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Enzymes can be used effectively in swine diets!

Average weight gain and feed:gain improved 7.4% and 6.1% respectively, when an enzyme was added to existing grower and finisher diets in 15 regional trials.

by TAN MIN YONG*

Enzymes which target the fibre components in feeds are now routinely added to broilers and layers fed on diets containing wheat or barley. However the acceptance of enzymes in swine diets, and especially for the grower and finisher periods and in corn-based feeds has been much slower. This is due to the perception that fibre in such diets is present at low levels and has no negative effects on the animal. Yet new research conducted largely in Asian countries suggest there is a role for such enzymes, and they can be cost effectively formulated into many diets. This is particularly so when corn, sorghum or broken rice are the grains used, and where grain by-products such as rice bran and wheat bran/pollard are available.

Table 1: Fibre composition of several ingredients.

%, as is	Corn	Rice bran	Wheat bran	Wheat Pollard
Crude fibre	2.5	9	11	8
Total fibre	10	20	40	29
Beta glucans	_	_	1.8	1.9
Arabinoxylans	4.4	10	20	14
Cellulose	2.0	6	11	8
Lignin	0.5	4.5	5.8	3.5

Why the need for enzymes?

In diets composed largely of grains such as corn, sorghum or broken rice, some grain by-products such as rice bran or wheat bran/pollard, and soybean meal, the amounts of fibre (non starch polysaccharides or NSP'S) are quite considerable.
This fact is not fully appreciated by many nutritionists, because when assayed as crude fibre, these NSP's are vastly underestimated. As a general rule, the total fibre in such ingredients is more than three times the amounts indicated by a crude fibre measurement.
For example, corn contains 2.5% crude fibre, but actually contains 10% total fibre. Similarly rice bran would show 9% as crude fibre, but in reality contains 20% total fibre. Table 1 illustrates this point with several commonly used ingredients.
Not only are there large amounts of total fibre, but the location of fibre within the cell walls creates a 'box' effect. This creates a barrier to the pigs' own enzymes ability to fully digest the starch and protein within the cells. The negative effects of this fibre on digestibility of energy and protein have been clearly demonstrated in past research, and lead to depression in animal performance. Examples of the negative effects of fibre are shown in Tables 2 and 3, when wheat pollard was added to corn-soybean meal diet. Enzymes which target this fibre, allowing for partial

breakdown, are able to reverse some of the negative effects of fibre on digestibility, leading to increased available nutrients from the feed. The pig can then utilise these extra nutrients for improved performance.

Trial results

Over the past four years numerous trials have been run in research institutes and commercial farms to test this concept, using a commercial high xylanase enzyme product, Porzyme 9300, from Finnfeeds International. In total, 15 such trials have been conducted in Asian countries and Australia. The trials have been designed to test the effect of Porzyme to improve pig performance, by adding over-the-top of an existing diet, or alternatively to prevent losses in performance from use of diets lowered in energy and/or protein/amino acids. The average of 15 trials shows improved weight gains and feed:gain of 7.4% and 6.1% respectively when Porzyme was added to existing grower and finisher diets. An average of nine modified diets trials show no performance losses when feeding energy/amino acids reduced diets containing Porzyme.
An example of one of these trials is shown in Table 2, conducted in the Philippines under the supervision of Professor P. Alcantara, from the University of the Philippines, Los Banos. The control diet was corn-soy-10% wheat pollard. The modified diet contained an additional 10% wheat pollard, and was 4% lower in DE. Note the large improvements in gain (6%) and feed:gain (10%) when Porzyme 9300 was added to the high wheat pollard diet, fully restoring the lost performance.

Table2: Effect of Porzyme 9300 in a high wheat pollard diet.

	Control	Modified Diet (MD)	MD+Porzyme
Initial weight, kg	39.4	39.4	39.4
Final weight, kg	81.2	78.9	81.2
Daily gain, g	696	659	696
Feed intake, kg/d	2.02	2.02	1.92
Feed :gain	2.89[ab]	3.07[b]	2.76[a]

[ab]P<0.05

Table3: Performance effects of Porzyme 9300 in an energy reduced diets.

	Corn-soy control	Corn-soy-wheat pollard	Corn-soy- wheat pollard + Porzyme
Initial weight, kg	41.8	42.1	42.3
Final weight, kg	75.9[a]	70.9[b]	75.8[a]
Daily gain, g	773[a]	692[b]	770[a]
Feed intake, kg/d	1616	1573	1407
Feed :gain	2.04[ab]	2.31[b]	1.86a

[ab]P<0.05

A second trial example is summarised in Table 3. This was conducted by Bunge Meat Industries, Australia.
In this trial, 20% wheat pollard replaced 20% corn, giving a diet which was 6% lower in DE. Porzyme completely compensated for this large energy reduction.
A third example, taken from Vietnam, and supervised by Dr La Van Kinh of the Institute of Agricultural Sciences is shown in Table 4.
The basal diet was corn, broken rice, cassava and 20% rice bran. Porzyme added over the top gave large improvements in weight gain and feed:gain during the grower phase.

Table 4: Porzyme 9300 effects in a rice-based diet.

	Control	+ Porzyme	Improvement
Initial weight, kg	19.19	19.19	
Final weight, kg	49.2[a]	51.9[b]	+2.7kg
Daily gain, g	488[a]	533[b]	+ 9%
Feed intake, kg/d	1.37	1.40	+2%
Feed :gain	2.80[a]	2.62[b]	+7%

[ab]P<0.05

How should enzymes be used?

A close study of the results from these trials provides suggestions on how best to use Porzyme 9300 in grower and finisher diets. Adding Porzyme to standard diets would be expected to result in improvements in weight gain and feed:gain in the range of 5-7%. When fed from 20-90 kg liveweight, this would mean 3.5-5 kg heavier pigs at a given age, plus savings in feed costs.
An alternative approach, often favoured by feed companies, is to reduce the minimum dietary energy and digestible amino acid levels by 4%, and allowing increased levels of grain by-products (rice bran or wheat bran/pollard) to enter the formulations. Porzyme is then added, and animal performance will be maintained. Depending on the relative prices of grains and grain by-products, this method can lead to worthwhile net savings in feed costs.

Conclusions

It is now more clearly recognised that ingredients such as corn, broken rice, grain by-products and soybean meal contain quite high levels of fibre components and that this fibre has negative impacts on feed digestibility and pig performance.
The use of the xylanase based enzyme product Porzyme 9300, which targets this fibre, has the effect of overcoming some of these negative effects, leading to improved nutrient availability. This allows for the options of using the enzyme to improve pig growth and feed:gain or else to use in diets with lowered levels of energy and protein/amino acids to maintain performance with lower net feed costs.

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Key words: Porzyme 9300, swine, pig, wheat pollard, corn, rice bran, xylanase, downspec