

Effect of Ergot-Contaminated Barley on Growing-Finishing Pig Performance

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Summary and Implications

Barley samples from Allamakee County were used in a swine feeding study. Pigs fed a barley-corn and soybean meal (SBM) diets containing up to 0.18% ergot (1.62 ppm ergot alkaloids) performed similarly to pigs fed a basal corn-SBM diet. In general, the level of ergot contamination in the final diets was insufficient to depress the performance of growing and finishing pigs.

Introduction

Ergot is a parasitic fungus that affects cereal grains by invading the grass ovary, forming a dark, elongated body called a sclerotium. Total ergot alkaloid content commonly ranges from 0.2 to 0.6% of sclerotia weight. USDA has set a tolerance of 0.3% by weight ergot in grain. As little as 0.1% ergot may reduce feeder pig gain, and higher levels (3.0%) have been implicated in feed wastage and slow growth (Diseases of Swine, 7th edition, 1992. ISU Press, Ames, IA).

Many farmers in northeast Iowa planted barley in 1996 in anticipation of an early harvest to substitute for corn shortages. Weather conditions resulted in many of the barley fields becoming infected with ergot and, when fed to dairy cows, milk production dropped precipitously.

The purpose of this experiment was to evaluate the effect of feeding barley at two concentrations of ergot contamination to growing-finishing pigs.

Materials and Methods

Barley samples were obtained from Allamakee County in northeast Iowa in the Fall of 1996. All barley samples had some contamination with ergot. Clean barley samples were prepared cleaning barley at the ISU Seed Science Lab and with a commercial cleaner located in Waukon, IA. Lots of cleaned barley were combined for Treatment 2 and uncleaned barley plus some screenings from the cleaned barley were combined to obtain the final barley product for Treatment 3. Clean barley contained approximately 0.15% ergot and the contaminated barley contained 0.50% ergot (wt/wt). Based on the final dilution with corn and soybean meal (SBM), the clean barley-corn-SBM diet contained approximately 0.05% ergot and the

ergot containing barley-corn-SBM diet contained approximately 0.18% ergot.

Cleaned and ergot containing barleys were ground on November 20, 1996, and stored in overhead bins at the ISU Swine Nutrition Research and Management facility near Ames. Barley diets were prepared as needed. The corn-soybean basal diets were those routinely fed at the research farm.

Sixty growing pigs were fed from an average initial weight of 54.1 lb to a final average weight of 216.8 lb. The light final weight was selected based on the quantity of barley available for the experiment. Each treatment was fed to five pens of pigs and each pen contained four pigs with the ratio of barrows to gilts within a block the same. Pigs were randomly allotted on the basis of initial weight and sex to pens within blocks, with a restriction that littermates not be in the same pen. Treatments were randomly allotted to contiguous pens within blocks and pigs were transferred from the grower to the finisher diet at a pen average of approximately 120 lb. A pen of pigs was the experimental unit for statistical analysis as a randomized block design.

Pigs were housed in partially slotted, concrete floor pens containing a nipple drinker and a stainless steel self-feeder. Up to approximately 120-lb body weight pigs were housed in pens that allowed 7.5 ft²/pig and subsequently were housed in pens that allowed 12 ft²/pig. The experiment was conducted from November 21, 1996, until February 27, 1997. A minimum temperature of 55°F was maintained in the environmentally controlled rooms.

Pigs were weighed individually and pen feed intake data were collected first at 2-week intervals, then at 1-week intervals as pigs approached the off-test weight. The last two pigs were removed from a pen together when one reached 220 lb. One pig was removed from Treatment 1 at 120 lb, when it became sick and one pen on Treatment 3 was ended at approximately 192 lb when the pigs in that pen became sick. Performance data for pigs removed are included in the data up to the weigh day in which their growth rate was obviously affected by illness.

Diets are presented in Table 1. Note that barley simply replaced one half of the corn in the barley treatments. Total ergot alkaloid levels, as analyzed by the ISU Veterinary Diagnostic Laboratory, also are listed for the grower diets. The basal grower diet contained 0.52 ppm, ergot alkaloids, cleaned barley-corn diet contained 1.04 ppm and ergot barley-corn diet contained 1.62 ppm. Note that the basal diet contained

low levels of ergot alkaloids and was mixed at different times than the barley-corn diets.

Results and Discussion

Feed intake, daily gain, and feed efficiency are presented for the grower, finisher, and the entire feeding period. Data are presented in Table 2. Performance was not significantly affected by the treatments with the exception of feed intake during the grower phase in which the treatments differed ($P < 0.02$). Pigs on the

corn-SBM basal diet grew numerically faster and more efficiently but no statistical differences were observed ($P > 0.14$).

Cleaned barley-corn-SBM (1.04 ppm ergot alkaloids and 0.05% ergot) or ergot containing barley-corn-SBM diets (1.62 ppm ergot alkaloids and 0.18% ergot), in which the barley replaced one half of the corn, performed similarly to pigs fed a corn-SBM diet (0.52 ppm ergot alkaloids).

Table 1. Diets.

Ingredient	Grower			Finisher		
	Trt. 1 Corn-SBM	Trt. 2 Clean Bly	Trt. 3 Ergot Bly	Trt. 1 Corn-SBM	Trt. 2 Clean Bly	Trt. 3 Ergot Bly
Corn	750.90	375.45	375.45	791.70	395.85	395.85
Barley (0.15% ergot)	-	375.45			395.85	
Barley (0.50% ergot)			375.45			395.85
Soybean meal, 48%	213.00	213.00	213.00	173.00	173.00	173.00
Dicalcium phosphate	10.90	10.90	10.90	12.00	12.00	12.00
Limestone	8.70	8.70	8.70	8.30	8.30	8.30
Sodium chloride	2.50	2.50	2.50	2.50	2.50	2.50
Trace mineral ^a	0.50	0.50	0.50	0.25	0.25	0.25
Vitamin premix ^b	2.00	2.00	2.00	1.00	1.00	1.00
Fat	10.00	10.00	10.00	10.00	10.00	10.00
Lysine•HCl	1.00	1.00	1.00	1.00	1.00	1.00
Tylan-40; BMD-60	0.50	0.50	0.50	0.25	0.25	0.25
Total	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
Alkaloid levels, ppm	0.52	1.04	1.64			
Calculated analysis:						
ME, kcal/lb	1517	1458	1458	1517	1456	1456
Lysine, %	0.92	0.97	0.97	0.81	0.87	0.87
Calcium, %	0.64	0.65	0.65	0.64	0.65	0.65
Phosphorus, %	0.55	0.57	0.57	0.56	0.58	0.58
Phos., avail, %	0.27	0.29	0.29	0.28	0.31	0.31

^a Contributes at 0.05% of the diet in ppm: 75 Zn; 87.5 Fe; 30 Mn; 8.75 Cu; 0.1 Iodine.

^b Contributes at 0.20% of diet per pound of diet: 2,000 IU vitamin A; 500 IU vitamin D₃; 3 mg riboflavin; 8 mg pantothenic acid; 15 mg. niacin; 10 ug vitamin B₁₂.

Table 2. Effect of barley sources on performance of growing-finishing pigs.

Finisher	Corn-SBM Basal	Clean Barley	Ergot Barley	Trt. effect
Daily feed, lb				
Grower	4.22	4.02	3.89	P<0.024
Finisher	6.27	6.39	6.35	
Entire period	5.25	5.28	5.16	
Daily gain, lb				
Grower	1.81	1.85	1.71	
Finisher	2.00	1.86	1.95	
Entire period	1.90	1.84	1.83	
Feed/gain				
Grower	2.33	2.20	2.29	
Finisher	3.14	3.52	3.28	
Entire period	2.76	2.87	2.81	