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Factors Affecting the Replacement Components in an Organized Herd of Sahiwal Cattle

Prem Singh* Mojpal Singh** R.K. Atrey***
** Joint Director, Dept. of Animal Husbandry*
Haryana Govt.
*** Associate Professor, Dept. of Diary Science and Technology (Animal Husbandry & Dairying)*
J.V. College, Baraut (Bahpat)
****Assistant Professor, Dept. of Dairy Science and Technology, (Animal Husbandry & Dairying)*
J.V. College, Baraut (Bagpat)

Abstract:
The rate of male births, abnormal births, female calves mortality and culling from birth to age at first calving is lowered and breeding of adult females is maintained on a regular basis, it would be possible to achieve a higher rate of replacement and a considerable increase in the selective value. In the present study, it was found that on an average the incidence of abnormal births was 2.40 percent among 1667 total births in the herd. The rate of abnormal births was lowest in the year 2006 (0.65%) and highest in the year 2010 (7.69%) except in few years (1993, 1994, 1995, 1997 and 2003) during which the incidence of abnormal births was zero. The analysis of variance revealed non-significant effect of year on abnormal births.
The occurrence of abnormal births was lowest among the calves born during summer (1.97) than during other seasons. However analysis of the data revealed non-significant effect of season of birth on abnormal calvings. This showed that animals are well fed and cared throughout the year. The abnormal birth varied from 1.77 percent to 4.35 percent among the cows of different parities except no abnormal birth was found for the cows belonged to 6^{th} & 7^{th} parities. Statistical analysis had shown non-significant effect of parity on abnormal calving.
The average sex ratio (percent male births) was observed as 44.15 percent. The sex ratio was highest among the calves born during the year 1994 (55.00%) and lowest in the year 2005 (33.06%). The frequency of male births among different years did not differ significantly.
The sex ratio varied from 41.63 percent among summer born calves to 46.18 percent among those born during rainy season. However, the season of birth had no effect on the sex ratio as per analysis.
The sex ratio in different parities varied from 40.58 to 50.94 percent. The parity of calving does not affect sex ratio significantly.

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I. Introduction

Poor management, lack of adequate breeding facilities and in efficient breeding policies, imbalanced nutrition and the poor genetic potential of Zebu Cows are the main factors responsible for a wide gap in the cattle population and production statistics. These factors impeding the cattle breeding can be temporarily improved by enhancing the nutritional facilities and management skills whereas sound breeding policies leading to improve in a genetic potential is a permanent solution to these problems. Therefore, suitable selection and mating systems of an appropriate breeding plan can permanently by improve the genetic potential leading to desirable social change and a rapid growth in economy.

Improvement in the dairy herd production through selection procedure can be brought about by rearing the heifer calves obtained from superior parents and turning them into healthy high yielding cows and also by eliminating the low yielding cows. The factors like death and culling lead to a decreased number of calves in the herds thus leaving little scope for future replacement. Thus, the calf disposal rate of a herd plays a crucial role in maintaining its strength and the standard of the farm. One of the essential tools of genetic improvement is the selection procedure even if the herd in question is an indigenous one. Adoption of any mating system intended at improving the genetic conditions remains ineffective without selection. The selection is a long and expensive process which become futile if the superior Germplasm fail to replace itself. So replacement rate is an important parameter of dairy cattle breeding. Abnormal births and sex ratio (percent male birth) are most important components of replacement rate. The herd size can be best increased by reducing the prenatal and post natal mortality and increasing the fertility status to obtain more female calves. So the female calves are most

important for maintaining the herd size. Keeping in view, the present study was planned and conducted the effect of factors on replacement components viz. Abnormal births and sex ratio (percent male birth).

II. Material and Method

The relevant data for the present investigation was collected from the history and pedigree sheets on 472 Sahiwal cows pertaining to the 18 years from 1993 to 2010. Maintained at government livestock farm, Hisar. These cows have 1667 progenies.

To study the effect of year, season and parity on replacement components, viz. abnormal birth and sex ratio (percent male birth). the year of calving was divided into four seasons depending upon the temperature, relative humidity and rainfall.

Month	Season	Code
December-March	Winter	1
April – June	Summer	2
July to September	Rainy	3
October to November	Autumn	4

The replacement rate and its components like abnormal births, sex ratio were expressed in terms of proportions of percentage which did not adhere to normal distribution. So the data was transformed in arcsine (Senedecor and Cochran, 1967). The transformation of data was carried out so as to make the data amenable to least squares analysis as also to make the variance independent of mean. The least squares analysis without interaction (Harvey, 1966) on transformed data was conducted using the following model :

$Y_{ijkl} = u + p_i + s_j + L_k + e_{ijkl}$

Where,

u is the overall mean

p_i is the effect of i^{th} perod of calving (i = 1, 2, ...18)

S_j is the effect of j^{th} season of calving (j = 1.....4)

L_k is the effect of K^{th} parity of calving (k=1.....8)

e_{ijkl} is the random error specific to particular observation

III. Result & Discussion

The average values of replacement components in relation to non genetic factors are depicted in the table I & II.

Abnormal Births :

The average incidence of abnormal births among total births according in year, seasons and parities are presented in Table I and the effect of non genetic factors on the abnormal birth have been shown in the ANOVA Table II.

In the present study, it was found that on an average the incidence of abnormal births was 2.40 percent among 1667 total births in the herd. Almost similar estimate have been recorded by Lathwal *et.al.* (1993) in Red Sindhi 4.7 cows, Sangeeta *et.al.*, (2002) in crossbred cows 3.03 and Bhattacharya and Buchoo (2008) in cattle in Kashmir Valley 4.93 whereas higher values of the trait were recorded by Mandal *et.al.* (2001) for Frieswal cattle 6.86, Atrey *et.al.* (2005a) in Frieswal cattle 11.32, Rawal and Tomar (1996b) for Tharparkar cattle 4.6 and Balasundaran *et.al.* (2011) in Karan Fries cows 11.7.

Table I. Average incidence (%) of abnormal births and sex ratio in relation to non-genetic factors.

Effects	Total Births	Abnormal Births		Normal births			
		No.	%	Male births	% Sex ratio	Female births	Total
Overall	1667	40	2.40	736	44.15	891	1627
Year							
1993	12	0	0.00	4	33.33	8	12
1994	40	0	0.00	22	55.00	18	40
1995	47	0	0.00	24	51.06	23	47
1996	60	2	3.33	27	45.00	31	58
1997	81	0	0.00	41	50.62	40	61
1998	74	3	4.05	36	48.65	35	71
1999	92	3	3.26	46	50.00	43	89
2000	136	3	2.21	66	48.53	67	133
2001	117	3	2.56	52	44.44	62	114
2002	113	6	5.31	56	49.56	51	107
2003	107	0	0.00	48	44.86	59	107
2004	95	6	6.32	39	41.05	50	89
2005	121	3	2.48	40	33.06	78	118

2006	153	1	0.65	66	43.14	86	152
2007	149	5	3.36	70	46.98	74	144
2008	142	2	1.41	63	44.37	77	140
2009	102	1	0.98	35	34.31	66	101
2010	26	2	7.69	1	3.85	23	24
Season							
1	768	18	2.34	344	44.79	406	750
2	406	8	1.97	169	41.63	229	398
3	314	9	2.87	145	46.18	160	305
4	179	5	2.79	78	43.58	96	174
Parity							
1	472	10	2.12	201	42.58	261	462
2	371	12	3.23	161	43.40	198	359
3	283	5	1.77	129	45.58	149	278
4	207	9	4.35	84	40.58	114	198
5	148	3	2.03	70	47.30	75	145
6	101	0	0.00	50	49.50	51	101
7	53	0	0.00	27	50.94	26	53
8	32	1	3.13	14	43.75	17	31

Table II. Analysis of variance (m.s. value) to test the effect of non-genetic factors on abnormal births and sex ratio.

Source of variance	D.F.	Abnormal birth	Sex ratio
Year	17	0.053	0.520
Season	3	0.023	0.121
Parity	7	0.017	0.149
Error		0.053 (1639)	0.239 (1577)

Figures in parentheses are the error degree of freedom.

The rate of abnormal births was lowest in the year 2006 (0.65%) and highest in the year 2010 (7.69%) except in few years (1993, 1994, 1995, 1997 and 2003) during which the incidence of abnormal birth was zero (Table I). The analysis of variance revealed non-significant effect of year on abnormal births (Table II). Similar findings had been observed by Tomar and Verma (1988a) in Tharparkar cows, Tomar and Verma (1988b) in Karan Fries cattle, Singh and Jain (1997) for native and crossbred cattle, Singh *et.al.* (2002b) in Holstein Friesian cows and Balasundaram *et.al.* (2011) in Karan Fries cows whereas significant effect of year on abnormal births have been reported by Lathwal *et.al.* (1993) in Red Sindhi cows, Mukherjee *et.al.* (1993) in Karan Fries cows, Rawal and Tomar (1996a) in Sahiwal cows, Rawal and Tomar (1996b) in Tharparkar cows, Mukherjee and Tomar (2000) in Karan Swiss cows, Mandal *et.al.* (2001) in Frieswal cattle, Sangeeta *et.al.* (2002) in crossbred cows, Singh *et.al.* (2002a) in Crossbred and Sahiwal Cattle, Atrey et.al. (2005a) in Frieswal cows, Sahi and Kumar (2006) in Sahiwal and Jersey X Sahiwal cows and Bhattacharaya and Buchoo (2008) in cows of Kashmir valley.

The occurrence of abnormal births was lowest among the calves born during summer (1.97) than during other seasons (Table 1). However, analysis of the data revealed non-significant effect of season of birth on abnormal calvings (Tabel II). This showed that animals are well fed and cared throughout the year. Similar findings were reported by Tomar and Verma (1988a) in Tharparkar cows, Tomar and Verma (1988b) in Karan Fries cattle, Rawal and Tomar (1996a) in Sahiwal cows, Rawal and Tomar (1996b) in Tharparkar cows, Singh and Jain (1997) for native and crossbred cattle, Singh *et.al.* (2002a) in Crossbred and Sahiwal cattle, Mandal *et.al.* (2005) in Sahiwal cattle, Sahi and Kumar (2006) in Sahiwal and Zersy x Sahiwal Cows, Banik and Naskar (2006) in Sahiwal Cattle and Balasundaram *et.al.,* (2011) in Karan Fries cows. On the other hand, significant effect of season of calving was reported by Lathwal *et.al.* (1993) in Red Sindhi cows, Mukherjee *et.al.* (1993) in Karan Fries cows, Mukherjee and Tomar (2000) in Karan Swiss cows, Mandal *et.al.* (2001) in Frieswal cattle Sangeeta *et.al.* (2002) in crossbred cows, Singh *et.al.* (2002b) in Holstein Friesian cows, Atrey *et.al.* (2005a) in Frieswal cows and Bhattacharaya and Buchoo (2008) in cows of Kashmir valley.

The abnormal birth varied from 1.77 percent to 4.35 percent among the cows of different parities except no abnormal birth was found for the cows belonged to 6^{th} and 7^{th} paritites. Statistical analysis (Table II) had shown non-significant effect of parity on abnormal calving. These results are conformity to those reported by Tomar and Verma (1988a) in Tharparkar cows, Tomar and Verma (1988b) in Karan Fries cattle, Lathwal *et.al.* (1993) in Red Sindhi cows, Rawal and Tomar (1996a) in Sahiwal cows, Rawal and Tomar (1996b) in Tharparkar cows, Singh *et.al.* (2002a) in Crossbred and Sahiwal cattle, Singh *et.al.* (2002b) in Holstein Friesian cows and Banik and Naskar (2006) in Sahiwal cattle whereas the significant effect of parity was reported by Mukherjeet *et.al.* (1993) in Karan Fries cows, Singh and Jain (1997) for native and crossbred cattle, Mukherjee and Tomar (2000) in Karan Swiss cows and Atrey *et.al.* (2005a) in Frieswal cows.

Sex Ratio (percent male births)

The average values of sex ratio (percent male births) according to year, season and parity have been presented in Table I and ANOVA in Table II.

The average sex ratio was observed as 44.15 percent (Tabel I). Similar findings have been observed by Arun *et.al.* (1992) in crosbred cattle whereas higher values have been reported by Lathwal *et.al.* (1993) in Red Sindhi cows 51.6 percent, Tomar and Verma (1998a) in Tharparkar cows 52.0 percent and Mukherjee *et.al.* (2000) in Karan Swiss cattle.

The sex ratio was highest among the calves born during the year 1994 (55.00%) and lowest in the year 2005 (3306%). The frequency of male births among different years did not differ significantly (Table II). Non significant effect of year on sex ratio has been reported by Tomar & Verma (1988a) in Tharparkar cows, Tomar & Verma (1988b) in Karan Fries cattle, Shukla and Parekh (1988) in Gir cows and their Crossbreds, Lathwal *et.al.* (1993) in Red Sindhi cows, Rawal and Tomar (1995), Rawal and Tomar (1996b) in Tharparkar cows, Mukherjee *et.al.,* (2000) in Karan Swiss cattle, Singh *et.al.,* (2002a) in crossbred and Sahiwal Cattle, Singh *et.al.,* (2002b), Atrey *et.al.,* (2005a) in Frieswal cows and Sahi and Kumar (2006) in Sahiwal and Jersey X Sahiwal cows. On the contrary, significant effect of year on sex ratio had been observed by Arun *et.al.* (1992) in Crossbred cattle and Singh *et.al.* (2004) in Hariana, Jersey and Crossbred.

The sex ratio varied from 41.6 percent among summer born calves to 46.18 percent among those born during rainy season. However, the season of birth had no effect on the sex ratio as per analysis. Similar results have been observed by Tomar & Verma (1988b) in Karan Fries cattle, Arun *et.al.* (1992) in Crossbred cattle, Rawal and Tomar (1995), Rawal and Tomar (1996b) in Tharparkar cows, Singh and Jain (1997) for native and crossbred cattle, Mukherjee *et.al.,* (2000) in Karan Swiss cattle, Singh *et.al.* (2002a) in Crossbred and Sahiwal cattle, Singh *et.al.* (2002b). Atrey *et.al.,* (2005a) in Frieswal Cows and Sahi and Kumar (2006) in Sahiwal and Jersey x Sahiwal cows. On the other hand, significant effect of season of birth on sex ratio have been reported by Tomar and Verma (1988a) in Tharparkar cows, Lathwal *et.al,.* (1993) in Red Sindhi cows, Singh *et.al.,* (2004) in Hariana, Jersey and Crossbred.

The sex ratio in different parities varied from 40.58 to 50.94 percent (Table I). The parity of calving does not affect sex ratio significantly (Table II). Similar findings had been observed by Tomar & Verma (1988a) in Tharparkar cows, Shukla and Parekh (1988) in Gir cows and their Crossbreds, Tomar & Verma (1988a) in Karan Fries cattle, Arun *et.al.* (1992) in Crossbred cattle, Rawal and Tomar (1995), Rawal and Tomar (1996b) in Tharparkar cows, Mukherjee *et.al.,* (2000) in Karan Swiss Cattle, Singh *et.al.,* (2002a) in Tharparkar Cows, Singh *et.al.,*(2002b) in Holstein Friesian Cows and Atrey *et.al.,* (2005a) in Frieswal cows whereas significant effects of parity on sex ratio have been reported by Lathwal *et.al.,* (1993) in Red Sindhi cows, Singh and Jain (1997) for native and crossbred cattle and Singh *et.al.,* (2004) in Hariana, Jersey and Crossbred.

IV. Conclusion :

The rate of abnormal births was lowest in the year 2006 (0.65%) and highest in the year 2010 (7.69%) except in few years (1993, 1994, 1995, 1997 & 2003) during which the incidence of abnormal birth was zero. The analysis of variance revealed non-significant effect of year on abnormal births. Analysis of data revealed non-significant effect of season of birth on abnormal calving. This showed that animals are well fed and cared throughout the year. The abnormal birth varied from 1.77% to 4.35% among the cows of different parities except no abnormal birth was found for the cows belonged to 6^{th} and 7^{th} parities. Statistical analysis had shown non-significant effect of parity on abnormal calving. The frequency of male births among different years did not differ significantly. The sex ratio varied from 41.63% among summer born calves to 46.18% among those born during rainy season. However the season of birth had no effect on the sex ratio as per analysis. The sex ratio in different parities varied from 40.58 to 50.44%. The parity of calving does not affect sex ratio significantly.

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