REPRODUCTION OF ONE-HALF AND ONE-QUARTER MEISHAN, FENGJING, MINZHU AND DUROC GILTS AND SOWS

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SUMMARY

Reproductive traits were evaluated on first-cross gilts produced by mating Duroc, Meishan, Fengjing, and Minzhu boars to White Composite gilts and in backcross females produced by backcrossing the first-cross gilts to White Composite boars. First-cross Chinese gilts were superior to first-cross Duroc gilts for nearly all of the reproductive traits. Meishan and Fengjing first-crosses had similar reproductive performance and generally had values numerically, but not always statistically, better than Minzhu first-crosses. First-cross breed groups did not differ for litter size at second parity. As expected, differences in reproduction among backcross breed groups where smaller than among first-cross breed groups. Most differences among backcrosses were not statistically significant but were generally numerically better for backcross Meishan and Fengjing than for backcross Duroc and Minzhu.

INTRODUCTION

The Meishan, Fengjing, and Minzhu are among the most highly prolific breeds in The People's Republic of China (Li and Enfield, 1989). Research in Europe documents their superior reproduction relative to the French and English Large White (Legault and Caritez, 1983; Haley and Lee, 1990). Early results of research on reproduction in the U.S. have been similar to the European results (White et al., 1993; Young, 1993). Additional information is required to estimate the usefulness of crossbred females produced from these Chinese breeds relative to domestic U.S. breeds under U.S. production environments.

This paper evaluates reproductive traits of gilts and sows that are one-half or one-quarter Meishan, Fengjing, Minzhu, or Duroc.

MATERIALS AND METHODS

First-cross (one-half) females were the progeny of eight Duroc, nine Meishan, eight Fengjing, and seven Minzhu boars mated to White Composite females during two 42-d breeding seasons. The White Composite females were from advanced generations of an *inter se* mated population derived from a crossbred foundation with equal genetic contribution from Chester White, Landrace, Large White, and Yorkshire. Backcross (one-quarter) females were produced by backcrossing the first-cross females to White Composite boars.

Pigs were born in confinement and weaned at 28 d of age. They were raised in a nursery from 28 to 56 d of age. Daily checks for estrus were initiated when the gilts were moved to the finishing pen (about 63 d of age) and continued through the end of the breeding season. Each breeding season was 42 d in length and gilts were bred so as to produce their first litter at approximately one year of age. All gilts detected in estrus during the breeding season were mated. Gilts in excess of the farrowing capacity were slaughtered at 60 or 100 d of gestation to evaluate ovulation rate.

Lactation feed efficiency was estimated as the ratio of total gain from birth to weaning for all pigs weaned in a litter relative to feed inputs. The feed inputs considered were consumption of lactation feed by the sow, consumption of creep feed by the pig, and feed consumption during gestation which was required to gain the weight lost by the sow during lactation. Because the diets differed in composition, all feed inputs were converted to Mcal of feed energy and summed to provide a single estimate of total feed inputs. The efficiency ratios reported must be multiplied by the Mcal of energy per kg of feed to get a normal ratio of kg of gain per kg of feed.

Following weaning, all females were monitored for estrus daily and mated at first and second estrus. Second parity females were slaughtered at approximately 100 d of gestation to evaluate ovulation rate and litter size.

All traits were considered to be traits of the female. Data were analyzed by least squares mixed-model procedures (Harvey, 1985) with different models for first-cross and backcross females. Sex adjusted individual pig weights were summed to give litter weights representative of litters with equal numbers of males and females.

RESULTS

Least squares breed group means are presented in Table 1. Comparisons are valid only among first-crosses or among backcrosses.

Relative to first-cross Duroc, a higher ($P<.05$) percentage of first-cross Meishan and Fengjing reached puberty and reached puberty at a younger age; first-cross Minzhu were intermediate, and significantly different from the other breed groups for these traits. Differences among backcrosses were smaller for these puberty traits. Fengjing backcrosses had the highest ($P<.05$) percentage pubertal (not significantly different from Meishan backcross) and lowest ($P<.05$) age at puberty. Duroc backcrosses were the oldest ($P<.05$) at puberty, but did not differ from Meishan or Minzhu backcrosses for percentage pubertal.

First-crosses of the Chinese breeds had a significantly higher ovulation rate as gilts than did Duroc first-crosses, and Fengjing crosses had a higher ($P<.05$) value than Meishan or Minzhu crosses. Backcross Meishan and Fengjing had higher ($P<.05$) ovulation rate than Duroc and Minzhu backcrosses. Number born and number weaned per litter were significantly higher and similar for all three first-cross Chinese breeds than for Duroc first-crosses. While mean values favored the Chinese breeds, differences among backcrosses were smaller and not significant for number born or number weaned. Litter weaning weight was higher for Chinese first-crosses than for Duroc first-crosses, but only the difference between Duroc and Meishan was significant. Differences among backcrosses were small and not significant for litter weaning weight.

First-cross Fengjing were most efficient ($P<.05$) and first-cross Duroc were least efficient ($P<.05$) in converting feed inputs into litter gain. Backcross genotypes did not differ significantly for lactation feed efficiency.

Following weaning of their first litter, all Chinese first-crosses had a significantly shorter interval to first estrus than did Duroc first-crosses. Mean interval to conception was shortest for Fengjing first-crosses followed in order by Meishan, Minzhu, and Duroc; differences between adjacent means were not significant. Differences among backcross breed groups for mean interval to first estrus or conception were not large or significant.

At second parity, ovulation rate was highest for Fengjing first-crosses followed in order by

Meishan, Duroc, and Minzhu with differences between adjacent means not significant. However, differences among first-cross breed groups were not large or significant for litter size at 100 days of gestation. Although Meishan and Fengjing backcrosses had higher mean values for ovulation rate at second parity, backcrosses did not differ significantly for ovulation rate or litter size at 100 days of gestation.

DISCUSSION

These analyses indicate that Meishan and Fengjing can be used to produce first-cross gilts that are earlier to reach puberty, have a higher ovulation rate and litter size, are more efficient in converting feed energy into litter weight gain, and recycle and rebreed sooner after weaning than Duroc first-cross gilts. The performance level of first-cross gilts produced from Minzhu would be generally less than for Meishan and Fengjing but higher than for Duroc. Litter size did not differ significantly among these breed types at second parity. These data also indicate that one-quarter Meishan and Fengjing crosses have modest advantages over one-quarter Duroc crosses for age at puberty and gilt ovulation rate. Backcrosses did not differ significantly for other reproductive traits. However, Chinese backcrosses weaned about one pig more per litter than Duroc backcrosses. This difference is about one-half the advantage of Chinese first-crosses relative to Duroc first-crosses and would be of economical importance if supported by additional data. Additional information is needed on litter size at later parities and on growth and carcass traits of progeny, especially from first-cross gilts, before recommendations can be made on the appropriate use of these Chinese breeds in commercial production.

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Table 1. Least squares means for reproductive traits of first-cross and backcross females derived from Duroc, Meishan, Fengjing or Minzhu

Trait	Breed of sire or maternal grandsire				P level
	Duroc	Meishan	Fengjing	Minzhu	
Percentage pubertal[a]	114/132	122/142	119/144	111/135	
First-cross	56[b]	100[d]	99[d]	89[c]	<.01
Backcross	75[b]	85[b,c]	93[c]	75[b]	.02
Age at puberty (observed)[a]	63/96	122/123	118/133	99/102	
First-cross	224[d]	146[b]	148[b]	195[c]	<.01
Backcross	231[d]	213[c]	200[b]	216[c]	<.01
Gilt ovulation rate[a]	22/24	70/43	64/44	30/25	
First-cross	12.1[b]	14.6[c]	15.8[d]	14.3[c]	<.01
Backcross	11.6[b]	13.2[c]	13.1[c]	12.0[b]	.01
Number born[a]	32/40	38/42	34/44	36/44	
First-cross	9.4[b]	11.5[c]	12.0[c]	11.0[c]	<.01
Backcross	8.5	9.8	9.9	9.5	.15
Number weaned[a]	32/40	38/42	34/44	36/44	
First-cross	7.9[b]	10.4[c]	10.1[c]	9.7[c]	<.01
Backcross	7.8	8.8	8.7	8.6	.50
Litter weaning wt.[a], kg	32/40	38/42	34/44	36/44	
First-cross	51.3[c]	61.5[b]	56.8[b,c]	55.9[b,c]	.02
Backcross	30.6	32.9	31.8	32.1	.62
Mcal feed/kg litter gain[a]	28/35	31/39	27/38	30/36	
First-cross	.0858[b]	.1031[c,d]	.1050[d]	.0971[c]	<.01
Backcross	.0924	.0949	.0953	.0928	.66
Weaning to estrus, d[a]	51/40	38/39	46/43	45/41	
First-cross	12.8[c]	4.9[b]	4.9[b]	6.1[b]	<.01
Backcross	7.8	8.7	7.3	9.2	.70
Weaning to conception[a]	51/40	38/39	46/43	45/45	
First-cross	14.1[d]	8.4[b,c]	6.5[b]	12.7[c,d]	<.01
Backcross	10.9	8.9	10.0	10.4	.83
Sow ovulation rate[a]	51/40	38/39	46/43	45/45	
First-cross	17.2[b,c]	18.8[c,d]	20.0[d]	15.2[b]	<.01
Backcross	14.3	15.3	15.6	13.9	.18
Sow no. fetuses, 100 d[a]	51/40	38/39	46/43	45/45	
First-cross	11.4	11.8	11.6	10.2	.40
Backcross	10.2	10.6	9.4	9.0	.19

[a]Number of observations for first-cross/backcross.

[b,c,d]Means within a row lacking a common superscript letter differ (P<.05).