Influence of soluble and insoluble dietary fibre on growth, organ weights and blood lipid metabolites in weaner pigs

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Non–starch polysaccharides (NSP) are important in monogastric nutrition because of their effects on digestion, feed intake, organ size and blood lipid metabolites. This study investigated the effects of soluble and insoluble NSPs in young pigs. Gelling (β–glucan) and non–viscous (arabinoxylan) soluble NSP were compared.

Twenty five 6–week old piglets, selected from five litters, were used. Five piglets, one from each litter, were randomly allocated to each of five experimental diets based on wheat starch, sugar and casein; coconut oil was included for its hypercholesterolaemic effect. Diet I contained 7.5% cellulose (100% insoluble NSP); Diet II, 3.5% cellulose and 4.0% of purified maize arabinoxylan (50% soluble and 50% insoluble NSP); Diet III, 7.5% arabinoxylan (100% soluble NSP); Diet IV, 3.5% cellulose and 4.0% of a barley β–glucan extract (Glucagel^{TM}, 50% soluble and 50% insoluble NSP); and Diet V, 7.5% β–glucan (100% soluble NSP). The pigs were fed the experimental diets twice daily for 21 d; the amount offered was 600 g/d at the start, and then increased every 4 d by 50 g. The animals were housed in individual cages under heat lamps, with access to fresh water at all times. Blood samples were collected from anaesthetised pigs (fasted overnight), at the start of the experiment (day 1) and at the end (day 21). Feed refusals were recorded daily and live weights weekly. On day 21, the piglets were euthanased and organ weights and gut fill were recorded. Blood samples were analysed for total cholesterol, triglycerides, high density lipoprotein (HDL) and low density lipoprotein (LDL). Linear models with diet and litter of origin as fixed effects were fitted to the data.

Organ weights (heart, liver minus gall bladder, lungs, kidneys, spleen, small intestine, large intestine, caecum, colon) adjusted for empty body weight were not affected by the type of NSP in the diet nor were the increases with time in blood cholesterol, HDL and LDL.

Piglets fed Diets III and V (100% soluble NSP) grew faster and had better feed conversion ratios (FCR) than those fed diets containing insoluble NSP (Diets I, II and IV; Table 1). Gut fill expressed as a percentage of liveweight was highest for piglets fed 7.5% β–glucan (Diet V). Our results shows that the type of NSP (soluble vs insoluble) influenced growth rate, feed conversion ratio and gut fill, but had no effect on organ size or blood lipid parameters over the 3–week trial period. The better performances may be explained by a higher digestibility of soluble NSP and the positive effects of β–glucan on gut health in young pigs (Decuypere *et al.* 1998).

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Decuypere J.A., Dierick N.A. and Boddez S. (1998). The potential for immuno–stimulatory substances (β 1/3, 1/6 glucans) in pig nutrition. *Journal of Animal and Feed Sciences* 7, 259–265.

Table 1 Influence of dietary fibre type on feed intake and growth by weaner pigs.

	Diet I	Diet II	Diet III	Diet IV	Diet V			
Cellulose (%)	7.5	3.5	0	3.5	0			
Arabinoxylan (%)	0	4.5	7.5	0	0			
Betaglucan (%)	0	0	0	4.0	7.5	RSD	Litter	Diet
LW at start (kg)	14.6	14.3	14.6	14.0	14.7	1.15	NS	NS
ADG (g/d)	177^{a}	186^{a}	238^{ab}	186^{a}	269^{b}	41.1	*	*
FI (g/d)	536	543	587	549	580	52.8	NS	NS
FCR	3.13^{a}	3.01^{a}	2.60^{ab}	2.98^{a}	2.20^{b}	0.39	+	*
Gut fill (% LW)	2.89^{a}	3.87^{ab}	3.29^{a}	2.78^{a}	5.22^{b}	1.16	NS	*

NS, $P>0.1$; + $P<0.1$; *$P<0.05$