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Effects of a heat-stable yeast product and antibiotics in diets for nursery pigs

Abstract

A total of 192 pigs (average initial BW of 15 lb and 21 d of age) were used in a 35-d experiment to determine the effects of a heatstable yeast product on growth performance of nursery pigs fed diets without and with antibiotics. Treatment diets were formulated to: 1.7% lysine for d 0 to 7, 1.5% lysine for d 7 to 21, and 1.3% lysine for d 21 to 35. The treatments were arranged as a 2 × 2 factorial, with main effects of antibiotics (without and with carbadox at 50 g/ton) and yeast (without and with 0.2% Biosaf). All diets had 3,000 ppm total Zn for d 0 to 7 and 250 ppm total Cu for d 7 to 35. For d 0 to 7 and 7 to 21, the diets were steam conditioned for approximately 10 seconds at atmospheric pressure and temperatures of 140oF and 160oF, respectively. For d 21 to 35, the diets were fed in meal form. The antibiotic improved efficiency of gain for d 0 to 7 and 0 to 21 (P<0.04). Rate of gain was greater (P<0.01) in pigs fed the antibiotic for d 0 to 21 and overall (d 0 to 35). However, there was no effect of yeast addition on growth performance (P>0.15) and there were no interactions among antibiotic and yeast addition in any phase of the experiment (P>0.08). In conclusion, the antibiotic (carbadox) was effective as a non-specific growth promoter, but the yeast product had minimal effect.; Swine Day, 2003, Kansas State University, Manhattan, KS, 2003

Keywords

Swine day, 2003; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 920; Kansas Agricultural Experiment Station contribution; no. 04-120-S; Nursery; Antibiotic; Yeast; Swine

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EFFECTS OF A HEAT-STABLE YEAST PRODUCT AND ANTIBIOTICS IN DIETS FOR NURSERY PIGS

J.D. Hancock, C.L. Jones, and C.W. Starkey

Summary

A total of 192 pigs (average initial BW of 15 lb and 21 d of age) were used in a 35-d experiment to determine the effects of a heat-stable yeast product on growth performance of nursery pigs fed diets without and with antibiotics. Treatment diets were formulated to: 1.7% lysine for d 0 to 7, 1.5% lysine for d 7 to 21, and 1.3% lysine for d 21 to 35. The treatments were arranged as a 2 × 2 factorial, with main effects of antibiotics (without and with carbadox at 50 g/ton) and yeast (without and with 0.2% Biosaf). All diets had 3,000 ppm total Zn for d 0 to 7 and 250 ppm total Cu for d 7 to 35. For d 0 to 7 and 7 to 21, the diets were steam conditioned for approximately 10 seconds at atmospheric pressure and temperatures of 140°F and 160°F, respectively. For d 21 to 35, the diets were fed in meal form.

The antibiotic improved efficiency of gain for d 0 to 7 and 0 to 21 ($P < 0.04$). Rate of gain was greater ($P < 0.01$) in pigs fed the antibiotic for d 0 to 21 and overall (d 0 to 35). However, there was no effect of yeast addition on growth performance ($P > 0.15$) and there were no interactions among antibiotic and yeast addition in any phase of the experiment ($P > 0.08$). In conclusion, the antibiotic (carbadox) was effective as a non-specific growth promoter, but the yeast product had minimal effect.

(Key Words: Nursery, Antibiotic, Yeast)

Introduction

The effects of direct-fed microbials on animal growth and health have been of interest for many years, especially with the ever-increasing pressure to reduce (or eliminate) subtherapeutic use of antibiotics as non-specific growth promoters. In a previous experiment (Maloney et al., 1998), we demonstrated positive effects (improved ADG and gain/feed) in nursery pigs fed diets with antibiotics and a heat-stable yeast product (Biosaf) used in combination. Our results were encouraging as far as demonstrating improved growth performance in weanling pigs, but the experiment did not address the need to identify a direct-fed microbial that could be used to replace antibiotics. Thus, the experiment reported herein was designed to determine the effects of a heat-stable yeast product on nursery pigs fed diets without and with antibiotics.

Procedures

A total of 192 pigs (average initial BW of 15 lb and 21 d of age) were used in a 35-d experiment to determine the effects of a heat-stable yeast product on growth performance of nursery pigs fed diets without and with antibiotics. The pigs were blocked by weight and allotted to pens based on gender and ancestry. There were six pigs per pen and eight pens per treatment.

Treatment diets (Table 1) were formulated to: 1.7% lysine, 0.9% Ca, and 0.8% P for d 0

to 7; 1.5% lysine, 0.8% Ca, and 0.7% P for d 7 to 21; and 1.3% lysine, 0.75% Ca, and 0.65% P for d 21 to 35. The treatments were arranged as a 2 × 2 factorial with main effects of antibiotics (without and with carbadox at 50 g/ton) and yeast (without and with 0.2% Biosaf). All diets had 3,000 ppm total Zn for d 0 to 7 and 250 ppm total Cu for d 7 to 35.

For d 0 to 7 and 7 to 21, the diets were steam conditioned for approximately 10 seconds at atmospheric pressure and temperatures of 140°F and 160°F, respectively. In previous experiments, we found that the yeast product endured pelleting temperatures of 158 to 176°F with negligible loss of colony-forming units. Thus, the temperatures used in the present experiment were deemed to be sufficiently low to killing the yeast cells. Pelleting was in a CPM Master Model HD1000 pellet mill equipped with a 1.25 inch × 5/32 inch diameter holes. For d 21 to 35, the diets were fed in meal form.

The pigs were housed in an environmentally controlled nursery room having 4 × 5 ft pens with wire-mesh flooring. Room temperature initially was 90°F and was decreased by

3°F each week thereafter. The pens had a self-feeder and nipple waterer to allow ad libitum consumption of feed and water. Pig and feeder weights were collected on d 0, 7, 21, and 35 to allow calculation of ADG, ADFI, and feed/gain.

All data were analyzed as a randomized complete block design using the GLM procedure of SAS. Means separation was that appropriate for a 2 × 2 factorial with the main effects of antibiotic treatment and incorporation of yeast into the diets.

Results and Discussion

The antibiotic improved efficiency of gain for d 0 to 7 and 0 to 21 ($P < 0.04$). Rate of gain was greater ($P < 0.01$) in pigs fed the antibiotic for d 0 to 21 and overall (d 0 to 35). However, there was no effect of yeast addition on growth performance ($P > 0.15$) and there were no interactions among antibiotic and yeast addition in any phase of the experiment ($P > 0.08$). In conclusion, the antibiotic (carbadox) was effective as a non-specific growth promoter, but the yeast product had minimal effect.

Table 1. Composition of Diets

Ingredient, %	d 0 to 7	d 7 to 21	d 21 to 35
Corn	30.52	44.01	60.90
Soybean meal	23.07	27.37	31.34
Edible grade whey	20.00	20.00	-
Lactose	10.00	-	-
Spray-dried animal plasma	4.00	-	-
Spray-dried wheat gluten	5.00	-	-
Spray-dried blood cells	1.00	2.00	-
Soybean oil	2.00	3.00	4.00
Lysine HCl	0.43	0.30	0.29
DL-methionine	0.17	0.23	0.10
Threonine	0.11	0.15	0.10
Tryptophan	0.01	0.01	-
Limestone	1.06	0.96	1.15
Monocalcium phosphate	1.64	1.18	1.28
Salt	0.20	0.30	0.35
Vitamin premix	0.25	0.25	0.25
Mineral premix	0.15	0.15	0.15
Zinc oxide ^a	0.39	-	-
Copper sulfate ^b	-	0.09	0.09
Antibiotic/yeast ^c	-	-	-
Calculated composition			
CP, %	24.12	21.19	20.05
Total lysine, %	1.70	1.50	1.30
Ca, %	0.90	0.80	0.75
Total P, %	0.80	0.70	0.65
ME, kcal/lb	1,519	1,542	1,574

^aTotal Zn concentration for d 0 to 7 was 3,000 ppm.

^bTotal Cu concentration for d 7 to 35 was 250 ppm.

^cProvided 50 g/ton carbadox for d 0 to 35 in the diets with antibiotic and 0.02% Biosaf for the diets with yeast.

Table 2. Effects of Antibiotics and a Heat-Stable Yeast Product on Growth Performance of Nursery Pigs^a

Item	W/O antibiotic		With antibiotic		SE	Contrasts ^b		
	W/O yeast	With yeast	W/O yeast	With yeast		Antibiotic	Yeast	AB × yeast
d 0 to 7								
ADG, lb	0.71	0.73	0.75	0.76	0.03	– ^c	–	–
ADFI, lb	0.63	0.70	0.65	0.65	0.02	–	0.15	0.18
Feed/gain	0.89	0.96	0.87	0.86	0.04	0.04	–	0.11
d 0 to 21								
ADG, lb	0.93	0.92	1.00	1.02	0.02	0.002	–	–
ADFI, lb	1.04	1.08	1.10	1.08	0.03	–	–	–
Feed/gain	1.12	1.17	1.10	1.06	0.04	0.02	–	0.08
Overall (d 0 to 35)								
ADG, lb	1.14	1.14	1.17	1.20	0.02	0.01	–	–
ADFI, lb	1.50	1.53	1.55	1.57	0.02	0.06	–	–
Feed/gain	1.32	1.43	1.32	1.31	0.03	–	–	–

^aA total of 192 pigs (six pigs/pen and eight pens/treatment) with an average initial BW of 15 lb and an average initial age of 21 d.

^bContrasts were: 1) no antibiotic vs antibiotic; 2) no yeast vs yeast; and 3) no antibiotic vs antibiotic × no yeast vs yeast.

^cDashes indicate $P=0.15$ or greater.