EFFECT OF AGE AT CALVING ON MILK YIELD IN F_1 HOLSTEIN FRIESIAN x SAHIWAL

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The data on 305-day milk yield and age at calving in F_1 H. Friesian x Sahiwal crossbred cows for 1977 to 1990 were utilized for this study.. The average 305-day milk yield for 1057 normal lactation records was 2622.71 litres and the average age at different calvings was 66.62 months. The maximum milk production (2993.84 litres) was achieved at the calving age of 117 months; the milk production then began to decline at a comparatively slow rate. The quadratic equation developed was:

$$Y_i = 1568.33 + 24.422\ m_i - 0.1046\ m_i^2$$

Based on this equation, age conversion factors were developed.

INTRODUCTION

Dairymen and others frequently compare cow's milk production records for many reasons. Two major reasons are:

1. Evaluating the breeding values of cows to determine potential genetic ability of offspring.
2. Comparing cows to make decision on culling for low production, i.e. predicting future production of cows under consideration.

There are many environmental (non-genetic) influences which affect production and which tend to obscure genetic differences. The major ones include: number of days in lactation, number of times milked per day, age at calving and season of calving (month of the year). These non-genetic influences must be accounted for if cows are to be compared accurately.

Mature equivalent (ME) factors have been developed in various breeds of cattle and buffaloes for adjusting production on a mature age basis. Ahmed (1972) and Khan (1986) have developed age correction factors for Sahiwal cows and Nili-Ravi buffaloes, respectively. Age correction factors for crossbred cows have not so far been developed. This study was therefore undertaken to develop age correction factors for F_1 Holstein Friesian x Sahiwal cows.

MATERIALS AND METHODS

The data on 305-day milk yield and the age at calving of F_1 Holstein Friesian x Sahiwal (HS) corssbreds calving from 1977 to 1990 were utilized for this study. All the incomplete lactation records for any known reason or lactations showing any abnormality were excluded from the study. The lactation records less than 100 days lactation length (only 10 records) were also excluded from the study. The cows were maintained at the Livestock Production Research Institute, Bahadurnagar (Okara) under loose system of housing. The cows were hand-milked twice daily.

The normal lactation records were used to determine the effect of age at calving on milk yield. The quadratic equation given below was fitted to the data

$$Y_i = \alpha X + B_1 m_i + B_2 m^2_i$$

where

Y_i = is the expected lactation record of crossbred cow in ith age group,
α = is a constant,
B_1 = is first degree regression coefficient,
B_2 = is a second degree regression coefficient,
m_i = is the age in months of crossbred cow in ith age group.

The analysis suggested that the age at calving had a definite influence on the lactation milk yield. The age conversion factors were, thus, developed by using the quadratic equation. The quadratic equation was used to estimate the lactation milk yield at various ages and the age of maximum production was taken as mature equivalent (ME). The estimated mature production was taken as standard and it was divided by the estimated lactation yield of other age groups to obtain respective multiplicative correction factors for adjusting differences due to age at calving. All 305-day lactation records were brought on mature equivalent basis.

RESULTS AND DISCUSSION

The average milk yield for various age groups is presented in Table 1. The total lactation records used for this study were 1057 and average 305-day milk production was 2622.71 litres, while the average age was 66.62 months. It is evident that lactation yield increased with advancing age till the maximum production (2993.84 litres) was attained at the age of 117 months (say at about 10 years). The production then began to decline at a comparatively slow rate and decreased to its minium at 171 months of age which is the maximum age group for the study. The increase in milk production was sharp; the cows calving at the age of 117 months yielded on an average 2993.84 litres of milk in a lactation as compared to 2094.21 litres of milk in cows calving at the age of 24 months. A curvilinear trend in production with advancing age was observed. The quadratic equation fitted to this data revealed that the milk production increased by 24.4221 litres with each month increase in age at calving until the age of maximum production was attained. The decline in linear regression of milk yield after the mature production was 0.1936 litres for an increase of each one month in age at calving. The quadratic eauation was:

$$Y_i = 1568.33 + 24.4221\ m_i - 0.1046\ m_i^2$$

Table 1. Age conversion factors for adjusting 305-day lactation milk records of F_1 Holstein Fresian x Sahiwal crossbreds on a mature equivalent basis

Age in months	Average milk yield (litres)	Conversion factors
1	2	3
21	2035.06	1.471
24	2094.21	1.430
27	2151.47	1.392
30	2206.85	1.357
33	2260.35	1.325
36	2311.96	1.295
39	2361.69	1.268
44	2440.39	1.227
47	2485.10	1.205
50	2527.93	1.184

53	2568.88	1.165
56	2607.93	1.148
59	2645.11	1.132
61	2668.85	1.122
64	2702.90	1.108
67	2735.06	1.095
70	2765.33	1.083
73	2793.73	1.072
76	2820.24	1.062
79	2844.86	1.052
82	2867.61	1.044
85	2888.48	1.036
88	2907.45	1.030
91	2924.55	1.024
94	2939.76	1.018
97	2953.09	1.014
100	2964.54	1.010
103	2974.11	1.007
106	2981.78	1.004
109	2987.59	1.002
112	2991.51	1.001
115	2993.54	1.000
118	2993.68	1.000
121	2991.95	1.000
124	2988.34	1.002
127	2982.84	1.004
130	2975.46	1.006
133	2966.20	1.009
136	2955.05	1.013
139	2942.02	1.018
142	2927.12	1.023
145	2910.32	1.029
148	2891.64	1.035
151	2871.09	1.043
154	2848.64	1.051
157	2824.31	1.060
160	2798.11	1.070
163	2770.01	1.081
166	2740.04	1.093
169	2708.18	1.105
171	2685.90	1.115

The age conversion factors based on this equation are presented in Table 1.

Webb (1977) has tabulated the factors to standardize lactation records of Holstein, Jersey, Brown Swiss, Ayrshire and Guernsey cows in dairy information sheet. The maximum 305-day milk production has been recorded at the age of 7 years. Similarly, Everett (1977) has also given mature equivalent factors for Holstein cows according to age at freshening and month of freshening. Verde (1969) reported that in Holstein and Holstein crossbreds maintained in Venezuela the maximum milk production was recorded during 8th lactation which was 132% of the first lactation. He found that the effect of lactation length and age at calving on milk production was significant.

Lobo *et al.* (1979) noted that in Gir cows reared in Brazil the milk yield was maximum at the age of 144 months and the milk yield increased according to the lactation length. Wellington (1968) concluded that in Jamaica Hope breed, cows having 21-24 months age at first calving gave substantially lower milk yield than others. The mean age at first calving was 34.20 months. The correlation between the age at first calving and first lactation milk yield was 0.11 and was highly significant.

Ruvuna *et al.* (1984) analysed data of 9086 lactation records from six breed groups (three native breeds and three crossbreds with Brown Swiss) kept in one herd at Karnal, India. They found that age differences within a given parity significantly affected milk yield. Patil and Kale (1986) found that parity differences on total and 305-day milk yield were highly significant ($P<0.01$) in H.Friesien x Gir and Jersey x Gir halfbreds.

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