Effect of Feeding Alfalfa on Nursery Pig Growth Performance

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Story in Brief

Two experiments were conducted to determine the effect of feeding high-quality, low-fiber alfalfa on growth performance during the nursery period. Dietary treatments in each phase consisted of 0, 5, or 10% alfalfa and were fed from d 0 to 42 postweaning [Phase 1 (d 0-14), Phase 2 (d 15-28), and Phase 3 (d 29-42)]. In experiment 1, 270 pigs (initial BW = 14.65 ± 0.007 lb) were blocked by BW and allotted randomly to one of the three treatments and reared in a wean-to-finish facility (9 pigs/pen). Overall, ADG (P = 0.020) and final BW (P = 0.023) responded quadratically with increasing level of alfalfa. In experiment 2, 234 pigs (initial BW = 13.74 ± 0.011 lb) were blocked by BW and randomly allotted to one of three treatments and reared in a conventional nursery (6 pigs/pen). Overall ADG (P = 0.001), ADFI (P = 0.013), and BW (P = 0.001) decreased linearly with increasing level of alfalfa, while F/G increased linearly (P = 0.011) with increasing alfalfa level. In summary, feeding greater than 5% alfalfa during Phase 1 and 2 to pigs during the nursery period may decrease average daily gain and body weight. However, Phase 3 nursery diets containing 10% alfalfa had no effect on growth performance.

Introduction

As feed costs increase, the potential benefits of alfalfa supplementation to swine diets could promote the utilization of this crop by partially replacing feedstuffs used in typical swine diet ingredients, such as corn and soybean meal. Sows raised on alfalfa pasture or fed late-cutting alfalfa in a complete mixed ration exhibit enhanced performance and health status. Pigs born to these sows had improved vigor, enhanced resistance to disease, and healthier physical appearance. Alfalfa contains phytoestrogenic compounds similar to those found in soy that have been reported to have neutraceutical benefits in the human diet and improve the health of virus-infected pigs. Alfalfa phytoestrogens, most notably apigenin and coumesterol, possess antioxidant properties, and may provide health benefits similar to the soy isoflavones. Therefore, a possible mechanism by which alfalfa may enhance performance is by modulating the pigs' immune system. The objective of this experiment was to determine the potential benefit of feeding alfalfa as an alternative protein source directly to nursery pigs.

Experimental Procedures

Animals and Housing. In experiment 1, 270 barrows and gilts (initial BW = 14.65 ± 0.007 lb) were blocked by BW and allotted randomly to one of the three treatments and reared in a wean-to-finish facility (9 pigs/pen). The pens were totally slatted and equipped with radiant heaters, a two-hole nursery feeder, and a wean-to-finish watering cup. In experiment 2, 234 pigs (initial BW = 13.74 ± 0.011 lb) were blocked by BW and randomly allotted to one of three treatments and reared in a conventional on-site nursery (6 pigs/pen). The pigs were housed in an environmentally controlled nursery facility in elevated pens with one nipple watering cup and a two-hole feeder.

Diets and Growth Performance. Water and feed were available ad libitum throughout both studies. Typical nursery diets were fed in three phases. Diets in each phase consisted of 0, 5, or 10% alfalfa (Table 1). A late fall cutting of alfalfa leaves and stems from Arkansas were used in experiment 1, and alfalfa leaves from Wisconsin were used in experiment 2. Diets were fed from d 0 to 42 after weaning [Phase 1 (d 0-14), Phase 2 (d 15-28), and Phase 3 (d 29-42)]. Pig BW and feed intake were determined at initiation and at each phase change throughout the study to evaluate ADG, ADFI, and feed-to-gain ratio (F/G).

Statistical Analysis. Performance data were analyzed using PROC GLM of SAS (SAS Inst., Inc., Cary, N.C.) with block and level of alfalfa in the model. Contrasts were used to determine linear and quadratic effects of increasing levels of alfalfa on the measure of growth performance.

Results and Discussion

In experiment 1, phase 1 and 2 ADG responded quadratically with increasing alfalfa level (P < 0.03; Table 2), but there were no differences (P = 0.13) in growth performance during Phase 3. Overall, ADG (P = 0.020) and final BW (P = 0.023) responded quadratically with increasing level of alfalfa, with pigs consuming the 5% alfalfa diet having the greatest ADG and final BW at the end of phase 3.

In experiment 2, phase 1 ADG, ADFI, and BW decreased linearly with increasing level of alfalfa (P < 0.001; Table 3). During Phase 2, ADG, ADFI, and BW decreased quadratically with increasing level of alfalfa (P < 0.03). There were no differences (P = 0.37) in growth performance during Phase 3. Overall ADG, ADFI, and BW decreased linearly with increasing level of alfalfa (P < 0.02), while F/G increased linearly with alfalfa inclusion in the diet (P = 0.011).

These experiments demonstrate that feeding greater than 5% alfalfa during Phase 1 and 2 to pigs during the nursery period may decrease average daily gain and body weight. However, Phase 3 nursery diets containing up to 10% alfalfa had no effect on growth performance.

Implications

Alfalfa can potentially replace a portion of corn and soybean meal in late nursery pig diets without compromising growth performance. As feed costs continue to rise, the use of alfalfa and other alternative ingredients may become more commonplace in swine diets.

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Table 1. Composition of phase 1, phase 2, and phase 3 diets.

	Phase 1			Phase 2			Phase 3		
	Alfalfa			Alfalfa			Alfalfa		
Item, %	0%	5%	10%	0%	5%	10%	0%	5%	10%
Corn, ground	40.14	35.67	31.75	49.28	45.35	41.30	60.50	56.31	52.01
Lactose	15.00	15.00	15.00	8.10	8.10	8.10	0.00	0.00	0.00
Soy meal, 48% CP	16.00	14.25	12.00	30.50	28.20	26.00	30.75	28.75	26.80
Soy protein conc.	8.00	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00
Oat groats	5.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Alfalfa[a]	**0.00**	**5.00**	**10.00**	**0.00**	**5.00**	**10.00**	**0.00**	**5.00**	**10.00**
Spray dried cells	0.00	0.00	0.00	1.50	1.50	1.50	0.00	0.00	0.00
Plasma protein	3.50	3.50	3.50	1.00	1.00	1.00	0.00	0.00	0.00
Fish meal	5.00	5.00	5.00	2.00	2.00	2.00	1.00	1.00	1.00
Soy oil	3.00	4.40	5.77	0.00	0.00	0.00	0.00	0.00	0.00
Fat, Darling	0.00	0.00	0.00	3.00	4.39	5.80	3.00	4.37	5.78
Threonine	0.08	0.08	0.06	0.08	0.08	0.07	0.04	0.03	0.02
Lysine	0.17	0.17	0.17	0.14	0.15	0.16	0.15	0.15	0.15
Methionine	0.11	0.11	0.11	0.11	0.12	0.12	0.04	0.04	0.05
Vitamin premix[b]	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Ethoxyquin	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
NeoTerramycin	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mineral premix[c]	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Dicalcium phosphate	1.55	1.56	1.63	1.30	1.32	1.38	1.55	1.59	1.66
Calcium carbonate	0.52	0.33	0.08	0.76	0.56	0.34	0.74	0.53	0.30
Zinc oxide	0.00	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.30
Salt	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

[a] A late fall cutting of alfalfa leaves and stems from Northwest Arkansas were used in experiment 1 and alfalfa leaves from Wisconsin were used in experiment 2.
[b] Supplied 11023 IU of vit. A, 1653 IU of vit. D_3, 44 IU of vit. E, 4.4 mg of vit. K, 33 mg of pantothenic acid, 55 mg niacin, 10 mg riboflavin, and 44 mg of vit. B_{12} per kg of feed.
[c] Supplied 0.30 mg of Se, 40 mg of Mn, 165 mg of Zn, 165 mg Fe, 17 mg of Cu, and 0.30 mg of I per kg of feed.

Table 2. Growth performance of nursery pigs fed increasing levels of alfalfa in experiment 1[a].

	Alfalfa					Contrast P-value	
	0%	5%	10%	SE	P-value	Linear	Quadratic
Initial BW, lb	14.7	14.7	14.6	0.01	0.387	0.195	0.656
Phase 1							
ADG, lb	0.448	0.470	0.399	0.020	0.044	0.090	0.028
ADFI, lb	0.604	0.597	0.556	0.022	0.253	0.132	0.497
F/G	1.358	1.283	1.424	0.053	0.182	0.503	0.086
BW, lb	20.5	20.8	19.8	0.25	0.041	0.083	0.056
Phase 2							
ADG, lb	1.228	1.310	1.219	0.026	0.037	0.799	0.011
ADFI, lb	1.693	1.759	1.682	0.026	0.119	0.798	0.042
F/G	1.380	1.245	1.384	0.018	0.264	0.919	0.106
BW, lb	37.7	39.1	36.9	0.53	0.019	0.312	0.008
Phase 3							
ADG, lb	1.552	1.519	1.473	0.026	0.129	0.046	0.870
ADFI, lb	2.623	2.630	2.566	0.033	0.373	0.250	0.421
F/G	1.713	1.739	1.741	0.031	0.789	0.500	0.918
BW, lb	59.4	60.4	57.54	0.66	0.016	0.058	0.023
Overall							
ADG, lb	1.087	1.116	1.045	0.015	0.016	0.072	0.020
ADFI, lb	1.662	1.689	1.625	0.022	0.373	0.244	0.113
F/G	1.535	1.513	1.557	0.01	0.110	0.315	0.063

[a] Phase 1, d 0-14; Phase 2, d 15-28; and Phase 3, d 29-42.

Table 3. Growth performance of nursery pigs fed increasing levels of alfalfa in experiment 2[a].

	Alfalfa					Contrast P-value	
	0%	5%	10%	SE	P-value	Linear	Quadratic
Initial BW, lb	13.7	13.8	13.7	0.01	0.07	0.176	0.061
Phase 1							
ADG, lb	0.381	0.355	0.282	0.018	0.002	0.001	0.329
ADFI, lb	0.529	0.505	0.425	0.018	0.001	0.001	0.219
F/G	1.396	1.461	1.559	0.052	0.096	0.033	0.799
BW, lb	19.1	18.7	17.7	0.26	0.001	0.001	0.289
Phase 2							
ADG, lb	1.144	1.149	1.012	0.024	0.001	0.001	0.023
ADFI, lb	1.508	1.508	1.338	0.031	0.001	0.001	0.028
F/G	1.325	1.315	1.325	0.020	0.921	0.999	0.687
BW, lb	34.1	33.9	31.0	0.48	0.001	0.001	0.029
Phase 3							
ADG, lb	1.391	1.354	1.329	0.031	0.368	0.163	0.876
ADFI, lb	2.275	2.295	2.264	0.049	0.901	0.885	0.668
F/G	1.639	1.695	1.707	0.027	0.183	0.085	0.521
BW, lb	53.6	52.8	49.8	0.57	0.001	0.001	0.109
Overall							
ADG, lb	0.963	0.937	0.862	0.015	0.001	0.001	0.826
ADFI, lb	1.426	1.415	1.325	0.024	0.013	0.007	0.208
F/G	1.482	1.517	1.543	0.016	0.037	0.011	0.826

[a] Phase 1, d 0-14; Phase 2, d 15-28; and Phase 3, d 29-42.