

Long-Term Feeding of Graded Levels of Deoxynivalenol in Finisher Pigs

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Summary

With a lack of effective strategies (i.e., feed additives) available for mitigation of DON-contamination, it will be important to evaluate alternative strategies, including reevaluation of the recommended level of DON in feed. With the potential for adaptation to mycotoxins, use of mycotoxin-contaminated grain in the grower-finisher period presents a possible strategy to minimize the impact of mycotoxins on growth performance and profitability of pork production. However, in order for this strategy to be successful, economic and physiological analysis of long-term DON exposure will need to be conducted. Performance and feed intake (75 kg – market) was compared among four diets (control and 1, 3, & 5 ppm DON) in finishing pigs. Results indicate there was an immediate reduction in feed intake, growth performance, and feed efficiency, however these parameters had recovered by week four, for DON3-fed pigs, and week five, for DON5-fed pigs. Overall, it may be possible to feed diets containing higher levels of DON than currently recommended, however, adjustments may be needed to account for reduced performance.

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Introduction

Mycotoxin-contaminated grains are commonly downgraded for use in livestock feed and while the best strategy for livestock producers is to avoid feeding mycotoxin-contaminated grain altogether with the increased incidence and level of contamination this is no longer a viable option. Therefore, many strategies have been proposed to eliminate or reduce the negative effects of mycotoxins in animal feeds. Most of these strategies are based on deactivation of the mycotoxin through binding of the mycotoxin using adsorbents, such as silicate clays and activated carbon, which can be included in feed as non-nutrient additives. In general, however, current feed additives are relatively ineffective in mitigating the negative effects of DON.

Experimental Procedures

A total of 200 finisher pigs (initial body weight of 75 kg) were housed in groups of five pigs/pen and randomly assigned to one of four dietary treatments over two blocks (n=10/trt). Dietary treatments (Table 1) consisted of a control diet with no DON contamination (CON), or one of three DON-contaminated diets containing 1, 3, or 5 ppm DON (DON1, DON3, DON5). DON diets were achieved by replacing clean wheat with naturally-contaminated wheat and wheat screenings. Diets were formulated to be isonitrogenous and isocaloric and to meet or exceed nutrient requirements according to NRC (2012). Pigs were fed ad libitum for a total of six weeks. Growth performance (body weight) and feed intake were monitored on a weekly basis for the duration of the study.

Results and Discussion

Compared to CON fed pigs, body weight was reduced in pigs fed the DON3 and DON5 diet from week one to the end of the study. Average daily gain was reduced on the DON3 and DON5 diets for the first three weeks of the study but recovered by week four for DON3 and week five for DON5. Average daily feed intake was reduced only in week one for pigs fed DON3 and up to week 4 for DON5 fed pigs, whereas afterwards ADFI was the same across diets. Feed efficiency was only reduced for DON5 fed pigs in week one. There was no difference between CON and DON1 fed pigs for any measures.

Implications

Initial results indicate margin over feed costs may not differ between Control, 1, 3, and 5 ppm DON contaminated diets. While feeding diets containing 3 and 5 ppm DON resulted in a lighter hog at market resulting in lost revenue up to \$20/hog, feed consumption was also reduced by approximately \$20/hog resulting in little change when comparing margin over feed cost. Overall, it may be possible to feed diets containing higher levels of DON than currently recommended, however, adjustments may be needed to account for reduced performance.



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Table 1. Experimental diets used to determine effects of long-term mycotoxin exposure in finisher pigs

	CON	DON ¹	DON ³	DON ⁵
Ingredient (% , as-fed)				
Wheat (clean)	39.6	32.9	19.6	6.3
Wheat (8 ppm DON) ¹	-	4.9	14.8	24.7
Wheat screenings (35 ppm DON) ¹	-	1.7	5.2	8.6
Barley	44.0	44.1	44.1	44.1
Canola oil	3.5	3.5	3.5	3.5
Soybean meal	10.0	10.0	10.0	10.0
Calculated nutrient content³				
DM (%)	86.5	86.5	86.5	86.6
ME (kcal/kg)	3282	3282	3282	3282
CP (%)	15.9	15.9	15.9	16.0
Lysine (% , SID)	0.76	0.76	0.76	0.76
DON (ppm)	0	1	3	5
Analyzed nutrient content⁴				
DM (%)	88.1	88.3	88.4	88.1
CP (%)	15.5	16.1	16.2	15.7
DON (ppm)	<0.2	1.0	3.5	5.1

Table 2: Growth performance of finisher pigs fed diets containing graded levels of DON for 6 weeks

	CON	DON ¹	DON ³	DON ⁵	SEM	P-value
Body weight (kg)						
Day 0	76.9	77.0	76.3	76.0	1.18	0.917
Day 7	85.4a	84.8a	83.0b	80.8c	0.34	<.0001
Day 14	95.3a	95.3a	92.4b	88.7c	0.42	<.0001
Day 21	103.4a	103.8a	99.8b	95.7c	0.50	<.0001
Day 28	112.1a	111.9a	107.8b	103.0c	0.53	<.0001
Day 35	119.7a	119.8a	114.9b	110.4c	0.63	<.0001
Day 42	126.7a	126.9a	123.6b	118.5c	0.80	<.0001
Average daily gain (kg/d)						
Week 1	1.27a	1.18a	0.93b	0.60c	0.05	<.0001
Week 2	1.40ab	1.49a	1.33b	1.13c	0.04	<.0001
Week 3	1.17ab	1.21a	1.06b	1.01c	0.04	0.004
Week 4	1.24a	1.17ab	1.15ab	1.04b	0.04	0.033
Week 5	1.08	1.12	1.01	1.06	0.04	0.392
Week 6	1.06	1.00	1.20	1.14	0.06	0.116
Overall	1.19a	1.20a	1.12b	1.00c	0.02	<.0001
Average daily feed intake (kg/d)						
Week 1	2.59a	2.59a	2.22b	1.70c	0.06	<.0001
Week 2	2.98a	3.07a	2.89a	2.55b	0.07	<.0001
Week 3	3.03a	3.03a	2.88a	2.56b	0.05	<.0001
Week 4	3.25a	3.19a	3.13a	2.85b	0.05	<.0001
Week 5	3.22	3.20	3.19	3.04	0.06	0.222
Week 6	3.19	3.11	3.36	3.05	0.08	0.079
Overall	2.99a	3.06a	2.94a	2.60b	0.05	<.0001
Gain:Feed (kg/kg)						
Week 1	0.49a	0.46a	0.41a	0.34b	0.02	<.0001
Week 2	0.47	0.49	0.47	0.44	0.01	0.136
Week 3	0.38	0.40	0.37	0.40	0.01	0.518
Week 4	0.38	0.36	0.37	0.36	0.02	0.738
Week 5	0.33	0.35	0.32	0.35	0.01	0.211
Week 6	0.33	0.32	0.36	0.37	0.01	0.083
Overall	0.40	0.39	0.38	0.38	0.01	0.073

a,b,c,d Means within a row without a common superscript differ significantly (P < 0.05)