

EFFECT OF GENETIC FACTOR ON REPRODUCTIVE TRAITS AND MORTALITY RATE IN PIGS

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ABSTRACT

Present study was undertaken to evaluate the effect of genetic factor on reproductive traits and mortality rate in four pig breeds namely Large Whiter Yorkshire (LWY), Landrace (LR), LWY x LR and LR x Desi (D) maintained at Regional Pig Breeding Station-cum-Bacon Factory, Haringhata, West Bengal. Data collected was subjected to Least Squares Analysis. The Least Squares Means \pm SE of Litter Weight (kgs) at Birth was found to be 7.909 ± 0.274 , 9.638 ± 0.179 , 9.794 ± 0.240 and 8.113 ± 0.271 ; and Litter Weight (kgs) at Weaning was found to be 36.039 ± 2.005 , 52.306 ± 1.311 , 53.582 ± 1.757 and $37.075a \pm 1.989$, respectively, for LWY, LR, LWYxLR and LRxD pigs. Least Squares Means \pm SE of Age at First Farrowing (Days) was found to be 369.444 ± 2.891 , 367.883 ± 4.640 , 347.913 ± 3.492 and 356.554 ± 3.203 , respectively, for LWY, LR, LWYxLR and LR x D pigs. Least Squares Means \pm SE of Mortality Rate (%) was found to be 31.593 ± 2.472 , 20.636 ± 1.617 , 19.332 ± 2.166 and 31.801 ± 2.446 for LWY, LR, LWYxLR and LR x D pigs, respectively. Also, The Least Squares Analysis has revealed a significant effect of genetic factor on litter weight at birth and at weaning, age at first farrowing and mortality rate. This result suggests the importance of genetic factor in improving reproductive efficiency of sows. Although this finding is of use in pig rearing practices, Least Squares Analysis of more data with environmental factors in addition to genetic factor will prove the importance of eliminating non-genetic factors in enhancing the returns on investments in pig husbandry.

Key Words: Swine, Genetic Factor, Reproductive Traits, Mortality Rate

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INTRODUCTION

Perception towards the swine industry in India is changing from subsistence to commercial level due to rapid growth of this sector. This also can be attributed to the change in food habits of human population. Through their prolificacy, high feed conversion ratio, shorter generation interval, fast growth rate and high dressing percentage, pigs are enhancing the rural economy to resolve the acute demand for protein of high biological value, comparatively at low cost. This minimized cost of production and eventual higher returns on investment is a good fortune for animal husbandry activities in rural mass. In India, only 15-20% is of improved genotype including graded pigs and remaining is of indigenous with poor reproductive efficiency. Therefore, superior germplasm of improved exotic pig breeds were introduced in our country to improve native pigs through crossbreeding. Also, the performance of purebreds was assessed in our environmental conditions. The performance of pigs is controlled by various genetic and non-genetic factors. Therefore, with dearth of information on the factors affecting the economic traits, the present study was undertaken with an objective to investigate the effect of various factors affecting reproductive traits in Large White Yorkshire and Landrace Pigs.

MATERIALS AND METHODS

The present investigations were carried out on different genetic groups of pigs maintained at the Regional pig Breeding station-cum-Bacon factory, Haringhata, West Bengal. The observation pertaining to reproductive traits

viz. Litter weight at birth and at weaning, age at first farrowing (AFF), and mortality rate over a period of 29 years from 1972 to 2000 was recorded from the available history cum pedigree sheets. Genetic factors used in this study were Large White Yorkshire (LWY), Landrace (LR), LWY x LR and LR x Desi (D) pigs. Total period under study was divided into five periods of five years each except for 1st period which was nine years. Sows up to 5th parity were considered in the study.

Different groups of animals were housed in a separate pucca pens under uniform housing and managemental conditions. They were fed with recommended concentrate mixture and were provided with free access to fresh water. New born piglets were protected from cold effects. As a preventive measure against piglet anemia, an iron tonic (Imferon) @ 1ml per piglet was injected intramuscularly on 3rd/4th and repeated on 14th/15th day of age. After two weeks of age, creep feed was provided to suckling piglets in creep box. At the age of 8 weeks piglets were weaned. Deworming was carried out immediately after weaning and repeated if needed. A vaccine against Swine fever was administered. All the breedable sows were observed for oestrus once daily by noting heat symptoms and served by same boar during mid and late heat to ensure maximum litter size. Once served, they were kept separately. The data collected was subjected to Least Squares Analysis as per Harvey (1966) using the below given statistical model;

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

where,

μ	=	Overall mean
a_i	=	Effect of i th genetic group

e_{ij} = Random error distributed with mean 0 and variance σ^2

Duncan's multiple range (DMR) test as modified by Kramer, 1957 was utilized for pair-wise comparison of the least squares means of 0.01 and 0.05 level of probability.

RESULTS AND DISCUSSION

LITTER WEIGHT AT BIRTH

The estimates of average litter weight at birth for LWY, LR, LWY x LR and LR x D are given in Table 1. Previous studies have revealed the average litter weight at birth to range from 6.89±0.15 kg (Sharma, 1989) to 12.42±0.49 kg (Singh *et al.*, 1990a) in LWY and the range of 10.6±3.2 kg (Kumar *et al.*, 1990) to 13.56±1.57 kg (Sukhdeo *et al.*, 1979) in Landrace. Similarly, it was ranged from 6.50±2.27 to 7.60±0.39 kg in LR x D (Singh and Devi, 1997). In LWY, Sharma (1989) and Singh *et al.* (1991) have reported the lower and higher litter weight at birth than the present findings, respectively. In Landrace, litter weight at birth reported in this study is the lowest so far. Interestingly, Singh and Devi (1997, 1997a) have reported a higher litter weight at birth. In LR x D, litter weight at birth reported in this study is the highest value than the previous reports. The differences in litter weight at birth reported till date reflects the differences in inherent growth rate in uterine environment.

Effect of genetic group: Least squares analysis of variance has revealed the significant ($P<0.01$) effect of genetic factor on litter weight at birth (Table 1). The heaviest and lightest litter weights at birth were observed in LWY x LR

and LWY pigs, respectively. LR (1.729 kg) and LWY x LR (1.885 kg) breeds had significantly ($P<0.05$) heavier litter weight at birth than the LWY. Similarly, LR (1.525 kg) and LWY x LR (1.681 kg) pigs have significantly heavier litter weight at birth than the LR x D pigs. Although LWY x LR had 0.156 kg more litter weight at birth than LR, yet the difference was non-significant. The LR x D pigs had 0.204 kg more litter weight at birth than LWY and they differ non-significantly. Significant effect of genetic group on litter weight at birth was reported by Mukhopadhyay *et al.* (1992) in Desi and their crossbred and Singh and Devi (1997, 1997a) in exotics, Desi and their crosses. On the contrary, Sukhdeo *et al.* (1979) have reported the non-significant effect of genetic group on litter weight at birth at LR, LWY and their crosses.

LITTER WEIGHT AT WEANING

The estimates of average litter weight at weaning (kg) for LWY, LR, LWY x LR and LR x D, are given in Table 1. Previous reports show an average litter weight at weaning ranging from of 45.12±3.23 kg to 69.90±5.70 kg in LWY (Chatterjee *et al.*, 1988; Sharma, 1989); 50.50±15.90 kg to 64.22±2.03 kg in LR (Singh and Devi, 1997 and 1997a); and in LWY x LR, and LR x D, it was 46.50±3.29 kg (Mukhopadhyay *et al.* 1992) and 37.30±2.80 kg (Sharma, 1989). The average litter weights at weaning obtained in this investigation is in agreement with the reported range. The average litter weight at weaning reported in this study for LWY is the lowest value than previous reports (Singh *et al.*, 1990; and Singh *et al.*, 1992). The values obtained in this study 52.306±1.311 kg for LR it lies in the range reported earlier (Singh and Devi, 1997; 1997a).

Similarly, the value 37.075 ± 1.989 kg for LR x D is in good agreement previous reports. The difference in litter weight at weaning among the different pig breeds reflects the differences in growth rate in a given environment.

Effect of genetic group: Least squares analysis of variance has revealed a significant ($p < 0.01$) effect of genetic factor on litter weight at weaning in pigs (Table 1). The heaviest and lightest litter weights at weaning were observed in LWY x LR and LWY pigs, respectively. LR (16.267 kg) and LWY x LR (17.543 kg) breeds had significantly ($p < 0.05$) heavier litter weight at weaning than LWY. Similarly, LR (15.507 kg) and LWY x LR (16.507 kg) pigs have significantly higher litter weight at weaning than LR x D pigs. Although, LWY x LR had 1.276 kg more litter weight at weaning than LR yet it did not differ significantly. The difference between LWY and LR x D pigs for litter weight at weaning is 1.036 kg and it is non-significant. Significant effect of genetic group on litter weight at weaning has been reported in LWY, Desi and their half-breeds (Singh *et al.*, 1990). On the contrary, Sukhdeo *et al.* (1979) reported non-significant effect of breed on litter weight at weaning in LR, LWY and their crosses.

AGE AT FIRST FARROWING (AFF):

The estimates of average age at first farrowing for LWY, LR, LWY x LR and LR x D are given in Table 1. Previous investigations have revealed the average AFF of 411 to 500 days in LWY; 448 ± 13 days to 476.31 ± 10.39 days (Singh and Devi, 1997) in LR and a 352.37 ± 15.11 days in LR X Desi (Singh and Devi, 1997).

Effect of Genetic group: Least squares analysis of variance has revealed a significant ($P < 0.01$)

effect of genetic factor on AFF (Table 1). In this study, the highest and lowest AFF was found in LWY and LWY X LR, respectively. LWY x LR (21.531 days) and LR (1.561 days) breeds had significantly lower AFF than LWY. Similarly, LWY x LR (8.641 days) pig had a significantly lower and LR (11.329 days) pig had a significantly higher AFF than LR x D pigs. Although LWY x LR pigs have 19.970 days lower AFF than Landrace, yet it did not differ significantly. Also, LWY pigs with 12.890 days higher AFF than LR x D, it differed non-significantly.

MORTALITY RATE (%):

The estimates of Mortality rate (%) for LWY, LR, LWY x LR and LR x D are given in the Table 1. The average mortality rate was reported to vary from 15.29% to 29.50% in LWY (Sukhdeo *et al.*, 1979; Sharda and Singh, 1982); 16.07% to 30.34% in LR (Mukhopadhyay, 1989); 18.01% to 28.14% in LR x D (Mukhopadhyay, 1989; Kumar, 1989). However, no definite range is available in LWY x LR. Mortality rate of 31.593% reported in this study for LWY is higher than the previous studies (Goonewardene *et al.*, 1984). Compared to the present study, lowest (Bardoloi and Raina, 1984) and highest mortality rate (Kumar *et al.*, 1990) has been reported in LR. In LR x D pigs, average mortality rate of this study is higher than the previous studies (Mukhopadhyay, 1989). This difference in mortality rate reflects the difference in the environment in which animals were grown.

Effect of genetic group : Significant ($P < 0.01$) effect of genetic factor on the average mortality rate has been revealed by Least Squares Analysis of variance (Table 1). The highest and lowest mortality rates were observed in

LR x D and LWY x LR pigs, respectively. LWY had the significantly ($P < 0.05$) higher mortality rate than LR and LWY x LR, but it was approximately similar to LR x D pigs which is non-significant. Similarly, LR and LWR x LR pigs have significantly lower mortality rate than

LR x D breed. Although LR have 1.304% higher mortality rate than LWY x LR yet it did not differ significantly. Similar to the results of present study, Sharma (1989) reported significant effect of genetic group on mortality rate in LWY, LR, D and their half breeds.

Table 1: Least Squares Means \pm SE of reproductive traits in Pigs

Effects	n	Litter Weight (kgs)		Age at First Farrowing (Days)	Mortality Rate (%)
		at Birth	at Weaning		
<i>Genetic Factor</i>					
A) Breed		**	**	**	**
a) LWY	196	7.909 ^a \pm 0.274	36.039 ^a \pm 2.005	369.444 ^a \pm 2.891	31.593 ^a \pm 2.472
b) LR	369	9.638 ^b \pm 0.179	52.306 ^b \pm 1.311	367.883 ^b \pm 4.640	20.636 ^b \pm 1.617
c) LWY x LR	218	9.794 ^b \pm 0.240	53.582 ^b \pm 1.757	347.913 ^b \pm 3.492	19.332 ^b \pm 2.166
d) LR x D	161	8.113 ^a \pm 0.271	37.075 ^a \pm 1.989	356.554 ^a \pm 3.203	31.801 ^a \pm 2.446

n= Number of observations in each subclass of a factor. ** Significant at $P < 0.01$; NS: Non-significant

CONCLUSION

Present study was undertaken to evaluate the effect of genetic and non-genetic factors on reproductive traits and mortality rate in four pig breeds maintained at Regional Pig Breeding Station-cum-Bacon Factory, Haringhata, West Bengal. Least Squares Analysis of data has revealed the significant effect of genetic factor on litter weight at birth and at weaning, age at first farrowing and mortality rate. This result suggests the importance of genetic factor in improving reproductive efficiency of sows. Although, this finding is of use in pig rearing practices, Least Squares Analysis of more data with environmental factors in addition to genetic factor will prove the importance of eliminating non-genetic factors in enhancing the returns on investments in pig husbandry.

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