ACCURACY OF SIMULTANEOUS ADJUSTMENT OF MILK YIELD FOR VARIOUS SYSTEMIC SOURCES USING ADDITIVE & MULTIPLICATIVE STANDARDIZED CORRECTION FACTORS IN CROSSBRED CATTLE

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SUMMARY

The additive & multiplicative Correction Factors (CFs)were developed for various systemic sources which affect the milk yield as age at calving (AAC),days open or service period (DOPN),days dry or dry period (DDRY) & lactation length (LL) by using 1648 lactation records of 491 crossbred cows generated under ALL INDIA CO-ORDINATED RESEARCH PROJECT (AICRP) on cattle at Jabalpur station. These CFs were used simultaneously to correct the milk yield & the effectiveness of the correction was judged by comparing the h^2 ,r & residual variance (RV) of the uncorrected & the corrected 300 day milk yield.

The results showed that the CFs developed are quite effective in correcting the milk yield as indicated by a reduction in r & res. var.and an increase in the h^2.

Key words: multiplicative correction factor, additive correction factor, accuracy of correction factor.

INTRODUCTION

The milk reccords provide a basis for selection but for the selection to be effective it should be based only on the genetic merit of the animal as this is the part of the variation which is transmitted to the next generation. The milk yield is a quantitative trait & is affected by environmental as well as well as systemic factors, which are not random, in addition to the genotype & random environment. The environmental factors can be controlled by the breeder but the systemic factors cannot be hence the milk records needs to be corrected for these systemic factors like age at calving(AAC), days open(DOPN), days dry(DDRY) & lactation length(LL) under field conditions so that the milk yield data truly represents the genotype of the animal for that particular environment.

The systemic factors can be controlled physically by planning an experiment or statistically by using standardized correction factors.

Sporadic attempts have been made to develop correction factors (CFs) (Deb *et al.* 1981;Das & Balaine 1983;Tajane & Gurnani 1984).With the genetic improvement programmes in our country most of the cattle population is crossbred & hence it was found to be highly essential to develop CFs which could be used countrywide for correcting the milk yield of the crossbred population.

MATERIAL & METHOD

A total of 1648 lactation records of 491 CB cows belonging to 5 different genetic groups generated under ALL INDIA CO-ORDINATED RESEARCH PROJECT ON CATTLE at Jabalpur for a period of 15 years was used for the purpose of the study.

The data on milk yield,AAC,DOPN,DDRY & LL were taken into consideration for the study.

The data on milk production were analysed using Least Squares analysis for unequal subclass no. (Harvey 1966) using the following models:

1.Mathematical model for age at calving :

$Y_{ijk}=u+Se_i+S_j+A_k+b_1(DO_{ijk}-DO)+b_2(DD_{ijk}-DD)+b_3(LL_{ijk}LL)+e_{ijk}$

2.Mathematical model for service period:

$Y_{ijk}=u+Se_i+S_j+DO_k+b_2(DD_{ijk}-DD)+b_3(LL_{ijk}-LL)+b_4(A_{ijk}-A)+e_{ijk}$

3.Mathematical model for dry period:

$Y_{ijk}=u+Se_i+S_j+DD_k+b_1(DO_{ijk}-DO)+b_3(LL_{ijk}-LL)+b_4(A_{ijk}-A)+e_{ijk}$

4.Mathematical model for lactation length:

$Y_{ijk}=_u+Se_i+S_j+LL_k+b_1(DO_{ijk}-DO)+b_2(DD_{ijk}-DD)+b_4(A_{ijk}-A)+e_{ijk}$

Where Se,S,A,DO,DD,LL were the effect of season of calving, sire, age at calving, days open, days dry & lactation length respectively.The covariances (bi's)were the regression of milk yield on non genetic factors excluding the one for which the correction factor was developed.A suitable equidistant discrete classes were identified for different non-genetic systemic sources to develop the CF.

The Additive Correction factors (ACFs) were derived using Least Squares Constants (LSCs) as given by (Chauhan 1988 ; Saxena 1989)

$$\text{ACFof } i^{th} \text{ effect class=LSC } i^{th} \text{ class-LSC base class}$$

where Base class is the class with the maximum frequency.

$$MY_{C+}= MY_R- ACF.$$

where MY_{C+} = milk yield corrected additively, MY_R = uncorrected milk yield .

The Multiplicative Correction factors (MCFs) were derived from the Least Squares Means (LSM) as per the expression given by Miller *et al* 1966 & Gacula *et al* 1968

$$\text{MCF of the ith subclass} = \frac{\text{LSM of the Base class}}{\text{LSMof the } i^{th} \text{ subclass}}.$$

$$MY_{CX} = MY_R \text{ X MCF}$$

where MYCX = milk yield corrected multiplicatively.

The ACF & MCF for the different systemic sources were used simultaneously for correcting the Lactation milk yield.

RESULT & DISCUSSION

The results of analysis showed highly significant ($P<0.01$) effect of all non-genetic sources measured either as discrete class or continuous in the form of regression values . This dictates the importance of developing CFs so as to bring all the milk records at comparable level using standardized CFs . (Dutt 1994)

The efficiency of correction using the CFs simultaneously was judged by considering h^2, r & residual variance (RV) of the uncorrected & corrected milk yield.

Table 1. Estimates of the genetic parameters for the MY before and after correction for the systemic sources

Est	GG1	GG2	GG3	GG4	GG5	GG6	GG7
r R	0.3106	0.3415	0.3472	0.2012	0.3194	0.4572	0.2928
C+	0.3581	0.2558	0.2674	0.3587	0.1607	0.4745	0.3134
CX	0.3224	0.2831	0.1443	0.2194	0.1001	0.4573	0.2403
h^2 R	0.3804	0.2106	0.0364	0.0616	0.0033	1.0826	0.0896
C+	0.4580	0.1777	0.2203	0.1763	0.0956	1.0961	0.2594
CX	0.3876	0.1013	0.1763	-0.0497	0.0103	1.0621	0.0904
RV (x 10^3)							
R	353.93	318.12	352.58	352.20	356.02	345.51	353.33
C+	182.72	149.94	143.80	149.03	132.42	174.67	137.48
CX	228.90	186.95	173.74	237.58	224.38	209.56	252.46

r =repeatability ; h^2 = heritability ; RV = residual variance ; C+ = MY corrected additively ; CX = MY corrected multiplicatively ; GG = genetic group .

The repeatability estimate should decrease on correction for the systemic sources since the permanent environmental component (V_P) is being eliminated from the numerator of the *r* estimate . The reduction in the *r* estimate is indicated by a "+" and an increase by a "-" in Table2.

It is expected that the h^2 estimate should increase on correction since the permanent environmental variance (V_P) in the denominator of h^2 is decreasing on correction. When the h^2 estimate increases on correction it is indicated by a "+" otherwise by a "-" as in Table2.

The variation due to AAC,DOPN,DDRY and LL are supposed to be the component of systemic error variance which should reduce on correction this leads to a reduction in the RV as indicated in Table2 by a "+".

Table 2. Efficiency of correcting 300 days MY simultaneously for systemic sources - AAC, DOPN, DDRY and LL

Parameters	GG1		GG2		GG3		GG4		GG5		GG6		GG7	
	C+	CX	C+	CX	C+	CX	C+	CX	C+	CX	C+	CX	C+	CX
r	-	-	+	+	+	+	-	-	+	+	-	-	-	+
h^2	+	+	-	-	+	+	+	-	+	+	+	-	+	+
RV	+	+	+	+	+	+	+	+	+	+	+	+	+	+

C+ =MY corrected additively ; CX = MY corrected multiplicatively

From Table 2 it is clear that simultaneous correction for all the four factors additively is 76.2% and multiplicatively is 71.4% effective calculated on the basis of number of '+' score in comparison to the total score. However it was found that the difference between the two percentages was non-significant hence the MCF are more useful looking to the operational restriction since they can be used anywhere irrespective of the feeding and management since they are ratio factors while the ACF can only be used in the herd where they are developed.

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