

Type of rice fed to pigs after weaning influences apparent digestibility of starch at the ileum but not in the rectum

J.R. Pluske*, L. Montagne**, F.S. Cavaney*, B.P. Mullan***, D.W. Pethick* and D.J. Hampson*

*Murdoch University, Murdoch, WA 6150. **UMRVP, INRA, Rennes, 35042 France. ***Department of Agriculture, South Perth, WA 6151.

Cooked rice is being used commercially in some countries as an alternative cereal to wheat and (or) maize, particularly where dietary growth-promoting antibiotics are no longer permissible (Mateos *et al.*, 2001; Vicente *et al.*, 2004). Many varieties of rice are grown and, as expected, they differ in chemical characteristics such as the amylose: amylopectin ratio and resistant starch (RS) levels. The hypothesis tested in this study was that rice types having a lower amylose:amylopectin and (or) lower RS levels would have a higher apparent digestibility of starch when measured at the ileum but any differences would disappear when ascertained in the distal large intestine.

Forty-eight male pigs aged 19-24 days and weighing 6.7 ± 0.24 kg (mean \pm SE) were used in a completely randomised block design having four experimental treatments, with 12 pigs allocated to each. Three rice-based diets differed only in the type of cooked rice fed, which were (i) medium-grain (cv. Amaro; AM), (ii) long-grain (cv. Doongara; DOON) and (iii) waxy (WAXY). All diets were fortified with a supplement consisting predominately of animal protein sources. A fourth diet comprised a weaner diet based on wheat, barley and lupins (WBL). All diets contained titanium dioxide (TiO₂) as an indigestible marker. Each rice type was cooked in an autoclave at 121°C for 20 minutes using a ratio of 2:1 water:dry rice and was left to cool overnight in a cool room (4°C) before feeding the following day. Diet WBL was fed as a meal. Pigs were fed the experimental diets on an *ad libitum* basis for 14 days, at which time they were euthanased for sample collection. Diets and digesta were measured for starch (Megazyme Total Starch Kit), dry matter and TiO₂ using established procedures. The ANOVA analysis of Statview 5.0 for Windows (SAS Inc.) was used for statistical analysis.

Table 1. Apparent digestibility of starch in the digesta of pigs fed different diets after weaning.

	Diet				s.e.ds ²	P=
	AM ¹	DOON	WAXY	WBL		
Starch digestibility (%)						
Ileum	96.2 ^a	88.6 ^b	99.1 ^a	88.5 ^b	5.78	0.004
Rectum	99.8 ^a	99.8 ^a	99.9 ^a	97.6 ^b	0.55	<0.001

¹Refer to text for details of diets.

²SED: standard error of difference between treatment means.

^{a,b}Means in the same row lacking a common superscript are significantly different (P<0.05).

The amylose contents of rice types AM, DOON and WAXY were 182, 238 and 61 g/kg and the RS contents (after cooking) were 0.6, 1.42 and 0.75 g/kg dry matter, respectively. Rice types AM and WAXY having the lowest amylose to amylopectin ratio showed superior (P=0.004) digestibility of starch at the terminal ileum than the long-grain rice DOON and the commercial diet (WBL). Differences in apparent starch digestibility between rice types disappeared in the rectum, although pigs fed diet WBL showed a lower digestibility (average of 99.8% versus 97.6%, P<0.001). Starch digestibility in the ileum between rice types depended on the amylose to amylopectin ratio and the amount of RS but microbial fermentation in the hindgut caused total disappearance of rice starch. Digestibility of starch in pigs fed WBL was incomplete in the rectum, reflecting differences in ingredient composition and physical and chemical properties between diets.

Supported by the Rice Sub-Program of the Rural Industries Research and Development Corporation.

References

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