.87 ^b	0.87 ^b	0.90 ^c	**	0.005
Diet DE (MJ/kg DM)	13.1 ^a	13.6 ^b	14.1 ^c	14.8 ^d	***	0.077

Values within a row with different superscripts differ; * = P<0.05; ** = P<0.01; *** = P<0.001;

DM= dry matter; DE= digestible energy; SEM= standard error of the mean; ¹Modified ethanol extraction (1)

²Sum of raffinose, stachyose and verbascose

The ethanol extraction removed 73% and 67% of the oligosaccharides from *L. angustifolius* and *L. albus*, respectively, but did not change the gross energy content. Ethanol extraction did not influence the ileal energy digestibility of diets containing *L. angustifolius*, but improved the ileal (P<0.05) and faecal (P<0.01) energy digestibility of diets containing *L. albus* and the faecal energy digestibility (P<0.01) of those containing *L. angustifolius*. Ethanol extraction improved the DE of diets containing *L. angustifolius* and *L. albus* by 0.5 and 0.7 MJ/kg, respectively.

Assuming ethanol extraction did not affect other nutrients, it appears that oligosaccharides in *L. angustifolius* and *L. albus* significantly depress the digestion of other dietary energy components in the small intestine to a far greater extent than in the large intestine. As a consequence, extraction of oligosaccharides will increase dietary net energy even more than dietary DE.

1. Coon CN, Leske KL, Akavanichan O, Cheng TK. Effect of oligosaccharide-free soybean meal on the true metabolisable energy and fiber digestion in adult roosters. Poultry Science 1990;69:787-93.