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Secondary Sex Ratio in Nili-Ravi Buffalo

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Abstract

The study was based on 2903 buffalo calves born at six buffalo dairy farms in Pakistan during the period 1978 to 1994. The overall sex ratio was biased towards males (1:1.36). Late maturing buffaloes had greater tendency of having male calves as compared to early maturing buffaloes. There was non significant increase in male sex ratio with increase in parity in overall data. The effect of season of calving on sex ratio was also studied. The male sex ratio was significantly higher in spring as compared to summer ($X^2_{(1)} = 4.7$; $P < 0.05$). The male sex ratio was non significantly high in winter and spring as compared to summer and fall in both early and late maturing groups.

Introduction

Sex ratio in cattle and buffalo has been investigated by authors from different regions. Ratio of males to females at birth in Sahiwal cattle and crossbreds of Sahiwal is 50.36:49.64 (Singh *et al.*, 1991). They also examined that effects of year of birth, calving season and parity on sex ratio are not significant.

King *et al.* (1991) investigated that male: female ratio at embryonic level was 0.528:0.472 which did not deviate significantly from expected 1:1 ratio. Green and Rothstein (1991) investigated in bison that calves of old females were nearly always females. Beradar and Mallikarjunappa (1991) observed percentage of males as 49 in Surti buffaloes and also found that season of birth and parity has no significant effect on sex ratio. Islam *et al.* (1990) reported in Zebu cows that the percentage of male calves is higher in the 2nd, 3rd and 5th parities than in other parities.

Since the number of calves born alive influence directly the availability of the young animals for replacement and fattening for beef production (Shah, 1991). The present study was planned to investigate the secondary sex ratio in Pakistani buffalo. It would provide a basis for further planning and execution of projects for buffalo milk and meat production as females are kept for milk production and males for meat production.

Materials and Methods

The study was based on 2903 buffalo calves which were born during the period 1978 to 1994 at Military Dairy Farms (MDFs) Peshawar, Nowshera, Rawalpindi, Khyber Okara, Punjab and Livestock Research Station (LRS) National Agricultural Research Centre (NARC), Islamabad, Pakistan. Secondary sex ratio was calculated for the overall data as well as for individual farms. The effect of parity and season of calving on sex ratio was also studied.

To see the effect of season of calving the division of the year into four seasons (Winter, December to February; Spring, March to May; Summer, June to August and Autumn, September to November) was followed after Shah

and Shah (1968). The mean age at maturity was earlier at MDF Khyber Okara, MDF Punjab and LRS, NARC as compared to MDFs Peshawar, Nowshera and Rawalpindi. The farms were thus divided into two groups: Group I, early maturing (EM) and Group II, late maturing (LM). These two groups were also taken into consideration when sex ratio was studied. Statistical analysis of the data involved X^2 test and regression analysis following Sokal and Rohlf (1969).

Results

The sex ratio recorded from six dairy farms, based on the total number of male (1675) and female (1228) calves was biased towards males (Table 1). The overall sex ratio was 100♀:136♂. The male calves produced at LRS, NARC Islamabad were less than the females (100♀:96♂). The highest percentage of males (182.35 per 100 females) was seen at MDF Nowshera (Table 1). There was highly significant difference in sex ratio when LRS, NARC Islamabad and MDF Nowshera were compared ($X^2_{(1)} = 16.38$; $P < 0.001$). In Group-I (early maturing) sex ratio (100♀:130.76♂) was lower than in Group II (late maturing) (100♀:152.51♂), but the difference between the two Groups was not significant ($X^2_{(1)} = 2.83$; $P > 0.05$).

Table 1: Sex ratio in Nili-Ravi buffalo maintained at different farms in Pakistan

	No. of Females	No. of Males	Sex ratio (♀/100 ♂)
MDF Peshawar	51	70	100:137.25
MDF Nowshera	119	217	100:182.35
MDF Rawalpindi	148	198	100:133.78
MDF Khyber, Okara	358	465	100:129.89
MDF Punjab	381	465	100:129.89
LRS, NARC, Islamabad	171	165	100:96.49
Overall	1228	1675	100:136.40

Table 2: Effect of parity on sex ratio (males against 100 females)

	1	2	3	4	5	6	7	8	9	10	Overall
MDF Peshawar											
M	16	9	14	8	8	15					
F	9	16	7	5	5	9					70
Sex ratio	177	56	200	160	160	166*					51
MDF Nowshera											137
M	56	61	44	26	16	14					
F	24	38	30	14	7	6					217
Sex ratio	233	160	146	185	228	233					119
MDF Rawalpindi											182
M	51	56	42	19	14	16					
F	42	41	31	20	9	6					198
Sex ratio	121	136	135	96	155	266					148
MDF Khyber Okara											133
M	116	119	133	61	23	13					
F	112	96	81	49	14	6					465
Sex ratio	103	123	164	124	164	216*					358
MDF Punjab											129
M	123	125	113	77	41	31	21	12	17		
F	108	77	61	59	28	14	11	11	12		560
Sex ratio	113	162	185	130	146	221	190	109	141*		381
LRS, NARC, Islamabad											146
M	42	49	34	17	12	11					
F	38	46	31	22	14	20					165
Sex ratio	110	106	109	77	85	55*					171
Overall											96
M	404	419	380	208	114	66	37	21	15	11	1675
F	333	314	241	169	77	41	23	14	10	6	1228
Sex ratio	121	133	157	123	148	160	160	150	150	183	136

*Value at asterisk onward were combined

Table 3: Effect of season of calving on sex ratio (males against 100 females)

Farm	Spring	Summer	Fall	Winter
MDF Peshawar	228.57	160.00	105.56	100.00
MDF Nowshera	400.00	165.85	177.08	166.66
MDF Rawalpindi	136.84	143.24	110.00	165.63
MDF Khyber Okara	157.69	113.64	139.31	120.25
MDF Punjab	180.56	126.92	151.56	168.85
LRS, NARC, Islamabad	78.57	97.78	94.59	105.26
Overall*	167.16	126.73	134.16	139.59

*Significant increase in spring than in summer: $X^2 (1) = 4.7$; ($P < 0.05$)

Table 4: Sex ratio (males against 100 females) in winter + spring and summer + Fall

Farm	Winter + Spring			Summer + Fall		
	Male	Female	Sex ratio	Male	Female	Sex ratio
MDF Peshawar	27	18	150	43	33	130
MDF Nowshera	64	30	213	153	89	171
MDF Rawalpindi	79	51	154	119	97	122
MDF Khyber Okara*	177	131	135	228	227	100
MDF Punjab	168	97	173	392	284	138
LRS, NARC, Islamabad	51	52	98	114	119	95
Overall	566	379	149	1109	849	130

Table 5: Effect of season of calving on sex ratio of calves in early (I) and late (II) maturing groups in Nili Ravi buffalo

	Group I		Group II	
	Winter + Springing	Summer + Fall	Winter + Springing	Summer + Fall
No. Of females	280	630	99	219
No. Of males	396	794	170	315
Sex ratio (males against 100 females)	141	126	171	143

Sex ratio increased non-significantly ($b=5.2861$; $F=4.576$; $P>0.05$) in the data from all the six dairy farms as the parity increased (Table 2). Similarly, non-significant increase was seen at MDFs. Peshawar ($b=6.1628$; $F_{(1,4)}=0.2252$; $P>0.20$), Nowshera ($b=6.9474$; $F_{(1,4)}=0.4986$; $P>0.20$), Rawalpindi ($b=21.218$; $F_{(1,4)}=2.2414$; $P>0.20$) and Punjab ($b=0.06501$; $F_{(1,7)}=0.0297$; $P>0.0297$). However, at MDF Khyber Okara the increase in sex ratio with the increase in parity was significant ($b=18.4794$; $F_{(1,4)}=10.1378$; $P<0.05$).

At LRS, NARC, Islamabad there was significant decrease in sex ratio as parity increased ($b=-10.6425$; $F_{(1,4)}=15.728$; $P<0.05$).

A non-significant increase in sex ratio, with the increase in parity was observed in both, Group-I (early maturing) ($b=2.5422$; $F_{(1,6)}=0.7377$; $P>0.20$) and Group-II (late maturing) ($b=12.5368$; $F_{(1,4)}=1.5807$; $P>0.20$).

Sex ratio in relation to season of calving at six dairy farms is shown in Table 3 and 4.

In over all data sex ratio was highest ($100\text{♀♀}:167.16\text{♂♂}$) in spring and it was lowest ($100\text{♀♀}:126.76\text{♂♂}$) in summer. The sex ratio significantly increased in spring as compared to summer ($X^2_{(1)}=4.7$; $P<0.05$).

Sex ratio was high in winter + spring as compared to summer + fall at all the farms but the differences was only significant at MDF Khyber Okara ($X^2_{(1)}=3.99$; $P<0.05$).

In Group I sex ratio was non significantly higher in winter + spring than in summer + fall. In summer + fall sex ratio was non significantly higher in Group II as compared to Group I (Table 5).

Discussion

The sex ratio in over all data as well as at all the farms is biased towards males except LRS, NARC, Islamabad where males were less than females ($100\text{♀♀}:96\text{♂♂}$). The sex ratio biased for male calves has been reported in Murrah buffalo (55.64% males) by Sethi and Sharma (1983); in cattle of Amsterdam Island (1:1.25) by Berleaux and Micol (1992). Sex ratio biased in favour of males has also been reported in calves produced by transfer of bovine embryos (Missip *et al.*, 1996).

The male calves produced at LRS, NARC, Islamabad were less than females ($100\text{♀♀}:96\text{♂♂}$). This does not vary significantly from the expected 1:1 ratio. This is in agreement with the results reported 49.76 per cent males

in Murrah buffalo (Tomas and Tripathi, 1988); 1:0.84 in Sahiwal X Jersey cows and 1:1 in Murrah and Purnathadi buffalo (Kukde and Gire, 1992); 1♀:1.01♂ in Sahiwal and crossbred cattle (Ashok Singh, *et al.*, 1991).

Sex ratio increases non-significantly as the parity number increases in the over all data as well as at MDFs Peshawar, Nowshera, Rawalpindi and Punjab (Table 3). This is in agreement with the results reported in the literature for Holstein X Indian crossbred cattle (Kumar, *et al.*, 1992; Ashok Singh, *et al.*, 1991); for Surti buffalo (Biradar and Mallikarjunappa, 1991) and for Murrah buffalo (Sethi and Sharma, 1983; Chourasia, *et al.*, 1985).

At MDF Khyber Okara sex ratio increased significantly ($b=18.4794$; $F=10.1378$; $P<0.05$) as the parity (1,4) number increased. The results are in agreement with the report of Islam *et al.* (1990) in Zebu cows.

In over all data sex ratio is found to be significantly higher in spring than in summer ($X^2_{(1)}=4.7$; $P<0.05$). This is in agreement with the finding of Tomas and Verma (1987) in Murrah buffalo. They found sex ratio significantly low in summer than in rainy season.

Sex ratio is high in winter + spring as compared to summer + fall at all the farms but the difference is only significant at Khyber Okara ($X^2_{(1)}=3.99$; $P<0.05$). This is in agreement with the findings of Tomas and Tripathi (1988) and Sethi and Sharma (1983). They report significant similar effects of season of calving on sex ratio in Murrah buffalo.

No significant effect of season of calving on sex ratio was seen in non-descript rural bovine (Kumar, *et al.*, 1988) crossbred cattle (Sing, *et al.*, 1991; Kumar, *et al.*, 1991) and in Surti buffalo (Biradar and Millikarjunappa, 1991).

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