

**COMPARATIVE PERFORMANCE OF SAHIWAL COWS AT THE LIVESTOCK  
EXPERIMENT STATION BAHADURNAGAR, OKARA VS PATADAR'S HERD**

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**ABSTRACT**

The data on 3434 records for lactation milk yield and lactation length and 2314 records for dry period of Sahiwal cows maintained at the Livestock Experiment Station (LES), Bahadurnagar, Okara, Pakistan and its Patadars during 1986-2000 were analyzed by least square analysis of variance techniques, using the LSMLMW computer programme. The population means for lactation milk yield, lactation length and dry period were  $1547 \pm 36.69$  kg,  $268 \pm 4.53$  days and  $214 \pm 16.64$  days, respectively. The milk yield averaged  $1617 \pm 35.09$  kg at LES and  $1477 \pm 43.54$  kg at Patadar's herds of Bahadurnagar. The effects of herd and year of calving on milk yield were highly significant ( $P < 0.01$ ), while season of calving had only significant ( $P < 0.05$ ) effect on the said trait. Lactation number had no effect on lactation milk yield. The least squares means of lactation length were  $265 \pm 4.33$  and  $271 \pm 5.37$  days, at herds of LES and Patadars, respectively. The variation in lactation length due to herd and lactation number was non-significant but year and season of calving had significant ( $P < 0.01$  and  $P < 0.05$ , respectively) effect on the said trait. The least squares means for dry period were  $155 \pm 16.41$  days at LES and  $273 \pm 17.84$  days for the cows kept by Patadars of Bahadurnagar. The dry period differed significantly ( $P < 0.01$ ) by herd, year of calving and lactation number, while season of calving had no effect on this trait. The lactation milk yield was significantly less in Sahiwal herd kept by Patadars as compared to the herd maintained at LES, Bahadurnagar, Okara.

**Key words:** Sahiwal cows, lactation milk yield, lactation length, dry period.

**INTRDUCTION**

Lactation milk yield is the most important trait for a dairyman. High milk yield increases the profitability and decreases the rearing cost of animals. The Sahiwal breed is well known among Zebu cattle for its superior dairy qualities. It has been exported to many countries (Maule, 1990) for both cross and pure breeding purposes. There is also a dire need to conserve Sahiwal breed due to decreasing trend of purebred population (Dahlin *et al.*, 1998) in Pakistan.

To overcome decreasing population of Sahiwal cattle in Pakistan, 477 hectares of land have been leased out to Patadars at Livestock Experiment Station (LES), Bahadurnagar, Okara, Pakistan, since 1980. The aim behind was to conserve and improve the productive potential by producing high quality Sahiwal cattle. An effort has been made to compare some performance traits of Sahiwal cows maintained at Livestock Experiment Station, Bahadurnagar and by its Patadars in this study.

**MATERIALS AND METHODS**

The data on 3434 records of lactation milk yield, lactation length and 2314 records of dry period

for Sahiwal cows maintained at LES, Bahadurnagar and its Patadars during 1986-2000 were analyzed by least square analysis of variance technique, using the LSMLMW computer programme (Harvey, 1990). The year was divided into five seasons depending on the climatic condition i.e. winter (December to February), spring (March to April), hot dry (May to June), hot humid (July to September) and autumn (October to November). The mathematical model assumed was as follows:

$$Y_{ijklm} = \mu + H_i + Y_j + S_k + P_l + e_{ijklm}$$

Where,

$Y_{ijklm}$  = Observation of any trait

$\mu$  = Population mean

$H_i$  = Effect of  $i^{\text{th}}$  herd

$Y_j$  = Effect of  $j^{\text{th}}$  year of calving

$S_k$  = Effect of  $k^{\text{th}}$  season of calving

$P_l$  = Effect of  $l^{\text{th}}$  lactation number

$e_{ijklm}$  = Remainder

**RESULTS AND DISCUSSION**

**Lactation milk yield**

The population least squares mean for lactation milk yield was  $1547 \pm 36.69$  kg for 3434 records of Sahiwal cows kept at LES Bahadurnagar and by its

Patadars (Table 1). The least squares mean for lactation milk yield from 2548 Sahiwal cows was  $1617 \pm 35.09$  kg at LES Bahadurnagar. Almost similar result ( $1632 \pm 23.65$ ) was reported by Shafiq *et al.* (1992). The lactation milk yield of 886 Sahiwal cows of Patadars averaged  $1477 \pm 43.54$  kg. These results are comparable with the results ( $1475 \pm 651$  kg) reported by Bajwa *et al.* (2002). The analysis of variance showed that the lactation milk yield differed significantly ( $P < 0.01$ ) between herds (Table 2). Moreover, the effect of calving year and season also showed significant variation for this trait. However, the effect of lactation number (parity) was non-significant. The non-significant variation for lactation number, especially for first three lactations might be due to the reason that data were pooled from LES Bahadurnagar and Patadar's herds in this case. The management of the Patadar's herd was comparatively poor, which was mixed up with the LES Bahadurnagar herd. So the effect of parity showed non-significant variation.

The cows calved during the year 1987 had highest milk yield ( $1691 \pm 54.81$  kg), while the lowest milk yield ( $1325 \pm 61.68$  kg) was recorded during 1994. This value is partially in agreement with  $1369.87 \pm 48.15$  kg reported by Shafiq *et al.* (1995). The cows calved in autumn season had the highest milk yield ( $1633 \pm 49.76$  kg) and those calved in hot humid season had the lowest milk yield ( $1474 \pm 46.47$ ). These results are comparable with the study reported by Javed *et al.* (2000). Bajwa *et al.* (2004<sup>a</sup>) studied environmental factors affecting lactation milk yield and lactation length in Sahiwal cows and indicated that year and season of calving had significant effect on lactation milk yield.

The average milk yield in this study was similar to the earlier studies on Sahiwal cattle in Pakistan. Ahmad (1993) used data from LES, Bahadurnagar Okara, Pakistan from 1966 to 1991 and reported that average milk yield of these cows was  $1692 \pm 484$  kg. In his study lactations of 180-308 days durations were used. Moreover, the effect of year and season of calving showed significant variation for the trait. Iqbal (1996) reported a higher average of  $1971 \pm 473$  kg for this station when lactations were 308 days in length. Dahlin *et al.* (1998) lately published average yield of 1477 kg for an average lactation length of 256 days for 11 institutional herds in Pakistan including the LES, Bahadurnagar. Only first three lactations were used in their study and there was no minimum for the lactation length to be indicated. Anonymous (2003) showed the mean lactation milk yield as  $1546 \pm 20.07$  kg in a mean lactation length of  $272 \pm 2.54$  days. These results were based on 1369 lactation records of 449 Sahiwal cows

maintained at LES Bahadurnagar during the period 1992-2003.

The earlier reports for LES Bahadurnagar indicated average milk yield of  $1603 \pm 648$  kg for an average lactation length of 296 days (Mohiuddin, 1987) and  $1474 \pm 648$  kg for an average lactation length of 240 days (Talbot, 1994). Ahmad (1972) reported a higher average lactation milk yield of  $2384 \pm 775$  kg for Allahdad Cattle farm with an average lactation length of 321 days. Javed (1999) reported average lactation milk yield of  $1980 \pm 927$  kg for LES Jahangirabad. The average lactation length was 267 days for these 6780 lactations which were required to have a length of at least 150 days. The variation in these estimates may be due to size of data set, location, method of analysis used and differences in managerial practices at different farms and time periods.

### Lactation length

The population least squares mean for lactation length was  $268 \pm 4.53$  days. The comparable result ( $259 \pm 71$  days) for length of lactation was stated by Dahlin *et al.* (1998). The least squares mean for lactation length was  $265 \pm 4.33$  and  $271 \pm 5.37$  days in Sahiwal cows at LES, Bahadurnagar and Patadar's herds, respectively (Table 1). The herd and lactation number effects were non-significant for lactation length. The maximum ( $305 \pm 6.55$  days) lactation length was observed in the cows calved during 1998, while the minimum ( $246 \pm 6.55$  days) was found in 1989. The cows calved in autumn season had the highest lactation length ( $277 \pm 6.14$  days), while the cows calved in hot humid season had the lowest lactation length ( $265 \pm 5.74$  days). No variation was observed due to herds and lactation numbers on lactation length. The effect of calving year was highly significant ( $P < 0.01$ ) and season of calving had significant ( $P < 0.05$ ) effect on the lactation length (Table 2).

Dahlin *et al.* (1998) reported an average lactation length of 256 days for different Sahiwal herds in Pakistan, while Ahmad (1999) indicated an average lactation length of  $281 \pm 55$  days in Sahiwal cattle for the data set for the period 1968-1994. Furthermore, parity, herd, year and season of calving showed significant variation for this trait. Bajwa *et al.* (2004<sup>b</sup>) reported mean lactation length of  $248 \pm 67$  days on the basis of analysis of 2039 lactation records of Sahiwal cows for the period from 1990 to 2000. Higher average lactation length of  $321 \pm 68$  days has also been reported by Ahmad *et al.* (1978).

**Table 1: Least squares means ( $\pm$  SE) for lactation milk yield, lactation length and dry period**

Particulars	No. of Obs.	Lactation milk yield (Kg)	Lactation length (days)	No. of Obs.	Dry period (days)
Population mean	3434	1547 $\pm$ 36.69	268 $\pm$ 4.53	2314	214 $\pm$ 16.64
Herd of Patadars	886	1477 $\pm$ 43.54	271 $\pm$ 5.37	620	273 $\pm$ 17.84
Herd of LES, Bahadurnagar	2548	1617 $\pm$ 35.09	265 $\pm$ 4.33	1694	155 $\pm$ 16.41
<b>Years of calving</b>					
1986	303	1628 $\pm$ 53.68	255 $\pm$ 6.63	236	211 $\pm$ 19.53
1987	281	1691 $\pm$ 54.81	272 $\pm$ 6.77	218	213 $\pm$ 19.57
1988	303	1569 $\pm$ 52.94	256 $\pm$ 6.54	225	230 $\pm$ 19.37
1989	300	1535 $\pm$ 53.03	246 $\pm$ 6.55	215	253 $\pm$ 19.14
1990	316	1591 $\pm$ 52.70	257 $\pm$ 6.51	193	194 $\pm$ 20.08
1991	204	1586 $\pm$ 59.80	266 $\pm$ 7.38	144	226 $\pm$ 20.88
1994	202	1325 $\pm$ 61.68	249 $\pm$ 7.61	131	247 $\pm$ 20.06
1995	213	1448 $\pm$ 60.41	257 $\pm$ 7.46	157	236 $\pm$ 20.99
1996	251	1509 $\pm$ 57.19	270 $\pm$ 7.06	212	233 $\pm$ 19.78
1997	245	1443 $\pm$ 56.31	276 $\pm$ 6.95	199	226 $\pm$ 19.81
1998	302	1611 $\pm$ 53.04	305 $\pm$ 6.55	225	230 $\pm$ 19.53
1999	269	1553 $\pm$ 54.65	293 $\pm$ 6.75	132	168 $\pm$ 21.47
2000	245	1618 $\pm$ 56.85	280 $\pm$ 7.02	27	115 $\pm$ 35.46
<b>Seasons of calving</b>					
Winter	1177	1543 $\pm$ 40.83	261 $\pm$ 5.04	775	207 $\pm$ 17.42
Spring	793	1551 $\pm$ 42.78	267 $\pm$ 5.28	555	231 $\pm$ 17.55
Hot dry	495	1474 $\pm$ 46.47	265 $\pm$ 5.74	342	211 $\pm$ 18.41
Hot humid	580	1536 $\pm$ 44.38	270 $\pm$ 5.48	382	205 $\pm$ 18.23
Autumn	389	1633 $\pm$ 49.76	277 $\pm$ 6.14	260	217 $\pm$ 19.23
<b>Lactation number</b>					
1	956	1509 $\pm$ 24.10	269 $\pm$ 2.97	706	261 $\pm$ 6.84
2	730	1510 $\pm$ 27.19	267 $\pm$ 3.36	497	208 $\pm$ 7.10
3	533	1512 $\pm$ 31.81	267 $\pm$ 3.93	366	212 $\pm$ 9.12
4	398	1552 $\pm$ 36.93	275 $\pm$ 4.56	272	226 $\pm$ 10.64
5	297	1461 $\pm$ 42.74	260 $\pm$ 5.28	197	202 $\pm$ 12.32
6	208	1538 $\pm$ 50.85	270 $\pm$ 6.28	124	206 $\pm$ 15.31
7	150	1518 $\pm$ 59.52	271 $\pm$ 7.35	77	226 $\pm$ 19.15
8	80	1702 $\pm$ 80.08	273 $\pm$ 9.89	39	201 $\pm$ 26.57
9	45	1419 $\pm$ 106.21	262 $\pm$ 13.11	20	234 $\pm$ 36.74
10	20	1523 $\pm$ 158.13	250 $\pm$ 19.52	10	228 $\pm$ 51.83
11	17	1395 $\pm$ 266.69	250 $\pm$ 32.92	6	154 $\pm$ 73.23

The study of Javed (1999) for Sahiwal cattle at LES Jahangirabad indicated an average lactation length of 267  $\pm$  63 days. The later report of Javed *et al.* (2001<sup>a</sup>) showed the mean lactation length as 214  $\pm$  95 days. These findings were based on data set for lactation records of 1071 Sahiwal cows from four Livestock Experiment Stations in Punjab, Pakistan. So keeping in view the cattle standard, lactation length is much lower than breeds like Friesian. Syrstad (1993) has reported that generally the lactation length is much smaller in Zebu cattle than Taurines. The findings thus of this study are in line with most of earlier studies on Sahiwal cattle (Dahlin *et al.*, 1998; Javed *et al.*, 2001<sup>b</sup>; Sattar *et al.*, 2003).

### Dry period

The population least squares mean for dry period was found to be 214  $\pm$  16.64 days from 2314 records of Sahiwal cows. Similar mean value (221.68  $\pm$  5.20 days) was reported by Javed *et al.* (2000) for the 1<sup>st</sup> lactation in Sahiwal cattle. The least squares mean for dry period was 273  $\pm$  17.84 days for the Sahiwal cows kept by Patadars, while it was 155  $\pm$  16.41 days for the cows kept at LES Bahadurnagar, Okara (Table 1). The longest dry period (253  $\pm$  19.14 days) was observed during the calving year 1989, while the lowest (115  $\pm$  35.46 days) was observed in the year 2000. Similarly, the longest mean dry period was observed in the first lactation (261  $\pm$  6.84 days), while the shortest (154  $\pm$

**Table 2: Least squares analysis of variance for lactation milk yield, lactation length and dry period**

Source of variation	Lactation milk yield		Lactation length		Dry period	
	DF	F-ratio	F-ratio	DF	F-ratio	
Herd	1	22.543**	2.732 <sup>NS</sup>	1	205.426**	
Year of calving	12	4.321**	10.914**	12	3.953**	
Season of calving	4	2.822*	2.556*	4	2.335 <sup>NS</sup>	
Lactation number	10	1.208 <sup>NS</sup>	0.795 <sup>NS</sup>	10	4.232**	
Remainder	3404			2286		

\*\* = highly significant (P<0.01); \* = Significant (P<0.05); NS = Non-Significant

DF = Degree of freedom,

73.2 days) was noted in the 11<sup>th</sup> lactation. The year of calving and lactation number had significant (P<0.01) effect on dry period, however, season of calving had no effect on this trait (Table 2).

Anonymous (1974) showed that the average dry period in 1976 calvings from 1962 to 1974 ranged from 119–134 days in Sahiwal cows. Ahmad and Ahmad (1974) reported the average first dry period of 182 ± 5 days in 795 Sahiwal cows. Khan *et al.* (1992) based on 2392 lactations records in Sahiwal cattle reported an average dry period of 192.39 ± 6.53 days. A later report of Ahmad (1999) showed the mean dry period in Sahiwal cows as 148 days with a range from 30 to 568 days. Moreover, the effect of parity, year and season of calving was significant, while the herd had non-significant effects on this trait. Javed *et al.* (2001<sup>b</sup>) reported that dry period in Sahiwal cows averaged 222 ± 5.20 days for 8948 performance records from LES Jehangirabad (Khanewal).

### Conclusion

It is concluded that the Sahiwal cows kept by Patadars have lower milk production potential and longer dry period due to a number of factors like traditionally management practices, poor feeding, poor livestock health cover and financial constraints etc. To overcome the problems, farmers should improve their managerial/husbandry practices.

### REFERENCES

- Ahmad, M., 1993. Studies on the persistency of lactation in Sahiwal cows. MSc Thesis, Univ. Agri. Faisalabad, Pakistan.
- Ahmad, M., 1999. Genetic evaluation of native and crossbred dairy cattle in Pakistan. PhD Thesis, Univ. New England, Armidale, NSW, Australia.
- Ahmad, Z., 1972. Genetic analysis of a pure herd of Sahiwal cattle. PhD Thesis, West Pakistan Agri. Univ. Lyallpur (Faisalabad), Pakistan.
- Ahmad, Z. and M. D. Ahmad, 1974. Effect of age at first calving on length of first lactation, dry period and calving interval in Sahiwal cows. J. Agri. Sci. Pakistan, 25(1): 45-48.
- Ahmad, Z., M. D. Ahmad., A. W. Qureshi., R. A. Gill and S. K. Fahmy, 1978. Genetic progress through selection in performance traits of Sahiwal cattle. Agri. Res. Rev. (Cairo), 56: 1-6.
- Anonymous, 1974. Annual Report. Directorate of Livestock Farms, Punjab, Lahore, Pakistan.
- Anonymous, 2003. Annual Report. Directorate of Livestock Production Research Institute, Bahadurnagar, Okara, Punjab, Pakistan, pp:21-24.
- Bajwa, I. R., M. S. Khan, Z. Ahmad and K. Z. Gondal, 2002. Genetic parameters of lactation milk yield as affected by lactation length adjustment procedures. Proc. 7<sup>th</sup> World Cong. Genet. Appl. Livest. Prod., INRA Dept. Genet. Anim., Castanet-Toloson, France.
- Bajwa, I. R., M. S. Khan, M. A. Khan and K. Z. Gondal, 2004<sup>a</sup>. Environmental factors affecting milk yield and lactation length in Sahiwal cattle. Pakistan Vet. J., 24(1): 23-27.
- Bajwa, I. R., M. S. Khan, M. A. Khan and K. Z. Gondal, 2004<sup>b</sup>. Comparison of different procedures for lactation length adjustment of milk yield in Sahiwal cattle. Pakistan Vet. J., 24(3): 117-120.
- Dahlin, A., U. N. Khan., A. H. Zafar, M. Saleem, M. A. Chaudhry and J. Philipsson, 1998. Genetic and environmental causes of variation in milk production traits of Sahiwal cattle in Pakistan. Anim. Sci., 66: 307-318.
- Harvey, W. R., 1990. Mixed Model Least Squares and Maximum Likelihood Computer Program (LSMLMW), PC-1 version.
- Iqbal, J., 1996. Sire evaluation on partial records in Sahiwal cattle and Nili-Ravi buffaloes. PhD Thesis, Univ. Agri., Faisalabad, Pakistan.

- Javed, K., 1999. Genetic and phenotypic aspects of some performance traits in purebred herd of Sahiwal cattle in Pakistan. PhD Thesis, Uni. Agri., Faisalabad, Pakistan.
- Javed, K., G. Mohiuddin and M. Abdullah, 2000. Environmental sources of variation in some productive traits in Sahiwal cattle. Proc. 32<sup>nd</sup> All Pakistan Sci. Conf. Garhi Dopatta, Azad Kashmir.
- Javed, K., M. Afzal and M. Ahmad, 2001<sup>a</sup>. Some environmental sources of variation for age at first calving and first lactation milk yield in Sahiwal cattle. J. Anim. plant. Sci., 11(1): 1-4.
- Javed, K., G. Mohiuddin and P. Akhtar, 2001<sup>b</sup>. Heritability estimates of some productive traits in Sahiwal cattle. Pakistan Vet. J., 21(3): 114-117.
- Khan, U. N., A. Olsson and J. Philipsson, 1992. Sahiwal herd development in Pakistan. Anim. Prod. Rural Devel. Proc. 6<sup>th</sup> Anim. Sci. Cong. Asian-Austr. Assoc. Anim. Prod. Bangkok, Thailand. I: 171-178.
- Maule, J.P., 1990. The cattle of the tropics. Univ. Edinburg, Centre for Trop. Vet. Med. Edinburg, UK.
- Mohiuddin, G., 1987. Studies on Sahiwal cattle in Pakistan. II. Genetic and phenotypic parameters of production and reproduction traits. MSc Thesis, Univ. Agri., Faisalabad, Pakistan.
- Sattar, A., L. A. Lodhi, I. Ahmad, Z. I. Qureshi and N. Ahmad, 2003. Study of some productive traits in Sahiwal cows and their calves after immunostimulation of pregnant dams during late gestation. Pakistan Vet. J., 23(4): 169-172.
- Shafiq, M., M. Rabbani, M. Arshad, T. Yaqub and A. Razzaq, 1992. Environmental factors affecting the production traits in Sahiwal cattle. Pakistan J. Livestock. Res., 2(1-2): 44-47.
- Shafiq, M., M. Saleem, H. A. Mahmood and P. Akhtar, 1995. Performance of Sahiwal cows upto 4<sup>th</sup> calving under sub-tropical environment. Pakistan Vet. J., 15(1): 20-25.
- Syrstad, O., 1993. Milk yield and lactation length in tropical cattle. World Anim. Rev., 74/75: 68-78.
- Talbott, C. W., 1994. Potential to increase milk production in tropical countries. PhD Thesis, North Carolina State University, Raleigh, USA.