

MATURE EQUIVALENT AGE ADJUSTMENT FACTORS FOR LACTATION MILK YIELD IN INDIAN BUFFALOES

Dharmeswar Das¹ and Daya Singh Balaine²

ABSTRACT

Adjustment factors for lactation milk yield were derived for Indian buffaloes by using 3258 lactation records of 733 buffaloes maintained on the Jullundur and Ferozepur Military Dairy Farms and the Progeny Testing Farm of Hissar. Adjustment factors on mature (fourth) lactation basis were calculated by considering age in terms of lactation number. While calculating the factors, significant effects of lactation length and body weight at calvings were considered along with the farm, period and seasonal effects. Factors were derived by using the methods of least squares, gross comparison, paired comparison, and multiple regression. The multiplicative adjustment factors for converting the milk yield record of a particular lactation to mature equivalent (fourth) lactation basis derived by the least squares method were found to be the most efficient. The factors for the first lactation to the fourteenth lactation were 1.180, 1.066, 1.024, 1.000, 1.014, 1.070, 1.089, 1.053, 1.071, 1.041, 1.064, 1.504, and 1.652, respectively.

INTRODUCTION

In order to have unbiased inter-cow comparisons and to estimate the breeding value of animals for economic traits such as milk production, the effect of non-genetic factors such as age at calving must be known, estimated, and then removed. A readily understood situation in which age differences could cause a bias is that in which a group of bulls are compared on genetic basis. Systematic differences in age among the mates of the bulls would tend to create bias in their evaluation. In order to circumvent this problem and to

make unbiased inter-cow comparison of different ages, it is necessary to adjust production records so that comparisons may be made on some uniform basis. Das and Balaine (1985) developed a set of first lactation equivalent age adjustment factors for lactation milk yield for Indian buffaloes. The present investigation was aimed at the development of the same on a mature equivalent age (lactation) basis for Indian buffaloes.

MATERIALS AND METHODS

A total of 3258 lactation records on 733 Indian buffaloes maintained on the Jullundur and Ferozepur Military Farms and the Progeny Testing Farm at Hissar were utilized in the present investigation. The data were available over a period of 35 years, and this was divided into seven periods, each of five years' duration. According to the frequency of calving, the data were classified into two seasons, viz., 'least calving season' and 'most calving season'. All complete lactation records, irrespective of length, for each buffalo cow were included in the study.

Mature equivalent age adjustment factors for lactation milk production were derived by using the gross comparison (Gowan, 1922), paired comparison (Sanders, 1928), least squares (Harvey, 1966), and multiple regression (Choudhury, et al., 1974) methods. The factors derived by these methods were examined for their efficiency in removing variation caused due to age effect by using certain testing criteria given by Searle and Handerson (1960). These were coefficient of variation, estimates of repeatability and reduction in among lactations variance.

¹ Dept. of Animal Genetics and Breeding, Fac. of Vet. Sci., Assam Agric. Univ., Khanapara, Guwahati - 781022, Assam, India

² National Institute of Animal Genetics and Bureau of Animal Genetic Resource Conservation, Karnal, Haryana, India

All statistical analyses were conducted on a B-4700 computer at the Indian Agricultural Statistics Research Institute, New Delhi.

RESULTS AND DISCUSSION

Das and Balaine (1982) reported that in order to remove the variability of lactation milk production due to age effect, it seemed desirable to derive the factors by considering age in terms of lactation number in Indian buffaloes. They also reported that while developing age adjustment factors, the effect of body weight at calving and lactation length should also be considered along with farm, period and season of calving effects. Accordingly, various sets of mature equivalent age adjustment factors were developed by different methods and are presented in Table 1. The factors derived by using gross comparison and paired comparison methods from both uncorrected and corrected record are also depicted in the table.

The value of the factors followed a decreasing trend from first to the fourth (mature) lactation in all methods. This was due to continuous increase in production from the first to the fourth lactation. The increase in production from the first to the mature lactation ranged from 16.05 to 19.44 percent by different methods of comparison. Beyond the fourth lactation, the factors followed an increasing trend, which is evident from the Table 1. This was due to gradual decline in production in the later lactations. Although milk yield decreased considerably in the fourteenth lactation, the decreasing trend beyond eighth lactation was not uniform and marked variation was observed from one lactation yield to another. Consequently, certain fluctuations in the magnitude of the factors were observed in later lactations, particularly after the ninth lactation.

Out of all the sets of mature equivalent age adjustment factors derived by different methods, the set which was developed by using the least squares method was found to be the most efficient. The factors derived by this method maintained the coefficient of variation of adjusted milk yield records in different lactations at the same level as was the case with adjusted records. Besides, the adjusted milk yield records by the use of least squares age factors increased the repeatability estimate significantly from that of the unadjusted records. They also caused maximum reduction in

variation of yield among lactations.

Singh and Desai (1962) also estimated mature equivalent age adjustment factors for lactation milk yield in the Bhadawari breed of buffalo. Sane et al. (1972) derived factors on a first lactation basis for Murrah buffaloes. The factors developed by Singh and Desai (1962) had slightly higher values than those of the factors derived in the present study, although the trend remains the same. This difference could be a reflection of the magnitude of the real age effect on yield of buffaloes and the methodology followed, or it could be due to the breed/type effect or different environmental conditions. Differences in age factors due to such causes were reported in cattle by Miller (1964), McDaniel and Corley (1966), Mahadevan (1966), and McDaniel (1973).

It was concluded that the age adjustment factors derived by the least squares method may be used in cow and bull evaluation programmes in order to get more efficient estimates of their breeding values. However, these factors would probably be applicable with greater precision on animals maintained only in the geographical region under study.

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REFERENCES

- Choudhury, R.K., Prasad, M. and Saxena, P.N. (1974). Standardization of milk yield records of Sahiwal herd with respect to age. *Indian J. of Dairy Science*, 27: 62-65.
- Das, D. and D.S. Balaine (1982). First lactation equivalent age adjustment factors for milk yield in Indian buffaloes. *Indian Vet. J.*, 62: 976-980.
- Gowen, J.W. (1920). Studies on milk secretion. V. On the variation and correlations of milk secretion with age. *Genetics*, 5: 11 - 16.
- Harvey, W.R. (1966). Least squares analysis of data with unequal subclass numbers. *ARS 20-*

8, U.S.D.A.

Mahadevan, P. (1966). Breeding cattle for milk production in the tropics. Commonwealth Agril. Bureau Farnham Royal Bucks. England.

McDaniel, B.T. (1973). Merits and problems of adjusting to other than mature age. J. of Dairy Science, 56: 959-967.

McDaniel, B.T. and Corley, E.L. (1966). Environmental influence on age correction factors. J. of Dairy Science, 49: 736.

Miller, R. H. (1964). Biases in the estimation of the regression of milk production on age. J. of Dairy Science, 47: 855 - 860.

Sanders, H.G. (1928). The variation in milk yield caused by season of the year, service, age and dry period and their elimination. III. Age. J. of Agri. Science, 18: 46-67.

Sane, D.D., Khanna, R.S., Bajpai, L.D. and Bhat, P.N. (1972). Studies on Murrah buffaloes (*Bubalus bubalis*) II. Genetic analysis of milk yield and peak yield. Indian J. of Animal Production, 3: 61 - 65.

Searle, S.R. and Henderson, C.R. (1960). Judging the effectiveness of age correction factors. J. of Dairy Science, 45: 82-85.

Singh, S.B. and Desai, R.N. (1962). Production characters of Bhadawari buffalo cows. Indian Vet. Journal, 39: 332 - 343.

Table 1. Multiplicative adjustment factors for adjusting a record to a mature equivalent basis as derived by different methods in Indian buffaloes

Lactation Order	GCMUC	GCMC	PCMUC	PCMC	LSM	MRM
1	1.194	1.161	1.137	1.157	1.180	1.166
2	1.064	1.039	1.038	1.056	1.066	1.065
3	1.025	1.021	1.026	1.032	1.024	1.016
4	1.000	1.000	1.000	1.000	1.000	1.000
5	1.022	1.015	1.037	1.028	0.014	1.007
6	1.040	1.025	1.061	1.028	1.040	1.029
7	1.100	1.047	1.136	1.073	1.079	1.062
8	1.135	1.090	1.216	1.157	1.089	1.098
9	1.138	1.065	1.283	1.203	1.053	1.130
10	1.153	1.074	1.315	1.281	1.071	1.145
11	1.018	1.021	1.176	1.005	1.041	1.134
12	1.107	1.136	1.156	1.378	1.064	1.090
13	1.233	1.556	1.467	1.646	1.504	1.013
14	1.784	1.625	2.530	1.641	1.652	0.910

GCMUC Gross comparison method using uncorrected records

GCMC Gross Comparison method using corrected records

PCMUC Paired comparison method using uncorrected records

PCMC Paired comparison method using corrected records

LSM Least squares method

MRM Multiple regression method