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GENETIC AND ENVIRONMENTAL FACTORS AFFECTING THE BIRTH WEIGHT OF CALVES IN THARPARKAR CATTLE.

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The data on 249 Tharparkar calves born at Livestock Experiment Station Nabisar Road, Sind which were progeny of 11 bulls, were analysed for some genetic and environmental sources of variation. The sex ratio between male and female was 43.775 and 56.225 per cent respectively. The average birth weight of male and female was 53.2 and 47.5 pounds respectively. The statistical analysis showed significant differences between sex of calf, and between different years. Non significant effects were found for the month of calving and season of calving. The heritability estimate calculated by paternal halfsib correlation method was 0.54.

INTRODUCTION

Birth weight in cattle is one of the most important factors from the economic point of view as it is directly correlated with weight at maturity. It is a measure of growth in a relatively homogeneous environment. It is the first component of growth rate which can be easily evaluated. Birth weight being a phenotypic observation is influenced by the genetic as well as environmental factors. Some of the environmental factors considered in this study were sex of the calf, month, season and year of birth. The heritability has been estimated as a measure of genetic parameter.

MATERIALS AND METHODS

Data on birth weight of Tharparkar calves born at Government Livestock Experiment Station Nabisar Road, Sind during the years 1966 to 1972 were analysed. All the calves were born as single and were dropped throughout the year. They were weighed within 24 hours after birth. The birth weight of calves dropped as stillbirth were excluded. There were 249 calves which were the progeny of 11 bulls.

The variation in birth weights of calves of either sex, born during different months, seasons or years were analyzed. The data was however

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not adjusted for these sources of variation for genetic analysis. The heritability was estimated by the method of paternal halfsib corrlation. Standard errors for these estimates were also worked out.

RESULTS AND DISCUSSION

The data on birth weights of 249 calves comprising 109 males and 140 females born during the period under report gave a sex ratio of 43.8 and 56.2 per cent respsctively. The average birth weight of calves ignoring sex was 48.8 pounds. When the sex was considered, the average birth weights of male and female calves were 53.2 and 47.5 pounds. There were highly significant differences between sexes, the male being 5.7 pounds heavier than the female calves at birth in this breed. Asker and Ragab (1953) while analysing the birth weight in Egyptian cattle reported male calves about 4 pounds heavier than the female calves. Significant differences between birth weights of male and female calves have also been reported by Kohli and Suri (1957) in Hariana breed. The average birth weights were 51.8 and 49.8 pounds respectively at Government Livestock Farm Hissar India among 771 calves. Batra and Desai (1962) have reported the average birth weight of Sahiwal calves being 50.4 pounds for male and 45.7 pounds for female calves, the difference being significant. Kohli *et al* (1962) reported the average birth of male and female calves in Hariana cattle as 52.1 and 47.5 pounds. Legault and Touchberry (1962), Anderson (1962), Nielsen (1964) and Plasse and Kogar (1967) have all reported male calves being significantly heavier than female at birth in different breeds.

The data in Table 1 show the difference in birth weight of male and female calves born during different years (1962-1972). The heaviest average birth weight of male calves were recorded in the year 1970 being 52.9, while the lowest birth weight being 41.0 pounds in the year 1964. The heaviest average birth of female calves were recorded in the year 1970 being 50 5 pounds while the lowest being 44.2 pounds in the year 1964. Statistical analysis (Table 2) revealed highly significant differences between birth weight of calves born during different years This may be due to the availability of better nutritional and managemental conditions during different years. These results are in accordance with the findings of Alim (1964) and Everelt and Magee (1965), who have repoted that the years significantly affect the birth weight of calves.

When the data was grouped according to month of calving, there was no significant difference between the average birth weight of calves born

TABLE 1. *Year-wise variation in the birth weight of calves.*

	Year	Male		Female		Overall	
		No. of calves born	Av. birth weight	No. of calves bron	Av. birth weight	Total No. of calves	Over-all average
1.	1962	—	—	1	46.0	1	46.0
2.	1963	3	48.7	1	46.0	4	48.0
3.	1964	4	41.0	9	42.2	13	41.0
4.	1965	16	45.9	15	44.7	31	45.7
5.	1966	7	51.6	14	46.8	21	45.3
6.	1967	13	51.7	12	46.2	25	48.4
7.	1968	11	50.8	19	47.9	30	49.1
8.	1969	17	49.8	24	47.0	41	49.0
9.	1970	22	52.9	23	50.5	45	48.2
10.	1971	12	44.8	20	49.2	32	51.7
11.	1972	4	51.0	2	48.5	6	50.2
		109		140		249	

TABLE 2. *Analysis of variance for the birth weight of calves.*

S.V.	D.F.	S.S.	M.S.	F. Ratio
Between years.	10	1426.60	142.66	5.30**
Within years.	238	6403.39	26.91	

**Significant at the one per cent level

during various months (Table 3). Apparently the heaviest calf was born in the month of June and the lightest calf was born in the month of May. This may be due to rainy season which usually starts in Tharparkar district in the month of June, and more of nutritious forage is available. These findings are in accordance with the findings of Asker and Ragab (1953), Kohli and Suri (1957) and Goswami (1963), who have reported that month of calving had no affect on the birth weight of calves.

The months were further grouped into four seasons; Winter (December, January and February); Spring (March, April and May); Summer

TABLE 3. *Monthly variation in birth weight of calves.*

Month	Male		Female		Overall	
	No. of calves born	Av. birth weight	No. of calves born	Av. birth weight	Total No. of calves born	Overall average
January	16	49.8	21	45.0	37	47.1
February	13	49.8	9	49.6	22	49.7
March	9	50.6	18	47.2	27	48.4
April	7	52.4	13	50.0	20	50.9
May	5	47.2	6	45.8	11	46.5
June	6	52.0	6	50.2	12	51.1
July	11	50 1	16	47.4	27	48.5
August	7	53.7	9	49.0	16	51.1
September	6	53.7	10	47.9	16	50.1
October	5	51.4	9	44.9	14	47.2
November	8	49.1	11	47.5	19	48.2
December	16	49.7	12	47.9	28	48.9

(June, July and August); Autumn (September, October and November). Table 4, shows the average birth weight of male and female calves born during different seasons. The statistical analysis showed no significant effect of season on the birth weight of calves. Apparently the calves born during Summer season were heaviest being 49.2 lbs, while the lowest were born in Spring, and Autumn born were intermediate. This may be due to the fact that in Tharparkar district the rains are avilable during Summer season and environmental conditions are favourable, though the days are hot but the nights are very pleasent. These results are in accordance with the findings of Suchanker (1961), and Abdalnijozov (1968). They have reported that calving season has no effect on the birth weight of calves.

The heritability was estimated by the paternal halfsib correlation method. The variance components between sires and within sires were calculated. As the number of progeny per sire was not equal, the value of K was worked out, which was 21.8 The sire component was calculated, by subtracting the within sire variation from the between-sire variation and dividing it by the value of K. The value of sire component was 4.365. The intra-class correlation was worked out dividing the sire component by the sum of sire component and error (within sire) mean square and was 0.1359. The analysis of variance and intra-class

correlation are given in (Table 5). The heritability was obtained by multiplying the intra class correlation 't' by the factor 4. This value came to 0.54. It may be concluded that selection of breeding stock on the basis of higher birth weight will be firmly effective in raising the population mean.

TABLE 4. *Season-wise variation in birth weight of calves.*

SEASON	Male		Femal		Overall	
	No. of calves born	Av. birth weight	No. of calves born	Av. birth weight	Total No. of colves born	Overall average
Winter	45	49.8	42	46.8	87	48.3
Spring	21	50.3	37	48.0	58	48.9
Summer	24	51.6	31	48.4	55	49.2
Autumn	19	51.2	30	46.8	49	48.5

TABLE 5. *Analysis of variance showing the variation among offspring of sire group.*

S.V.	D.F.	S.S.	M.S.	E.M.S
Between sires	10	1229.9	122.9	$\delta^2 w + K\delta^2 s$
Within sires	234	6600.0	27.7	$\delta^2 w$

K = 21.8
t = 0.1359
h^2 = 0.54

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