



# NO EFFECT ON FINISHER PRODUCTIVITY OF ECONASE XT

TRIAL REPORT NO. 960

The addition of Econase XT to finisher feed with either wheat or rye as primary grain ingredient did not improve FCR.

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## Abstract

Finishers fed a diet to which the carbohydrate-splitting enzyme Econase XT was added did not perform better than pigs fed a diet without Econase XT. The effect of adding Econase XT was not influenced by whether wheat or rye was the primary grain ingredient.

Pig Research Centre investigated the effect of adding Econase XT to finisher feed with a high content of wheat or rye on one farm where 100 g Econase XT was added to each tonne of finished feed corresponding to an enzyme activity of 16,000 BXU/kg feed. Econase XT is approved in the EU for use in feed for weaners and finishers in a minimum inclusion rate of 24,000 BXU/kg feed, but AB Vista wishes to reduce this inclusion rate for finishers. The effect on productivity of adding Econase XT was compared with a control group without Econase XT.

Nutrient analyses demonstrated good agreement between the declared and analysed nutrient content, and confirmed the declared enzyme activity of Econase XT.

Results revealed no differences in production value between trial and control diets, demonstrating overall that there is no profit in adding Econase XT (16,000 BXU/kg feed) to finisher feed. It is

therefore not profitable to add Econase XT to finisher feed in the inclusion rate investigated in this trial. It remains unclear whether productivity may be affected by adding 24,000 BXU/kg feed.

## FUNDING

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## Background

Feed constitutes a major cost in pig production making feed conversion ratio an essential parameter in pig production. Results from finisher trials with the carbohydrate-splitting enzyme xylanase vary from no effect at all to an improvement in FCR of approx. 3% and in daily gain of 1-2% [1], [2], [3], [4], [5].

However, some enzyme products may have a significantly greater potential than what we have seen in other products. One of these is Econase XT, produced by AB Vista, with xylanase as the main activity. Econase XT is approved in the EU for use in feed for weaners and finishers in a minimum inclusion rate of 24,000 BXU/kg feed [6]. Econase XT is available in Denmark, but has not been investigated for pigs under Danish production conditions. AB Vista believes that a lower inclusion rate would still be effective, and therefore wishes to lower it to 100 g per tonne finished feed for finishers, corresponding to 16,000 BXU per kg feed. In case of a positive outcome, data will be used for revising the minimum inclusion rate.

Enzymes are specific, ie. they can only break down certain types of bindings. Xylanase splits coherent xylose units in large complex molecules such as arabinoxylans. Arabinoxylans constitute a significant part of the fibre fraction in all types of grain, but the highest concentrations are found in wheat, rye and barley. Research has demonstrated that the largest effect of xylanase is observed in wheat [10], [11], which makes it relevant to test the effect of Econase XT in wheat-based feed. Furthermore, wheat is the most common grain in pig feed and is thereby also the most relevant type of grain in a trial set-up.

In recent years, feed prices have soared, and producers therefore look to alternative ingredients in order to produce animals at the lowest possible cost. Pig producers who own land suitable for rye production may be able to reduce their feed costs by cultivating rye as rye produces a high yield thereby minimising the need to purchase other types of grain. Research shows that feed intake in pigs

drops when rye is used in feed, ie. gain dropped as rye content increased [7], which may be attributed to the fact that rye kernels have a high content of arabinoxylans [8]. The use of carbohydrate-splitting enzymes containing xylanase may enhance the decomposition of rye arabinoxylans in pigs' gastrointestinal tract [8]. Consequently, the reductions seen in feed intake when rye is used may not be all that important as xylanase is likely to compensate with a correspondingly better FCR. It is therefore interesting to investigate whether the use of xylanase may reverse the negative effect of rye on productivity.

The aim of this trial was to analyse the effect of adding a xylanase (Econase XT) to finisher diets with a high content of wheat or rye.

## Material and method

The trial was conducted at Pig Research Centre's experimental station Grønhøj where pigs were fed *ad lib* pelleted feed with 10% rolled barley added after pelleting. The addition of 10% rolled barley was attributed to a history of gastric changes among finishers at the experimental station. Each pen was equipped with one feeder and one nipple drinker/valve. Feeding was managed by a computerised feeding system (AP system). Pelleted feed and rolled barley were mixed 9:1 when feed was weighed out to each feed valve.

The effect of adding Econase XT to pig feed with either wheat or rye as primary grain ingredient was analysed in a 2x2 factor trial with type of grain as the one factor (wheat/rye) and the addition of Econase XT as the other (-/+). Start weight averaged 31 kg and slaughter weight averaged 107 kg. The trial design is shown in Table 1. The pigs in groups 1 and 3 were fed control feed without xylanase and with wheat and rye, respectively, as primary grain ingredient for the entire finisher period and the pigs in groups 2 and 4 were fed trial diets with Econase XT.

**Table 1.** Trial design - finishers, approx. 30-105 kg.

Groups	1	2	3	4
Primary grain ingredient	Wheat		Rye	
Inclusion of Econase XT <sup>1</sup>	-	+	-	+

1) 100 g Econase XT added per tonne finished feed corresponding to an enzyme activity of 16,000 BXU/kg feed.

The trial comprised 53-55 blocks (replicates) with 476-494 pigs per group. The trial was initially designed to comprise 56 replicates in each group, but due to trial errors, some batches were discarded before data processing.

100 g Econase XT with an enzyme activity of 160,000 BXU/g (corresponding to 16,000 BXU/kg feed) was added to each tonne of finished feed. Appendix 1 provides a detailed description of Econase XT.

## Feed

All diets complied with the Danish nutrient standards for finishers in the weight interval 30-105 kg [9] and included phytase (100% inclusion). All diets included a safety margin for the calculated amino acid content of 5% above the current standard and of 10% for phosphorus and calcium. A safety margin will neutralize any effect of nutrient deficiency per feed unit as the addition of xylanase increases the energy content of a diet. The addition of xylanase increases the energy concentration of a diet by approx. 1 feed unit per 100 kg feed, and the diet formulation in this trial did not take this into consideration [10], [11]. The outcome of the trial is thereby the pigs' biological response to xylanase in energy-sufficient diets.

The feed for groups 1 and 2 contained more than 60% wheat, and in groups 3 and 4, 40% units of this was replaced by rye. Coloured microgrits were added to the feed to be able to check that the right feed went to the right feeder.

All diets were produced by Danish Agro in Janderup. Appendix 2 provides a detailed outline of the diet composition in all groups.

## Recordings

Daily gain and feed intake were recorded at pen level in the entire trial period, and lean meat percentage was recorded at slaughter. These parameters were all used for calculating the production value as the primary trial parameter. Treatments for diseases and mortality were recorded as secondary parameters.

## Analyses of feed

One batch of rye was used for the entire trial. Samples were collected before trial start when the batch was transported to Danish Agro's storage facilities with a tractor shovel. A grain spear was inserted five times in each shovelful, and the samples were subsequently split into 16 subsamples with a sample divider. Eight samples were subject to analysis for FUGp, calcium and phosphorus, and results were used in the formulation of the feed for groups 3 and 4. Eight samples were also analysed for ergots of rye.

At each of the seven (eight in group 1) production rounds, a representative sample of the feed was collected according to the TOS principles (Theory of Sampling) [12], and subject to analyses for energy, crude protein, lysine, methionine, cystine, threonine, calcium, phosphorus and phytase.

Enzyme activity in Econase XT in all feed samples was analysed by AB Vista.

Rolled barley mixed with the pelleted feed was not subject to any analyses.

## Production value (PV)

Daily gain, FCR and lean meat percentage were used to calculate the production value (PV/place unit/year), which is based on an average of the last five years' prices of pigs and feed (September 2007 – September 2012). Production value is thereby the expression of the pigs' biological response to the treatment as price trends are neutralised when five years' prices are used for calculating the production value.

Production value was calculated as follows:

- $PV/\text{pig} = \text{sales price} - \text{purchase price} - \text{feed costs} - \text{various costs}$ .
- $PV/\text{place unit}/\text{year} = PV \text{ per pig} \times (365 \text{ days}/\text{productive days per pig}) \times \text{utilization of housing}$ .

Calculations of PV also included the below values:

- Price of a 30 kg pig: DKK 348 per pig
- Kg adjustment: DKK - 5.80 per kg (25-30)/ DKK + 5.96 per kg (30-40 kg)
- Price of a finisher, incl. bonus payment: DKK 10.00 per kg
- Finisher feed: DKK 1.64 per FUgp (identical feed prices in all 4 groups)
- Various costs: DKK 20 per pig
- Utilization of housing: 95 %

## Statistics

Production value (PV) was analysed as primary parameter, and disease recordings and mortality as secondary parameters. Data was subject to analysis in proc MIXED in SAS® as a two-factor trial with grain (wheat/rye) as the one factor and the inclusion of Econase XT (-/+ ) as the other. Production value was calculated for the entire trial period and corrected for start weight. The model included housing, block and group as variables. Results are shown as corrected average for each group. Significant differences are stated at min. 5% level. The statistical model included grain and the addition of Econase XT as systematic effects and replicate as random effect. Comparisons of wheat and rye as primary grain ingredients are part of another trial, and results and significant differences are therefore not presented in this trial report.

# Results and discussion

## Feed

Appendix 3 shows the declared and the analysed nutrient content of all four diets. Analyses demonstrated good agreement between declared and analysed content for almost all nutrients. The

analysed calcium content was slightly lower than declared, but due to the safety margin, and as this deficiency was identical in all groups, the outcome of the trial was not affected by this. The analysed phytase content was slightly higher than declared, which may be attributed to the fact that the analysis method reveals both the added phytase and the feed's natural content of phytase, while the declared value only concerns the added amount.

EDOMi values (Enzyme Digestible Organic Matter at ileum) remained largely unchanged when Econase XT was added.

The average of feed units analysed in the control diets (groups 1 and 3), including 10% rolled barley, was used for calculating FCR. The result was 108.9 feed units per 100 kg in groups 1 and 2, and 108.7 feed units per 100 kg in groups 3 and 4. With this procedure it was possible to disregard the varying impact that xylanase addition may have on EDOMi and thereby prevent corrections of effects of xylanase (see Appendix 3). The outcome of the analyses will thereby show the pigs' biological response to the inclusion of Econase XT. It should be noted that EDMOi and not I factor was used for the analyses as the trial was planned and designed before the I factor was introduced for control of feed units in finished feed.

Analyses of rye samples revealed an average content of ergots in rye (*Claviceps purpurea*) of 69.2 ppm. Recommended maximum content in feed for growing pigs is 500 ppm ergots [13]. The total content of ergots in diets with 40% rye was therefore far below the recommended maximum.

Enzyme activity in the diets with Econase XT averaged 21,000 BXU/kg (Appendix 4). Enzyme activity varied, but was at all times above the guaranteed minimum of 16,000 BXU/kg. This corresponds with results of a previous trial that demonstrated that the pelleting processes, which do normally not exceed 95 °C, should not affect the activity in Econase XT negatively [14].

Analyses for Econase XT confirmed that, with the exception of one batch, enzyme activity in the diets without xylanase was below the detection limit of 3,000 BXU/kg (Appendix 4). Anything below this is considered "interference" in the analyses. The feed in which analyses revealed enzyme activities above 3,000 BXU/kg was only marginally above this level (3,904 BXU/kg). There may have been a small, insignificant carry over, which did not affect the results.

## Health

Mortality averaged 1.5% and the sum of dead pigs and pigs moved to a hospital pen averaged 9.5% for the entire trial period. No differences were observed between the groups in mortality or in the sum of pigs moved to a hospital pen regardless of whether xylanase was added or whether wheat or rye constituted the primary grain ingredient.

## Production results

The comparisons of wheat vs rye form part of another trial with more replicates and will therefore be published in trial report at a later point in time.

No interaction was observed between type of grain and Econase XT, ie. the effect of Econase XT was the same regardless of wheat/rye. Results revealed that daily gain, FCR and lean meat percentage were unaffected by the addition of Econase XT (Table 2). Consequently, Econase XT did not significantly affect production value (Table 3). Appendix 5 provides an outline of the production results for all four groups according to wheat/rye with and without Econase XT.

**Table 2.** Production results for entire trial period, +/- Econase XT.

Factor	Inclusion of Econase XT	
	-	+
Daily gain, g/day	995	998
Feed intake, FUgp/day	2.79	2.79
FCR, FUgp/kg gain	2.81	2.80
Lean meat percentage	60.7	60.8

When the production value was calculated with 5 years' prices and included the price of the feed with Econase XT, index dropped 2 percentage points for the diets with xylanase. This is the result of a slight increase in feed prices when the price of Econase XT was included in the analyses. The cost of adding Econase XT is approx. DKK 1.5 per pig.

Diet formulation did not take into account the fact that xylanase increases energy concentration in feed by one feed unit per 100 kg feed compared with a diet with the same number of analysable feed units and without xylanase. However, when purchasing a diet containing Econase XT, the energy concentration will be included in the P control with the additional feed unit. Consequently, when Econase XT is added FCR would be slightly poorer than shown in Table 2.

**Table 3.** Production value (PV), prices September 1, 2007 – September 1, 2012 excl. the price of Econase XT.

Factor	Inclusion of Econase XT		Effect of Econase XT
	-	+	
PV per place unit/year, DKK	410	425	NS <sup>2</sup>
PV per place unit/year, index <sup>1</sup>	100	104	

1) A minimum difference of 5 index points is required for the difference to be significant.

NS = Not significant

# Conclusion

Overall, analyses revealed no significant effect on production value of adding Econase XT to finisher feed. It is thereby not profitable to add Econase XT in the inclusion rate tested in this trial. It remains unclear whether productivity would be affected by adding Econase XT in a minimum inclusion rate of 24,000 BXU/kg feed.



# References

- [1] Callesen, J. (1998): Porzyme 9300 til slagtesvin. [Meddelelse nr. 403. Landsudvalget for svin.](#)
- [2] Hansen, C. F.; Kjærsgaard, H. D.; Bach Knudsen, K. E.; Jensen, B. B. (2002): Effekt af melfoder og Porzyme 9300 på salmonella, mave-tarm-sundhed og produktivitet hos slagtesvin. [Meddelelse nr. 558. Landsudvalget for svin.](#)
- [3] Rasmussen, D. K. (2008): Bergazym P in feed mixed on-farm. [Trial report no. 826. Pig Research Centre.](#)
- [4] Hansen, S.; Rasmussen, D. K. (2009): Afprøvning af Ronozyme WX til slagtesvin. [Meddelelse nr. 848. Dansk Svineproduktion.](#)
- [5] Hansen, S. (2011): Ronozyme WX og Porzyme 9302 til slagtesvin. [Meddelelse nr. 892. Videncenter for Svineproduktion.](#)
- [6] European Food Safety Authority (EFSA) (2011): Scientific Opinion on the safety and efficacy of Econase XT P/L (endo-1,4-beta-xylanase) as a feed additive for laying hens, minor poultry species (including ducks, geese, quails, pheasants and pigeons) and pigs for fattening. EFSA Panel on Additives and Products or Substances used in Animal Feed (FEEDAP). EFSA Journal, 9(6):2277.
- [7] Jørgensen, L. (1997): Rug i foder til slagtesvin. [Meddelelse nr. 374. Landsudvalget for svin.](#)
- [8] Choct, M. (1997): Feed Non-Starch Polysaccharides: Chemical Structures and Nutritional Significance. Feed Milling International, June Issue, pp. 13-26.
- [9] Tybirk, P.; Sloth, N. M.; Jørgensen, L. (2012): [Nutrient standards.](#) Pig Research Centre.
- [10] Tybirk, P.; Kjeldsen, N. J. (2004): Værdisætning af xylanase ud fra hensyn til enzymets effekt på de kontrollerbare foderenheder. [Notat nr. 0422, Landsudvalget for svin, Dansk Landbrugsrådgivning og Landscentret - svin.](#)
- [11] Hansen, C. F.; Tybirk, P.; Boisen, S. (2007): Enzymprodukters effekt på EFOSi-analysen. [Notat nr. 0704. Dansk Svineproduktion.](#)
- [12] Jørgensen, L. (2011): Udtagning af foderprøver. [Videncenter for Svineproduktion.](#)
- [13] Nielsen, N. O.; Jørgensen, L. (1995): Meldrøjer – begrænset mulighed for opfodring til svin. [Notat nr. 9540, Landsudvalget for svin.](#)
- [14] Rasmussen, D. K. (2010): Difference in heat stability of phytase and xylanase products. [Trial report no. 875. Pig Research Centre.](#)

## Participants

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# Appendix 1

Product information, Econase XT, provided by AB Vista

Product	Econase XT
Producer	AB Vista 3 Woodstock Court Blenheim Road Marlborough Business Park Marlborough Wiltshire SN8 4AN United Kingdom
Content	Contains endo-1,4-beta-xylanase (EC 3.2.1.8) as main activity and is produced from a genetically modified strain of <i>Trichoderma reesei</i> . EU identification number 4a8.
Guiding price	€10 per kg (October, 2012) of the product corresponding to DKK 74.60 per kg (exchange rate: 7.46). With the inclusion rate used in this trial (100 g/tonne), this corresponds to an increase in feed price of DKK 7.46 per tonne finished feed.

## Appendix 2

Composition of diets, %

Group	1	2	3	4
Rye	-	-	40.00	40.00
Wheat	62.97	62.97	21.6	21.6
Wheat bran	1.88	1.87	1.09	1.08
Rolled barley	10.00	10.00	10.00	10.00
Soybean meal	15.50	15.50	17.80	17.80
Sunflower meal	4.00	4.00	4.00	4.00
Molasses	1.00	1.00	1.00	1.00
Vegetable oil	1.50	1.50	1.50	1.50
Feed lime	1.31	1.31	1.31	1.31
Mono calcium phosphate	0.75	0.75	0.69	0.69
Dietary salt	0.41	0.41	0.43	0.43
Lysine	0.28	0.28	0.21	0.21
Methionine	0.05	0.05	0.04	0.04
Threonine	0.08	0.08	0.06	0.06
Vitamin/mineral mix	0.21	0.21	0.21	0.21
Phytase	0.01	0.01	0.01	0.01
Xylanase	-	0.01	-	0.01
Microgrits (coloured particles)	0.05	0.05	0.05	0.05

## Appendix 3

Declared and analysed nutrient content before the addition of 10% barley, and standard value for barley used for calculating feed units in the finished feed (90% pelleted feed and 10% rolled barley). The diet for group 1 was produced over one more round than the rest, which explains the variations in the number of analysed samples. Analysed values for all four groups are weighted averages in relation to the amount of feed delivered.

Group	1+2	3+4	1	2	3	4	Barley
	Wheat	Rye	Wheat - Econase XT	Wheat + Econase XT	Rye - Econase XT	Rye + Econase XT	
	Declared	Declared	Analysed <sup>1</sup>	Analysed <sup>2</sup>	Analysed <sup>2</sup>	Analysed <sup>2</sup>	Standard value <sup>3</sup>
Crude protein, %	17.2	17.4	17.1	17.1	17.4	17.3	8.9
Crude fat, %	3.3	3.4	3.9	3.9	3.7	3.7	2.5
Ash, %	5.4	5.5	4.9	4.8	5.0	5.0	1.8
Water, %	14.1	13.1	13.3	13.1	12.5	12.5	15.0
EDOM, %	91.4	91.0	90.5	90.4	90.4	90.4	85.3
EDOMi, %	84.3	83.4	82.3	82.0	82.0	82.4	79.1
FUgp per 100 kg	108.0	108.0	109.4	109.3	109.2	109.8	104
Calcium, g/kg	8,50	8.50	7.96	7.87	7.71	8.00	0.5
Phosphorus, g/kg	5.47	5.54	5.64	5.54	5.51	5.51	3.1
Lysine, g/kg	10.10	10.20	10.49	10.65	10.82	10.65	3.44
Methionine, g/kg	3.04	3.06	3.07	3.07	3.09	3.10	1.54
Cystine, g/kg	3.03	2.99	3.05	3.10	3.08	3.05	2.16
Theonine, g/kg	6.69	6.81	6.81	6.86	7.10	7.00	3.11
Phytase, FTU per kg/ FYT per kg	500/1,500 <sup>4</sup>	500/1,500 <sup>4</sup>	763/2,587 <sup>5</sup>	770/2,556 <sup>5</sup>	800/2,932 <sup>5</sup>	863/3,280 <sup>5</sup>	-

1) Crude protein, crude fat, ash, water, EDOM and EDOMi: Average of eight analyses. Calcium and phosphorus: Average of seven analyses. Amino acids: Average of five analyses.

2) Crude protein, crude fat, ash, water, EDOM and EDOMi: Average of seven analyses. Calcium and phosphorus: Average of six analyses. Amino acids: Average of five analyses.

3) Standard values, spring barley, 2011.

4) Phyzyme XP/Ronozyme NP: added amount. Phyzyme XP was added in the first four production rounds (500 U/kg). Ronozyme NP was added in the subsequent four rounds (1,500 U/kg).

5) Phyzyme XP/Ronozyme NP. First phytase: Average of three analyses. Second phytase: Average of two analyses.

## Appendix 4

Recorded enzyme activity in Econase XT (BXU/kg feed) in each of seven production rounds and average recorded enzyme activity for groups 2 and 4 with Econase XT.

Group	1	2	3	4
Primary grain ingredient	Wheat		Rye	
Inclusion of Econase XT	-	+	-	+
Expected activity, BXU/kg feed	< 3,000	16,000	< 3,000	16,000
1 <sup>st</sup> batch	< 3,000	18,613	3,904	19,007
2 <sup>nd</sup> batch	< 3,000	18,300	< 3,000	24,000
3 <sup>rd</sup> batch	< 3,000	19,900	< 3,000	18,900
4 <sup>th</sup> batch	< 3,000	27,000	< 3,000	24,800
5 <sup>th</sup> batch	< 3,000	20,400	< 3,000	20,300
6 <sup>th</sup> batch	< 3,000	24,484	< 3,000	22,504
7 <sup>th</sup> batch	< 3,000	20,700	< 3,000	17,100
Average enzyme activity, BXU/kg feed		21,342		20,944

## Appendix 5

Production results for the entire trial period (wheat/rye, +/- Econase XT).

Groups	1	2	3	4
Primary grain ingredient	Wheat		Rye	
Inclusion of Econase XT	-	+	-	+
Replicates	53	55	55	55
Pigs	476	494	494	494
Start weight, kg	31.2	31.2	31.3	31.1
Slaughter weight, kg	107.6	108.0	106.6	106.5
Daily gain, g/day	1,023	1,022	966	973
Feed intake, FUgp/day	2.86	2.83	2.72	2.74
FCR, FUgp/kg gain	2.80	2.77	2.82	2.82
Lean meat %	60.3	60.4	61.0	61.2

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