WP

DUCKS

Ducks perform better with enzymes

The use of enzymes in chicken production is commonly accepted. So far, little was known about the effect of enzymes in duck rations. Trials in the USA and EU gave more insight in this issue. They showed that feed efficiency could be improved by the use of specific enzymes.

Andrea Barratt, Marketing Manager and Milan Hruby, Technical Services Manager, Finnfeeds, Marlborough, United Kingdom.

Key Words: Avizyme 1300, Avizyme 1500, duck, wheat, corn, xylanase, protease, amylase, digesta viscosity, VEBA

Table 1. Diets used in a commercial trial, France.

	Starter diet 1-21 days		*Finisher 22-48 days*	
	Positive control (corn-based diet)	Negative control (wheat-based diet)	Positive control (corn-based diet)	Negative control (wheat-based diet)
Ingredients - kg/tonne as fed:				
Corn	423	162	467	105
Wheat	250	500	250	600
SBM, sunflower meal & peas	215	175	170	150
Full fat soyabeans	12	63	-	20
Meat meal, fats & premix	100	100	113	125
Calculated analysis:				
ME (MJ/kg)	12.1	12.1	12.6	12.6
ME (kcal/kg)/	2900	2900	3000	3000
Crude protein (%)	20.5	20.5	18.2	18.4

The application of xylanase-based enzymes in wheat diets for broilers has been established as a commercial routine in countries where wheat is the most cost-effective cereal. It is well recognised that the high viscosity of the intestinal digesta brought about by the long chain soluble arabinoxylans present in wheat is the major problem in these diets. Endo-xylanases are an effective means of reducing viscosity by partially breaking down the fibre components.

Enzyme use in corn and sorghum-based broiler diets is also increasing, as recent research conducted both independently and in collaboration with Finnfeeds, has revealed significant variability between batches of corn and sorghum in their feeding value, which may be explained in terms of differences in starch digestibility. Specific enzyme combinations have been developed to improve starch digestibility, thereby reducing corn and sorghum variability and increasing energy availability to the bird.

What about enzyme use in ducks?

In 1999, more than 2.5 million tonnes of duck meat was produced, compared to approximately 53 million metric tonnes of chicken meat (FAO statistics). Whilst enzymes are routinely used in wheat-based broiler diets and use in corn or sorghum-based broiler diets is increasing, enzyme use in duck diets is relatively low. Recent studies have demonstrated that supplementing diets with enzymes can improve the efficiency of feed utilisation by up to 5.7% in ducks fed wheat/soy or corn/soy-based diets.

High molecular weight soluble non-starch polysaccharides (NSPs) found in wheat, barley, triticale, rye and oats, dissolve within the gut of young poultry, increasing the levels of intestinal viscosity, resulting in decreased nutrient digestion and absorption and reduced broiler performance.

In ducks, water intake tends to be higher than broilers. Higher water intake results in higher digesta water content which could translate into lower digesta viscosity, and therefore reduce the negative impact on duck performance of feeding these types of grains. Nevertheless, trials have shown that digesta viscosity can be elevated in ducks fed wheat based diets, for instance. A trial conducted with a French producer showed that a *Bacillus* based protease and *Trichoderma* based xylanase enzyme complex (Avizyme®1300) significantly reduced digesta viscosity of ducks fed wheat-based diet. This translated into improved duck performance up to 48 days of age. Digesta viscosity and performance of ducks fed an enzyme supplemented wheat based diet was compared to ducks fed a non-enzyme supplemented wheat-based diet (negative control) and a non-enzyme supplemented corn-based diet (positive control). A total of 900 male Blancs Lourds ducks were assigned to 18 pens of 50, with 6 replicates per diet. Diets were formulated and produced by a commercial feed manufacturer (*Table 1*). The pelleted diets were fed *ad libitum.*

Enzymes offer duck growers the opportunity to improve the feed efficiency

Foregut digesta viscosity was determined at 21 days on 10 animals per diet using the Finnfeeds'Viscometric Enzyme BioAssay.

Feeding the non-enzyme supplemented wheat-based diet significantly increased digesta viscosity ($P<0.05$) compared to the corn-based positive control. Enzyme supplementation significantly reduced digesta viscosity ($P<0.05$) to a level similar

Table 2. The effect of a *Trichoderma* based xylanase and *Bacillus* based protease (Avizyme® 1300) on duck performance (1- 48 days)

	Corn control	*Wheat control*	*Wheat + Avizyme*
1-21 days			
Liveweight (g)	481[b]	482[b]	493[a]
Feed gain	1.44	1.47	1.43
Digesta viscosity (cPs)	4.1[a]	5.6[b]	3.8[a]
1-48 days			
Liveweight (g)	2694[c]	2726[b]	2904[a]
FCR	1.98[b]	2.02[b]	1.94[a]

[ac] Means not sharing a superscript differ significantly (P<0.05)

Table 4. The effect of a *Trichoderma* xylanase (Avizyme® 1310) on duck performance (7- 46 days)

	Weight gain(g)	*Feed intake (g)*	*FCR (g/g)*
Control	2416[b]	6292[b]	2.61[a]
+Enzyme	2748[a]	6794[a]	2.47[b]
P value	0.0001	0.001	0.011

[ab] values with no common superscript differ significantly

Table 3. Diets used in the trial conducted at Purdue University, USA

	Starter diet 7-21 days	*Grower/Finisher diet 22-46 days*
Ingredients- kg/tonne as fed:		
Soft wheat	690	840
Soybean meal, 48%	237	89
Soy oil	35	35
Sodium chloride	4	4
DL-methionine	2	2
L-Lysine- HCl	1	2
Limestone	10	10
Dicalcium phosphate	16	15
Vitamin/mineral premix	3	3
Calculated analysis:		
ME, kcal/kg	3013	3112
ME, MJ/kg	12.6	13.0
Crude Protein, %	19.8	14.7
Lysine, %	1.02	0.71
Methionine, %	0.49	0.42
TSAA, %	0.85	0.71

Table 6. Diets used in the trial conducted at Roslin Research Institute, UK

	Starter diet 1-21 days	*Grower/Finisher diet 22-42 days*
Ingredients- kg/tonne as fed:		
Corn	625	718
Soybean meal, 46.5%	280	171
Fishmeal, 64.9%	10	20
Rye	50	50
Soy oil	-	10
Sodium chloride	3.80	3.00
DL-methionine	1.80	1.51
L-Lysine- HCl	-	0.75
Limestone	9.20	5.50
Dicalcium phosphate	15.0	15.9
Vitamin/mineral premix	5.0	5.0
Calculated analysis:		
ME, kcal/kg	2949	3125
ME, MJ/kg	12.3	13.1
Crude Protein, %	20.0	16.0
Lysine, %	1.06	0.85
Methionine, %	0.51	0.43
TSAA, %	0.85	0.70

Table 5. The effect of a *Bacillus* based protease, a *Bacillus* based amylase and *Trichoderma* based xylanase enzyme complex (Avizyme® 1500) on duck performance (1- 42 days)

	Weight gain, g	*Feed intake, g*	*FCR, g/g*	*Uniformity of bodyweight[1], %*
Control	3097	6362	2.05[a]	91.42
+ Enzyme	3152	6308	2.00[b]	93.00

[ab] values with no common superscript differ significantly at P<0.05
[1]Percentage of ducks of average bodyweight ± 15%

to the ducks fed the corn-based diet and significantly improved weight gain and feed:gain (P<0.05) at 48 days compared to both the ducks fed the wheat-based and corn-based diets (*Table 2*).

A second trial, conducted at Purdue University, USA, examined the effect of adding a *Trichoderma* based xylanase (Avizyme®1310) on the FCR of ducks fed wheat-soy based diets up to 46 days of age.

The trial consisted of seven-day-old male White Pekin ducklings, 12 replicates per treatment and 10 ducks per replicate. All ducklings were fed *ad libitum* and diets fed as mash. The xylanase was applied as a liquid, at 0.5kg/tonne (0.05%) of feed. The diets in both trials were prepared without antibiotic growth promoters or coccidiostats, and full diet details are given in *Table 3*.

Enzyme addition significantly improved the FCR (P<0.01) of the ducks by 14 points (control group FCR 2.61 vs enzyme group FCR 2.47). In addition, enzyme supplementation significantly increased weight gain (P<0.0001) by 332g (2416g vs. 2748g) - *Table 4*.

The performance of the ducks fed the control diets was considered as good throughout both trials, nevertheless enzyme treatment further improved performance.

Enzyme use in corn-based duck diets

Whilst many nutritionists would consider corn as being almost completely digested and consistent from sample to sample, recent data suggests that the variability of corn can be as great as that determined in wheat and barley. Furthermore, digestibility studies have shown that corn starch digestibility at the terminal ileum can be as low as 85% and does not seem to increase with age. Since intestinal viscosity of birds fed corn or sorghum is very low compared with wheat or barley, it is unlikely that viscosity plays a major role in describing the variation between samples reported. Nevertheless, the starch that escapes digestion in the small intestine, which is termed resistant starch, presents an opportunity for use of feed enzymes.

In a trial conducted at the Roslin Research Institute, UK, the effect of adding a *Bacillus* based protease, a *Bacillus* based amylase and *Trichoderma* based xylanase enzyme complex (Avizyme®1500) on the performance of ducks fed corn-soy based diets up to 42 days of age was measured (*Table 5*).

The trial consisted of 288 one-day-old mixed-sex Pekin ducklings, allocated to two treatments of 12 replicates per treatment, with 12 ducks per replicate. All ducklings were fed *ad libitum*. Both diets were fed as pellets. The enzyme blend was added at the recommended dose of 1kg/tonne (0.1%) of feed (*Table 6*).

Enzyme addition resulted in a 5-point improvement in FCR (p<0.01). The enzyme-fed ducks were also heavier and were of a more uniform bodyweight. This allows us to draw the conclusion that supplementing corn or wheat-based diets with enzyme activities tailored to specifically match these grains, offers duck producers the opportunity to improve the efficiency of feed use, and ultimately improve profitability. ?