Birth Weight in Jersey Cattle

T. G. Rajagopalan* and A. D. Dave

Gujarat College of Veterinary Science and Animal Husbandry
GAU, Anand Campus, Anand-388001.

ABSTRACT

Factors affecting birth weight of Jersey calves were studied using 180 birth records of the Jersey Cattle Breeding Farm, Anand.

Mean birth weight of Jersey calves was observed to be 19·64 ± 0·2371 kg. This was significantly influenced by sex of the calf, sequence of calving and body weight of the dam at the time of calving. Sire effect was found to be nonsignificant.

Heritability of birth weight was calculated by paternal half sib correlation method and was found to be 0·1877 ± 0·4732.

(Received on Jan. 8, 1975)

INTRODUCTION

BIRTH weight is the first character that can be measured with reasonable accuracy. It indicates the status of health of the dam at parturition and also gives some indication of the calf's ability to survive and grow. Quite an extensive information on birth weight of the exotic cattle and several factors affecting it under foreign countries condition is available. However limited information in this regard is available under Indian conditions. The present study was undertaken to bridge the gap.

MATERIALS AND METHODS

Data for this study were collected from Jersey Cattle Breeding Farm, Anand for the period from March, 1971 to March, 1974. The foundation Jersey animals were received in two batches from Australia in 1971. There was little variation in the feeding and management of the herd during the period of study. The herd was completely stall fed during this period. Records of 180 births collected during this period were used for analysis.

Statistical method of analysis of variance and correlation were used as suggested by Snedecor (1956). Heritability estimate was calculated by paternal half sib correlation method as described by Lush (1949) and standard error of heritability was calculated as recommended by Hazel and Terril (1945). For unequal numbers of observation under different sires K (average number of calves per sire) was calculated according to Hetzer, Dickerson and Zeller (1944).

RESULTS AND DISCUSSION

(A) *Mean birth weight of calves:*

Average birth weight of male and

* Present address: College of Veterinary and Animal Science, Mannuthy.

TABLE 1

Average birth weight of Jersey calves.

Sex	*Mean B. Wt. kg.*	*No. of Records*	*S.E.*	*C.V.*
Male	20·92	97	0·3160	14·86
Female	18·59	83	0·3070	15·06
Overall	19·64	180	0·2371	16·02

female Jersey calves is presented in Table 1.

Mean birth weight of Jersey calves was observed to be 19·64 kg with a range from 11·1 kg to 30·4 kg. The mean birth weight for male and female calves was 20·92 kg and 18·59 kg, respectively. Thus the male calves on an average were heavier by 2·33 kg (11·8%).

Birth weight obtained in the present study was lower than that reported by Brody (1945)(25·6 kg), Morrison (1956) (25·1 kg), and Mathew and Forman (1957) (25·4 kg). As 47·2 per cent and 40·0 per cent of the records were from the first and second lactation cows, respectively, it is likely that the lower birth weight observed in the present study may be due to the indirect effect of the parity of the dam on birth weight of calves.

(b) *Effect of sex of the calf and sequence of calving on birth weight of calves:*

Average birth weight of calves according to the sex and sequence is presented in Table 2.

TABLE 2

Effect of sex of the calf and sequence of calving on birth weight of calves.

Sequence	*Sex*	*No. of records*	*Mean B.Wt.kg.*	*S.E.*	*C.V.%*
1st calving	Male	44	19·62	0·3785	12·79
	Female	41	18·05	0·3785	11·08
	Overall	85	18·26	0·2605	12·74
2nd calving	Male	39	21·95	0·5496	15·62
	Female	33	19·63	0·5766	16·86
	Overall	72	20·89	0·4174	16·95
3rd calving	Male	14	22·21	0·6310	10·67
	Female	9	17·20	0·9833	17·15
	Overall	23	20·20	0·7807	18·51

A. V. Table

Sources	*D.F.*	*S.S.*	*M.S.*	*F. Value*
Between sex	1	243·72	243·72	30·81**
Between sequence	2	162·66	54·22	6·85**
sex x sequence	3	38·05	19·02	2·40 N.S.
Error	174	1376·25	7·91	
Total	179	1820·68		

** Significant at 1 per cent; N.S. — Non-significant

Male calves were heavier at birth than female calves, irrespective of the number of lactation. This effect of sex on birth weight was found to be highly significant ($P<0.01$).

The interaction between sex of the calf and sequence of calving was found to be nonsignificant, indicating that sex and sequence influence the birth weight independently of each other.

Significant difference (0·45 kg to 3·62 kg) between the birth weight of male and female calves has been reported in the exotic cattle by Askar and Rabag (1952), Arnold and Baker (1953) and Roy (1959).

In Indian breeds of cattle similar significant difference in the birth weight (1·4 — 2·3 kg) due to sex has been reported by Singh and Dutt (1961); Batra and Desai (1962); Bhalla *et al.*, (1967) and Dhillon *et al.* (1971).

Sequence of Calving:

The overall mean birth weight of calves increased by 2·23 kg from the first to second lactation. The increase in mean birth weight of male and female calves from the first to the second lactation was 2·32 (11·83%) and 1·58 kg (8·77%), respectively. From second to third lactation the average birth weight of male calves increased only by 0·17 kg (0·77%). The mean birth weight of female calves, however, showed a downward trend. Mean birth weight of calves of both the sexes thus increased with sequence of calving from the first to second lactation. The trend, however, from the second to third was different with the two sexes. Though due to lesser number of observations (23) this decreasing trend noticed in female calves cannot be taken as conclusive, it does indicate that birth weight in these animals might not increase significantly from second to third lactation.

Significant difference in birth weight due to sequence has been reported by Askar and Ragab (1952); Lazarus and Rangaswami (1953) and Venkateswarulu *et al.*, (1972).

The findings of the present study are in agreement with those of Knapp *et al.*, (1941) who reported that primy para calves were lighter than those of later lactations. Thereafter, however, there was no significant increase in the birth weight of calves as the age in terms of sequence increased.

(c) *Effect of dam's weight on birth weight of calves:*

The relationship between the body weight of the dam at the time of calving and birth weight of calves is presented in Table 3.

Correlation coefficient between the dam's weight at the time of calving and birth weight of calves in the first calving was significant in males (+0·4360) and in females (— 0·4123). The same in the second calving was non-significant in males (— 0·0602) and in females (+0·1417). In the third calving it is nonsignificant in male (0·4781) and female (0·0758). When the correlation was calculated for pooled data it was found to be highly significant for males (+0·3964) and nonsignificant for females (0·0961).

TABLE 3

Effect of dam's weight on birth weight of calves.

Calves	*No. of records*		*Dam's Wt. kg.*	*B. Wt. kg.*	*r*
1st calving	male	35	303·91 ± 6·16	19·58 ± 0·47	+ 0·4360*
	female	35	303·90 ± 6·26	17·55 ± 0·28	— 0·4123*
2nd calving	male	33	347·24 ± 4·87	21·66 ± 0·56	— 0·0602 NS
	female	30	351·03 ± 6·20	19·78 ± 0·57	+ 0·1417 NS
3rd calving	male	13	388·53 ± 8·64	22·21 ± 0·66	+ 0·4789 NS
	female	8	387·75 ± 6·00	17·29 ± 1·21	+ 0·0758 NS
Pooled	male	81	335·14 ± 5·24	20·85 ± 0·32	+ 0·3604**
	female	70	333·68 ± 2·08	18·87 ± 0·93	+ 0·0961 NS

NS = Nonsignificant
** = Significant at 1%
* = Significant at 5%

TABLE 4

A. V. Table for sire effect.

Source	*D.F.*	*S.S.*	*M.S.*	*F. Value*
Between sire	12	196·78	16·398	1·590 NS
Error	91	936·00	10·307	
Total	103	1134·78		

NS = Nonsignificant.

From the present study it appears that correlation between body weight of the dam at the time of calving and birth weight of calves is not consistant as the value was positive and significant for males in the first calving, negative and nonsignificant in the second calving and nonsignificant in the third calving. The same in females was negative and significant in the first calving, postitive and nonsignificant in the second calving and the third calving.

(d) *Sire effect:*

Mean birth weight of the calves born to 13 sires studied showed a variation from 18·0 kg to 23·0 kg. The effect of sire on birth weight of calves was found to be nonsignificant (Table 4).

This finding is contrary to that of

Lazarus and Anantakrishnan (1953) and Venkateswarulu *et al.*, (1972), who reported significant sire effect on birth weight of calves.

(e) *Heritability of birth weight:*

Heritability of birth weight was calculated by paternal half sib correlation method.

$K = 12 \qquad h^2 = 0{\cdot}1877$

$b^2e = 10{\cdot}307$

$b^2s = 0{\cdot}507 \quad SE = 0{\cdot}4732$

The value of h^2 was found to be low ($0{\cdot}1877 \pm 0{\cdot}4732$).

Similar values of heritability was reported by Singh and Desai (1959) in Hariana cattle, Batra (1961) in Sahiwal cattle and Shukla (1965) in Gir cattle.

ACKNOWLEDGEMENT

The authors are very grateful to Dr. Kurien, Chairman, National Dairy Development Board, Anand and Dr. R. M. Patel, Director of Campus, Anand, the Gujarat Agricultural University, for their kind permission to undertake this study.

REFERENCES

Arnold, P.T.D. and R.B. Becker, 1953. Dairy calves, their development and survival. Flo. Agric. Exp. Sta. Bul. No. 529. *Anim. Breed. Abstr.* **23**(2): 144.

Askar, A.A. and M.T. Ragab, 1952. Causes of variation in birth weight of Egyptian cattle and buffaloes. *Indian J. Vet. Sci.* **22**(4): 265.

Batra, T.R. 1961. Genetic studies in Sahiwal cattle. M.V.Sc. Thesis, Agra University.

Batra, T.R. and R.N. Desai, 1962. A genetic study of birth weight in Sahiwal cattle. *Indian J. Vet. Sci. and Anim. Husb.* **32**(3): 198.

Bhalla, R.C., D.P.S. Senger, and B.K. Soni, 1967. Study on the birth weight of Murrah buffalo and Sahiwal calves and factors affecting them. *Indian J. Dairy Sci.* **20**(3): 139.

Brody, S. 1945. Bioenergetics and growth, Reinhold Pub. Corp. New York. p. 484.

Dhillion, J.S., R.M. Acharya, M.S. Tiwana and M.L. Nagpal, 1971. Non genetic factors influencing birth weight in Hariana cattle. *Indian J. Dairy Sci.* **24**(3): 96.

Hazel, L.N. and C.E. Terril 1945. Effects of some environmental factors on weaning traits or range Rambouillet lambs. *J. Anim. Sci.* **4** (4): 331.

Hetzer, H.O., C.E. Dikerson and J.H. Zeller, 1944. Heritability of type in Poland-China swine as evaluated by scoring. *J. Anim. Sci.* **3** (4): 390.

Knapp, B. Jr., W.V. Lambert and W.H. Black, 1940. Factors influencing length of gestation period and birth weight in cattle. *J. Agric. Res.* **61** (3): 277.

Lazarus, A.J. and C.P. Ananthakrishnan, 1953. Observation of some Indian cattle. Part IV. A study of the birth weight of calves *Indian J. Dairy Sci.* **6** (1): 23.

———— and M.C. Rangaswami, 1950. A study of the birth weight of calves of Indian breeds. *Indian J. Dairy Sci.* **3** (2): 46.

Lush, J.L., 1949. Heritability of quantitative characters in farm animals. Pro. Eighth intern. Congr. Genetics, Hereditas, Supplementary. Vol. pp. 356.

Mathew, C.A. and M H. Forman, 1954. Beltsville growth standard for Jersey cattle. U.S.D.A. Tech. Bull. 1098.

Morrison, F.B. 1956. Feeds and feeding. Morrison Pub. Co. Clinton, Iowa. 22nd Edn.

Roy, J.H.B. 1959. The calf, its management, feeding and health. Farmer and stock breeder. Pub. Ltd. London. 2nd Edn.

Shukla, R.K. 1965. Estimates of genetic and phenotypic parameters of some economic characters of Gir cattle M.Sc. (A.H.) Thesis, Magadh University.

Singh, S.B., M. Dutt and R.N. Desai, 1965. Persistency of milk yield in Hariana cattle. *Indian J. Vet. Sci.* **35** (3): 249.

Snedecor, G.W. and William Cochran, 1956. Statistical Methods. The Iowa State College Press, Ames, Iowa. 15th Edn.

Venkateswarulu, M., B.P. Singh, B.D. Kapri and S.P.S. Thomar, 1972. Studies on the factors influencing the birth weight in Ongole cattle. *Indian Vet. J.* **49** (4): 374.