

Influence of *Trichoderma longibrachiatum* xylanase supplementation of wheat and corn based diets on growth performance of pigs

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Van Lunen, T. A. and Schulze, H. 1996. **Influence of *Trichoderma longibrachiatum* xylanase supplementation of wheat and corn based diets on growth performance of pigs.** Can. J. Anim. Sci. 76: 271–273. A trial was conducted to evaluate the effects of supplementing wheat- and corn-based diets with xylanase on growth performance and FCR of pigs from 10 to 18 wk of age. Seventy-two castrated male pigs were assigned to pens of two and in a randomized block design to six dietary treatments consisting of diets containing 60% wheat, 40% wheat and 20% corn, and 20% wheat and 40% corn with and without supplementation with xylanase. Feed and water were available ad libitum. Xylanase supplementation improved growth rate and FCR by 9.2 and 5.3%, respectively, regardless of level of wheat and corn inclusion.

Key words: Pig, growth, feed enzyme, *Trichoderma longibrachiatum* xylanase, wheat, corn

Van Lunen, T. A. et Schulze, H. 1996. **Influence de la xylanase de *Trichoderma longibrachiatum* comme supplément dans les régimes alimentaires à base de blé et de maïs, sur les performances de croissance des porcs.** Can. J. Anim. Sci. 76: 271–273. L'objet de nos travaux était d'évaluer les effets de l'adjonction de xylanase à des aliments à base de blé et d'orge sur les performances de croissance et sur l'indice de conversion des porcs à partir de la 10^e jusqu'à la 18^e semaine d'âge. Soixante-douze castrats étaient répartis par groupes de 2 entre 6 traitements alimentaires: 60% blé, 40% blé–20% maïs et 20% blé–40% maïs, avec ou sans complément de xylanase. L'expérience était conduite selon un dispositif en blocs randomisés. L'eau et les aliments étaient disponibles à volonté. L'apport de xylanase améliorerait le taux de croissance et l'indice de conversion, respectivement, de 9,2 et de 5,3%, quelles que soient les proportions de blé et de maïs dans l'aliment.

Mots clés: Porc, croissance, enzyme alimentaire, xylanase de *Trichoderma longibrachiatum*, blé, maïs

The cell walls of cereals contain primarily complex carbohydrates referred to as NSP. These NSPs exhibit anti-nutritive activity which can negatively affect performance of pigs and poultry (Dierick and DeCuyper 1994). One of the major constituents of the cell walls of wheat and corn is arabinoxylan (Englyst et al. 1989). Enzymic digestive processes of monogastric animals are not capable of hydrolysing cell wall NSPs. The hydrolysis of arabinoxylans can be induced through the action of endo-1,4- β -xylanase, β -1,4-xylosidase and a number of enzymatic debranching activities (Morgan and Bedford 1995).

However, attempts to improve feed utilization through supplementation with xylanase enzymes have met with mixed results (Bodart and Thielemans 1978; Fekete 1984). More recently, the use of xylanase in young pigs improved daily gain and feed conversion ratio (FCR) by 3 and 9%, respectively (Dierick 1989).

Flores et al. (1994) reported that a mixture of β -glucanase, hemicellulase, cellulase and pentosanase added to poultry diets containing 60% wheat improved weight gain and FCR by 7.3 and 6.9%, respectively. Skoufos and Ftenakis (1992) observed 8.8 and 7.4% improvements in daily gain and FCR, respectively, when wheat-based starter pig diets were supplemented with a pentosanase. Little or no

benefits have been observed when pentosanases were added to barley- or rye-based diets (Bedford et al. 1992; Thacker et al. 1992)

Although arabinoxylans are the major constituents of wheat and corn NSP, there do not appear to be any reports in the literature regarding xylanase treatment of corn-based diets for pigs or poultry. This study was conducted to determine the effects of xylanase supplementation of wheat- and corn-based diets on growth performance and FCR of pigs from 10 to 18 wk of age.

Seventy-two castrated male pigs (10 wk of age) were randomly assigned to pens of two and in a randomized block design to six dietary treatments in a 3 \times 2 factorial design consisting of diets containing 60% wheat, 40% wheat and 20% corn, 20% wheat and 40% corn with and without supplementation with *Trichoderma longibrachiatum* xylanase. In addition to wheat and corn, all diets contained 10% wheat middlings, 20% soybean meal, 5% meat and bone meal, 0.5% salt, 1% limestone and 1% vitamin mineral premix. The 60% wheat diets also contained 0.5% canola oil. L-

Abbreviations: DE, digestible energy; FCR, feed conversion ratio; NSP, non-starch polysaccharides

Table 1. Influence of xylanase supplementation on growth and feed utilization of pigs fed wheat and corn based diets

	Initial wt. (kg)	Final wt. ^z (kg)	Gain ^z (kg d ⁻¹)	Feed consumption ¹ (kg d ⁻¹)	Feed/gain ^z
<i>Enzyme effects</i>					
No xylanase	23.11	77.52 ^b	0.98 ^b	2.69 ^b	2.78 ^a
Xylanase	22.57	82.54 ^a	1.07 ^a	2.78 ^a	2.63 ^b
Mean					
<i>Diet effects</i>					
60% wheat	22.84	80.03	1.03	2.74	2.71
40% wheat + 20% corn	24.00 ^a	80.80 ^a	1.04	2.89 ^a	2.82 ^a
20% wheat + 40% corn	21.79 ^b	80.44 ^a	1.03	2.66 ^b	2.62 ^b
Mean	22.73 ^b	78.85 ^b	1.00	2.67 ^b	2.68 ^b
Mean	22.84	80.03	1.03	2.74	2.71
<i>SE and (significant levels of effects)</i>					
Enzyme	1.382 (0.442)NS	3.124 (0.002)	0.0558 (0.002)	0.1076 (0.064)	0.1278 (0.028)
Diet	1.692 (0.039)	3.912 (0.002)	0.0698 (0.558)NS	0.1348 (0.0001)	0.1600 (0.044)

^zAdjusted by covariance for initial weight.

a, b Values for each effect within columns with different letters are significantly different.

lysine HCL was added to the 60% wheat, 40% wheat and 20% wheat diets at the rate of 0.095, 0.115 and 0.135%, respectively. Diets were fed ad libitum and were isocaloric and isonitrogenous, containing 21.4% crude protein and 13.4 MJ kg⁻¹ DE. All diets were pelleted and their lysine/DE ratio was estimated to be 0.75 g MJ⁻¹ with an "ideal" (Cole and Van Lunen 1994) amino acid pattern being utilized. Feed consumption and liveweight were monitored on a weekly basis until 18 wk of age when the trial was terminated. The animals used in this experiment were cared for according to the guidelines set out by the Canadian Council on Animal Care (1980).

The general linear model procedure of Genstat 5 (Genstat 5 Committee 1987) was used to analyse the data which was in the form of a 2 × 3 factorial with enzyme inclusion and grain type as main effects. Analysis of variance and covariance for each criterion was conducted while means were compared using Duncan's multiple range test.

Three pigs died while on test due to encephalomyocarditis virus contracted from pigs from another source on test in a separate wing of the research facility. These mortalities were deemed to be unrelated to dietary treatment. Missing values were generated by Genstat 5 for these animals.

Table 1 shows the effects of xylanase supplementation of the wheat and corn based diets on growth performance and feed consumption. There were no enzyme × diet interactions for any of the parameters measured. Initial weights were significantly ($P = 0.039$) different for each wheat inclusion rate treatment and therefore all data were adjusted by analysis of covariance for initial weight.

The highest wheat inclusion rate resulted in higher feed consumption; however, this was not translated into faster growth resulting in slightly but significantly ($P = 0.044$) poorer FCR. Xylanase inclusion resulted in a 9.2% higher growth rate, 3.5% higher feed consumption and a 5.3% improvement in FCR over all diets.

The results of this trial indicate that xylanase supplementation improves growth performance and FCR of growing

pigs fed diets containing either high levels of wheat or mixtures of wheat and corn. This suggests that the impact of xylanase addition on the tested diets leading to increased nutrient availability was similar. Xylanase supplementation appears to have increased feed consumption while concomitantly improving efficiency of feed utilization. As a result it had a significant impact on growth performance. These results are similar to those reported by Dierick (1989) where xylanase supplementation improved feed conversion and growth rates in young pigs. These results are more dramatic than those of Dierick (1989) however, since they represent the performance of pigs in the growing stage from 20 to 80 kg liveweight, a weight range where enzyme supplementation has been less successful in the past. Further work is required to fully understand the mechanisms involved in enzyme supplementation of wheat- and corn-based diets on availability of nutrients to the growing pig.

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