

FACTORS AFFECTING BIRTH WEIGHT IN NILI-RAVI BUFFALO CALVES

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ABSTRACT

The study was based on birth weight of 2756 buffalo calves born during 1978-1994 at six dairy farms. The mean birth weight of the calves was 33.63 ± 0.13 kg. The male calves (35.98 ± 0.17 kg.) were significantly heavier than female (30.45 ± 0.14 kg.) calves ($P < 0.001$). Higher birth weight was observed in male and female calves born to early maturing buffaloes as compared to late maturing group. It was observed that birth weight of male calves increased non-significantly, whereas, birth weight of female calves increased significantly ($P < 0.001$) with the increase in parity. The repeatability estimates of birth weight for male and female calves ranged from 0.36 ± 0.19 to 0.85 ± 0.02 at different farms. Age at first calving in dams was found to have non-significant negative correlation with birth weight of calves.

INTRODUCTION

Birth weight of the buffalo calves, both male and female, varies from country to country. Male and female Kujang buffalo calves on an average weigh 28.1 ± 1.39 and 27.0 ± 1.4 kg (Dash and Mishra, 1990). Calves from Indonesian Murrah buffaloes weigh 22.4 kg and those born to Indian Murrah buffaloes weigh 24.9 kg (Situmorang and Sitepu, 1991). Le-xuan (1983) observed average calf birth weight as 24-35 kg in Vietnamese Swamp buffalo, 24-42 kg in Murrah buffalo and 26-36 kg in their crossbreds.

Wahid (1976) reported significantly higher birth weight ($P < 0.05$) in male calves of Nili-Ravi buffaloes compared to female calves as has also been observed by Usmani *et al.* (1987) and Khan and Khan (1996). Al-Amin *et al.* (1988) observed the average birth weight of male and female calves as 42.86 ± 0.82 and 41.28 ± 0.8 kg in Iraqi buffaloes. They investigated a linear increase in birth weight from parity 1-7. Further they showed that calves born in summer were the heaviest than those born in spring.

Saravaiya *et al.* (1992) reported that birth weight was positively correlated with gestation length in Indian Surti buffaloes. They also reported that birth weight was significantly affected by parity.

The present study was conducted to determine the effects of various factors on birth weight of Nili Ravi buffalo calves in Pakistan.

MATERIALS AND METHODS

The study was based on 2756 buffalo calves born during the period from 1978 to 1994 at Military Dairy Farms (MDFs) Peshawar, Nowshera, Rawalpindi, Khyber Okara, Punjnad, Okara and Livestock Research Station (LRS) National Agricultural Research Centre (NARC), Islamabad, Pakistan. Birth weight was studied for the overall data as well as for individual farms. The effect of age at maturity, age at first calving, parity number and season of calving on birth weight of calves was studied. In order to see the effect of heredity, repeatability estimates were calculated by analysis of variance procedure given by Falconer (1981). The farms were divided into two groups: Group I, earlier maturing (EM) and Group II, late maturing (LM). Birth weight of the calves was studied in both these groups.

The correlation and regression coefficients of age at first calving of the dam and parity number on birth weight of calves were studied. To see the effect of season of calving, the year was divided into four seasons (Winter, December to February; Spring, March to May; Summer, June to August and Autumn, September to November).

RESULTS

Mean birth weight of calves (2756) was 33.63 ± 0.13 kg. Mean birth weight for male calves was 35.98 ± 0.15 and female calves was 30.45 ± 0.14

kg (Table 1). The male calves were significantly heavier than the female calves ($P < 0.001$). The mean birth weight in combined data ranged from 24.82 ± 0.21 kg (MDF, Peshawar) to 37.69 ± 0.23 kg (MDF, Khyber, Okara). The difference between the two was highly significant ($P < 0.001$). Among male calves, the mean birth weight ranged from 24.95 ± 0.32 kg (MDF, Peshawar) to 42.1 ± 0.19 kg (MDF, Khyber, Okara) whereas in females it ranged from 24.65 ± 0.22 kg (MDF, Peshawar) to 34.85 ± 0.46 kg (LRS, NARC, Islamabad). The males born at MDF, Khyber, Okara were significantly heavier than the males born at MDF, Peshawar ($P < 0.001$). The females born at LRS, NARC, Islamabad were also significantly heavier than the females born at MDF, Peshawar ($P < 0.001$).

Higher birth weight was observed in males born in Group-I (early maturing) compared to males born in Group-II (late maturing) ($P < 0.001$). Similarly, higher ($P < 0.001$) birth weight was observed in females born in Group-I (early maturing) compared to females born in Group-II (late maturing) (Table 2).

The mean birth weight of calves from over all data from six dairy farms showed significant increase ($P < 0.05$) as parity increased (Table 3). An increase in birth weight of calves was observed in successive lactations at all the farms except at MDF, Rawalpindi. Significant increase in birth weight, as parity advanced, was observed at MDF, Punjnad, Okara ($P < 0.05$) and LRS, NARC, Islamabad ($P < 0.05$). A significant decrease in birth weight as parity increased, was observed at MDF, Rawalpindi ($P < 0.01$).

Regression analysis of variance of parity on birth weight of male calves showed significant increase at MDF, Punjnad, Okara ($P < 0.001$) and significant decrease at MDF, Rawalpindi ($P < 0.01$). Female calves showed significant increase in birth weight with the increase in parity in over all data ($P < 0.001$). An increase in birth weight, with the increase in parity was observed at all the farms except MDF, Rawalpindi.

In combined data (male+female calves) and in male calves the birth weight increased non-significantly as parity increased in Group-I (early maturing). A non-significant decrease in birth weight was observed in Group-II (late maturing) with the increase in parity. In female calves, however, significant negative trend in birth weight was observed in Group-II (late maturity) ($P < 0.05$) and non-significant positive trend was seen in Group-I (early maturing).

The repeatability estimates for birth weight for male calves were 0.68, 0.50, 0.85, 0.85, 0.65 and 0.72 at MDFs., Peshawar, Nowshera, Rawalpindi,

Khyber, Punjnad and LRS, NARC, Islamabad whereas, repeatability estimates for female calves were 0.36, 0.58, 0.61, 0.53, 0.46 and 0.53 at respective farms. Age at first calving showed non-significant negative correlation with birth weight of male and female calves in overall data as well as at majority of the farms.

Distribution of mean birth weight in male calves did not show much difference in the four seasons. However, at MDF, Peshawar, males born in winter were significantly heavier than those born in spring ($P < 0.01$). At MDF, Rawalpindi, males born in summer were heavier than those born in spring ($P < 0.001$), but at LRS, NARC, Islamabad males born in spring were heavier than those born in summer ($P < 0.001$).

DISCUSSION

Birth weight in the present study ranges from 24.82 ± 0.21 to 37.69 ± 0.23 kg which is comparable to that reported for Indonesian buffaloes (22.4 kg) and Indian Murrah buffaloes (24.9 kg) (Situmorang and Sitepu, 1991). It is also comparable to Vietnamese swamp buffalo, 24-25 kg; Murrah, and crossbred of Murrah and Vietnamese, 24 to 42 kg (Le-Xuen, 1983).

In this study, the average birth weight of male and female calves was 35.98 ± 0.17 kg (range 24.95 ± 0.32 to 42.1 ± 0.19 kg) and 30.45 ± 0.14 kg (range 24.65 to 34.85 ± 0.46 kg). The male calves were significantly heavier than the female calves ($P < 0.001$). Wahid (1976) reported significantly higher birth weight ($P < 0.05$) in male calves of Nili-Ravi buffaloes compared to female calves. However, the average birth weight of male calves, 39.79 ± 5.37 (Wahid, 1976), 39 kg (Usmani *et al.*, 1987) and 37.5 ± 3.8 Kg (Khan and Khan, 1996) is on the higher side compared to birth weight of male calves found in the present study on all the farms, except at MDF, Khyber, Okara (42.10 ± 0.19 kg). The average birth weight at MDF, Khyber, Okara is on the higher side. The birth weight of male calves at MDF, Khyber, Okara is comparable to the average birth weight of the male and female calves (42.86 ± 0.82 and 41.28 ± 0.8 kg) in Iraqi buffaloes (Al-Amin *et al.*, 1988).

The female birth weight 37.74 ± 5.35 kg (Wahid, 1976); 37.5 kg (Usmani *et al.*, 1987) and 36.6 kg (Khan and Khan, 1996) is higher than that investigated in the present study (30.45 ± 0.14 kg, range 24.65 ± 0.22 to 34.85 ± 0.46 kg). Kujang buffalo male calves weigh on an average 28.1 ± 1.39 kg (Dash and Mishra, 1990) which is comparable to that found at MDF, Nowshera (28.09 ± 0.35). The birth weight of

female Kujang buffalo calves, 27.0 ± 1.4 kg reported by Dash and Mishra (1990) is comparable to birth weight of female calves 27.75 ± 0.45 kg at MDF, Rawalpindi.

Repeatability for birth weight of male calves ranged from 0.50 (MDF, Nowshera) to 0.85 (MDF, Rawalpindi and MDF, Khyber, Okara). Repeatability for birth weight of female calves range from 0.36 (MDF, Peshawar) to 0.61 (MDF, Rawalpindi).

Correlation between age at first calving and birth weight of first calf was found to be negative and non-significant. Correlation of age at first calving and production traits can be readily located in the literature, for instance Dahama *et al.* (1991), Tien and Tripathi (1991), Khan *et al.* (1990) and Mohammad *et al.* (1991).

The mean birth weight of the calves from six dairy farms, show significant increase as the birth rank increased. In overall data in male as well as female calves, the increase in birth weight was observed with the increase in parity, but this increase

was significant only in female calves (Table 3). Similarly, linear increase in birth weight is reported in Indian Surti buffaloes (Saravaiya *et al.*, 1992) and in Iraqi buffaloes (Al-Amin *et al.*, 1988).

Al-Amin *et al.* (1988) reported that calves born in summer were the heaviest and those born in the spring were the lightest in weight. This is in agreement with the present findings for male calves born at MDF, Rawalpindi and in contrast to the findings of male calves born at MDF, Peshawar, where males born in winter were significantly heavier than those born in spring. At LRS, NARC, Islamabad males born in spring were heavier than those born in summer (Table 4).

It can be concluded from this study that: 1) Male calves are significantly heavier than females calves. 2) Birth weight of the calves is significantly higher in early maturing buffaloes as compared to late maturing buffaloes. 3) The birth weight of females calves increases significantly with the increase in birth order.

Table 1: Birth weight (kg) of Nili-Ravi buffalo at different Farms

	MDF, Peshawar	MDF, Nowshera	MDF, Rawalpindi	MDF, Okara	KDF, Punjad	LRS, NARC, Islamabad	Overall
Male*	24.95±0.32 (65)	28.09±0.35 (193)	33.33±0.37 (181)	42.10±0.19 (465)	42.10±0.19 (465)	35.71±0.60 (126)	35.98±0.17 (1587)
Female*	24.65±0.22 (49)	25.07±0.36 (105)	27.75±0.45 (138)	31.97±0.24 (358)	30.62±0.19 (381)	34.85±0.46 (138)	30.45±0.14 (1169)
Overall*	24.82±0.21 (114)	27.02±0.27 (298)	30.92±0.33 (319)	37.69±0.23 (823)	33.71±0.15 (938)	35.26±0.37 (264)	33.63±0.13 (2756)

* Significant differences among the farms ($P < 0.001$)

Table 2: Birth weight of calves in early (I) and late (II) maturity groups in Nili-Ravi buffaloes.

	Group I	Group II	Significance
Age at maturity of dams (Days)	957.93±10.68 (447)	1015.26±17.39 (214)	$T_{(659)} = 2.81 *$
Birth weight of males (kg)	38.35±0.17 (1148)	29.79±0.27 (439)	$T_{(1585)} = 27.39 **$
Birth weight of females (kg)	31.84±0.15 (877)	26.27±0.26 (292)	$T_{(1167)} = 18.16 **$

* Significant difference ($P < 0.01$); ** Significant difference ($P < 0.001$)

Table 3: Correlation and regression co-efficients for number of parity (1-10) on birth weight.

	MDF, Nowshera	MDF, Peshawar	MDF, Rawalpindi	MDF, Okara	MDF, Punjad	LRS, NARC, Islamabad	Overall
Birth weight combined	r= 0.57 b= 0.31	0.664 0.2082	-0.948*** -0.4946**	0.2637 0.2385	0.841*** 0.3409	0.8544** 0.70107*	0.6936* 0.3078*
Birth weight (male)	r= 0.47716 b= 0.22035	0.55219 0.2839	-0.8966** -0.060499**	-0.1419 -0.1114	0.9032*** 0.5023	0.7222* 0.6717	0.54666 0.3549
Birth weight (female)	r= 0.6069 b= 0.2548	-0.09748 -0.0194	-0.9169** -0.0417	-0.1028 0.03828	0.5362 0.169	0.7893* 0.7803*	0.8890*** 0.1733**

* Significant difference ($P < 0.05$); ** = Significant difference ($P < 0.01$); *** = Significant difference ($P < 0.001$).

Table 4: Effect of season on calving on birth weight (kg)

Farm	Spring		Summer		Fall		Winter	
	Male	Female	Male	Female	Male	Female	Male	Female
MDF, Peshawar *	23.40±0.78 (15)	24.67±0.66 (6)	24.27±1.28 (22)	24.20±0.49 (15)	25.00±0.54 (19)	24.61±0.45 (18)	26.20±0.45 (10)	24.50±0.41 (10)
MDF, Nowshera	28.30±1.14 (23)	22.67±2.08 (6)	27.88±0.57 (60)	23.81±1.15 (36)	28.13±0.45 (79)	25.64±0.62 (45)	28.87±0.75 (31)	26.72±0.61 (18)
MDF, Rawalpindi **	30.74±0.80 (23)	26.24±1.19 (17)	35.59±0.57 (51)	29.81±1.15 (33)	32.15±0.81 (59)	27.51±0.71 (59)	33.46±0.62 (48)	26.90±0.86 (29)
MDF, Okara	43.20±0.41 (79)	31.66±0.82 (53)	41.52±0.19 (130)	32.10±0.41 (112)	41.59±0.29 (160)	32.43±0.41 (117)	42.79±0.36 (96)	31.53±0.46 (76)
MDF, Punjnad	35.71±0.47 (66)	29.49±0.70 (39)	36.02±0.06 (194)	31.12±0.30 (150)	35.55±0.26 (188)	30.32±0.40 (131)	35.92±0.37 (109)	30.05±0.45 (61)
LRS, NARD, Islamabad **	40.89±2.06 (9)	34.56±1.14 (18)	32.89±0.77 (35)	32.97±0.55 (34)	36.53±0.94 (55)	34.24±0.84 (59)	35.63±1.33 (27)	36.70±0.45 (27)
Overall	36.50±0.51 (215)	30.07±0.50 (139)	35.76±0.28 (491)	36.44±0.28 (380)	35.60±0.28 (560)	30.32±0.26 (429)	36.60±0.36 (321)	30.43±0.33 (221)

* = Difference between winter and spring in male calves ($P < 0.001$); ** = Difference between summer and spring in male calves ($P < 0.001$)

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