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INFLUENCE OF AGE AT FIRST CALVING ON THE MILK PRODUCTION OF NATIVE AND CROSSBRED DAIRY COWS

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The influence of age at first calving on the milk production of crossbred dairy cows produced under major dairy cattle crossbreeding projects in Pakistan was studied from the year 1974 to 1980. These animals were bred and raised at the Livestock Production Research Institute, Bahadurnagar (LPRI), Livestock Experiment Station, Karachi (LES) and the University of Agriculture, Faisalabad (UAF). Local Sahiwal (SWL) cattle were crossed with two European breeds, Holstein Friesian (HF) and Jersey (J) at LPRI and UAF. At LES, native Red Sindhi (RS) were crossed with the HF and J breeds. At LES and UAF, the crossbrd progeny thus, produced, comprised of halfbreds only while at LPRI 3/4 HF, 3/4 J, 1/4 HF and 1/4 J groups were also available for this study. The average age at first calving was considerably higher among the native breeds. At LES, the RS calved first at an age of approximately 56 months. Corresponding values for SWLs at LPRI and UAF were 44 and 64 months, respectively. The 1/2 HF and 1/2 J crossbreds calved first at the age of approximately 25, 26, 34, 36, 37 and 38 months at LPRI, LES and UAF respectively. For 3/4 HF, 3/4 J, 1/4 HF and 1/4 J groups of LPRI, the average age at first calving was 29, 26, 34 and 33 months. Considerable differences in age at first calving between the crossbreds and native breeds were observed. Due to early maturity, the former attained the peak level of milk production in third lactation whereas the latter groups, because of late maturity, reached this level in their fourth lactation. This study suggested that early maturity in Zebu cattle could be induced through crossbreeding with *Bos taurus*.

INTRODUCTION

Apart from various other factors, delayed first calving in dairy cattle

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makes the milk production uneconomical. Early maturity is considered as a character of great economic importance as from birth to the date of first calving, the animal produces nothing except dung and urine, the value of which is negligible as compared to the cost of maintenance. The age at first calving in the indigenous cattle is higher by about 12 months as compared to the improved European breeds. The latter are reported to freshen first at the age of about 24-28 months.

Previous studies on Sahiwal, Red Sindhi, Tharparkar and Hariana cattle revealed that age at first calving and first lactation yield were independent of each other and reduction in age at first calving (within physiological limits) would have no deleterious effect on heifer yield (Sundaresan *et al.*, 1954; Mahadevan, 1955; Singh and Choudhury, 1961 and Singh and Acharya, 1969). On the other hand, Venkayya and Anantakrishnan (1956) and Kushwaha and Misra (1969) observed that the two traits were significantly correlated and first lactation yield tended to increase with reduced age at first calving among the Red Sindhi and Sahiwal cows. This work was carried out to study the influence of age at first calving on the milk production of major indigenous dairy cattle and their crossbreds.

MATERIALS AND METHODS

The data were obtained from the following projects:

1. Breeding adapted strains of dairy cattle through crossing Sahiwal, Jersey and Holstein Friesian. This project was initiated at the University of Agriculture, Faisalabad (UAF).

2. Study on the production performance and adaptability of crossbred cows under the subtropical environment of the Punjab. This project was started at the Livestock Production Research Institute (LPRI), Bahadurnagar, District Okara in November, 1974.

3. Studies on evolving well-adapted synthetic strains of dairy cattle with superior production by crossing indigenous milch breeds with suitable improved exotic breeds. This project was implemented in Sind province at Livestock Experiment Station (LES), Karachi.

Local Sahiwal (SWL) cattle were crossed with two European breeds, Holstein Friesian (HF) and Jersey (J) at the LPRI and UAF. At LES, native

Red Sindhi (RS) were crossed with the HF and J breeds. At the LES and UAF, the crossbred progeny thus produced comprised of halfbreds only, while at LPRI, 3/4 HF, 3/4 J, 1/4 HF and 1/4 J groups were also available for this study.

RESULTS AND DISCUSSION

The average age at first calving in Sahiwal (44.33 ± 6.22 mo.) was less than that reported by Ahmad and Ahmad (1974), while the average age at first calving in Red Sindhi (56.07 ± 8.06 mo.) found in this study was higher than that reported by other workers (Wahid, 1975; and Manickam *et al.*, 1978).

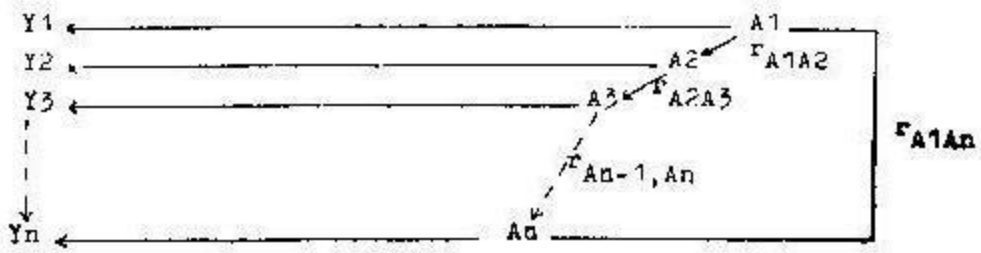
Table 1. *Phenotypic correlations between age at first calving and traits associated with first parity*

	Days in milk	Milk yield	Days dry	Days open	Calving interval	Gest. length
A. *LPRI*						
1/2 HF-1/2 SWL	.04	-.17	-.05	-.01	.01	.48**
1/2 J-1/2 SWL	.07	-.29	-.11	-.02	-.05	-.48**
3/4 HF-1/4 SWL	-.34*	.10	-.02	-.08	-.09	-.08
3/4 J-1/4 SWL	.28	.49	.69	.82*	.80*	-.30
1/4 HF-3/4 SWL	.26	.56*	.42	.61*	.41	-.29
1/4 J-3/4 SWL	.16	.09	-.06	-.86	-.86	.71
Sahiwal (SWL)	-.03	-.03	-.04	-.04	.01	.01
B. *LES*						
1/2 HF-1/2 RS	-.29	-.11	-.39	-.54	-.51	.04
1/2 J-1/2 RS	-.31	-.08	.61	.92**	.95**	.62*
Red Sindhi (RS)	.19	.32	.54*	.62**	.59**	.10
C. *UAF*						
1/2 HF-1/2 SWL	.03	-.29	.05	.06	.28	-.29
1/2 J-1/2 SWL	.57	.74*	-.36	.68	.12	.14
Sahiwal (SWL)	.19	.19	-.40	.88	.66	.18

* $P<.05$; ** $P<.01$

It is believed that there is a high correlation between age at calving an. rrespebive lactation number. This pchenomenon is biologically acceptabld However, a large variability in age at first calving needs further attention. The phenotypic correlations betwen age at first calving and other traits are presented in Table 1. With a few exceptions, the relationship between age at first calving and milk yield in first lactation was found statistically non-significant. A significant or non-significant correlation between these two traits can readily be located in the literature, for instance Venkayya and Anantakrishnan (1957) and Puri and Sharma (1965) found a significant correlation, while Sidhu (1964) and Patil *et al.* (1980) are among those who reported a non-significant correlation between age at first calving and first lactation milk production. However, it is worth mentioning that correlations and regressions for age at calving and milk production will only explain the linear part of the relationship.

Let Y1, Y2,..... Yn be the milk production in subsequent lactations and A1, A2,..... An be age at calving for respective lactation, then the relationship between milk production, age at first calving and age at subsequent calving can be expressed as follows:



The influence of age at first calving on milk production in nth lactation is through the correlation between age at first and nth lactation, which ranged from 0.59 to 0.87 in this study. Such a high relationship has a biological bearing. It is well known to animal breeders that animals calving at a younger age are most likely to have a shorter calving interval.

in their subsequent parity. Among the various causes of late age at first calving and subsequent calvings two factors seem most important, that is ,a defective overall management or the inability of a particular animal to grow and develop fast enough to attain early sexual maturity.

The milk production of F^1's and native cattle in different lactations as a percentage of production in the first lactation is presented in Table 2. It is evident from these comparisons that the peak level of milk production was attained in the third lactation in F^1 crossbreds while native breeds reached the deak level during fourth lactation. Lobo *et al.* (1983) also observed the highest milk yield in fourth lactation in Gir cattle of India. This may partly be due to late age at first calving in native breeds. The lactation records available to study the lactation curves beyond the peak levels were insufficient in the present investigation.

Table 2. *Milk production in different lactations as percentage of production in first lactation*

	Lactation number	Actual milk (litres)	Percentage of first lactation
A. *LPRI*			
1/2 HF-1/2 SWL	1	2725.29± 972.15	100 00
	2	2534.34± 840 71	92 99
	3	3177.38± 954.37	116 59
	4	3075.52± 786.71	112.85
	5	2791.15± 767.18	102.42
1/2 J-1/2 SWL	1	2363.25± 628.43	100-00
	2	2054.92± 481.95	87.95
	3	2625.26±1137.24	111.09
	4	2039.95± 969.44	86.82
	5	1742.43± 846.05	73.73
Sahiwal (SWL)	1	1426.87± 514.39	100.00
	2	1385.80± 632.38	97.12
	3	1564.81± 571.30	109.67
	4	1595.90± 566.45	111.85
	5	1405.67± 656.33	98.51

Continued

Table 2. *(Continued)*

	Lactation number	Actual milk (litres)	Percentage of first lactation
B. *LES*			
1/2 HF-1/2 RS	1	2176.35± 729.08	100.00
	2	1698.00± 863.44	78.25
	3	2318.30± 936.13	106.96
1/2 J-1/2 RS	1	2331.40±1129.99	100.00
	2	1774.50± 369.80	76.11
	3	2328.50±1530.89	99.88
	4	2482.00±1681.33	106.50
Red Sindhi (RS)	1	1317.56± 392.32	100.00
	2	1135.33± 493.39	86.17
	3	1306.88± 538.60	99.14
	4	1970.00± 664.88	149.52
C. *UAF*			
1/2 HF-1/2 SWL	1	3950.87±1269.05	100.00
	2	3230.53± 959.19	81.77
	3	4425.09±1718.50	112.00
	4	3493.67±1862.53	88.43
	5	4013.00± 531.74	101.57
1/2 J-1/2 SWL	1	2594.28±1598.79	100.00
	2	2456.67±1146.21	94.69
	3	3171.80±1421.43	122.26
	4	3062.33± 613.98	118.04

However, a decline in production following the peak and then an increase in production at a later stage could be expected based on the previous studies.

A definite relationship between age at first calving and milk yield in subsquent lactations was established in the present study. It was also evident that the crossbreds attained sexual maturity at a considerably younger age as compared to the native breeds. Consequently, the crossbred cows reached the peak level of milk production in third lactation, whereas the native cattle reached this level ih their fourth lactation. These results suggest superiority of crossbreds in

terms of growth and development to attain sexual maturity. These results also suggestthat early maturity in Zebu cattle could be induced through crossbreed ing with European breeds.

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