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GENETIC AND NON-GENETIC VARIABILITY OF WEANING WEIGHT IN LARGE WHITE YORKSHIRE PIGS

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Weaning weight is an important economic character which indicate increase in weights likely to be gained in the early growth phase of pigs. It is generally observed that heavier pigs at weaning reach slaughter weight earlier. Weaning weight is influenced by sex and environmental variation. The estimate of heritability of this trait is important as this gives some idea about the component of variance that is due to additive gene action. In the present study an attempt was made to study (1) the magnitude of variation that exist in weaning weight, (WW) due to inheritance and other non-genetic factors like sex, period and season of farrowing, and (2) the relationship between birth weight and weaning weight.

Materials and Methods

The data pertaining to Large White Yorkshire pigs maintained at the Swine Unit, Department of Animal Genetics and Breeding, Veterinary College, University of Agricultural Sciences, Bangalore were compiled. The individual records of 1477 piglets from 400 farrowings involving 18 boars, and 130 sows spread over a period of nine years (1984-1992) were utilised for the present investigation. Data were classified into three seasons based on meterological features as summer (March to June), monsoon (July to October) and winter (November to February) and three periods (at 3 year interval) were Period-I (1984-86), Period-II (1987-89) and Period-III (1990-92). The piglets were weighed within 24 hrs of birth and at weaning. The breeding stock were fed 2 kg of concentrates, 8-10 kg of kitchen waste and 500 gms of fresh green Napier grass per day. Drinking water was made available to pigs throughout the day. Animals were regularly vaccinated and dewormed as per standard schedules. Weaning was practised at the age of 8 weeks.

Least squares analysis of variance for disproportionate subclass frequencies as suggested by Harvey (1987) was followed to detect the significant source of non-genetic variation. The following fixed effect model was used for analysis.

$$Y_{ijkl} = u + S_i + P_j + X_k + {}_{ijkl}$$

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Where

Y_{ijkl} = the record of l^{th} individual belonging to k^{th} sex, j^{th} period of i^{th} season

u = population mean when equal subclass frequencies existed among groups

S_i = fixed effect of i^{th} season of birth (i = 1, 2, 3)

p_j = fixed effect of j^{th} period of birth (j = 1, 2, 3)

x_k = fixed effect of k^{th} sex (k = 1, 2)

$_{ijkl}$ = random error associated with Y_{ijkl} and assumed to be independently and normally distributed with mean zero and unit variance (O_e)

Any difference among the least squares means due to non-genetic factors was tested for significance through 't' test (Snedecor and Cochran, 1967) at 0.05 per cent level of significance only.

The records used to estimate h^2 were preadjusted for significant effects of non-genetic factors if any and those boars which had atleast five litters. The method of choice to estimate h^2 was paternal half-sib correlation method as discussed by Becker (1975) while that of SE of h^2 as per Swiger *et al.* (1964).

Simple correlation between birth weight and weaning weight was also computed and its significance was tested using 't' test as per the procedure (Snedecor and Cochran, 1967).

Results and Discussion

The least square means along with the respective standard errors and the coefficients of variation in weaning weight are detailed in Table 1. The mean squares from least square analysis of variance for weaning weight is presented in Table 2.

Table 1 Sex, period and season-wise least square means for weaning weights

Source of variation	No. of observation	Mean ± SE	CV %
Overall	1477	8.00±0.07	33.93
Male	751	8.03±0.09[a]	33.32
Female	726	7.97±0.10[a]	34.54
Period I	521	9.25±0.12[a]	29.64
Period II	628	7.62±0.09[b]	32.79
Period III	328	7.12±0.13[c]	33.31
Summer	376	7.29±0.13[a]	33.31
Monsoon	557	8.29±0.11[b]	33.14
Winter	544	8.02±0.11[b]	33.14

Means bearing same superscript within a subgroup are not significantly different from each other (P 0.05)

Table 2 Mean squares from least square analysis of variance for weaning weights

Source of variation	d.f	Means squares
Sex	1	1.2201[NS]
Periods	2	610.2662*
Seasons	2	85.6572*
Residual	1417	6.4565

* ($P \leq 0.05$)

NS Non-significant

The overall least square computed for 8mean WW was 8.0 ± 0.07 kg. This value is in close proximity with those reported by

Singh *et al.* (1977) and Sukh Deo *et al.* (1981) in Large White Yorkshire pigs. However, higher values were reported by Rai and Desai (1985) and Nagaraj *et al.* (1992). The coefficient of variation recorded was 33.93 per cent. This variation can be effectively capitalised through appropriate selection for obtaining higher WW.

The present study indicated that sex of piglet did not influence the WW significantly. Similar findings were reported by Rai and Desai (1985) and Nagaraj *et al.* (1992). The weaning weight of male piglets was 8.03 ± 0.09 kg and that of female piglets was 7.97 ± 0.10 kg. This study indicated that the weaning weight is independent of its sex.

The WW was significantly affected by period of birth. Higher weaning weight was noted for those pigs born during period I. Rai and Desai (1985) and Lakhani and Bhadoria (1988) also reported significant effect of period of birth on WW.

The season of birth significantly affected the WW. The piglets born during monsoon were heaviest followed by those born during winter season. This finding corroborates with those reported by Nambudiri and Thomas (1984), Rai and Desai (1985) and Nagaraj *et al.* (1992). The possible reason for the present finding might be due to conservation of energy during monsoon and winter season because of less activity of piglets leading to tissue building resulting in increased gain in weight.

The estimated heritability value for weaning weight was 0.70 ± 0.21. This estimate is considerably higher than the values reported by Singh *et al.* (1977), Gupta *et al.* (1982), Lakhani and Nema (1989) and Mishra *et al.* (1989) in Yorkshire pigs. The high heritability value may be attributable to the introduction of new boars periodically into the herd thereby increasing the additive genetic variation in the herd which could be exploited for further improvement of the trait.

Table 3 Mean squares from analysis of variance for heritability estimate of weaning weight

Source of variation	d.f	Means squares	h^2
Between sires8	17	216.5168	0.70 ± 0.21
Between progeny within sires	1456	12.1778	

The correlation coefficient between birth weight and weaning weight in this investigation was moderately high (0.34 ± 0.02), positive and highly significant ($P \leq 0.01$). This value was in close conformity with the report of Eusebio and Gallcardona (1970) and lower than those reported by Nadazdin and Pandza (1973) and Milosavljevic and Sovljanski (1971). The present study indicates the possibility of correlated response in WW in turn early selection on birth weight.

Summary

The effect of sex, period and season of birth on the weaning weight of Large White Yorkshire piglets and the heritability of this trait and its relationship with birth weight

was analysed using data of 1477 piglets, sired by 18 boars and born during 1984 to 1992. The overall mean weaning weight was 8.00 ± 0.07 kg. The period and season of birth significantly ($P \leq 0.05$) influenced the weaning weight. The heritability estimate for weaning weight was 0.70 ± 0.21. Weaning weight had moderately positive and highly significant ($P \leq 0.01$) correlation with birth weight.

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