AN EVALUATION OF RAPID VERSUS SLOW GROWING LINES OF PIGS

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Story in Brief

Lines of pigs that differ in their genetic potential for growth were developed through selection of sires to produce a base generation and four subsequent generations of selection for either rapid (RGL) or slow (SGL) postweaning gain. The RGL pigs grew faster and more efficiently than SGL pigs, but were also fatter at 220 lbs. Differences in the reproductive performance of the RGL and SGL were not consistent, but suggested that selection for gain may affect litter traits. These lines that are genetically different in their growth potential provide unique material for studying the biology underlying the growth process in pigs. Further selection for rapid growth has begun under either restricted or ad libitum intake in an attempt to better identify animals that are more efficient at converting feed to lean tissue.

(Key Words: Swine, Selection, Gain, Backfat, Feed Efficiency)

Introduction

Improving the efficiency of pork production results in greater profit to the producer through lower cost per unit of finished output. Postweaning growth rate is an important component in determining efficiency of the pork production system and previous studies have shown that selection is an effective way to improve genetic potential for growth in pigs. A study was begun to determine the effects of selection for growth rate on other production traits such as feed intake, lean tissue growth, lean tissue feed efficiency, litter size and litter gain. The study has recently been expanded to evaluate the relationship between appetite and lean tissue growth. Included in this report are results from four generations of selection for either rapid or slow postweaning gain and a discussion of how these lines of pigs are being further used to better understand the phenomenon of growth in swine.

Materials and Methods

Lines of pigs were established from litters born during 1981 at the Southwest Livestock and Forage Research Station. A rapid growth line (RGL) was derived from pigs sired by high indexing Duroc boars and out of gilts sired by high indexing Hampshire boars. A slow growth line (SGL) was established from pigs sired by low indexing Duroc boars and out of gilts sired by low indexing Hampshire boars. Duroc and Hamshire boars were purchased in breed pairs from various performance test stations with one of each pair having achieved a high index value and the other a low index value. The index used to rank them was consistent

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across test stations and breeds and put heavy emphasis on postweaning growth.

Once the RGL and SGL were established, they were further separated in their growth potential by four generations of selection among boars for rapid or slow gain during the postweaning period from 9 weeks of age to 230 pounds. Selection in each line was replicated with spring and fall farrowing seasons. Each line has been maintained with eight boars and 50 gilts each farrowing season. Litter size and individual pig weight were measured at birth, 21 and 42 days. Measurements at birth included all fully-formed pigs. Creep feed was provided at 21 days and weaning was at 42 days. Pigs were penned following weaning in groups of 14 to 18 and fed ad libitum. Average daily gain and pen feed efficiency of barrows and gilts from these lines was measured during a growing phase (9 weeks of age to a pen average of 120 lb) and a finishing phase (end of growing phase to 220 lb), and backfat thickness was measured with an ultrasonic probe at 220 lb. Results are for litters reflecting the initial selection of Duroc and Hampshire boars to form the base generation and four subsequent generations of selection among boars for postweaning gain. An early characterization of these lines following their initiation was reported by Buchanan et al. (1984).

Results and Discussion

Continued selection for rapid or slow postweaning growth has brought about further divergence in growth rate of the two lines. It is apparent that barrows and gilts from the RGL grew faster ($P<.01$) than those from the SGL during both the growing and finishing phases of each season (Table 1). On an overall basis, RGL pigs grew .29 lbs per day faster than SGL pigs in both the spring and fall farrowing groups. Pigs from the RGL were also fatter ($P<.01$) coming off test than pigs from the SGL. The RGL pigs were more efficient in their overall postweaning growth ($P<.01$) than SGL pigs, even though RGL pigs consumed more feed per day. It appears that differences in daily feed intake contributed to the differences in growth rate that have been acheived, but that the increased growth rate of the RGL was great enough to offset increased intake and provide a greater overall efficiency.

Differences in the reproductive performance of the RGL and SGL have not been consistent across farrowing season. In the spring season, size of SGL litters tended to be larger than that of RGL litters at birth, 21 days and 42 days (Table 2). These differences in litter size were probably also reflected in differences in average pig weight; pigs from the SGL had lower ($P<.05$) average weights than pigs from the RGL throughout the pre-weaning period. In the fall season, however, litter size at birth, 21 days and 42 days was greater ($P<.01$) in the RGL than the SGL. Differences in litter sizes of fall-born pigs were not consistently reflected in average pig weights. This interaction between line and farrowing season for litter traits has been observed following each of the last three cycles of selection. While the reason for this interaction is not clear, it appears selection for postweaning growth rate may have some effect on litter traits.

The increases in feed intake and backfat thickness that have accompanied increased gain in the RGL raise questions concerning the relationship between an animal's appetite and how efficiently it can convert what it eats into lean tissue. Selection for increased gain under some environment other than that of ad libitum intake may better identify animals that are superior for lean growth efficiency.

Table 1. Average daily gain, feed efficiency and backfat thickness of barrows and gilts from lines selected for rapid or slow growth.

Line	Season	N[a]	Average daily gain (lb/day)[d]			Feed efficiency (lb feed/lb gain)[ef]			Backfat thickness (in.)[g]
			Grower[b]	Finisher[c]	Overall	Grower	Finisher	Overall	
RGL	Spring	322	1.56	1.82	1.68	2.82	3.50	3.22	1.24
SGL	Spring	278	1.35	1.43	1.39	2.86	3.83	3.41	1.20
RGL	Fall	286	1.54	1.98	1.76	2.73	3.40	3.11	1.26
SGL	Fall	245	1.34	1.61	1.47	2.81	3.50	3.20	1.22

[a] Number of pigs.
[b] Period before pens averaged 120 lbs.
[c] Period after pens averaged 120 lbs.
[d] Average daily gain of RGL and SGL differed significantly ($P<.01$) in all phases of both seasons.
[e] Based on pen intake and gain.
[f] Feed efficiency of RGL and SGL differed significantly ($P<.05$) on an overall basis in both seasons and during the finisher phase of the spring season.
[g] Backfat thickness of RGL and SGL differed significantly ($P<.01$) in both seasons.

Table 2. Summary of litter traits for lines selected for rapid or slow growth.

Line	Season	N[a]	Litter size[b]			Average pig weight (lbs)[c]		
			Birth	21 days	42 days	Birth	21 days	42 days
RGL	Spring	48	9.77	8.52	8.29	3.62	12.90	27.85
SGL	Spring	48	10.23	8.81	8.63	3.06	11.66	23.77
RGL	Fall	47	10.32	8.68	8.43	3.26	10.94	23.50
SGL	Fall	45	9.02	7.53	7.24	3.24	11.42	23.33

[a]Number of litters.
[b]Litter size means for RGL and SGL differed significantly ($P<.01$) only for the fall season.
[c]Average pig weight means for RGL and SGL differed significantly ($P<.05$) only for the spring season.

Consequently, the RGL has been subdivided and selection for rapid postweaning growth begun under both ad libitum intake and where intake is limited to 82% that of predicted ad libitum. The initial data reflecting the first generation of selection under these selection environments have just recently been evaluated and results thus far are inconclusive.

Animals from the RGL and SGL provide unique material for studying the underlying biology that actually defines the complex process of growth in the pig. A study has begun to obtain profiles of hormones and other physiological growth factors in the two lines of pigs that may contribute to differences in their genetic potential for growth. These lines may also be useful in determining the response of animals with varying growth potential to treatment with some of the growth factors being suggested for use in today's industry.

Literature Cited

Buchanan, D.S. et al. 1984. Characteristics of rapid and slow growing lines of pigs. Okla. Agr. Exp. Sta. MP-116:1.