Effects of Mycotoxin Binders and a Liquid Immunity Enhancer on the Growth Performance of Wean-to-Finish Pigs[1]

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Summary

A total of 1,120 pigs (PIC 337 × C22, initial BW = 16.0 lb) were used in a study to evaluate the effects of 2 commercial mycotoxin binders and a liquid immunity enhancer product on growth performance of wean-to-finish pigs. Pigs were randomly assigned to 1 of 4 treatments balanced by initial average BW within gender with 10 replicate pens per treatment. Treatments were: (1) control standard phase-fed diets based on corn and soybean meal with DDGS (20 to 35%) fed for 132 d, (2) a control diet with mycotoxin binders Biomannan fed from d 0 to 55 and T-BIND fed from d 0 to 132, (3) a control diet with Biomannan and T-BIND fed from d 0 to 132, and (4) Treatment 3 with a liquid immunity enhancer product administered through the water lines of pens continuously for 7 d every 3 wk. Both mycotoxin binders and the liquid immunity enhancer product were provided by Biotech Development Company, Inc. (Dexter, MO). The mycotoxin binder products were added in the diets at the expense of corn. Pigs from each pen were weighed as a group and feed disappearance was determined every 2 wk to determine ADG, ADFI, and F/G. Results of laboratory analysis showed that all mycotoxins tested in diet samples were below the practical quantitation limit. Overall, there were no treatment × sex interactions ($P > 0.50$). As expected, gender differences were noted as barrows had greater ($P < 0.01$) ADG and ADFI but poorer ($P < 0.05$) F/G than gilts. The addition of mycotoxin binders and liquid immunity enhancer product did not affect growth performance ($P > 0.73$) as all treatment groups had similar performance during the nursery ($P > 0.28$) and growing-finishing stages ($P > 0.61$). Under the conditions of the present study, the products tested had no effect on growth performance of wean-to-finish pigs.

Key words: growth, mycotoxin binder

Introduction

Grains such as corn are susceptible to mold growth, particularly when exposed to high moisture coupled with poor handling and storage procedures. Although molds do not necessarily affect pigs' health, molds can produce mycotoxins that can have negative effects. Mycotoxins are substances that can cause a variety of problems in growing-finishing pigs including decreased feed intake, weight loss, and poor performance. They also can suppress the pig's immune system, which predisposes them to infectious diseases. Thus, keeping pig diets free of mycotoxins or within tolerable levels requires good production practices to avoid problems that may arise from consumption of

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contaminated grains. Mycotoxins are not visible to the naked eye, and detection in grains or feeds requires specific equipment, making on-farm detection difficult. Also, only small levels (measured in ppm or ppb) are required for mycotoxins to exert a negative effect on pigs.

Mycotoxin binders are substances that have the ability to bind mycotoxins and prevent their absorption in the gut when added in the diet. The most common substances used as mycotoxin binders are adsorbent clays such as bentonite. Yeast cell wall polysaccharides, such as β-glucans, also have been shown to adsorb various mycotoxins in addition to their known stimulatory effect on mucosal immunity. The use of mycotoxin binders in swine diets has received more attention as the use of dried distillers grains with solubles (DDGS) has become more widespread. Concerns have been raised recently regarding the possibility of DDGS having more concentrated mycotoxins (as much as 3 times) than the main grain source it originated from.

Also, with more emphasis on production efficiency, tools that can aid in disease prevention without compromising consumer health and the environment are receiving more attention. Thus, a wide array of natural products, such as organic acids and other phytogenic feed additives, that may help protect pigs from infectious agents are becoming more available. One such product is ARNAp (Biotech Development Co., Inc., Dexter, MO), which is a natural multi-use product that contains dried citrus pulp extract, vitamin C, and organic acids. It is marketed for use in pigs as an aid to strengthen the immune system and protect the pig from common infectious agents.

We conducted this study to determine the effect of two commercial mycotoxin binders and a liquid immunity enhancer product added to drinking water on growth performance of growing-finishing pigs fed diets containing DDGS.

Procedures

This study was approved by and conducted in accordance with the guidelines of the Kansas State University Institutional Animal Care and Use Committee. The experiment was conducted in a commercial research finishing barn in southwestern Minnesota. The barns were naturally ventilated and double curtain sided. Pens had completely slatted flooring and deep pits for manure storage. Each pen was equipped with a 5-hole stainless steel dry self-feeder and a cup waterer for ad libitum access to feed and water. Daily feed additions to each pen were accomplished through a robotic feeding system capable of providing and measuring feed amounts on an individual pen basis.

A total of 1,120 pigs (PIC 337 × C22, initial BW = 16.0 lb) were randomly assigned to 1 of 4 treatments balanced by average BW within gender. There were 10 single-gender pens (5 pens of barrows and 5 pens of gilts) per treatment with 28 pigs per pen. Treatments were: (1) control standard phase-fed diets based on corn and soybean meal with DDGS (20 to 35%) fed for 132 d, (2) a control diet with mycotoxin binders Biomannan fed from d 0 to 55 and T-BIND fed from d 0 to 132, (3) a control diet with T-BIND and Biomannan fed from d 0 to 132, and (4) Treatment 3 with ARNAp, a liquid immunity enhancer product, administered at 500 ppm through the water lines of pens continuously for 7 d every 3 wk. The mycotoxin binder products were added in the diets at the expense of corn. T-BIND is a blend of hydrated sodium calcium alumi-

nosilicates, and Biomannan is a natural mannan-based oligosaccharide and glucose fermentation product. ARNAp is a natural multi-use product that contains dried citrus pulp extract, vitamin C, and organic acids. It is being marketed for use in swine to help the immune system fight against common infectious agents. Both mycotoxin binders and the liquid immunity enhancer product were provided by a single manufacturer (Biotech Development Company, Inc., Dexter, MO). Pigs from each pen were weighed as a group and feed disappearance was determined every 2 wk to determine ADG, ADFI, and F/G. Control nursery and finishing diet samples were submitted for a complete mycotoxin analysis at the Veterinary Diagnostic Laboratory at North Dakota State University, Fargo.

Statistical analysis was performed by analysis of variance using the MIXED procedure of SAS (SAS Institute, Inc., Cary, NC). Data were analyzed as a completely randomized design with pen as the experimental unit. The main effects of the different treatment regimens, gender, and their interaction were tested.

Results and Discussion

Results of the laboratory analysis showed that all mycotoxins tested in both diet samples were below the practical quantitation limit (Table 1). Overall, there were no treatment × sex interactions ($P > 0.50$; Table 2). Growth performance of barrows and gilts was similar ($P > 0.59$) during the nursery stage. However, barrows exhibited greater ($P < 0.01$) ADG and ADFI with poorer ($P < 0.02$) F/G during the finishing stage than gilts. Overall, barrows had greater ($P < 0.01$) ADG and ADFI but poorer ($P < 0.02$) F/G than gilts. The addition of the mycotoxin binders or the liquid immunity enhancer product did not affect growth performance of the pigs in the nursery stage (d 0 to 55; $P > 0.28$), growing-finishing stage (d 55 to 132; $P > 0.61$), or overall (d 0 to 132; $P > 0.73$).

In this experiment, the mycotoxin binders and liquid immunity enhancer product used had no effect on growth performance of wean-to-finish pigs. However, it should be noted that the pigs used in this study had good health status during the entire course of the experiment. Also, all mycotoxins tested from feed samples were found to be well below the suggested cautionary levels. Therefore, in the absence of mycotoxin contamination and disease challenge, no beneficial effects were realized from the use of the products evaluated.

Table 1. Analyzed mycotoxin content (ppm) in diet samples (as-fed)[1]

Mycotoxin	Nursery diet[2]	Finishing diet[3]
Aflatoxin B1	<0.02	<0.02
Fumonisin B1	<2.0	<2.0
T-2 toxin	<0.5	<0.5
Vomitoxin	<0.5	<0.5
Zearalenone	<0.5	<0.5

[1] Major mycotoxins affecting feedstuffs commonly used in swine diets. Diet samples were submitted for a complete mycotoxin analysis at the Veterinary Diagnostic Laboratory at North Dakota State University, Fargo.
[2] The nursery diet was sampled 3 times during this portion of the study, and a composite sample was sent for analysis.
[3] The finishing diet was sampled 4 times during this portion of the study, and a composite sample was sent for analysis.

Table 2. Effect of mycotoxin binders and a liquid immunity enhancer on growth performance of wean-to-finish pigs[1]

	Treatment					Sex			Probability, *P* <		
	1	2	3	4							
T-BIND[2,3]:	-	+	+	+							
Biomannan (d 0 to 55)[2,4]:	-	+	+	+							
Biomannan (d 55 to 132)[2,5]:	-	-	+	+							
ARNAp[6]:	-	-	-	+	SEM	Barrow	Gilt	SEM	Treatment × sex	Treatment	Sex
Weight, lb											
d 0	15.9	16.0	16.1	15.9	0.26	16.0	15.9	0.18	0.95	0.94	0.57
d 55	85.7	87.1	87.1	88.4	1.21	86.9	87.2	0.86	0.62	0.50	0.81
d 132	233.0	234.0	234.6	235.3	1.44	237.3	231.1	1.02	0.77	0.73	0.0001
d 0 to 55											
ADG, lb	1.26	1.29	1.29	1.32	0.019	1.29	1.29	0.013	0.58	0.28	0.73
ADFI, lb	2.10	2.09	2.11	2.13	0.043	2.10	2.12	0.030	0.98	0.94	0.59
F/G	1.66	1.62	1.64	1.61	0.024	1.63	1.64	0.017	0.87	0.56	0.71
d 55 to 132											
ADG, lb	1.91	1.89	1.91	1.90	0.020	1.94	1.86	0.014	0.50	0.93	0.0004
ADFI, lb	4.93	4.93	4.98	4.97	0.046	5.11	4.80	0.032	0.61	0.76	<.0001
F/G	2.58	2.60	2.61	2.62	0.022	2.63	2.58	0.015	0.98	0.61	0.02
d 0 to 132											
ADG, lb	1.64	1.64	1.65	1.65	0.011	1.67	1.62	0.008	0.73	0.73	0.0004
ADFI, lb	3.74	3.74	3.78	3.78	0.037	3.84	3.67	0.026	0.81	0.77	<.0001
F/G	2.28	2.28	2.29	2.28	0.019	2.31	2.26	0.013	0.95	0.96	0.02

[1] A total of 1,120 pigs (PIC 337 × C22, initial BW = 16.0 lb) were used with 28 pigs per and 10 replications per treatment.
[2] Biotech Development Company, Inc., Dexter, MO.
[3] Added in all dietary phases at 4 lb/ton in place of corn.
[4] Added in the diet at 4 lb/ton in place of corn and fed during the nursery stage.
[5] Added in the diet at 1 lb/ton in place of corn and fed during the finishing stage.
[6] A liquid immune system enhancer product added to drinking water continuously for 7 days at 3-wk intervals starting at d 21.