



HUVEPHARMA®

Let's Talk About Enzymes...

OptiPhos® outcompetes Axtra® Phy in piglets

In recent years, new phytases have been launched globally claiming increasing levels of improvement of dig. P in pigs compared to the existing ones. OptiPhos®, at 250 OTU/kg, has a proven matrix value of 0.96 g dig. P/kg feed while new competitors like Axtra® Phy are claiming values of 1.1 to 1.2 g dig. P/kg.

In a recent piglet trial conducted at the University of Ghent (Belgium), piglet feeds were reformulated by reducing dig. P by 1.2 g/kg from the positive control. To these feeds OptiPhos® at 250 OTU/kg and Axtra® Phy at 500 FTU/kg were added (of both products the coated version was used).

Results indicated that:

- OptiPhos® added at 250 OTU/kg brought final body weight and feed conversion back to the positive control, so compensating for the 1.2 g/kg reduction in Dig. P. (Figure 1).
- The final body weight of piglets fed Axtra® Phy at 500 FTU/kg was lowest of all treatments, while also the feed conversion was substantially higher (+0.09 and 0.10 versus positive control and OptiPhos®).
- P digestibility was increased from 50.5 % (positive control) to 68.8 % (OptiPhos®) while it only reached 64.1 % for Axtra® Phy.



TABLE 1

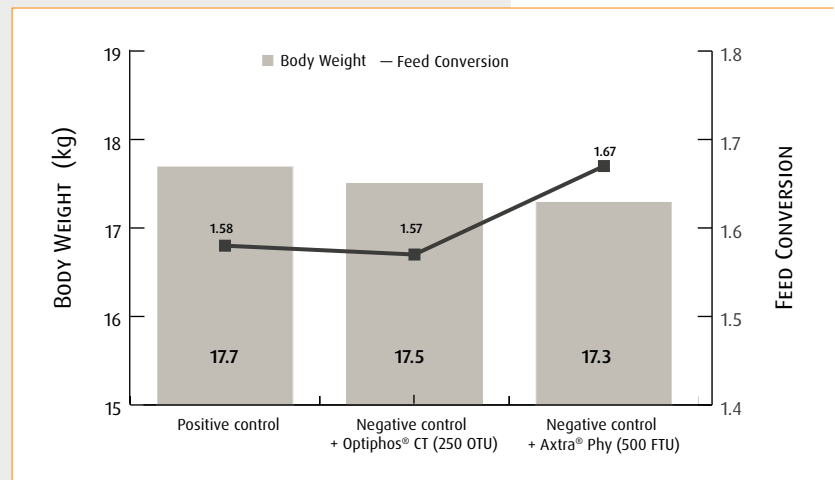
Effect of phytase addition on P digestibility and P in manure (%)

	P dig. (%)	P in manure (g/kg DM)
Control	50.5 ^b	18.0 ^a
Control - 1.2 g dig. P + OptiPhos® CT at 250 OTU/kg	68.8 ^a	8.1 ^b
Control - 1.2 g dig. P + Axtra® Phy at 500 FTU/kg	64.1 ^a	10.1 ^b

^{a,b} values in a column with different superscript is sign diff $P < 0.05^*$

FIGURE 1

Effect of phytase addition on technical performance



- OptiPhos® at 250 OTU/kg could compensate for the reduction of 1.2 g/kg dig. P although only 0.96 g dig. P is claimed with the current matrix value
- On the contrary, although the claimed matrix value of Axtra® Phy at 500 FTU/kg is close to 1.2 g/kg dig. P, it could not compensate for this reduction

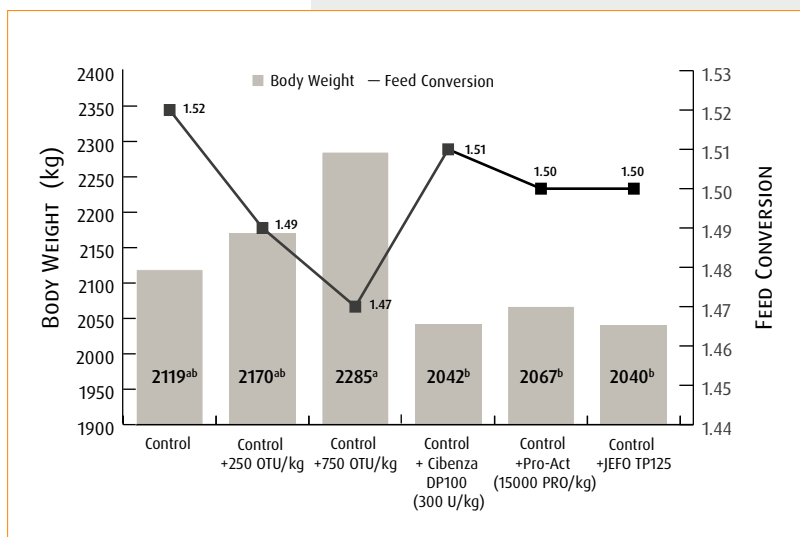
key facts



Superdosing OptiPhos® outperforms proteases in broilers on protein digestion and performance

Phytate is the natural storage form for phosphorus, present in all raw materials of vegetable origin. However phytate also acts as an anti-nutritional factor, binding nutrients like minerals but also proteins. Phytate can also be an irritator of the intestinal wall, leading to increase losses of endogenous protein. Therefore, superdosing of a phytase is intended not only to make more P available to the animal, but also to destroy phytate more completely and eliminate it as an anti-nutritional factor. For broilers for instance, a summary of trials looking at superdosing showed that OptiPhos® at double (2x) and fourfold (4x) inclusion level resulted in 55 and 98 g extra end weight respectively, while feed conversion was reduced by 0.03 and 0.05.

FIGURE 1
Effect on technical performance - control feed contains OptiPhos® CT at 250 OTU/kg



^{a,b} values followed by different letter are sign. different (p < 0.05)

A trial was recently conducted in order to demonstrate the effect of superdosing on performance and to evaluate its improvement of protein digestion. OptiPhos® added at 250 and 750 OTU/kg to a feed already containing OptiPhos® at 250 OTU/kg was hereby compared to the inclusion of different commercial available proteases.

Results of this trial showed:

- a very strong improvement in technical performance by superdosing OptiPhos® while no effect was observed for the proteases.
- an increase in protein digestibility of up to 5 % when superdosing OptiPhos®, while the protease gave limited to no benefit on protein digestion.
- a total dry matter digestibility increase by superdosing OptiPhos® while no such observation was seen when adding proteases.

TABLE 1
Effect on digestibility of dry matter and protein (control feed contains OptiPhos® CT at 250 OTU/kg)

	Dry matter	Protein
Control (already containing 250 OTU/kg)	72.6	74.8
Control + 250 OTU/kg	74.1	80.3
Control + 750 OTU/kg	74.5	78.1
Control + Cibenza DP100 (300 U)	73.2	75.1
Control + Pro-Act (15000 PRO)	72.8	74.4
Control + JEFO TP125	73.4	74.5

key facts

Superdosing OptiPhos® lead to improved technical performance and protein digestion, which was not the case for 3 commercially available proteases

Not all NSPases are the same: animal performance and microflora considerations

Hostazym® X is an enzymatic complex developed for optimal fibre degradation and its mode of action includes the hydrolysis of soluble arabinoxylans, which minimizes the negative impact of increased intestinal viscosity - an increase in intestinal viscosity can reduce the pancreatic enzyme activities and the digestibility of carbohydrates, proteins and fats. Additionally, a slower feed transit can result in an increased proliferation of the gut microflora and poor absorption of nutrients.

Together with the efficient reduction in viscosity, Hostazym® X will hydrolyse insoluble arabinoxylans - this action will unlock nutrients (mainly starch, proteins and lipids) being trapped in the cell walls of the vegetable feed ingredients.

Under this background Huvepharma sponsored a research study to validate if different commercial NSPases show different responses in microbial populations shifts and/or animal performance.

In this study Hostazym® X was compared with 3 different commercial NSPases: a single xylanase product (Econase® XT), a xylanase - glucanase blend (Natugrain®) and an enzymatic complex with xylanase, glucanase and cellulase declared activities (Ronozyme® Multigrain).

Basic trial set-up:

- 8 treatments x 10 replicates x 10 female Ross 308 broilers (from 1 to 42 days for performance indicators and microflora sampling at 28 days)
- Birds fed a wheat, maize, soya based diet (all treatments included phytase)
- Treatments: Control (C), C + test enzyme (Hostazym® X, Econase® XT, Natugrain® and Ronozyme® Multigrain)
- Measurements: standard performance indicators, pH in crop, ileum and caeca contents, ileum and caeca microbial populations

Relevant results are summarized in Table 1.

The results confirm that different enzymes have different effects. Not all tested NSPases showed a significant decrease in caeca pH or showed the same extent of influence in shifting microbial populations. The NSPases with limited influence on caeca pH drop and *Lactobacillus sp.* counts were also the ones with lower zootechnical performance (Ronozyme® Multigrain and Natugrain®).

Hostazym® X showed a significant effect on caeca pH drop and increase of lactic acid producing populations, alongside the good zootechnical performance.

TABLE 1
Comparison of different NSPases on selected microflora counts, caeca pH and zootechnical performance of broilers

	Control (C)	Hostazym® X	Econase® XT	Natugrain®	Ronozyme® Multigrain
BWG, g (42d)	2661 ^b	2655 ^b	2651 ^b	2606 ^a	2610 ^a
FCR	1.56	1.55	1.56	1.57	1.56
Total bacteria count (log cfu/ml)*	9.21 ^a	9.56 ^d	9.49 ^c	9.34 ^b	9.22 ^a
<i>Lactobacillus sp.</i> Count* (log cfu/ml)	8.50 ^a	8.79 ^e	8.69 ^d	8.66 ^c	8.57 ^b
Caeca pH	6.32 ^b	5.93 ^a	5.90 ^a	6.28 ^{ab}	6.22 ^{ab}

*Determined by DAPI staining and fluorescent in situ hybridization (FISH)

key facts

- Hostazym® X influences the composition of the intestinal microflora by supporting the growth and maintenance of a balanced and positive microflora
- Different non-starch polysaccharides degrading enzymes have different effects on animal performance and intestinal microflora

AXOS and Hostazym® X, the link

It is widely accepted that factors like: animal age, diet composition, dietary fibre, feed particle, etc have an impact on microbial populations in the gastro intestinal tract (GIT).

Research work has shown that high performing birds have a different microflora when compared with low performance birds. It was also shown that some NSP degrading enzymes alter the microbial populations at GIT: work done with broilers fed barley or oat base diets as shown that NSP degrading enzymes increase the amount of SCFA produced in the gut.

Hostazym® X mode of action beyond nutrient digestibility

Different enzymes (specifically different xylanases) will hydrolyse arabinoxylan (AX) at different extension generating different degradation products and that the response on SCFA production is substrate and enzyme dependent.

Hostazym® X is able to hydrolyse AX (both soluble and insoluble fractions) and will form AX oligosaccharides (AXOS) and xylan oligosaccharides (XOS), molecules that are recognized for their prebiotic properties. AXOS are associated with health promoting effects, such as increased levels of SCFA and higher concentration of bifidobacteria.

To evaluate the effect of Hostazym® X, on animal performance and GIT microbial populations, two broiler trials were conducted and selected microflora populations and zootechnical performance were measured.

The two trials were set as 42 days grow out experiments using wheat, maize, soya based diets and two treatments (with 10 replicates of 10 birds) – Control group and Hostazym® X at 1500 EPU/kg feed group. Caeca contents pH, caecal selected microbial populations, and standard performance indicators were measured.

Table 1 summarizes both trials results for the measured parameters with significant differences.

In both trials, Hostazym® X treatment, when compared to Control treatment, decreased pH in the caeca and increased total bacteria counts. Alongside Hostazym® X group showed significantly better zootechnical performance.

The pH decrease can be explained by fermentation processes, the AXOS and XOS generated by hydrolysis of fibre components are used by the intestinal microflora to produce SCFA (pH decrease), which can be used as energy source by the bird enhancing its performance and health.

TABLE 1

Summary results of two broiler trials to evaluate efficacy of Hostazym® X on improving animal performance and influence on microflora

	Trial 1		Trial 2	
	Control Group	Hostazym® X Group	Control Group	Hostazym® X Group
BWG, g (42d)	2745	2796	2661	2683
FCR	1.591	1.576	1.564	1.548
Total count (log cfu/ml) - caeca	9.15	9.22	9.21	9.56
<i>Lactobacilli</i> count (log cfu/ml) - caeca	8.42	8.53	8.50	8.79
Caecal content pH	6.37	5.85	6.32	5.93

key facts

- Hostazym® X is able to hydrolyse fibre and generate AXOS and XOS
- AXOS and XOS will be used by intestinal microflora and increase production of SCFA
- Alongside Hostazym® X effect on increasing animal performance will promote positive development of GIT microflora and contribute to a healthier digestive status