1963

The Value of Dehydrated Alfalfa Meal and Crude Protein for Sows Kept in Confinement

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A. S. Mimeo Series 63-5

THE VALUE OF DEHYDRATED ALFALFA MEAL AND CRUDE PROTEIN FOR SOWS KEPT IN CONFINEMENT

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The second experiment on the value of alfalfa meal in rations for confined sows is reported herein. The objective of this experiment was to determine the effects of dehydrated alfalfa meal and level of crude protein on reproduction and lactation performance of female swine which were reared in confinement on concrete continuously from birth.

Experimental Procedure

In the summer of 1960, 48 gilts were selected at approximately 200 pounds body weight for this trial. They were reared from birth on concrete. The gilts were allotted into 8 lots on the basis of breed, genetic relationship and body weight. The ration comparisons were 0, 2.5, 5.0 or 10.0 per cent dehydrated alfalfa meal in the rations. Each alfalfa level was replicated. In replicate I and replicate II rations were formulated to contain 14 and 18 per cent crude protein, respectively. Actual analysis of the rations showed the rations were 15 and 19 per cent crude protein. The rations shown in table 1 were hand-fed once daily at 8:00 a.m. Four pounds per head per day were provided to two weeks prior to breeding, when the amount provided was increased to 5 pounds per head per day. After the breeding period daily feed was limited to 4 pounds per head per day, then increased to 5 pounds after approximately 70 days of pregnancy. The same rations were fed during lactation. After farrowing, wheat bran was added for one week. The sows were essentially full fed during lactation by hand feeding twice daily the amount of feed they would clean up between feedings.

The housing facilities provided for each lot of sows were an 8 x 14 foot house with an adjoining 14 x 12 foot concrete slab. Sows were confined to these quarters until 5 days before they were due to farrow, when they were transferred to the farrowing house. They remained in 8 x 8 foot farrowing pens until the pigs were weaned at 6 weeks of age.

Three sows from each pen were slaughtered 25 days after breeding. The number of corpora lutea and embryos was counted. The remaining sows farrowed the next spring and again in the fall of 1961.

The same levels of alfalfa meal and crude protein were studied with another 48 gilts during 1962. These gilts were fed the same level of alfalfa meal as growing pigs as they received later as sows. The young gilts were allotted into 8 pens and the 4 levels of alfalfa meal were compared. Each level of alfalfa meal was compared with either ground shelled corn or ground ear corn as the major energy source in the ration. The results of the growing phase for these gilts were reported in 1962 (A. H. Mimeo 62-4).

Table 1. Composition of Rations

Lot	1	2	3	4	5	6	7	8
Alfalfa level, %	0	0	2.5	2.5	5	5	10	10
Crude protein, %	14	18	14	18	14	18	14	18
1961								
Sh. corn	437.5	387.5	428.0	377.5	418.5	368.0	399.0	349.0
Oats	437.5	387.5	428.0	377.5	418.5	368.0	399.0	349.0
Soybean meal	70	161	65	157	60	152	50	142
Tankage	30	40	30	40	30	40	30	40
Alfalfa meal	--	--	25	25	50	50	100	100
Dicalcium phosphate	10	10	10	10	10	10	10	10
Limestone	7	6	6	5	5	4	4	2
T.M. salt	6.55	6.55	6.55	6.55	6.55	6.55	6.55	6.55
Vitamin-antibiotic premix[1]	+	+	+	+	+ +	+	+	+
1962								
Sh. corn	447	398	438	388	429	378	409	359
Oats	447	397	437	387	428	378	409	359
Soybean meal	60	151	55	147	50	142	40	132
Tankage	20	30	20	30	20	30	20	30
Alfalfa meal	--	--	25	25	50	50	100	100
Dicalcium phosphate	10	10	10	10	10	10	10	10
T.M. salt	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vitamin-antibiotic premix[1]	+	+	+	+	+	+	+	+

[1] Vitamin additions furnished 1 mg. riboflavin, 2 mg. pantothenic acid, 4.5 mg. niacin, 5 mg. choline, 5 mcg. B_{12}, 900 I.U. of A, and 113 I.U. D_2 per pound of total ration. Aureomycin was added to supply 5 mg. per pound of ration.

After the growing phase the gilts were kept on the same level of alfalfa meal, but reallotted in order to minimize the effects of corn versus ear corn on subsequent performance. Thereafter the feeding and management of the sows were similar to the earlier trial. The rations were changed slightly for the second trial. The rations in the first trial analyzed approximately 15 and 19 per cent crude protein, so the crude protein of the rations for the second trial (1962) was lowered to the planned 14 and 18 per cent.

Results and Discussion

Trial 1. The results of the first trial (1961) are shown in table 2. All sows except two farrowed litters in the spring. One of the two sows that did not farrow was slaughtered and the reproductive tract appeared normal by gross examination. The second sow was not observed in heat during the breeding period. She was in heat at a later date, so she was kept to farrow a fall litter. A third sow in lot 4 aborted three days before she was due to farrow. This sow and litter are included in the data because the cause of abortion could not be determined. It may or may not have been related to the treatment. Five more sows did not farrow fall litters. Table 2 gives the condition of the reproductive tract upon slaughter.

Litter size was average for the herd in most lots, the exceptions were lot 3, both spring and fall, lot 4 in the spring and lot 1 in the fall. Except for lot 4, which includes the aborted litter, lots 1 and 3 are the low protein and low alfalfa meal rations. The 2.5% alfalfa-fed sows farrowed fewer pigs than the control sows or the higher alfalfa-fed sows. Sows fed higher protein rations farrowed more pigs than those given lower protein rations.

Average birth weight of pigs was variable and the larger pigs were in the smaller litters. A slight trend of larger pigs with increasing alfalfa level was observed. Protein did not have any effect on birth weight. Litter size at 42 days was variable. Death loss was quite high in some lots. The authors believe there are several reasons for the variation; therefore, litter size and pig weight at weaning should not be overemphasized. Some of the reasons are (1) high death loss was not particularly associated with small birth weight, (2) most pigs were strong and vigorous at birth, (3) some deaths were attributed to mastitis and baby pig enteritis, and (4) generally the pigs from the smaller litters at weaning were the heavier pigs.

The effect of alfalfa meal or protein upon the number of stillborn pigs hinges upon including or excluding the data from the aborted litter in lot 4. Based upon subsequent results, it might be excluded because treatment did not have consistent effects on the number of stillborn pigs farrowed. If excluded, no consistent effects were observed in this trial.

Sows given more protein had 1.5 more corpora lutea and 1.6 more embryos at 25 days of pregnancy than sows given less protein, but no trend was observed among alfalfa levels.

General observations were that sows in this trial had short heat periods and some sows appeared to be in estrus, but were not receptive to the boar. This was a comparative observation to other sows in our herd.

Table 2. Dehydrated alfalfa meal for sows in confinement - 1961

		1961 Farrowing							
Lot No.		1	2	3	4	5	6	7	8
Alfalfa level, %		0	0	2.5	2.5	5.0	5.0	10.0	10.0
Crude protein, %		14	18	14	18	14	18	14	18
No. sows farrowed	Spring	3	3	3	3	3	3	2[e]	2[f]
	Fall	3	3	2[a]	1[b]	2[d]	3	3	1[f]
	Total	6	6	5	4	5	6	5	3
Av. litter size, birth	Spring	10.00	10.00	7.00	6.00[c]	10.50	8.00	9.50	9.50
	Fall	6.67	11.00	6.00	10.00	11.00	9.33	9.00	11.00
	Av.	8.17	10.50	6.60	7.00	10.60	8.67	9.20	10.00
Av. birth wt., lb.	Spring	2.60	2.46	2.84	2.69	2.54	2.50	2.68	2.91
	Fall	3.03	2.65	3.27	2.16	2.70	2.84	2.81	2.94
	Av.	2.77	2.57	3.00	2.50	2.61	2.68	2.73	2.93
Av. litter size, 42 days	Spring	8.00	8.00	7.00	5.50	8.33	6.33	7.50	9.50
	Fall	5.00	8.67	5.50	8.00	8.00	5.00	7.67	7.00
	Av.	6.50	8.33	6.40	6.33	8.20	5.67	7.60	8.67
Av. pig wt., 42 days, lb.	Spring	22.0	17.8	23.5	25.0	20.0	23.1	19.1	23.5
	Fall	22.8	19.3	22.9	24.9	21.2	25.0	19.7	17.9
	Av.	22.3	18.6	23.3	24.9	20.5	23.9	19.4	22.0
No. stillborn pigs	Spring	1	1	0	11	2	0	2	0
	Fall	4	0	0	0	2	0	3	0
	Total	5	1	0	11	4	0	5	0
No. sows slaughtered at 25 da. pregnancy		3	3	3	3	3	3	3	3
Av. no. corpora lutea		10.0	13.7	12.7	13.0	12.7	15.7	13.7	12.7
Av. no. embryos		9.0	12.7	10.7	11.7	9.3	13.0	13.0	10.3

a One sow not pregnant, reproductive tract appeared normal.
b Two sows not pregnant, one sow had small, white, fibrous appearing ovaries. The other sow had cystic follicles.
c Includes one sow that farrowed three days before expected farrowing. Ten dead pigs were farrowed.
d One sow not pregnant, reproductive tract appeared normal.
e One sow not pregnant but exhibited heat later, so kept for a fall litter.
f One sow in the spring and one in the fall not pregnant, reproductive tracts appeared normal.

Trial 2. Table 3 summarizes this trial. Two sows did not have heat periods during fall breeding. One of these two had small immature uterine horns and ovaries. The other sow had small poorly developed follicles. Both sows were on low protein and 0 or 2.5 alfalfa meal. Four more sows did not breed for fall litters. Condition of the reproductive tracts is noted in the footnotes of table 3. Poor follicular development on the ovaries was observed rather consistently, also the ovaries appeared in the luteal phase of cycle, which was characterized by large pink corpora lutea.

Litter size was rather small in some lots for the first litters, but these same sows had large strong litters the second farrowing. Protein level apparently had considerable influence on litter size and birth weight of the pigs. Control sows farrowed fewer pigs than any other group. In general, either adding protein or alfalfa meal or a combination of alfalfa and protein improved the ration.

Average litter size at weaning was extremely small for the control sows and generally small for all other lots, except lots 3 and 6. Again, nervous sows, overlaying and mastitis also affected litter size at weaning. Pig weight at weaning appeared to be improved as the level of alfalfa meal increased.

Sows fed 10% alfalfa meal farrowed more stillborn pigs in this trial, yet sows fed 5% alfalfa meal farrowed fewer stillborn pigs. The reason for the difference is not clear at this time. Nine of 24 sows on test for breeding and slaughter after 25 days of pregnancy failed to conceive. The reproductive tracts of these sows appeared normal. However, as mentioned above, most of these sows appeared in the luteal phase of the cycle. The corpora appeared functional and the follicles poorly developed. The cause (if any) of this is unknown. If the high coumestrol content of the alfalfa meal used during this time had any relationship to possible hormone activity, its influence in the sow may be a factor. Studies need to be conducted on the relationship of hormone activity in the meal and effect upon conception and normal cycles in the female.

Summary of Trial 1 and Trial 2. Table 4 shows the combined data and table 5 shows the effect of alfalfa meal and protein. The results on these two tables are discussed simultaneously.

Control sows, no alfalfa meal and low protein, farrowed fewer pigs and weaned fewer pigs than other sows. This ration was improved by adding more protein or dehydrated alfalfa meal to the ration or a combination of more protein and alfalfa meal. Protein appeared to have the greatest influence on litter size, but alfalfa meal may have had some effect. Sows given the higher protein ration increased the number of pigs farrowed by 0.79 per litter. Two and one-half per cent alfalfa meal did not improve litter size, but sows fed 5 or 10 per cent alfalfa meal averaged more pigs per litter by 0.21 and 0.23, respectively, than the sows fed an alfalfa-free ration.

Protein level did not have any effect upon the birth weight of the pigs. Sows fed 10 per cent alfalfa meal farrowed slightly larger pigs, but the difference is probably unimportant. Alfalfa meal and protein level appeared to affect litter size at weaning. Litter size at weaning was 0.81 larger for sows given 10% alfalfa meal in the ration than for sows with no alfalfa meal in the ration. Higher protein

Table 3. Dehydrated alfalfa meal for sows in confinement - 1962

		1962 Farrowing							
Lot No.		1	2	3	4	5	6	7	8
Alfalfa level, %		0	0	2.5	2.5	5.0	5.0	10.0	10.0
Crude protein, %		14	18	14	18	14	18	14	18
No. sows farrowed	Spring	2[a]	3	2[d]	3	3	3	3	3
	Fall	1[b]	3	1[e]	3	2[f]	3	3	2[h]
	Total	3	6	3	6	5	6	6	5
Av. litter size, birth	Spring	2.50	8.33	10.00	8.67	6.00	6.67	5.67	7.67
	Fall	8.00	9.00	10.00	8.00	9.00	9.67	9.00	11.00
	Av.	4.33	8.67	10.00	8.33	7.20	8.17	7.33	9.00
Av. birth wt., lb.	Spring	4.80[c]	2.86	2.70	2.93	2.97	3.18	2.74	2.80
	Fall	3.81	3.03	2.87	2.86	2.99	2.99	2.93	3.30
	Av.	3.92	2.98	2.76	2.90	2.98	3.07	2.86	3.04
Av. litter size, 42 days	Spring	0	5.67	8.50	6.67	4.25	6.67	4.33	6.33
	Fall	8.00	6.00	7.00	4.50	6.50	10.00[g]	6.00	7.00
	Av.	2.67	5.80	8.00	5.80	5.20	8.00	5.17	6.60
Av. pig wt., 42 days, lb.	Spring	0	18.9	22.6	21.6	22.0	23.6	25.5	24.6
	Fall	13.8	19.9	21.0	19.8	20.9	19.8	24.8	23.1
	Av.	19.8	19.3	22.1	21.0	21.5	21.7	25.1	24.0
No. stillborn pigs	Spring	4	6	1	0	3	0	1	9
	Fall	1	0	0	5	2	0	7	1
	Total	5	6	1	5	5	0	8	10
No. sows slaughtered at 25 da. pregnancy[i]		2	3	3	2	2	3	2	1
Av. no. corpora lutea		14.5	11.3	15.3	11.5	10.5	14.0	11.0	11.0
Av. no embryos		12.0	9.0	7.7	9.0	9.0	8.0	6.0	10.00

a One sow not pregnant, small immature reproductive tract.
b One sow not pregnant, poor development of follicles.
c One live pig when weighed.
d Slaughtered - not related to treatments.
e One sow not pregnant, poor development of follicles.
f Small infantile tract (yet had a previous pregnancy).
g One sow with 6 pigs lost all her pigs due to mastitis this litter is excluded.
h One sow not pregnant, poor development of follicles.
i There were three sows in each lot slaughtered. Reproductive tracts from non-pregnant sows appeared normal.

Table 4. Dehydrated alfalfa meal for sows in confinement - 1961 and 1962

	1961 and 1962 Farrowings							
Lot No.	1	2	3	4	5	6	7	8
Alfalfa level, %	0	0	2.5	2.5	5.0	5.0	10.0	10.0
Crude protein, %	14	18	14	18	14	18	14	18
No. sows	6	6	6	6	6	6	6	6
No. litters farrowed	9	12	8	10	10	12	11	8
Av. litter size, birth	6.89	9.58	7.88	7.80	8.90	8.42	8.18	9.38
Av. birth wt., lb.	2.95	2.74	2.88	2.75	2.76	2.87	2.79	2.99
Av. litter size, 42 days	5.22	7.18	7.00	6.00	6.70	6.73	6.27	7.38
Av. pig wt., 42 days, lb.	21.8	18.9	22.8	22.6	20.8	22.7	22.0	23.1
No. stillborn pigs	10	7	1	16	9	0	13	10
Av. no. stillborn pigs per litter	1.11	0.58	0.12	1.60	0.90	0.0	1.18	1.25
No. sows slaughtered at 25 da. pregnancy	5	6	6	5	5	6	5	4
Av. no. corpora lutea	11.8	12.5	14.0	12.4	11.8	14.8	12.6	13.0
Av. no. embryos	10.2	10.8	9.2	10.6	9.2	8.8	10.2	10.2

Table 5. Effect of Alfalfa Meal or Crude Protein Level - 1961-62

Alfalfa level, % Crude protein, %	0	2.5	5.0	10.0	14	18
No. of litters	21	18	22	19	38	42
Av. litter size, birth	8.43	7.83	8.64	8.68	8.00	8.79
Av. birth wt., lb.	2.81	2.81	2.82	2.88	2.83	2.83
Av. litter size, 42 days	6.30	6.12	6.71	7.11	6.46	6.67
Av. pig wt., 42 days, lb.	20.0	22.7	21.8	22.5	21.8	21.6
No. stillborn pigs	17	17	9	23	33	33
Av. stillborn pigs/litter	0.81	0.94	0.41	1.21	0.87	0.79
No. sows slaughtered at 25 da. pregnancy	11	11	11	9	21	21
Av. no. corpora lutea	12.2	13.3	13.5	12.4	12.6	13.1
Av. no. embryos	10.5	9.8	9.9	10.2	9.7	10.6

improved litter size at weaning 0.21 per litter. Alfalfa meal may have affected weaning weight, but protein had no effect. Although sows fed 10% alfalfa meal in the ration farrowed and weaned more pigs, they also had heavier pigs at weaning (might expect smaller pigs). These pigs weighed 2.5 pounds more than the pigs from sows fed no alfalfa meal.

Sows fed 10% alfalfa meal farrowed more stillborn pigs, yet sows given 5% alfalfa meal farrowed fewer stillborn pigs than control fed sows. This difference cannot be explained. Differences in number of corpora lutea, ovulation or embryonic death loss could not be attributed to alfalfa meal. A trend was not observed. However, protein level affected the number of corpora lutea and number of embryos. The difference observed in early pregnancy agrees with the difference observed at farrowing. Apparently more protein is needed in the ration when limit fed in this experiment.

Major Observations

(1) Although the basal ration was formulated to contain adequate nutrients for sows during gestation, it proved inadequate for sows in confinement on a limited feeding program for proper condition of sows at time of farrowing. Addition of more crude protein to the ration or 5 or 10% alfalfa meal to the ration or a combination of more protein and alfalfa meal improved the basal ration. Both alfalfa meal and increased protein level improved litter size at birth and weaning. Birth weight of the pigs was not affected by the treatments.

(2) Pigs from the 10 per cent alfalfa treatment were 2.5 pounds heavier at 6 weeks of age than pigs from dams who were not given alfalfa meal. Protein did not affect weaning weight of the pigs.

(3) Alfalfa meal did not reduce the number of stillborn pigs or increase the number of embryos at 25 days of pregnancy. Protein had some effect upon the number of corpora lutea and embryos at 25 days after conception. Sows fed more protein had approximately one more embryo per litter.

(4) The percentage of sows conceiving was not unusually low according to some studies, yet the percentage seemed lower than other sows in our herd. Two observations are worth mentioning. First some of the reproductive tracts from sows which were fed low alfalfa meal and low protein were small and immature. Secondly, a large number of non-breeders in other lots appeared in the luteal phase of the cycle. In these cases the follicles were small. These observations arouse interest along the line of hormone activity in the alfalfa meal.

(5) General observations are that sows had shorter heat periods, and some sows appeared in heat, yet were not receptive to the male. These are comparative observations with other sows in our herd.