HUVEPHARMA®

Let's Talk About Enzymes...

The best method to compare commercial phytase products

Literature with comparisons between phytase products is abundant and special attention is required to interpret or make conclusions out of the published work. Amongst trial work done with different set ups to measure animal performance and phosphorous digestibility and bone ash, it is often found that the activity of the different phytase products is measured in the laboratory before being applied to the trial feed and the dosing into feed is determined by the analytical result.

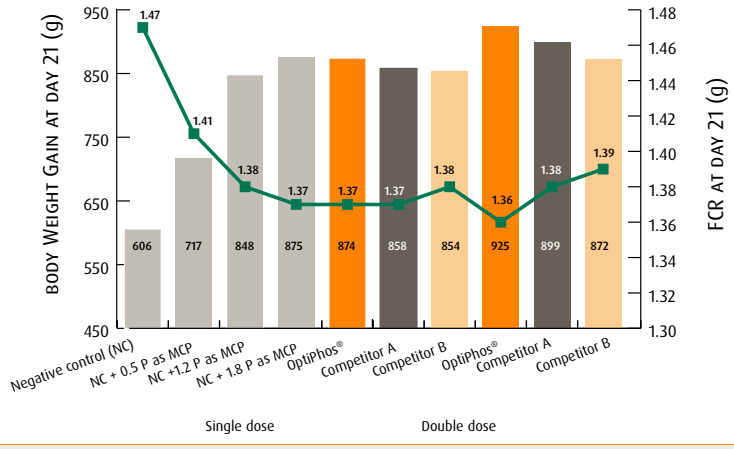
This method introduces bias into the comparison. In the official analytical method for phytase (described by ISO 30024:2009) the analysis pH is set at 5.5 and phytase activity is expressed in FTU per gram of pure phytase product, whereas in the animal digestive tract phytase should do its hydrolysis work at the pH range from 2 to 4.

The main question when comparing phytase products is: "*How much will cost 'x' grams of phytase for a certain release of phosphorous and how it compares between products for equivalent release?*"
The best way to answer the question and eliminate analytical bias is to set up an animal trial in which a feed, not deficient in Phosphorous (= positive control) is reduced in different levels of Phosphorous; for instance 0.6, 1.2 and 1.8 g/kg (= negative controls). To these control feeds, each different phytase product is included using the supplier recommendations single, double or even higher dose can be compared. *(see Figure 1)*

Based on technical performance, bone ash analysis and/or Phosphorous digestibility results, this set up will validate:

1. the Phosphorous matrix value proposed by each phytase supplier
2. how the different phytase products compare on technical and economic performance

FIGURE 1
How to set up phytase trials with the appropriate controls



key facts

- Phytase products should not be compared based on laboratory analysis of FTU at pH 5.5 and dosing it into feed at equivalent g/kg
- The best way to compare phytase products is in an animal performance trial in which phytase is added to a Phosphorous deficient diet at the supplier recommended doses and measure technical and economic performance results

Hostazym® X shows how difficult it may be to advance

Xylanase based enzymatic complexes, are of special interest to optimize animal production as their use will bring an economic advantage via increased zootechnical performance or via lower feed costs (due to the ability of the enzymes to improve metabolisable energy content of the feed).

Different enzymatic products will have different efficiency rates in the hydrolysis steps depending on several factors, such as microbial origin of the enzyme, type of enzyme, substrate selectivity properties, etc. Not all enzymatic complexes work the same and its efficiency needs to be evaluated product by product.

Supporting this evaluation, Huvepharma ran a recent trial where Hostazym® X (high efficiency enzymatic complex) was challenged against the new Adisseo enzymatic complex – Rovabio® Advance. The trial took place in Poland at Warmia and Mazury University.

The trial was set to measure broiler zootechnical performance (from 0 to 35 days) using 44 pens of 11 broilers (Ross 308, male chickens) and 4 different treatments: T1. Positive Control, T2. Negative Control (Positive reduced by 100 kcal and 3% protein), T3. Negative Control + Hostazym® X at 1500 EPU/kg and T4. Negative Control + Rovabio® Advance at 1100 VU xylanase - 760 VU glucanase/kg.

Birds were fed with a maize, wheat, soybean meal, rapeseed meal and sunflower meal based diet, pelleted, in a 3 phase feeding programme. Standard measurements of zootechnical performance : Body Weight gain (BWG), Feed Intake (FI), Feed Conversion Ratio (FCR) and EPEF were calculated.

The results, shown in Figure 1, show that:

- Overall trial performance was good
- Lower FCR and higher body weight registered for Positive Control and Hostazym® X treatment
- Rovabio® Advance had the lowest Body Weight response even when compared with Negative Control
- Hostazym® X results outperformed competitor

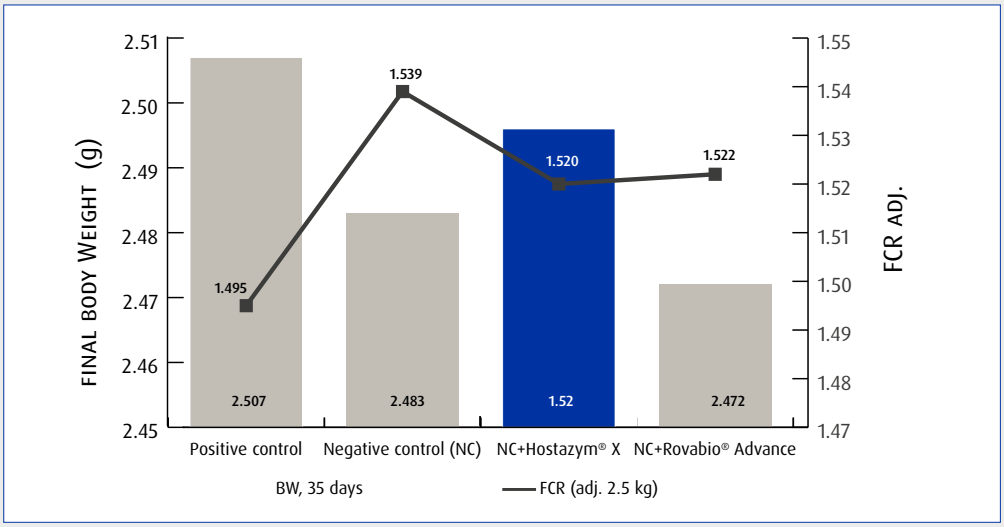


FIGURE 1
Broiler body weight and FCR (adjusted to 2500g) at 35 days

key facts

- Hostazym® X proved to be a superior enzymatic complex and an unique tool to support optimal animal performance
- Once again can be said: "Hostazym® X outperformed competitor!"

HUVEPHARMA
We add performance to your business

Hostazym® X proves again its added value in lactating sows nutrition

Huvepharma continues its work to validate Hostazym® X as an added value tool in sows' nutrition. Improved feed digestibility and an healthier digestive process will support the sow energy metabolism and help to maintain a good physical condition.

A recent digestibility trial conducted at ILVO – Belgium showed that Hostazym® X can significantly improve nutrient digestibility. The trial was set using 18 individually housed sows in farrowing crates. Sows were (equally distributed by parity and body condition to one of the two treatments.

The trial compared a control group fed with barley, wheat, wheat middling, rye, soybean meal and maize based diet with a group fed with the same diet supplemented with 1500 EPU/kg feed of Hostazym® X. The test diets were fed as soon as the sows were moved to the farrowing crates, approximately 7 days before farrowing.

TABLE 1
Effect of Hostazym® X in lactating sows and progeny

Parameter	Control treatment	Hostazym® X treatment
Body weight sow at start, kg	283.7	288.9
Loss of weight sow (from start to weaning), kg	53.3	50.8
Number of piglets at birth	16.3	16.6
Number of dead piglets at birth	3.8	2.8
Piglet weight at weaning, kg	8.1	8.0

The first 3 weeks' feeding were considered an adaptation period. At the fourth week, faecal samples of each sow were collected during four consecutive days. Samples were used for total apparent faecal digestibility of nutrients analysis.Technical performance of the sow and progeny was also measured.
Results, summarized in Table 1 and Table 2, clearly show that:

- There were no statistical significant differences in sows' zootechnical performance. Numerically, the Hostazym® X treatment group had a lower loss of weight per sow (from start to weaning) and the number of born piglets was slightly higher (+0.3 piglets), with lower dead pigs at birth (-1 piglet)
- Hostazym® X addition led to a significant increase in total apparent faecal digestibility of NDF (neutral detergent fibre), hemicellulose and NSP (non-starch polysaccharides) ($P<0.05$)
- Hostazym® X addition improved dry matter and organic matter digestibility ($0.05 < P < 0.10$). Numerical improvement on protein and gross energy digestibility were also registered

TABLE 2
Total apparent faecal digestibility of feed nutrients during lactation (%)

Parameter (%)	Control treatment	Hostazym® X treatment
Dry matter	80.1^{x}	80.8^{y}
Organic matter	83.4^{x}	84.1^{y}
Crude protein	82.4	83.5
Gross energy	81.5	82.1
Crude fibre	39.7	44.0
NDF	49.8^{a}	51.8^{b}
ADF	40.9	39.5
Hemicellulose	56.7^{a}	61.3^{b}
NSP	65.7^{a}	67.2^{b}

a,b: values in the same row with different superscript are sign. diff. $P < 0.05$ x,y: values in the same row with different superscript are sign. diff. $0.05 < P < 0.10$

key facts

Hostazym® X at 1500 EPU/kg:

- **significantly increases the nutrient digestibility of lactating sow's feed, especially hemicellulose and NSPs**
- **supports sow zootechnical performance with better body condition (less weight loss)**

What does “heat stable phytase” mean?

The pelleting process can be extremely aggressive to enzymes, such as phytases. When pelleting temperatures reach 75 to 85 degrees C, phytase can be denatured due to heat.

The survival of a phytase to the pelleting process determines its heat stability. It is commonly accepted that a phytase is heat stable at a certain temperature when at least 80 % of the original phytase activity is recovered after pelleting.

To overcome heat sensitivity, commercially available phytase products are coated using fat coating techniques (as in OptiPhos®) or using salt based coating techniques. Alternatively, non-coated, “intrinsic heat stable” phytases (genetically engineered) are also found on the market.

Heat stability during pelleting depends mainly on three factors: the temperature, the time of conditioning (ie. how long the feed is in contact with heat) and the pellet size (ie. the smaller the pellet more processing friction forces and the higher the temperature raises into the pellet). As a result, it is evident that a mild temperature, short conditioning time and larger pellet size might aid better phytaste recoveries. However, these conditions of feed processing are rarely found in commercial feed mills set ups.

A summary of 3 pelleting stability trials is shown in Figure 1. The trials compared OptiPhos® recovery after pelleting with Quantum® Blue (product with intrinsic heat stability claim) using 60 seconds conditioning time and 3 mm pellet. As can be seen at harsh processing conditions, the intrinsic heat stable phytase fails to survive at 85 threshold and has acceptable recovery results only at 80°C.

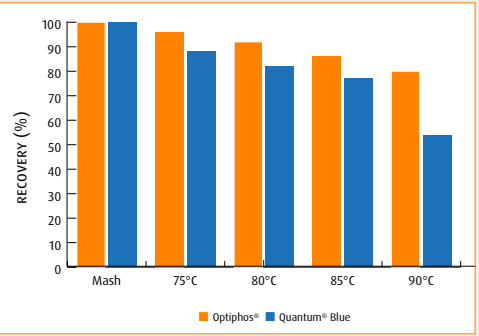


FIGURE 1
Recovery results after pelleting of coated OptiPhos® and Quantum® Blue
(average of 3 trials, different temperatures, 60 seconds conditioning time and 3mm pellet size)

Considering the worldwide spread of generic phytases claiming to be heat stable, an evaluation pelleting stability trial was set to compare such products.

Figure 2. shows the results overview and it can clearly be seen that none of the products has recovery results higher than 65 % when 85°C, 60 seconds conditioning and 3 mm pellet are used for feed processing.

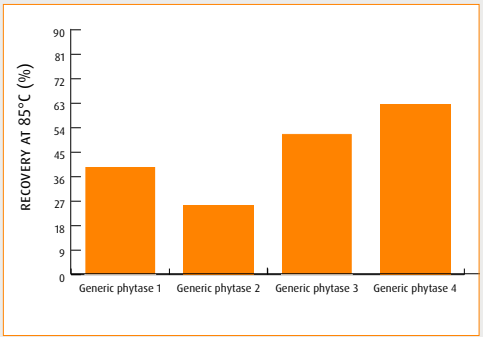


FIGURE 2
Recovery results after pelleting
(85°C, 60s conditioning, 3mm pellets) of claimed heat stable generic phytases

key facts

- Heat stability of a phytase is highly affected by the combination of temperature, conditioning time and pellet size factors
- “Intrinsic heat stable phytase” does not survive 85°C when pelleting is done according to common feed mill practices
- Coating gives better heat damage protection to a phytase when temperatures up to 85 °C are used