CHANGES OF PRODUCTION PERFORMANCE OF LANDRACE PIG AFTER ITS INTRODUCTION INTO CHINA

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SUMMARY

Landrace pig for a couple of decades of farming since its introduction into the eastern part of China in 1960s has met great changes on reproduction characters, growth and development, carcass performance etc. Litter size born was averagely increased by 2.9 heads (13.2 vs 10.3), litter size born alive by 2.4 heads (12.1 vs. 9.7) which have shown a significant difference. Compared with the normal growth rate, body weight, lean meat percentage etc. at 6 months are all decreased (respectively 83.2 vs 90 kg, 56.1 vs 65%). However, the thickness of backfat is generally increased (2.56 vs 1.77 cm). It shows that the environmental effect of Taihu Lake Basin in China can produce the possible potentials of exotic pigs into localized characters and it also explains the cause of high fertility of Taihu pig breeds.

INTRODUCTION

Landrace pig served as a father line in crossbreeding was introduced into China starting in 1964 from Great Britain, France, Sweden, the Netherlands, Denmark etc. Compared with the local Chinese pigs, particularly Taihu pig breeds distributing in the eastern part of China, the reproduction capabilities of Landrace pig is obviously poorly satisfied. That is, too, the reason why the world attentions have focused on the high fecundity of the Chinese local pig breeds. However, with the lengthy period of farming in China, it is found that Landrace pig in production characters is gradually localized into the Chinese breed of habitat. The present paper is intended to analyze some production parameters of Landrace and draw attentions on the enviromental factors affecting the production performances excepting the genetics concerns.

MATERIAL AND METHODS

Source of materials The data were collected from Daguanshan Pig Farm, Hangzhou municipality, Zhejiang province. The parameters for statistic studies include reproduction characters (litter number 788), all the data have been adjusted to the 3rd parity, growth and development (record from 222 female pigs as reserved replacement); carcass quality (data from 55 finished pigs). British and Swedish Landrace pigs introduced in 1964 are called old line, simplified by Line I, while Denmark Landrace introduced in 1980 are called new line simplified by Line II. The offsprings (II♂ × I♀) from the crossing by Line I and Line II are indicated by H.

Method for analysis The reproductive performance was studied by least square analysis method. The mathematical model is presented as the followings:

$$Y_{ij} = \mu + a_i + e_{ij}$$

where:

Y_{ij} a certain observed value on reproductive performance in ith group (line), jth litter

μ mean value of the total population when the number of group and litter is equal

a_i effect from ith group

e_{ij} random error submitting to normal distribution N (O, σ^2)

Growth and development effects were studied by two—way least square analysis method without interaction. The mathematical model is presented as:

$$Y_{ijk} = \mu + a_i + b_j + e_{ijk}$$

where:

Y_{ijk} a certain observed value on the growth and development in one replacement kth pig in ith year and in jth group

μ mean value as the number of subclass samplings is equal

a_i effect in ith year

b_j effect in jth group

e_{ijk} random error submitting to N (O, σ^2)

Carcass, meat quality and feed conversion rate were studied by normal variance analysis method: Heterosis percentage of H group is analyzed with the following formula,

$$H\% = \frac{H - (I + II)/2}{(I + II)/2} \times 100\%$$

The farming conditions were referred to the NRC standard along with green fodder for the reserved replacement and the fattening pigs to analyze the growth and development and the carcass quality.

RESULT AND ANALYSIS

Reproductive performance The reproduction performances of Line I, Line II and H are shown in Table 1. This table also presents data concerned on Line I after its introduction into China.

Table 1. Reproduction performance of Landrace pig of various lines

line	sampling size	litter size born	litter size born alive	litter birth wt. (kg)	litter wt. at 60 d (kg)
I	535	13.2 ± 0.14^{A}	12.1 ± 0.12^{A}	15.3 ± 0.45^{A}	239.43 ± 13.0^{A}
II	208	10.6 ± 0.18^{B}	9.8 ± 1.8^{B}	12.7 ± 0.23^{B}	194.8 ± 9.21^{B}
H	45	11.3 ± 0.39^{AB}	9.9 ± 0.39^{B}	13.0 ± 0.5^{B}	215.7 ± 18.7^{AB}
H%		−5.32	−9.22	−6.51	−1.11
I*	47	10.3 ± 0.14	9.7 ± 2.8	12.1 ± 6.1	200.7 ± 19.3

Note: I* indicated in Table 1 is adjusted value into third parity out of line I introduced into China in 1960s. The numbers followed by the capital letters are the results of significant test at the level of 1%.

Growth and development Growth and development of Line I, Line II and the female reserved replacement of H are indicated in Table 2.

Table 2. Growth and development of landrace pig of various lines

line	sampling size	wt. at 6 mth (kg)	daily gaing/d 2—6 mth (g)	body length (cm)	withers height (cm)	chest girth (cm)
I	42	83.2±0.87^{A}	516.1±0.19^{A}	117.5±0.53^{B}	61.4±0.32^{B}	95.1±0.47^{A}
II	153	75.6±0.46^{B}	454.3±0.1^{B}	116.4±0.28^{B}	62.1±0.17^{AB}	91.2±0.24^{B}
H	27	86.6±1.09^{A}	542.7±0.24^{A}	122.0±0.66^{A}	63.9±0.40^{A}	95.4±0.58^{A}
H%		9.07	11.85	4.32	3.48	2.42

Carcass quality Carcass quality of line I, Line II and the finished pigs of H is listed in Table 3.

Table 3. Carcass quality of the Landrace pig in various lines

line	sampling size	feed conversion rate	thickness of backfat (cm)	eye muscle area (cm^2)	lean meat %	fat %
I	10	3.76±0.09^{B}	25.6±0.1^{A}	35.1±2.02^{B}	56.2±0.94^{B}	27.0±0.9^{A}
II	35	4.06±0.05^{A}	17.7±0.05^{B}	45.90±1.08^{A}	65.0±0.5^{A}	18.02±0.48^{B}
H	10	4.18±0.09^{A}	22.2±0.1^{A}	40.7±2.02^{AB}	59.30±0.84^{B}	24.2±0.9^{A}
H%		6.91	2.54	0.49	−2.15	7.08

DISCUSSION

Changes of reproduction characters of Landrace pig after its introduction into China Taihu pig, populated in the Taihu Lake Basin, the eastern part of China has such a high fertility that has attracted the global interests from genetic specialists, thus leading to a heated debate on the concept between major gene and minor gene (Chen Runsheng, 1992) which control the characters of the offsprings, litter size of Landrace pig has been steadily kept between 9—11 heads for the past a few dozens of years without much changes (Chen Bing et al, 1993, Jose B., 1993, Daryl, L., 1993, Irvin, K. M., 1984, Bereskin, B., 1984, Mercer, J. T., 1990). There is almost no difference in reproduction performance between Landrace pigs introduced either in 1964 or in 1980s (litter size born 10.3 vs 10.6 and litter survival 9.7 vs 9.8). However, Landrace pig, introduced in 1964, with a couple of decades of domestic farming in China, the litter size was increased by over 2 heads (litter size born 13.2 vs 10.3, litter survival 12.1 vs 9.7). It is greatly surprising to see such a tremendous change on Landrace pig in China particularly in the eastern part of China. The litter size is already matchable with other Chinese breeds except Taihu pig. From the genetic point of view, the heritability of pig is extremely little (ranging between 0.00—

0. 2), in this regard the selection does not help at all(Wu Zhongxian, 1979), moreover, the farm did not make any plan purposely to increase the litter size. Therefore, hypophysis could be drawn as that the rapid increase of litter size of Landrace pig offspring of Line I is greatly attributable to the naturally environmental effect in the Taihu Lake Basin, the eastern part of China. This hypophysis is also strongly supported by other animals: Taihu sheep with high fertility, populated in this area, has a litter size of 3—4 heads, sometimes 5 heads, while othersheep breeds have a litter size of 1—2 only. In the light of this change occurred in Landrace pig in Taihu Lake Basin, the author believes that there is no major gene in controlling the litter size. However, there is no doubt about genetic factors affecting the reproduction characters, but it is the co—effect of genetics—environment. It is not definite to make sure that Landrace pig can produce as many as Taihu pig in the future, further observations and the studies are surely necessary.

comparisons between growth and development with carcass quality Compared with normal growth rate(Jose, B., 1993) the body weight of Line I at 6 month is less, while that of Line II is even much less (see Table 2). This is probably a cause of un—climatization with the environment — high temperature and great humidity for Line II in the eastern part of China. But the backfat of Landrace pig Line I has significant changes. Lean meat percentage of Line I has already decreased lower than 60%.

Discussion on heterosis There is much difference between Line I and Line II. Line I has already successfully adapted itself in the local environment and turned to be an independent native strain in China. The offspring heterosis from Line I and Line II become different: in the sense of reproduction performance, the crossbred which shows pauperization is inclined to Line II.

Obviously, many changes have taken place in the production performances on Landrace pig. However, more research are needed by virtue of selective breeding to increase the litter size and meanwhile to maintain the high growth rate and carcass quality. The changes of reproduction performance on Landrace pig provide a sufficient ground of the environmental effects which are, too the cause of high fertility of Taihu pig.

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