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Factors affecting replacement rate and its components in Jersey–Sahiwal cattle

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The farm economy can be increased by adopting proper selection and culling of the cows in a herd. The information on different components of replacement rate is needed to formulate the various breeding plans. Therefore, the replacement rate and its components are required.

The records on 719 Sahiwal and 147 Jersey-Sahiwal cows, 3583 calving records, maintained at State Government Livestock Farm, Chak Ganjaria, Lucknow, Uttar Pradesh, were used to determine the replacement rate and its components. The data spread over a period of 35 years extending from 1968 to 2002 were divided into 6 periods. The year of birth was divided into summer (April to June), winter (December to March), rainy season (July to September) and autumn (October to November). Replacement rate was calculated on basis of total pregnancies and total female calves born. The data were subjected to square root /angular transformation before analysis. The model included $Y_{ijkl} = \mu + G_i + P_j + S_k + e_{ijkl}$, where $Y_{ijkl} = l^{th}$ observation (replacement rate/its components from a cow) belonging to i^{th} season, j^{th} period and i^{th} genetic group, G_i = effect of k^{th} genetic group (i = 1 to 2), P_i = effect of j^{th} period of birth (j= 1 to 6), S_k = effect of k^{th} season of birth (k = 1 to 4), and e_{ijkl} = the random error associated with Y_{ijkl}.

Table 1. Mean values of replacement rate and is components

Effect	Total calving	Abnormal Births (%)	Normal calves (%)			Female calves (%)			Replacement rate (%)	
			Total	Males	Females	Died	Culled	Retained	Female calf basis	Total calf basis
Overall	3583	4.86(174)	95.14(3409)	49.52(1688)	50.48(1721)	15.92(274)	19.52(336)	1111	64.56	31.01
Genetic group										
Sahiwal	2976	4.50(134)[a]	95.50(2842)	49.51(1407)	50.49(1435)	15.54(223)	19.93(286)	926	64.53	31.12
Jersey-Sahiwal	607	6.59(40)[b]	93.41(567)	49.56(281)	50.44(286)	17.83(51)	17.48(50)	185	64.69	30.48
Period										
I (1965–75)	92	4.35(4)[a]	95.65(88)	47.73(42)	52.27(46)	19.57(9)[b]	10.87(5)[a]	32	69.57[a]	34.78[a]
II (1976–80)	821	3.53(29)[a]	96.47(792)	50.51(400)	49.49(392)	12.76(50)[a]	17.86(70)[b]	272	69.39[a]	33.13[a]
III (1981–85)	1062	3.30(35)[a]	96.70(1027)	48.98(503)	51.02(524)	13.55(71)[a]	17.75(93)[b]	360	68.70[a]	33.90[a]
IV (1986–90)	942	7.22(68)[b]	92.78(874)	50.46(441)	49.54(433)	17.78(77)[b]	21.94(95)[c]	261	60.28[b]	27.71[b]
V (1991–95)	412	5.83(24)[c]	94.17(388)	48.20(187)	51.80(201)	19.40(39)[b]	26.37(53)[d]	109	54.23[c]	26.46[b]
VI (1996–2002)	254	5.51(14)[c]	94.49(240)	47.92(115)	52.08(125)	22.40(28)[c]	16.00(20)[b]	77	61.60[b]	30.31[c]
Season										
Winter	1497	5.48(82)	94.52(1415)	49.47(700)	50.53(715)	15.80(113)	19.86(142)	460	64.34	30.73
Summer	842	4.99(42)	95.01(800)	51.63(413)	48.38(387)	15.76(61)	19.64(76)	250	64.60	29.69
Rainy	696	4.45(31)	95.55(665)	47.22(314)	52.78(351)	18.23(64)	16.81(59)	228	64.96	32.76
Autumn	548	3.47(19)	96.53(529)	49.34(261)	50.66(268)	13.43(36)	22.01(59)	173	64.55	31.57

Values with similar side scripts are not significantly different; significant ($P<0.01$) for abnormal birth and replacement rate due to period and for rest cases significant ($P<0.05$).

The overall means of replacement rate on female calf basis and on the basis of total pregnancies were 64.56 and 31.02% respectively. This indicated that about one-third of the total

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pregnancies resulted into successful heifers to reach the milking herd.

The period of birth had significant effect on replacement rate. The replacement rate was significantly lower in fourth and fifth period. Tomar and Rawal (1994), Singh and Jain (1997) and Arun (1999) also observed the significant effect of period on replacement rate. The incidence of abnormal birth was 4.86% on overall basis, 4.5% in Sahiwal and 6.59% in Jersey–Sahiwal cows. The differences among genetic groups and periods were significant for abnormal births. Tomar and Singh (1973) reported significant effect of genetic group on abnormal birth.

The overall sex ratio (frequency of male birth) among normal calves born was 49.52%, which did not differ significantly from expected ratio of 50%. Analysis of variance showed that genetic group, period and season of birth had nonsignificant effect on sex ratio. It was observed that 15.92% of the total female calves died before reaching the milking herd. The mortality was 15.54% in Sahiwal and 17.83% in Jersey-Sahiwal cattle. The effect of period on mortality rate was significant. However, the genetic group and season of birth had no effect. The significant effect of period on mortality was due to variation in disease occurrence, climatic fluctuation and managemental practices. Tomar and Verma (1988 a, b), Tomar and Rawal (1996), Arun (1999), and Singh and Gurnani (2003) also reported significant effect of period on mortality.

The overall value of culling rate among female calves was 19.52%. The effect of period on culling rate was significant, which was supported by the finding of Tomar and Rawal (1996), Mukherjee and Tomar (1997) and Arun (1999). The fluctuation in culling rate over the period could be because of variation in management practices, disease occurrence and environmental stress.

It could be inferred that the abnormal birth varied according to genetic group and period. The mortality, culling and replacement rate varied in different periods. These traits were not influenced by seasons. Genetic group did not affect the sex ratio, period and season of birth.

SUMMARY

The average value in per cent for abnormal birth, normal calving, male birth, female birth, death of female calves, culling of female calves, replacement rate on basis of total pregnancies and total female calves born were 4.86, 95.14, 49.52, 50.48, 15.92, 19.52,31.01 and 64.56 respectively. On an average 3 pregnancies were required for 1 female calf reached to milking herd. The period of birth had significant effect on replacement rate and its components.

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