

Summary

Further tests were conducted to study the effect of different levels of carotene intake during early lactation on beef cows which had been partially depleted of their vitamin A stores prior to calving. Sixteen, pregnant, three-year-old Hereford heifers were divided into three lots and received 0, 5, and 10 mg. of carotene per 100 lb. body weight per day for the first three months of lactation. Data obtained indicate little effect of carotene supplementation on the weight changes of the cows or gain of the calves to three months of age. However, two calves were lost from cows receiving no supplemental carotene. Plasma carotene and vitamin A levels of the cows reflected directly the levels of carotene fed. Liver stores in all the cows were depleted regardless of level of supplementation, but tended to be depleted at a less rapid rate with cows receiving the most carotene. Blood and liver levels of all the calves appeared dangerously low, even at the highest level of carotene supplementation of their dams. It appears that large amounts of carotene must be fed the lactating beef cow in order to permit transfer of sufficient vitamin A through the milk to protect the calf against a deficiency and to avoid death loss.

Performance Testing Boar Pigs

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To gain information on performance testing boars for rate of gain, economy of gain and probe backfat thickness, individual feeding tests of boar pigs were initiated at Fort Reno in 1954. The records of 138 of these individually fed boars have been included in this study. Sixty Line OK3 Duroc boars and 78 Line OK14 Hampshire boars were fed.

Test Procedure

Boars were selected for the feeding test when weaned at 56 days of age. At weaning, the boars were taken to the Boar Test Barn and placed on the test ration. When each boar weighed approximately 50 lbs., he was started on the feeding test. As each boar reached approximately 170 lbs. he was weighed off the test, but a limited number of boars weighed over 180 lbs. when removed from the test. At the conclusion of the test each boar was probed in four places for backfat thickness. Two probes were made on each side of the back about 1½ inches off the midline. The front probes were made about 2 inches behind the shoulder and the rear probes were made over the center of the loin. The four probes were averaged and adjusted to a 170 lb. standard weight.

The ration fed each season varied somewhat but was essentially the same except for two seasons in which wheat or milo was substituted for corn (Table 1). Beginning with the 1956 Fall farrowed boars, the ration

Table 1.—Fort Reno boar test rations fed from 1954 spring through 1957 fall

When Fed	1954 Spr.	1954 Fall	1955 Spr.	1955 Fall	1956 Spr.	1956 Fall	1957 Spr.	1957 Fall
How Fed	meal, self fed	meal, self fed	meal, self fed	meal, self fed	meal, self fed	pellets, self fed	pellets, self fed	pellets, self* fed
Ingredient								
Corn	73.3		73.3	73.3	73.3	74.0	74.2	
Wheat		73.3						
Milo								75.0
Soybean meal	13.6	13.6	13.6	13.6	13.6	13.5	13.3	12.5
Tankage	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Alfalfa meal	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Bone meal	1.5	1.5	1.5	1.5	1.5	1.0	1.0	1.0
Trace mineralized salt	1.0	1.0	1.0	1.0	1.0	.9	.9	.9
Aurofac	.5	.5	.5	.5	.5	.5	.5	.5
Fortafeed	.1	.1	.1	.1	.1	.1	.1	.1
Vita A & D sup.	—	—	+	+	+	+	+	+
Zinc sulfate	—	—	—	—	—	—	—	+

* Half of boars in the 1957 fall test were restricted in feeding.

was pelleted. In the Fall of 1957, litter mate boars were paired. One litter mate was self fed ad lib, while the other was restricted to a 30 minute morning and afternoon feeding of all that he would consume during those periods.

Line Comparison

A summary of the average performance of boars by lines and seasons is shown in Table 2. Comparing the performance of boars from the two lines in the five seasons in which both lines were fed, the Line OK3 boars gained .12 lbs. per day faster and required .10 lbs. less

Table 2.—Average performance of boars by line and season

Year	Seas.	Line Ok 3			Line Ok 14				
		No. Boars	Av. daily gain (lbs.)	Feed per lb. gain (lbs.)	Probe back fat (ins.)	No. boars	Av. daily gain (lbs.)	Feed per lb. gain (lbs.)	Probe back fat (ins.)
1954	Spr.	9	2.05	3.26	1.15				
1954	Fall	6	2.04	3.72	1.36				
1955	Spr.	9	1.86	3.32	1.41	8	1.89	3.19	1.25
1955	Fall	6	1.98	3.30	1.41	11	1.79	3.71	1.29
1956	Spr.	11	1.81	3.17	1.35	12	1.64	3.44	1.26
1956	Fall	10	1.87	2.98	1.39	11	1.81	2.81	1.22
1957	Spr.	9	1.92	2.92	1.42	13	1.71	3.05	1.16
1957	Fall					12	1.64	3.22	1.11
1957	Fall*					11	1.48	3.27	1.04

* Boars restricted to a 30 minute morning and afternoon feeding.

feed per lb. of gain than the Line OK14 boars. The OK14 boars, however, had .16 inches less backfat at 170 lbs.

Variation and Selection Intensity

Considerable variation was noted in the performance of boars of the same line and even between litter mate boars. Within each line and season the average range in performance was .54 lbs. in average daily gain, 1.08 lbs. in feed required per lb. of gain and .41 inches in probe backfat thickness. This wide variation offers considerable opportunity to select for performance in these traits. However, selection for several traits reduces the amount of selection that can be applied for each trait. The boars chosen for breeding were selected on the basis of rate of gain, economy of gain, probe backfat, and soundness of legs. Thus selection was on the basis of a combination of four traits. Some additional selection for dam's productivity had been made in the initial selection of boars to be placed on the feeding test.

The actual selection intensity for each of the three measured traits is shown in Table 3. This selection intensity is expressed as the selection differential, or the difference in the average performance of the selected boars and the average performance of all boars (after corrections were made for seasonal differences). The selection differentials in Table 3 indicate that about twice as much emphasis in selection was placed on feed required per pound of gain and probe backfat as on rate of gain.

Although the selection differentials appear to be low, selection in a herd of the intensity shown in Table 3 and applied on boars could in a 10-year period increase the average daily gain .08 lb., reduce the feed required per lb. of gain .27 lb., and reduce the backfat thickness .16 inch.

Table 3.—The advantage of selected boars over all boars tested in Lines OK 3 and OK 14 (Selection differentials)

Line	No boars		Av. daily gain lbs.	Selection differentials in	
	Tested	Saved		Lbs. feed per lb. gain	Probe backfat, inches
OK 3	60	10	+.02	— .23	— .13
OK 14	78	20	+.07	— .15	— .04

Rate of Gain and Economy of Gain

There is no question that economy of gain is one of the most important items in swine production, but individual feeding tests to measure this trait directly for selection are expensive, because of the housing, pens and equipment necessary to test very many boars. It is

Table 4.—The relation between feed required per pound of gain and average daily gain*

No. boars	Av. daily gain, lbs.		Lbs. feed per lb. gain
	Class-limits	Av.	
3	1.35-1.49	1.40	3.99
11	1.50-1.59	1.54	3.54
15	1.60-1.69	1.65	3.26
33	1.70-1.79	1.74	3.28
28	1.80-1.89	1.85	3.18
30	1.90-1.99	1.94	3.21
12	2.00-2.09	2.04	3.00
6	2.10-2.22	2.16	2.98
average		1.82	3.24

* The performance of individual boars in average daily gain and lbs. of feed per lb. of gain were corrected for differences in lines and seasons so that the data on all boars could be pooled for this table.

generally assumed that there is a high correlation between rate and economy of gain. Thus, indirect selection for economy of gain can be made by selecting for rate of gain, which can be measured with much less labor and expense.

In the present study the correlation between average daily gain and feed per lb. of gain on boars from the same line and fed in the same season was $-.44$. For each increase in rate of gain of .1 lb. per day, there was a decrease in feed required per lb. of gain of .09 lb. This tendency for the faster gaining boars to be more economical is clearly shown in Table 4. However, this relationship is not extremely high and selection for economy of gain directly would be roughly twice as effective as selecting for economy of gain indirectly by selecting for rate of gain only. Whether this increase in selection accuracy will pay for the added cost of individual feeding tests is debatable. It might be justified in top purebred herds where the identification of a very economically gaining boar could have an important genetic influence on the herd and on the breed.

Rate of Gain and Fatness

There was a very slight tendency for the faster gaining boars to be fatter than the slower gaining boars (Table 5). The correlation was $+.16$, which is low and not significant. An increase in average daily gain of .1 lb. per day increased probe backfat thickness only .01 of an inch. The relationship between these two traits is so slight that there is little difficulty in selecting low probing, meaty boars that are also fast gaining boars.

Economy of Gain and Fatness

It is believed by some that meat type hogs are not economically gaining hogs. This is contradicted by data from these boar tests. Table 6 shows a slight tendency for the more economical boars to have less backfat than the less economically gaining boars. This relationship is slight (the correlation between feed required per lb. of gain and probe

Table 5.—The relation between probe backfat thickness and average daily gain*

No. boars	Av. daily gain, lbs.		Probe backfat, ins.
	Class-limits	Av.	
3	1.35-1.49	1.40	1.19
11	1.50-1.59	1.54	1.32
15	1.60-1.69	1.65	1.23
33	1.70-1.79	1.74	1.24
28	1.80-1.89	1.85	1.26
30	1.90-1.99	1.94	1.31
12	2.00-2.09	2.04	1.30
6	2.10-2.22	2.16	1.32
average		1.82	1.27

* The average daily gain and lbs. feed per lb. of gain for each boar were corrected for line and season differences so that the data on all boars could be pooled for this table.

backfat thickness was +.19), but certainly there is no indication that the fatter boars are more efficient gainers.

Summary

During the period from 1954 through 1957, 138 boars from two lines of breeding were individually fed from 50 lbs. to 170 lbs. weight. Line Ok3 boars gained .12 lbs. per day faster and required .10 lbs. less feed per lb. of gain but the line Ok14 boars had .16 inches less backfat.

Twenty-two percent of the boars tested were saved for breeding and these selected boars differed from all boars tested by +.05 lbs., —.18 lbs. and —.08 inch in average daily gain, feed required per lb. of gain and probe backfat, respectively.

Rate of gain and feed required per lb. of gain were negatively associated. For each increase in rate of gain of .1 lb. per day, there was a decrease in feed required per lb. of gain of .09 lb.

There was a slight but non significant tendency for the faster gaining boars to have more backfat and also a slight tendency for the more economically gaining boars to have less backfat.

Table 6.—The relation between probe backfat thickness and feed required per pound of gain*

No. boars	Lbs. feed per lb. gain		Probe backfat, ins.
	Class-limits	Av.	
6	less than 2.69	2.56	1.26
10	2.70-2.89	2.84	1.20
35	2.90-3.09	3.00	1.26
37	3.10-3.29	3.20	1.25
20	3.30-3.49	3.38	1.29
17	3.50-3.69	3.58	1.34
6	3.70-3.89	3.80	1.32
7	3.90+	4.11	1.28

* Lbs. feed per lb. gain and probe backfat for each boar were corrected for line and season differences so that the data on all boars could be pooled for this table.