

Alfalfa and Other Roughage for Growing-Fattening Swine¹

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Alfalfa has long been recommended as an excellent supplement for swine. Many of the early textbooks on swine production and feeding make note of the advantage from inclusion of alfalfa or other legume as a ration ingredient for swine. Coburn, as early as 1907, in his writings in **Swine Husbandry** cited an experiment where adding chopped clover hay to corn increased gains by 40 percent as compared with corn alone. In 1912 Dietrich, in his book, **Swine**, recommended the inclusion of alfalfa in swine rations. Dawson (**Success with Hogs**, 1919) wrote "Alfalfa may be termed as a basic supplement for all grains used in hog feeding, whether it be for brood sows, growing pigs, or market hogs."

More recently F. B. Morrison reviewed the published results of research and wrote in his **Feeds and Feeding** 21st edition, "When well-cured alfalfa or other legume hay is available, the best way of preventing these (nutritional) deficiencies is to include the proper proportion of such hay in the rations of swine that are not on pasture." Carrol and Krider in their textbook (**Swine Production**, 2nd edition, 1956) recommended a minimum of five percent high quality alfalfa in all swine rations and higher levels for brood sows. Smith in his **Pork Production** (3rd edition, 1955) made similar recommendations.

It is readily understandable with the present knowledge of nutrition that the legume was furnishing many of the necessary vitamins, supplemental proteins and minerals in these earlier studies. However, with the availability and low cost of commercial supplements, it is possible that more economical and better means of supplementing the lacking vitamins, proteins and minerals can be achieved.

In research at the North Dakota station it had been noticed that whenever ground alfalfa was included in ground mixed rations for growing or fattening pigs there appeared to be greater waste from (rooting) the feeders and the feed efficiency appeared to be lowered. This was particularly apparent when barley or oats was the grain used. Because of these observations, research on the problem of alfalfa in the rations of growing fattening pigs under dry-lot conditions was begun.

Experiment 3

In the summer of 1950, two lots of 18 pigs each were put on trial to see if good quality alfalfa which had been stored nine months would have any effect. The pigs used were Duroc and

¹Appreciation is expressed to Merck & Co. for the gifts of vitamins used in these experiments.

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Chester White gilts averaging 44 pounds at the start of the trial. These were self-fed (on a concrete platform) a ration of corn supplemented with soybean oilmeal, meat scraps, steamed bonemeal, trace mineral salt with added cobalt and a B-12 supplement (A.P.F.). The only difference in the two rations was that one lot received 10 percent of the sun cured, ground alfalfa which had been stored nine months. The control lot (no alfalfa) outgained the alfalfa lot every weigh period. Therefore, excellent quality fresh alfalfa was used to replace the "old" alfalfa for the last third of the trial. This helped some but the lot receiving the 10 percent alfalfa never gained as well as the control and the average daily gain was only 1.3 pounds per day for the alfalfa lot compared with 1.5 pounds per day for the controls. This indicated a depressing effect of the alfalfa either by higher fiber content or lower palatability. The feed wasted by rooting out of the feeders was excessive in both lots but greater where the alfalfa was included.

To further study this problem, alfalfa was included as one of the treatments in a factorial experiment. In this experiment the alfalfa used was excellent-quality dehydrated meal containing 21 percent protein. When used as five percent of the ration it significantly reduced rate of gain and feed efficiency. These data are published in *Journal of Animal Science*, 12:623, 1953.

Experiment 13

In the spring of 1952 an experiment was started: (1) To compare sun cured vs. dehydrated alfalfa; (2) to compare additions of alfalfa vs. oat straw to see what effect added crude fiber would have; (3) to compare alfalfa with a commercial B-complex vitamin mixture as a source of these vitamins; and (4) to compare two levels of dehydrated alfalfa in rations for growing fattening pigs.

Fifty Duroc pigs were randomly divided into 10 lots. The pigs were confined to concrete pens which were washed daily, and self-fed the ground mixed rations. The formulas for these experimental rations are given in table I. The experimental design was a 2 x 5 factorial. The treatments were (A) basal, (B) six percent dehydrated alfalfa meal, (C) five percent sun cured ground alfalfa,

TABLE I.—Rations Used in Experiment 13.

Ration	A	B	C	D	E
Barley	56	51	51	50.5	46
Corn	30	30	30	30	30
Meat scraps	5	5	5	5	5
Soybean oilmeal	6	5	6	7.5	4
Dehydrated alfalfa		6			12
Sun cured alfalfa			5		
Quadrex premix	1	1	1	1	1
Vitamin premix	1	1	1	1	1
Oat straw				4	
Trace mineral salt plus cobalt	0.5	0.5	0.5	0.5	0.5
Ground limestone	0.5	0.5	0.5	0.5	0.5

(D) four percent ground oat straw, and (E) 12 percent dehydrated alfalfa meal. The additional five lots received the same treatments but received B-complex vitamins in addition. All rations contained Quadrex as a source of vitamins A and D. The vitamin premix was altered so that all rations were supplemented with a crude B₁₂ preparation but only the replicates of the treatments received the B-complex supplement containing riboflavin, pantothenic acid, niacin and choline.

A summary of the results is given in table II. The average daily gains are not too consistent. From these data it appears that the added vitamins were beneficial because there was a slight increase in gain. The six percent dehydrated alfalfa lots and the four percent oat straw lots gained about the same as the control. The six percent dehydrated alfalfa, five percent sun cured alfalfa and four percent oat straw added about the same crude fiber. However, the sun cured alfalfa lots and the 12 percent dehydrated alfalfa lots gained significantly less ($P = .05$). All the rations with added fiber show reduced efficiency.

TABLE II.—Summary of Results of Experiment 13.

Without B-Complex Vitamins						
Lot.....	1	2	3	4	5	Avg.
Rations.....	A	B	C	D	E	
	Basal	6% D.H.A.	5% S.C.A.	4% O.S.	12% D.H.A.	
Av. initial wt., lb.	41.4	40.4	41.6	41.2	41.6
Av. final wt., lb.	210.6	204.0	202.0	213.2	189.5
Av. daily gain, lb.	1.54	1.49	1.45	1.50	1.30	1.46
Av. feed per lb. gain, lb.	4.26	5.01	4.69	4.68	4.89	4.70
With B-Complex Vitamins						
Lot.....	6	7	8	9	10	
Rations.....	A	B	C	D	E	
Av. initial wt., lb.	41.2	41.6	41.4	41.6	41.4
Av. final wt., lb.	216.4	222.7	194.6	213.4	203.5
Av. daily gain, lb.	1.59	1.66	1.39	1.56	1.39	1.52
Av. feed per lb. gain, lb.	4.36	4.25	4.60	5.02	4.83	4.61
Av. gain (both lots)	1.57	1.58	1.42	1.53	1.35
Av. feed (both lots)	4.31	4.63	4.65	4.85	4.86

Five percent sun cured alfalfa and 12 percent dehydrated alfalfa all significantly less ($P = .05$).

Experiment 18

To further study this problem three lots of pigs were put on rations to compare dehydrated alfalfa with corn cobs as a source of fiber. The rations used are given in table III.

TABLE III.—Rations Used in Experiment 18.

Lot	1	2	3
Barley	95	90.5	88
Corn cobs			5
Dehydrated alfalfa		6	
Blood meal	1	1	1
Soybean oilmeal	3	1.5	5
Limestone	0.5	0.5	0.5
Trace mineral salt plus cobalt	0.5	0.5	0.5
Vitamin supplement ¹	yes	yes	yes

¹Vitamins A, D, riboflavin, choline, niacin, pantothenic acid, and B₁₂ were added to all rations.

From the response (see table IV) of the pigs to these rations it appears that crude fiber as such is not always to blame for the reduced gains and feed efficiency because lot 3, receiving ground corn cobs, gained as well as the basal. In order to get the same energy from ration 3 they had to eat more feed and this they did, .3 pound of feed per pig per day. As was anticipated, the pigs receiving the alfalfa or corn cob treatments needed more feed per pound of gain. However, the alfalfa lot consumed less feed than the control indicating the lowered palatability of this ration.

TABLE IV.—Summary of Results of Experiment 18.

Lot	1	2	3
Treatment	Basal	Dehy. alf.	Corn cobs
Pigs per lot	5	5	5
Av. initial wt., lb.	48	47	47
Av. final wt., lb.	187	177	185
Av. daily gain, lb.	1.48	1.39	1.50
Feed per lb. gain, lb.	4.19	4.32	4.34
Feed per pig per day, lb.	6.2	6.0	6.5

Experiment 19 and 19-A

These experiments were begun to see if adding three percent lard (or tallow) to the rations would increase palatability and overcome the "depressing" effect of the alfalfa. The two experiments were started six weeks apart, so much of the time ran concurrently. The same feeding and management procedures were used as in the previous experiments. The ration formulas are presented in table V. Both dehydrated and sun cured alfalfa with and without fat were used.

In experiments 19 and 19-A the addition of alfalfa, either dehydrated or sun cured, slightly reduced gains. In experiment 19, addition of three percent lard overcame the harmful effects in that there was increased gain and feed efficiency (lots 3 and 5). The trend was the same in experiment 19-A but towards the end of the experiment the supply of lard was exhausted and inedible tallow was substituted. This change threw the pigs completely "off-feed"

TABLE V.—Rations Used in Experiment 19 and 19-A.

Lot	1	2	3	4	5
Corn	87.0	83.0	79.5	83.0	79.5
Alfalfa, dehydrated	—	—	—	5.0	5.0
Alfalfa, sun cured	—	5.0	5.0	—	—
Lard or tallow	—	—	3.0	—	3.0
Blood meal	2.0	2.0	2.0	2.0	2.0
Soybean oilmeal	9.0	8.0	9.0	8.0	9.0
Limestone	0.5	0.5	0.5	0.5	0.5
Trace mineral salt + cobalt	0.5	0.5	0.5	0.5	0.5
Vitamin supplement ¹	1.0	1.0	1.0	1.0	1.0

¹Vitamins A, D, B₁₂, riboflavin, pantothenic acid, niacin and choline in soybean oil meal carrier.

and reduced the gains. This was not anticipated. It is felt that were the pigs accustomed to the tallow they would consume it readily, but a substitution from one fat to another apparently changed palatability enough to throw the pigs "off-feed."

TABLE VI.—Summary of Experiment 19.

Lot	1	2	3	4	5
Pigs per lot	5	5	5	5	5
Av. initial wt., lb.	40.0	41.6	42.0	42.2	40.6
Av. final wt., lb.	200.2	188.2	208.8	202.6	215.4
Av. daily gain, lb.	1.91	1.74	1.99	1.91	2.08
Av. feed per lb. gain, lb.	3.58	3.71	3.35	3.66	3.25
Feed per pig per day, lb.	6.8	6.5	6.7	7.0	6.8

TABLE VI-A.—Summary of Experiment 19-A.

Lot	1a	2a	3a	4a	5a
Pigs per lot	5	5	5	5	5
Av. initial wt., lb.	40.8	40.6	41.0	40.8	40.6
Av. final wt., lb.	213.6	206.8	192.4	204.2	192.4
Av. daily gain, lb.	1.89	1.83	1.66	1.80	1.67
Av. feed per lb. gain, lb.	3.87	3.61	4.18	3.64	3.40
Feed per pig per day, lb.	7.3	6.6	6.9	6.5	5.7

Discussion

These experiments reported here show no advantage to be derived from adding five percent sun cured or dehydrated alfalfa to rations for growing fattening pigs under dry lot conditions. This is particularly true when barley and oats, with their fibrous hulls, are the main grain. In these experiments, the cost of supplying the B-vitamins was 35 cents to \$1 less per ton than to add five percent alfalfa. The prices used were those prevailing at feed manufacturers in the area. No attempt was made to price home grown, homeground alfalfa in these rations.

These findings are not to be confused with alfalfa pasture. The effect of pasture is different than that of the dry alfalfa hay. Also, these findings should not be applied to gestation rations for gilts and sows because for these older pigs maximum feed intake is not desired and bulk is important to prevent over-fatness at farrowing.