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Summary

Two trials involving 105 finishing pigs (initial average weight 125 pounds) and 55 growing pigs (initial average weight 28 pounds) were conducted to determine the nutritional value of high-moisture, acid-treated milo in swine rations. Additionally, feeding method (complete mixed or free-choice) and processing method (ground or whole) were compared. The high-moisture milo (22% moisture) was treated with either propionic acid (P.A.) 0.6% w/w, or ammonium isobutyrate (AIB) 1.75% w/w.

Pigs fed high-moisture, acid-treated milo as a complete mixed ration gained at the same rate and were just as efficient in feed utilization as pigs fed the dry, complete mixed ration. In both trials, both acid treatments gave similar pig performances. In the finishing trial, pigs fed high-moisture, acid-treated milo and supplement free-choice gained at the same rate and were just as efficient in feed utilization as pigs fed the complete mixed rations. However, with growing pigs, free-choice feeding significantly ($P<.05$) reduced daily gain. Finishing pigs fed whole high-moisture, acid-treated milo required significantly ($P<.05$) more feed per unit of gain than pigs fed the ground high-moisture acid-treated milo. Whole high-moisture, acid-treated milo was used as efficiently as ground high-moisture, acid-treated milo by young pigs. Acid-treated, high-moisture milo is equal to dry milo in feeding value when the acid-treated milo is fed in a ground complete mixed ration. With free-choice feeding, pigs fed high-moisture, acid-treated milo may not eat enough supplement to give maximum performance.

Introduction

Harvesting high moisture grain and treating it with organic acid has increased in popularity in recent years. With acid treatment, conventional storage structures can be used as acid treatment lowers the pH of the grain and inhibits microbical growth. In these studies we evaluated the effects of propionic acid and ammonium isobutyrate on acceptance and utilization of high-moisture milo in swine rations.

Experimental Procedures

High moisture milo for both trials was harvested at 22% moisture and treated with either 0.6% propionic acid or 1.75% ammonium isobutyrate and stored in metal bins. The control (dry milo) contained 14% moisture.

Finishing trial. One hundred five Yorkshire finishing pigs averaging 125 pounds initially were randomly assigned to treatments from outcome groups based on initial weight and sex. The trial was conducted in a modified, open-front builidng

during the winter (November-February) and was terminated when each pen of pigs averaged approximately 220 pounds.

The treatments were:

1) Dry, ground, complete mixed
2) High-moisture, propionic acid, ground, complete mixed
3) High-moisture, AIB, ground, complete mixed

4) High-moisture, propionic acid, ground, free-choice supplement
5) High-moisture, AIB ground, free choice supplement

6) High-moisture, propionic acid, whole, free-choice supplement
7) High-moisture, AIB, whole, free-choice supplement

Compositions of the protein supplement and the dry control ration are shown in table 2. All complete mixed rations provided the same amount of milo on a dry matter basis. The protein supplement was fed as a 3/16 inch pellet in a seperate two-hole feeder when offered free-choice.

Growing trial. Fifty-five pigs averaging 28 pounds initially were randomly assigned from outcome groups formed on initial weight and sex to three replications of the five treatments. The treatments used were:

1) Dry, ground, complete mixed
2) High-moisture, propionic acid, ground, complete mixed
3) High-moisture, AIB, ground, complete mixed
4) High-moisture, propionic acid, ground, free-choice supplement
5) High-moisture propionic acid , whole, free-choice supplement.

Compositions of the protein supplement and the dry control ration are shown in table 3. The trial lasts 35 days.

Table 2. Compositions of protein supplement and control ration for finishing pigs.

Ingredient, %	Dry-control	Supplement
Milo[a]	81.55	
Soybean meal (44%)	15.3	82.99
Dicalcium phosphate	1.00	5.40
Limestone	1.00	5.40
Salt	0.50	2.70
Trace-mineral mix	0.05	0.27
Vitamin premix	0.50	2.70
Antibiotic premix	0.10	0.54
	100.0	100.0

[a]All complete mixed rations provided the same amount of dry matter from milo.

Table 3. Compositions of protein supplement and control ration for growing pigs.

Ingredient, %	Dry-control[a]	Supplement
Milo	69.4	
Soybean meal (44%)	26.6	86.94
Dicalcium phosphate	1.4	4.57
Limestone	1.2	3.92
Salt	0.5	1.63
Trace-mineral	0.1	0.33
Vitamin premix	0.5	1.63
Antibiotic premix	0.3	0.98
	100.0	100.0

[a]All complete mixed rations provided the same amount of dry matter from milo.

Results and Discussion

Performances of finishing pigs fed high-moisture or dry milo are shown in table 4. Weight gain and feed efficiency of pigs fed ground complete mixed ration were similar regardless of moisture content or acid treatment. Supplement consumption was reduced when pigs were offered high-moisture, acid-treated milo and supplement free-choice. Pigs fed whole high-moisture, acid-treated milo free-choice required significantly ($P<.05$) more feed per unit of gain than pigs fed ground milo. Numerous whole kernels of milo were observed in the feces of pigs fed whole high-moisture grain. Data were not included for pigs fed high-moisture, AIB treated milo that was ground with supplement offered free-choice because one replicate of pigs consumed an abnormally small amount of protein supplement.

Performances of growing pigs fed high-moisture or dry milo are shown in table 5. Pigs fed ground high-moisture, acid-treated milo as a complete mixed ration gained at the same rate and were just as efficient in feed utilization as pigs fed the dry complete mixed ration. Both acid treatments gave similar performances. Pigs fed high-moisture, acid-treated milo and supplement free-choice gained significantly ($P<.05$) slower than pigs fed the complete mixed diets. The reduced performance of the pigs fed free-choice is probably due to the reduced supplement consumption. This reduction in supplement consumption occured even though the only protein source was soybean meal, which is very palatable to pigs. Growing pigs fed whole high-mioisture milo gained as efficiently as pigs fed ground milo. Evidently, young pigs chew the whole grain better than do the finishing pigs. That apparently accounted for the difference in efficiency with whole high-moisture milo.

Table 4. Performances of finishing pigs fed high-moisture or dry milo[a]

Rations	Daily gain, lb.	Daily intake, lb.			Feed/ gain
		Milo	Supplement	Total	
Dry, ground, complete	1.45[b,c]	4.09	0.92	5.01	3.45[b]
H-M P.A. ground, complete	1.56[b]	4.29	0.97	5.26	3.36[b]
H-M AIB ground, complete	1.47[b,c]	3.98	0.90	4.88	3.32[b]
H-M P.A. ground, free choice	1.47[b,c]	4.20	0.79	4.99	3.39[b]
H-M P.A. whole, free-choice	1.39[c]	5.26	0.77	6.03	4.35[c]
H-M AIB whole, free-choice	1.39[c]	4.82	0.79	5.61	4.05[c]

[a]All feed data expressed on a dry matter basis.

[b,c]Means with different superscripts differ significantly (P<.05).

Table 5. Performances of growing pigs fed high-moisture or dry milo[a]

Rations	Daily gain, lb.	Daily intake, lb.			Feed/ gain
		Milo	Supplement	Total	
Dry, ground, complete	1.49[b]	2.07	0.91	2.98	2.00[b]
H-M P.A. ground, complete	1.49[b]	1.92	0.85	2.77	1.86[b]
H-M AIB ground, complete	1.53[b]	2.01	0.88	2.89	1.89[b]
H-M P.A. ground, free-choice	1.30[c]	1.80	0.70	2.50	1.92[b]
H-M P.A. whole, free-choice	1.30[c]	1.87	0.64	2.51	1.92[b]

[a]All feed data expressed on a dry matter basis.

[b,c]Means with different superscripts differ significantly (P<.05).