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PROCEDURES FOR THE STANDARDIZATION OF LACTATION RECORDS OF SAHIWAL COWS

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Data on 3812 lactation records of 967 Sahiwal cows maintained at Allahdad Cattle Farm, Jahanian, Multan during the years 1926 to 1966 were analyzed to develop correction factors for the length of lactation and age at calving by the regression techniques. These factors may be used to adjust the records for comparison on a 305-day mature equivalent basis in the selection of cows for high milk production.

INTRODUCTION

Lactation records of dairy cows are of great value in the selection of animals for high milk production. The actual record may be a poor indicator of breeding value, since the milk yield in a particular lactation is influenced largely by numerous environmental factors. Some of the most important items which deserve consideration are length of lactation and age of the cow at calving. The variability associated with these factors can be reduced by using some correction factors, thus bringing the lactation records on a comparable basis. Correction factors may be called statistical control which is used instead of some physical control which was not actually achieved. Both kinds of control are intended to remove variations caused by circumstances. Several sets of correction factors are available for standardization of lactation records for various European breeds of dairy cattle (Gowen, 1924; Turner and Ragsdale, 1924; Norton, 1932; Kendrick, 1941 and Lush and Shrode, 1950) but these are not applicable to the indigenous dairy cattle. At present no standard correction factors are known to exist for various breeds of tropics. The present investigation was thus designed to develop correction factors for these sources of variability for Sahiwal breed of cattle. These factors when applied would bring the lactation records on a comparable 305-day mature equivalent basis, thus reflecting the real genetic potentials of the dairy animals.

MATERIALS AND METHODS

The data on 3812 lactation records of 967 Sahiwal cows maintained at Allahdad Catttle Farm, Jahanian, Multan during the years 1926 to 1966 were

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used to develop correction factors for standardizing lactation records on a 305-day mature equivalent basis. Incomplete records commencing with any kind of abnormality such as stillbirth, abortion or premature birth or with any other known diseased conditions were not included in this study. Lactation records of less than six months duration were also excluded considering them abnormal These records were sorted out into various groups of five-day intervals. The prediction equation for estimating the lactation yield was derived by regression technique. The estimated values for each interval were utilized for developing multiplicative correction factors by using the formula :

$$R_i = \frac{M}{m_i}$$

where

R_i is the multiplicative correction factor for standardizing the lactation record completed in i^{th} five-day interval,

M is the average milk yield of cows completing their recorsd at 305-day interval,

m^i is the average milk yield of cows completing their records in i^{th} five-day interval.

The multiplicative correction factors thus developed were used to standardize all the lactation records with more than 305-day lactation lengths. However, normal and complete records with less than 305-day lactation duration were considered as such assuming them the maximum production potential of such cows in a standard period of lactation.

The records thus adjusted for lactation duration were used to develop age conversion factors. These were sorted according to the age at calving in three-month intervals which suggested a curvilinear trend. The quadratic equation given below was thus fitted :

$$Y_i = A + B_1 m_i + B_2 m^{2i}$$

where

Y_i is the age corrected lactation record of a cow in i^{th} age group,

A is a constant,

B_1 is first degree regression coefficient,

B_2 is second degree regression coefficient,

m_i is the age in months of cow in i^{th} age group.

The lactation milk yield for various age groups were estimated. The age group with maximum estimated yield was taken as the standard and multiplicative conversion factors developed.

RESULTS AND DISCUSSION

(a) *Correction Factors for Length of Lactation*

The analysis of 3812 lactation records of 967 Sahiwal cows gave the following regression equation :

$$Y = 496.421 + 15.455\ X.$$

where

Y is the estimated milk yield in pounds, and

X is the length of lactation in days.

The estimated lactation yield and multiplicative correction factors for various intervals of lactation duration are presented in Table 1. These factors may be used to adjust the lactation records of over 305 days duration to a standard 305-day lactation. Normal but incomplete records of less than 305 days duration (terminated by the death or the sale of the cow) may also be adjusted using these factors. However the normal and complete records of individuals yielding less than 305 days may be taken as such assuming them to be the maximum production potential of such cows in a standard period of 305-day duration.

(b) *Age-conversion Factors*

The quadratic equation for a second degree curve fitted to the records after adjusting to 305-day lactation duration was :

$$Y_1 = 2410.1891 + 56.5580\ m^1 - 0.2486\ m^{2)}$$

The lactation yields estimated by this equation for various age intervals have been presented in Table 2. The maximum yield was observed during 112-114 months of age and was taken as the basis of mature equivalent. The multiplicative conversion factors thus developed are presented in Table 2.

TABLE 1. Correction Factors for Converting Lactation Milk Records of Sahiwal Cows to a 305-day Basis.

Lactaiton length (days)	Estimated milk yield (pounds)	Correction factors	Lactation length (days)	Estimated milk yield (pounds)	Correction factors
188—192	3400	1.5177	313—317	5332	0.9712
193—197	3477	1.4843	318—322	5409	0.9574
198—202	3555	1.4524	323—327	5486	0.9440
203—207	3632	1.4218	328—332	5564	0.9310
208—212	3709	1.3924	333—337	5641	0.9183
213—217	3786	1.3642	338—342	5718	0.9059
218—222	3864	1.3371	343—347	5796	0.8939
223—227	3941	1.3111	348—352	5873	0.8822
228—232	4018	1.2861	353—357	5950	0.8708
233—237	4096	1.2621	358—362	6027	0.8597
238—242	4173	1.2389	363—367	6105	0.8489
243—247	4250	1.2165	368—372	6182	0.8384
248—252	4327	1.1950	373—377	6259	0.8281
253—257	4405	1.1741	378—382	6337	0.8180
258—262	4482	1.1540	383—387	6414	0.8082
263—267	4559	1.1346	388—392	6491	0.7986
268—272	4636	1.1158	393—397	6568	0.7893
273—277	4714	1.0977	398—402	6646	0.7802
278—282	4791	1.0801	403—407	6723	0.7712
283—287	4868	1.0631	408—412	6800	0.7625
288—292	4946	1.0466	413—417	6877	0.7540
293—297	5023	1.0306	418—422	6955	0.7456
298—302	5100	1.0151	423—427	7032	0.7375
303—307	5177	1.0000	428—432	7109	0.7295
308—312	5255	0.9854	433—437	7187	0.7217

TABLE 2. Age-Conversion Factors for Adjusting 305-day Lactation Milk Records of Sahiwal Cows to a Mature Equivalent Basis.

Age in months	Estimated milk yield (pounds)	Conversion factors	Age in months	Estimated milk yield (pounds)	Conversion factors
31—33	3965	1.4190	94—96	5540	1.0157
34—36	4085	1.3774	97—99	5565	1.0111
37—39	4200	1.3396	100—102	5587	1.0072
40—42	4311	1.3052	103—105	5603	1.0042
43—45	4417	1.2738	106—108	5616	1.0020
46—48	4519	1.2451	109—111	5624	1.0006
49—51	4617	1.2188	112—114	5627	1.0000
52—54	4709	1.1948	115—117	5626	1.0002
55—57	4798	1.1726	118—120	5620	1.0012
58—60	4882	1.1526	121—123	5610	1.0030
61—63	4961	1.1342	124—126	5596	1.0056
64—66	5036	1.1173	127—129	5577	1.0090
67—69	5107	1.1019	130—132	5553	1.0133
70—72	5173	1.0878	133—135	5525	1.0184
73—75	5234	1.0750	136—138	5493	1.0244
76—78	5291	1.0634	139—141	5456	1.0314
79—81	5344	1.0530	142—144	5414	1.0393
82—84	5392	1.0436	145—147	5368	1.0481
85—87	5436	1.0352	148—150	5318	1.0581
88—90	5475	1.0278	151—153	5263	1.0691
91—93	5509	1.0213	154—156	5204	1.0813

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