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The effects of dietary non-starch polysaccharides and resistant starch on weaner pig performance and digestive tract development

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The significance to health and intestinal development of non-starch polysaccharides (NSP) and resistant starch (RS) in the diet of the weaner pig is presently unclear, although there have been suggestions that certain levels of dietary NSP would be beneficial (1). This study investigated the influence of NSP derived from lupin (*L. angustifolius*) and RS on the performance and digestive physiology of piglets in the first 10 days after weaning.

Piglets (n=24) weaned at 21 days of age were housed in individual pens and randomly allocated to one of four diets (six pigs per diet) fed ad libitum. The reference diet (R) was hydrolysed rice fortified with an animal protein supplement (fishmeal, bonemeal, meatmeal, bloodmeal). In the remaining diets some rice was substituted with either a high amylose maize starch, Hi-Maize™, at 22% of the diet by weight (RS diet), a NSP isolate derived from lupin (31% of L diet) or both Hi-Maize™ (14% of diet) and the lupin isolate (20%; RS+L diet). The lupin NSP isolate contained insoluble NSP (34%) and soluble NSP (7%). Pigs were fed for 10 days after weaning and individual food intakes were measured. Body weights were recorded at weaning and 10 days later at post mortem, when indicators of intestinal development were obtained.

	R ¹	RS ¹	L ¹	RS+L ¹	P value
Growth rate (g/day)	89.3 ± 15.6 ^a	73.1 ± 21.3 ^a	4.6 ± 14.8 ^b	59.7 ± 25.1 ^{ab}	0.03
Full colon (g)	124.7 ± 13.5 ^a	188 ± 5.5 ^{ac}	219.9 ± 13.5 ^{bc}	235.5 ± 40.9 ^{bc}	0.01
pH colonic contents	6.65 ± 0.1 ^a	5.84 ± 0.1 ^b	5.67 ± 0.2 ^b	5.51 ± 0.1 ^b	0.0001
Carcass growth ² (g/day)	17.1 ± 9.0 ^a	11.8 ± 22.5 ^{ac}	-59.6 ± 7.6 ^b	-10.1 ± 16.7 ^{ac}	0.007

¹mean ± sem ²carcass = liveweight - weight of full gastrointestinal tract (including digesta)

^{a, b, c} means on same row without common superscripts are significantly different

The addition of either RS or lupin NSP increased the rate of fermentation in the large intestine of piglets, as shown by a decreased pH of the digesta (for both treatments) and an increased size of the large intestine (lupin NSP only). Diets resulting in the lowest rates of fermentation also produced the greatest rates of growth, and these pigs had the greatest average daily food intake (P<0.05) and driest faeces (P<0.01) (data not shown). From the carcass growth rate, it appeared that the diets promoting growth of the intestinal tissue did so at the expense of carcass growth. In conclusion, it is clear that the type and level of NSP can have a significant impact on piglet growth and intestinal development in the post-weaning period.

1. Bolduan G, Jung H, Schnabel E and Schneider R. Recent advances in the nutrition of weaner piglets. Pig News and Information 1988; 9:381-385.