

Effect of sex and nongenetic factors on birth weight of Sahiwal calves

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The weight of the newly born calf is of great importance to breeders in judging its health as well as that of its dam, and also gives a good indication of the subsequent development (Mudgal and Ray 1965). Birth weight reflects pre-natal growth and is related to post-natal growth and survivability of the calf. It is the earliest character that can be measured accurately (Dhillon *et al.* 1971). So the basic objective of this study was to estimate the average birth weight of Sahiwal calves and to ascertain the effect of different non-genetic factors and sex of the calf on birth weight.

The present investigations were carried out on birth weight of 2,857 Sahiwal calves (1,385 female and 1,472 male) born during a period of 47 years (1961–2007) at National Dairy Research Institute (NDRI), Karnal. The records of the animals with known pedigree were only considered and the abnormal records like abortion, still births, premature births etc. were not included in the study.

The data were classified according to different periods (16) of 3 years each and seasons (4) of birth to study the effect of different non-genetic factors on birth weight. The four seasons were winter (December–March), summer (April–June), rainy (July–September) and autumn (October–November). The least squares analysis of variance as described by Harvey (1987) was used. The statistical model used was:

$$Y_{ijkl} = \mu + S_i + P_j + C_k + e_{ijkl}$$

where, Y_{ijkl} was the birth weight of l^{th} calf of k^{th} sex born in j^{th} period and i^{th} season, μ was overall population mean, S_i was the effect of i^{th} season, P_j was the effect of j^{th} period, C_k was the effect of k^{th} sex and e_{ijkl} was random error. Duncan's multiple range test as modified by Kramer (1957) was used for testing differences among least squares means.

The overall least squares mean for birth weight was 21.47±0.05 kg (Table 1). Khan *et al.* (1999) also reported similar (21.6 kg) birth weight in Sahiwal cattle of Pakistan.

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However, Wakchaure and Meena (2010) reported comparatively lower birth weight (20.41±0.23) in sahiwal calves at NDRI, Karnal.

The effect of sex of calf was highly significant on birth weight of Sahiwal calves. The male calves on an average were 1.64 kg (7.95%) heavier than female calves. The average birth weights were 22.27±0.07 kg and 20.63±0.07 kg for male and female calves, respectively (Table 1). Similarly, Singh and Dutt (1961) reported that male calves on an average were 2.20 kg heavier than female calves (23.95 versus 21.75kg) in Sahiwal cattle.

The season of birth had highly significant ($P < 0.01$) effect on birth weight of Sahiwal calves. This was in

Table 1. Least squares means of birth weight in Sahiwal calves

Overall	No. of observations	Mean±SE (kg)
	2857	21.47±0.05
Sex		
1. Male	1472	22.27 ^a ±0.07
2. Female	1385	20.63 ^b ±0.07
Seasons		
1. Winter	1214	21.61 ^a ±0.08
2. Summer	725	21.46 ^{ab} ±0.10
3. Rainy	574	21.19 ^b ±0.11
4. Autumn	344	21.47 ^{ab} ±0.15
Periods		
1. 1961–63	291	22.82 ^a ±0.16
2. 1964–66	203	22.05 ^b ±0.19
3. 1967–69	217	21.91 ^b ±0.19
4. 1970–72	240	21.80 ^b ±0.18
5. 1973–75	48	20.44 ^d ±0.39
6. 1976–78	53	20.79 ^{cd} ±0.37
7. 1979–81	95	21.09 ^{cd} ±0.28
8. 1982–84	101	21.12 ^{cd} ±0.27
9. 1985–87	134	22.16 ^b ±.24
10. 1988–90	126	21.46 ^{bc} ±0.24
11. 1991–93	165	21.47 ^{bc} ±0.21
12. 1994–96	180	21.50 ^{bc} ±0.20
13. 1997–99	196	21.54 ^{bc} ±0.19
14. 2000–02	249	21.12 ^c ±0.17
15. 2003–05	330	20.56 ^d ±0.15
16. 2006–07	229	20.41 ^d ±0.18

Means with the same superscript did not differ significantly from each other.

agreement with the findings of Mudgal and Ray (1965), Taneja and Bhat (1971), Bhatnagar *et al.* (1974), Sakhare and Ingle (1983), Bakir *et al.* (2004) and Wakchaure and Meena (2010) in Sahiwal and HF crosses. Calves born during rainy season had significantly lower birth weight (21.19 ± 0.11 kg) in comparison to those born during winter season (21.61 ± 0.08 kg).

The influence of period was highly significant ($P < 0.01$) on birth weight in Sahiwal calves (Table 1). Taneja and Bhat (1971), Singh (1977), Sakhare and Ingle (1983), Aduli *et al.* (1996), Roy *et al.* (1996), Khan *et al.* (1999), Bakir *et al.* (2004), Madhuri *et al.* (2007), Siddalingswamy *et al.* (2007) and Wakchaure and Meena (2010) also observed highly significant effect of period of birth on this trait. Calves born during the period of 2006–07 had lowest birth weight (20.41 ± 0.18 kg), while those born during the period 1961–63 had highest (22.82 ± 0.16 kg) birth weight.

SUMMARY

The data on 2,857 Sahiwal calves born at NDRI, Karnal for the period of 1961–2007 were subjected to least squares analysis to find out the impact of important sources of variation on birth weight. The overall least squares mean for birth weight was 21.47 ± 0.05 kg. The sex of the calf, season and period of birth had highly significant influence on birth weight of Sahiwal calves. The average birth weight of male calves (22.27 ± 0.07 kg) was 1.64 kg (7.95%) higher than female calves (20.63 ± 0.07 kg). Calves born during rainy season had significantly lower birth weight (21.19 ± 0.11 kg) in comparison to those born during winter season (21.61 ± 0.08 kg).

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