Performance of pigs post-weaning fed cereal-based diets with an enzyme complex added either before or after pelleting

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Introduction The responses of pigs to diets supplemented with enzymes have been variable (review by Partridge, 2000). The situation has not been eased due to an uncertainty over the usefulness of laboratory analyses of enzyme activity as a measure of performance. One issue has been the temperature of feed pelleting in which laboratory assays for apparent enzyme activity have shown very low levels compared with the known level included in the feed, whereas experimental data have indicated typical poultry responses from the enzyme-supplemented feed (Bedford and Pack, 1998). The experiment reported here studied the performance of pigs fed diets to which enzymes were added either pre- or post- pelleting (which was conducted at 85^0 C).

Materials and Methods Thirty, individually penned, commercial hybrid male and female pigs were used, with 10 pen replicates (5 of each sex) per treatment. The pigs were weaned at around 26 days of age; the trial started after a 4 day adjustment period (9 kg live weight) and was completed after each pig reached 27.5 kg live weight (or 42 days on trial). Pigs were allocated to 1 of 3 diets: either 1) control treatment – cereal based diets; 2) control treatment with 1 kg of a dry enzyme complex containing xylanase, β-glucanase and α-amylase having minimum guaranteed activities of 4000, 150 and 1000 U/g respectively (Porzyme® tp100G) added pre-pelleting; 3) control treatment with 1 kg Porzyme® tp100G added post-pelleting. All three treatments were offered *ad libitum* as a two phase feeding regime. Phase 1 was offered for the first 21 days and phase 2 from day 21 to completion. The diets were multi-ingredient (mainly wheat, barley, cooked wheat and soyabean meal) and contained 14.3 and 14.0 MJ/kg DE and 11.4 and 10.5 g/kg digestible lysine (phases 1 and 2 respectively). The ingredients were coarsely ground (4 mm sieve), mixed, pelleted at 85°C and crumbled. Enzyme was added during mixing for treatment 2 (pre-pelleting) and during crumbling for treatment 3 (post-pelleting) by Roslin Nutrition Ltd. Live weight gain was calculated as the linear slope of the response of live weight (recorded weekly in kgs) to time (in days) using GENSTAT 5.3 for Windows. This analysis was initially conducted over the entire duration of the trial. Solving the linear equations for each piglet for a live weight of 7.5 and 27.5kg allowed a precise estimate of the initial and final day on trial. This then allowed, if necessary, an adjustment to recorded food intake to give the actual amount of food required to grow from 7.5 to 27.5kg.

Results Apparent enzyme activity was reduced by 89 and 69% (xylanase), 82 and 60% (β-glucanase) ('Megazyme ') and 41 and 10% (? -amylase) ('Pharmacia') for phases 1 and 2 respectively when comparing laboratory analyses of treatment 2 before and after pelleting. Treatment 3 enzymes, added post-pelleting, were either above or within 10% of minimum guaranteed activity except one α-amylase measurement which was low. Treatments 2 and 3 were better than treatment 1 (control) for daily live-weight gain and food conversion ratio (at least $P < 0.01$, table 1). Pigs on treatment 1 consumed significantly ($P < 0.001$) more food than those on treatments 2 and 3 overall, but total food intake per pig on treatment 1 was lower for the first 21 days (12.2, 14.3 14.6, sed 0.92, kg; $P < 0.05$) compared with the enzyme-supplemented treatments 2 and 3 respectively. Daily live-weight gain and food conversion ratio were also worse ($P < 0.001$) over the first 21 days for the control treatment 1, after which no differences in the treatment responses were observed.

Table 1 Effect of treatment on performance of post-weaning pigs over the complete experimental period

Treatment	Control (1)	Enzyme added pre-pelleting (2)	Enzyme added post-pelleting (3)	s.e.d.	P value
Daily live-weight gain (kg)	0.510^a	0.582^b	0.585^b	0.022	0.003
Food conversion ratio	1.78^a	1.56^b	1.48^b	0.142	<0.001
Total food intake/pig (kg)	35.6^a	31.1^b	29.6^b	1.38	<0.001

Means in rows with different superscripts are statistically significantly different ($P< 0.05$).

Conclusions The main responses of pigs to supplementation with the enzyme complex Porzyme® tp100G occurred during the first 21 days after weaning for both pre- and post- pelleting treatments and the differences were maintained throughout the entire experimental period. The results indicated that laboratory measurements of enzyme recovery were not related to assessments of enzyme activity as measured by pig performance, and that piglets responded similarly to supplementary dietary enzymes whether added to feeds pre- or post- pelleting (85°C pelleting). It has been postulated that this might be due to enzyme activity during the conditioning process (Silversides and Bedford, 1999).

References

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