# The Efficacy of Eight Different Feed Additives on Mitigating the Effects of Deoxynivalenol (DON)

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## SUMMARY

An experiment was conducted with nursery pigs to test the efficacy of 9 different feed additives on mitigating the effects of DON (2 ppm) contaminated feed. Sixty pens of pigs, 4 pig/pen were fed one of 12 diets for the 22 day experiment, beginning 7 days post-weaning. Treatments were a positive control, (non-contaminated corn) a negative control (2 ppm DON) and the negative control supplemented with one of 8 different feed additives, or in two cases a combination of feed additives. Consuming diets containing 2 ppm DON resulted in a 10% depression in feed intake which the feed additives did not reverse.

### INTRODUCTION

Deoxynivalenol (DON) is a trichothecene mycotoxin produced by fusarium moulds contaminating cereal and other grains, including corn and wheat. Gross symptoms of DON ingestion include vomiting and feed refusal and it can have serious if not dramatic effects on the financial viability of a commercial pig farm. There are several feed additives available which are reported to reduce the effect of the mycotoxin. Modes of action include binding the mycotoxin in the gut and preventing absorption, chemically transforming the toxin to decrease its toxicity, or enhancing immune system function. The overall objective of this experiment was to determine the effect of these feed additives on the performance of nursery pigs fed diets contaminated with DON.

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# MATERIALS AND METHODS

This experiment used 5 nurseries, with 24 pens per nursery and 4 pigs/pen (initial BW 9.02  $\pm$  0.36 kg). All pigs were fed 0.5 kg of Provision 1, then Provision 2 (FeedRite, Winnipeg, MB), until day 14 and treatment diets from day 15 to 35 post-weaning. Pigs were weighed on day -7 (7 days post-weaning) and on days 0 (14 days post-weaning, initiation of treatment diets) 8, 16, and 24 (nursery exit, day 35 post-weaning).

Treatment diets were formulated to meet or exceed all requirements for pigs of this age (Table 1). Samples of corn contaminated with known amounts of DON.were used for 35 % of the corn in diets 2 to 12 to provide 2 ppm DON in the final diet. This amount was used because a preliminary experiment indicated this level would cause a measurable reduction in feed intake but would not be fatal.

### **RESULTS AND DISCUSSION**

The concentrations of DON in diet samples are shown in Table 2. Concentrations ranged from "not-detected" in the positive control to 2.61 ppm in diet #11. Effects of treatment on overall performance are shown in Table 2. Pigs on the positive control tended to be heavier than those on the negative control by day 22 (0.50 kg, P = 0.09). Overall, pigs consuming diets contaminated with DON had reduced ADG and ADFI compared to those consuming the positive control diet free of DON (P < 0.001). Average daily gain and ADFI of pigs on the positive control was superior to those consuming the DON contaminated diet, regardless of the feed additive used. None of the feed additives ameliorated the effects of DON on feed intake or gain. Feed efficiency was unaffected by treatment (P > 0.05).

# CONCLUSIONS

Based on our preliminary experiment and a literature search we formulated the diets in this experiment to contain approximately 2 ppm DON. Analyses of the diets indicated a mean concentration in the DON containing diets of 1.99 ppm, however, concentrations ranged from 1.57 to 2.61 ppm. We are unable to determine if the variability shown in the treatment diets is the result of mixing, sampling, or analytical error. We suspect it may be a combination, and this illustrates some of the difficulties when working with mycotoxins. Very small amounts (ppm, parts per million) are toxic and it may exist as "pockets" within a grain which makes accurate sampling difficult.

None of the feed additives in this experiment effectively reduced the effects of the mycotoxins. There is no obvious explanation for this, but it could be because the response to the DON was so variable. The feed intake of the pigs on diets 4,5, and 8 was similar to the negative control, however, it didn't approach the feed intake of pigs on the positive control diet, and the feed intake of pigs on the other diets was actually less than those consuming the negative control.

In conclusion, approximately 2 ppm DON in the diet of nursery pigs will decrease growth and feed intake by almost 10% if consumed for 3 weeks. The feed additives used in this experiment had no effect on ameliorating the effect of the mycotoxoin, regardless of their mode of action.

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Ingredient	Percent
Corn <sup>a</sup>	50.61
Soybean Meal	29.25
Whey	10.00
Fish Meal	4.00
Canola Oil	2.00
Dicalcium Phosphate	1.40
Limestone	0.50
Vitamin Premix	0.50
Trace Mineral Premix	0.50
Celite	0.40
Salt	0.30
Lysine-HCl	0.15
Calcium Propionate	0.10
Antibiotic	0.10
Choline Chloride	0.08
DL-Methionine	0.07
Copper Sulphate	0.04

<sup>a</sup> Composed of appropriate proportions of contaminated and "clean" corn.

Table 2. Analyzed concentrations of DON and moulds in treatment diets and effect on performance of nursery pigs (initial BW 9.02 kg) fed DON contaminated corn.

				Performance					
Trt #	Treatment	DON ppm	Mould CFU/g <sup>a</sup>	BW Day 24	ADG, kg/d	ADFI, kg/d	Gain:Feed		
1	Positive control <sup>b</sup>	Neg <sup>c</sup>	850	21.72	0.58	0.88	0.67		
2	Negative controld	1.57	900	21.10	0.55	0.80	0.69		
3	Trt 2 + Ing. A	1.33	650	20.83 <sup>e</sup>	0.54 <sup>e</sup>	0.75 <sup>e</sup>	0.72		
4	Trt 2 + Ing. B	1.75	3,000	21.27	0.56 <sup>e</sup>	0.80 <sup>e</sup>	0.71		
5	Trt 2 + Ing. C	1.95	9,000	20.74 <sup>e</sup>	0.53 <sup>e</sup>	0.80 <sup>e</sup>	0.68		
6	Trt 2 + Ing. D	1.76	4,500	20.75 <sup>e</sup>	0.53 <sup>e</sup>	0.79 <sup>e</sup>	0.69		
7	Trt 2 + Ing. E	1.81	700	20.74 <sup>e</sup>	0.53 <sup>e</sup>	0.78 <sup>e</sup>	069		
8	Trt 2 + Ing. F	1.87	2,000	21.06	0.55	0.80	0.69		
9	Trt 2 + Ing. G	2.09	1,550	21.03	0.55 <sup>e</sup>	0.79 <sup>e</sup>	0.69		
10	Trt 2 + Ing. H	2.56	650	20.46 <sup>e</sup>	0.52 <sup>e</sup>	0.74 <sup>e</sup>	0.70		
11	Trt 2 + Ing. F + G	2.61	1,500	20.46 <sup>e</sup>	0.52 <sup>e</sup>	0.76 <sup>e</sup>	0.69		
12	Trt 2 + Ing. + E + B	2.57	2,000	20.33 <sup>e,f</sup>	0.52 <sup>f</sup>	0.75 <sup>e</sup>	0.69		
STATISTICS									
	SEM			0.25	0.01	0.03	0.02		
	Overall P-Value			0.009	0.009	0.11	0.81		
P-Value (Pdiff)		Trt 1	vs. Trt 2	0.09	0.08	0.06	0.36		
P-Value (Contrast)		Trt 1 v	s. Trt 3-12	0.0004	0.0003	0.0008	0.13		
P-Value (Contrast)		Trt 2 vs. Trt 3-12		0.20	0.20	0.35	0.77		
a Colony	a Colony forming units Moulds were primarily Penicillium ssp, Fusarium ssp and Mucor ssp.								

b Used exclusively non-contaminated corn.

c Negligible d Formulated to contain 2 ppm DON e Different from trt 1, positive control (P < 0.05).