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Breeding and Lactation Efficiencies, Production Profile, Productive Herd Life and Lifetime Productivity of Gir Cows in their Home Tract

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Abstract

Breeding and lactation efficiencies (BE and LE), parity-wise production profile, productive herd life and lifetime milk production (LTMP) of Gir cows (N=309), based on 1363 calvings during 1991 to 2010 at Cattle Breeding Farm, JAU, Junagadh were studied. Age at first calving (AFC) and calving interval (CI) of Gir cows were 1527.76±14.17 and 481.22±4.86 days, respectively. CI ranged from 386 to 505 days among different lactations. When AFC and CI were taken into account together, BE of the cows as per Tomar (BE-T) was estimated to be 86.91±0.49 %. About 17 % of Gir cows in the herd calved for the first time at <42 months of age (Av. 37.04 month) and 38 % of the cows had less than 14 months of CI. Lactation period (LP) of Gir cows varied significantly (P<0.05) from 230 days to 335 days showing an increasing trend with increase in no. of parity. Overall LP of Gir cows was 281.02±4.56 days, LE being 61.07±1.10%. Total lactation milk yield (TLMY) and standard lactation milk yield (SLMY) of Gir cows averaged 2006.29±48.77 and 1819.73±45.44 lit, respectively. Milk yield increased significantly (P<0.05), with increase in no. of parity, reaching peak TLMY (2425 lit) and SLMY (2303 lit) in 5th lactation. TLMY was 2134 to 2362 lit, and SLMY 1950 to 2110 lit in 6th to 8th lactation. Productive herd life averaged 3107.87±81.40 days (8.51 years). Mean number of calvings during lifetime was 4.25±0.15. A total of 19- 25 % of the total cows performed in the herd for more than 12 years, (average being 14.6 years) and for > 6 lactations. Gir cows produced 9988.71±649.08 lit LTMP. LTMP of Gir cows was significantly associated with both, the BE and LE (r =0.23 to 0.25). MSLMY showed significant (P<0.05) correlation (r=0.31 to 0.37) with BE-W and LE. Association of AFC was significant with BE-T (r=0.26). The 1st and 2nd CI showed a correlation (r= 0.57 to 0.59, P<0.01) of high magnitude with BE-W. The findings revealed that Gir cows in the herd are worth- retaining in the herd till 8th lactation with satisfactory breeding efficiency of about 87 % for economically viable sustainable dairy farming.

Key Words: Gir cattle, Breeding efficiency, Lactation efficiency, Production profile, Herd life, Lifetime productivity.

Introduction

Overall productivity of bovine females revolves around regularity in calving and total period during which they remain in milk during life-time. Performance of females in a herd in terms of breeding

efficiency and lactation efficiency during their productive life in the herd are important traits in deciding overall economy of a bovine herd. There is dearth of documented information on these aspects of Gir cows maintained in its native. Therefore, breeding and lactation efficiencies of Gir cows, their production profile, productive herd life, life-time productivity and certain related aspects were investigated and are reported in this paper.

Material and Methods

The age at first calving (AFC), parity wise calving interval (CI), productive life and breeding efficiency (BE) based on 1363 calvings of 309 Gir cows calved between 1991 to 2010 at Cattle Breeding Farm, JAU, Junagadh, Gujarat were studied. Data on AFC, dates of calving and drying during lifetime of these cows were utilized. Breeding efficiency was worked out as per Wilcox *et al.* (1957) and Tomar (1965) modified formula taking into account 1200 days (39.3 months) for Gir cows as empirically desired AFC. Lactation efficiency of the cows was estimated as per George (1988). The productive herd life defined as AFC plus number of days in all calvings, involving all days till last drying during lifetime were studied. Parity-wise production profile, lifetime milk production (LTMP) and maximum standard lactation yield (MSLMY) were also studied.

Data were analysed using standard statistical procedures (Snedecor and Cochran, 1994). Effect of parity on calving interval, lactation period and total as well as standard (300-d) lactation milk yield was studied. Multiple range comparison was applied to determine the difference between means. Association among breeding and lactation efficiencies, AFC, 1st and 2nd calving interval (CI-1, CI-2) and lactation periods (LP-1, LP-2) in the cows were studied by carrying out correlation analysis.

Results and Discussion

Age at first calving, calving interval and breeding efficiency:

The age at first calving (AFC) and overall calving interval (CI) of Gir cows were, 1527.76±14.17 days (50.1 month) and 481.22±4.86 days (15.8 month), respectively (Table 1,2**)**. A wide variation in AFC in Gir cattle from 1451 to 1719.09 days (Singh *et al.,* 1981; Benintendi *et al.,* 1988; Barwe *et al*., 1996; Bhadoria *et al.,* 2002) and CI between 466.6 and 568.2 days (Leite *et al.,* 1986; Singh and Shukla, 1986; Benintendi *et al*., 1988; Mathur and Khosla, 1994) have been reported by the many researchers.

About 17 % of Gir cows in the herd calved for the first time at <42 months of age (Av. 37.04 month) and 12 % from 42 to 46 months of age. Around 38 % of the cows had less than 14 months of CI. It varied from 386 to 505 among different lactations, the difference being non-significant. There was an indefinite trend (Table 2).

The breeding efficiency (BE) as per Wilcox (BE-W) of the Gir cows based on all calvings during lifetime averaged 77.72±0.92 %. The BE-W of 75.27 to 78.23 % in Gir cattle and 78.94 % in Nellore cattle has been estimated by Singh *et al.* (1986), Mathur and Khosla (1994) and Balieiro *et al.* (2002). When AFC was also taken into account, BE-T (as per Tomar) of the Gir cows was estimated to be 86.91±0.49 % (Table 1). The BE-T 75.27 to 77.24 % has been estimated earlier in Gir (Singh *et al.,* 1982 and Benintendi *et al.,* 1988) and 86.59 % in Nellore (Balieiro *et al.,* 2002) cattle. Thirty per cent of total cows expressed more than 85% BE-W based on CI alone and 27 % of the cows showed above 91% BE-T when AFC and CI both were considered simultaneously**.**

Lactation period and lactation efficiency:

Overall lactation period (LP) of Gir cows was 281.02±4.56 days (Table 2). The values LP observed in the present study confirms the findings of Benintendi *et al.,* (1988) who reported it to be 283 days in Gir herd. A wide variation from 283 to 315.8 days in AFC of Gir cattle has been reported by the many researchers (Singh *et al*., 1986; Saha and Khan, 1987; Benintendi *et al*., 1988; Mathur and Khosla, 1994; Nanawati *et al*., 1996; Pires *et al.,* 1996; Bhadoria *et al*., 2002)

Table 1: Breeding and lactation efficiencies (%) and productive life of Gir cows

Trait	N	Mean ± SE
Age at first calving (AFC)	309	1527.76 ± 14.17
Breeding efficiency, BE (%), as per Wilcox	256	77.72 ± 0.92
Breeding efficiency, BE (%), as per Tomar	198	86.91 ± 0.49
Lactation efficiency, LE (%)	225	61.07 ± 1.10
No. of lactations during herd life	258	4.25 ± 0.15
Productive life, days	231	3107.03 ± 81.4
Life-time milk production (LTMP), lit.	168	9988.71± 649.08
Maximum standard lactation milk yield (MSLMY), lit.	168	2218.76 ± 75.81

Table 2: Parity-wise calving interval (CI), lactation period, total lactation milk yield (TLMY) and standard lactation milk yield (SLMY) in Gir cows

Parity	CI, days		Lactation days*		TLMY, lit*	SLMY, lit*
	N	Mean ± SE	N	Mean ± SE	Mean ± SE	Mean ± SE
1	226	492.96 ±9.13	316	247.28^{ac} ±9.02	1699.24^{bc} ± 69.40	1427.49^{a} ± 51.36
2	194	481.91 ±10.42	262	293.18^{bcde} ±10.93	1910.03^{bc} ± 72.20	1697.90^{ad} ± 57.68
3	127	470.35 ±12.32	169	319.12^{ae} ±11.20	1993.17^{bc} ± 81.21	1870.52^{ae} ± 69.46
4	92	476.03 ±14.67	82	252.33^{ad} ±11.99	2418.01^{bc} ± 300.04	2207.12^{a} ± 302.35
5	67	481.61 ±16.29	112	333.59^{e} ±13.00	2423.65_{b} ± 106.34	2303.05^{bcde} ± 87.24
6	50	505.22 ±22.96	64	237.92^{ab} ±16.74	2361.67_{b} ± 129.54	2111.11^{a} ± 109.07
7	35	485.74 ±27.04	90	335.69^{e} ±15.11	2275.21^{bc} ± 168.59	2029.04^{a} ± 129.72
8	27	449.93 ±23.82	48	230.58^{a} ±21.87	2134.59^{bc} ± 160.03	1951.89^{a} ± 139.47
9	12	429.75 ±25.26	66	335.11^{e} ±21.98	1354.29^{ac} ± 192.63	1294.81^{a} ± 179.78
>9	9	386.56 ±7.07	154	280.69^{ae} ±12.11	1862.00^{a} ± 37.89	1689.97^{a} ± 357.38
Over-all	839	481.22 ±4.86	1363	281.02 ±4.56	2006.29 ± 48.77	1819.73 ± 45.44

*Means in a column bearing at least one common superscript do not differ (P<0.05)

LP varied significantly (P<0.05) from 230 days to 335 days. It showed an increasing trend with increase in no. of parity in first three lactations (Table 2). About 17 % of cows had 270-330 days of desired LP. Higher proportions of cows (34%) with LP less than 210 days were observed. About 14 % of the cows produced milk for a short LP of less than 4 month. On the other hand, 27 % cows had even more than 360 days of LP.

Overall lactation efficiency (LE) defined as lactation days /calving interval x 100 of Gir cows was 61.07±1.10 %. The LE from 60.47 to 64.70% in Gir cattle (Singh *et al.*, 1986; Mathur and Khosla,

1994) has been reported. About 28 % of Gir cows performing in the herd exhibited above 70 % LE.

Productive herd life, number of calving. production profile and lifetime productivity:

Productive life defined as AFC plus number of days in all calvings averaged 3107.87±81.40 days (8.51 years). The productive life of 6.46 to 7.30 years and 4.27 to 5.50 has been estimated in different Zebu breeds of Kenya by Rege *et al.* (2001).

Nineteen per cent of the total cows performed in the herd for more than 12 years, average for these cows being 14.6 years. About 6 % cows remained in the herd for 10 to 12 years. Mean number of calvings during lifetime was 4.25±0.15. In Nellore cattle, 2.45 calvings during the lifetime has been reported (Balieiro *et al.,* 2002). A total of 25 % cows performed in the herd for more than 6 lactations. Ten per cent of the cows remained in the herd for more than 8 lactations.

Gir cows in the herd produced 9988.71±649.08 lit of life-time milk production (LTMP) with 2218.76±75.81 lit as average maximum standard lactation yield (MSLMY). A total of 31 % of Gir cows produced more than 14000 liters of milk in their herd-life. Eleven % cows in the Gir herd produced more than 3200 lit (av. being 3569.3 lit.) as MSLMY. Forty % cows (i.e., of elite category) produced more than 2710 lit of MSLMY.

Total lactation milk yield (TLMY) and standard lactation milk yield (SLMY) of Gir cows averaged 2006.29±48.77 and 1819.73±45.44 lit., respectively. These traits were significantly (P<0.05) influenced by parity number. Milk production of Gir cows increased with increase in number of parity, reaching peak TLMY (2425 lit) and SLMY (2303 lit) in 5th lactation. Then after, although their productivity decreased marginally; TLMY was 2134 to 2362, SLMY being 1950 to 2110 lit, i.e., quite satisfactory for sustaining dairy farming even up to 8th lactation (Table 2). This indicated persistency of production even in advanced age of life.

Association among breeding and lactation efficiencies and production traits:

Correlation analysis (Table 3) revealed that TLMY of Gir cows was significantly (P<0.05) associated with both, the BE and LE (r =0.23 to 0.25). MSLMY showed correlation with BE-W (r=0.31). MSLMY and LE were correlated by the r-value of 0.37, all these associations being significant. Association of AFC was significant with BE-T (r=0.26). The CI-1 and CI-2 showed a correlation (P<0.01) of high magnitude, i.e., 0.57 to 0.59 with BE-W and slightly lower association (r =0.15 to 0.32) with BE-T. Similarly, LP-1 and LP-2 were moderately correlated, with LE, r being, 0.42 to 0.53 (P<0.01).

Table 3: Association of breeding and lactation efficiencies with production traits in Gir cows

Production traits	BE-Wilcox, %	BE-Tomar, %	LE, %
Lifetime total milk production, lit	0.23*	0.25*	0.23*
Maximum Std. Lact. Yield, lit	0.31*	0.18	0.37*
AFC, days	0.04	0.26*	-
CI-1, days	0.57**	0.32*	-
CI-2, days	0.59**	0.15	-
LP-1, days	-	-	0.42**
LP-2, days	-	-	0.53**
LE,%	0.17	0.07	-

*P<0.05, ** P< 0.01.

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Conflict of Interest: All authors declare no conflict of interest.

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