ESTIMATION OF HERITABILITY OF FIRST AND SECOND LACTATION YIELDS IN BUFFALOES

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Heritability of the first and second lactation yield in *Nili-Ravi* buffaloes was estimated. The heritability estimates for first and second lactation production were 0.113±0.152 and 0.132±0.216 respectively by the method of half-sib correlation. The corresponding estimates by the method of intrasire regression of daughter on dam were 0.127± 0.150 and 0.180±0.274 respectively.

It is pointed out that the estimation by daughter dam regression method are higher probably due to the inclusion dominance component in the estimates. The heritability of the second lactation is higher in both the methods of estimation. The difference between the daughter dam regression estimates of the first and second lactation were found to be statistically non-significant. It is concluded that no appreciable loss in the efficiency of selection will accrue if selection of buffaloes is made on the basis of first lactation yield alone.

INTRODUCTION

Dairy animals are primarily kept for milk production which is a perfect human diet. Dairy cows and buffaloes are the main source of milk and the economic justification for these animals is their proficiency in transferring feeds mostly inedible by man into one of the most nutritious foods for human consumption. The buffaloes are known to maintain themselves under poor management and possess a remarkable ability to convert roughages into milk. The importance and superiority of buffaloes is thus recognized. Various measures have been adopted to improve the performance of this class of animal. The livestock breeder striving for genetic improvement in milk production has two basic tools available at his disposal—selection and mating system. The heritability of the trait helps in measuring the genetic progress. The present study was undertaken to estimate heritability of the first and second lactation yield of buffaloes from the record of the Commonwealth Livestock Farm Herd, Rakh Ghulaman.

REVIEW OF LITERATURE

Although buffalo is an important dairy animal in this sub-continent, little work has been done to study the genetics of this species. Information on

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heritability of milk production of Pakistani buffaloes is not available in the published literature with the exception of one reported by Ashfaq and Mason (1954). A large number of workers have estimated the heritability of milk yield and their work is reviewed briefly.

Ashfaq and Mason (1954) analysed records of Pakistani buffaloes to find out the environmental and genetic efforts on milk yield. Lactation records obtained from the buffaloes kept at Bahadurnagar Farm, District Sahiwal were used for the purpose. First 300 days' milk yields of 278 daughter from 27 bulls were adjusted for lactation number and seasons of calving. A heritability estimate of 0.18×0.16 was found by half-sib correlation method. In order to reduce the environmental variance they averaged the first two available lactation yields and then calculated the heritability for the pooled records which was found to be 0.26 ± 0.20. Asker *et al.* (1953) estimated the heritability of milk in Egyptian buffaloes. The data for this study consisted of 796 lactations obtained for 345 buffaloes scattered over a period of 10 years. Heritability estimates for milk as reported by them was 0.24. El-Itriby and Asker (1956) analysed 1,270 lactation records of Egyptian buffaloes kept by the Animal and Poultry Breeding Department and reported a heritability estimate of 0.20. Asker and Dedeir (1961) calculated the heritability of initial milk yield ranging from 11 to 13 per cent. These results were based upon 877 lactation records of 277 buffaloes over a period of 15 years. In another study, Asker *et al.* (1963) analysed 1,614 records of 400 buffaloes and found heritability estimates for 305 days' milk, total milk yield and maximum daily production as 0.26, 0.27 and 0.43 respectively.

In India, Dhinsa (1963) studied the inheritance of some economic traits in *Murrah* buffaloes. He studied 540 lactation of 165 buffaloes in which the average milk yield was 3873.2 lbs. The heritability estimates for first lactation yield and peak daily were 0.324 ± 0.284 and 0.484 ± 0.288 respectively. Tomar and Desai (1967) analysed the data recorded from 1952 to 1962 on 477 buffaloes at five military farms. The overall heritability estimates of peak yield of milk by parental half-sib correlation method was found to be 0.1180 ± 0.1183.

Mallosini and Pilla (1965) analysed 829 lactation records of 193 Italin buffaloes kept during the years 1932 to 1964. They found that heritability of milk yield was 0.13 by daughter dam regression method.

MATERIAL AND METHOD

The data on *Nili-Ravi* buffaloes kept at Commonwealth Livestock Farm, Rakh Ghulaman, Kalurkot, District Mianwali, were analysed for the estimation of heritabilities of the first and second lactation yield. A total of 199 first

lactation record, 134 second lactation record were used for half-sib analysis and 121 daughter-dam pairs for first lactation and 70 pairs for second lactation were used for analysis by the method of intra-sire regression of daughter on dam. All the records were standardized to 305 yield. The standard errors for these estimate were also calculated.

RESULTS AND DISCUSSION

Differences in the First and Second Lactation Records

The means and variances of the corrected records are shown in Table 1. It appears that the average of the second lactation is 459.5 pounds higher than the first lactation but the 't' test shows that this difference is non-significant. This is because of high variability of the lactation records observed in the small sample. The variability in the second lactation record is higher than in the first lactation. F test shows that these variances are significantly different. Hence, it may be concluded that the population of first lactation records and the second lactation records are different.

Heritability by half-sib Method

The estimates of heritability for milk yield in the first and second lactation were found to be 0.113 ± 0.152 and 0.132 ± 0.216 respectively.

Ashfaq and Mason (1954) reported the stimate of first lactation yield as 0.18 ± 0.16 in Pakistani buffaloes. Tomar and Desai (1967) analysing the data of 477 buffaloes kept at 5 Military Dairy Farms during 1952-62 reported the estimate of 0.118 ± 0.118 as an overall heritability of peak yield of milk. Asker *et al.* (1953) worked out the estimate of 0.24 in Egyptian buffaloes

TABLE 1.—*Means and variance of milk yield*

Record		Number of observations	Mean	Variance (s^2)	Standard Deviation
First lactation	..	199	3562.2	648799.6	805.5
Second lactation	..	134	4021.7	10300335.9	1014.9

't' = 0.355 not significant statistically

$$F = \frac{s_1^2}{s_1^2} = 1.877 \text{ highly significant}$$

while El-Itriby and Asker (1956) obtained the estimate of 0.20. Asker and

Bedeir (1961) while working on the data of 877 lactations of 277 Egyptian buffaloes got the estimate of heritability of initial milk yield which ranged from 0.11 to 0.13.

Our estimates compared well with the estimates obtained by afore mentioned workers. However, pooled estimates of heritability of first and second lactation yield estimates by Ashfaq and Mason (1954) was 0.26 ± 0.20. Asker *et al.* (1963) analysing 1614 records of 400 buffaloes had the estimate of 0.26 for 305 days' milk yield, 0.27 for total milk yield and 0.43 for maximum daily production. Dhinsa (1963) worked out the heritability of first lactation and peak daily yield from 540 records of 165 buffaloes as 0.324 ± 0.284 and 0.484 ± 0.288 respectively.

Heritability by Intra-sire Regression Method

The estimates of heritability of first and second lactation milk yields were worked out by the method of intra-sire regression of daughter on dam using 121 and 70 daughter dam pairs respectively. Lush and Straus (1942) reported that doubling the intra-sire regression of daughter's record on dames record seems the most dependable method for estimating the heritability in data of milk yield where sire cannot express characters himself, dams are likely to be selected a bit more than daughters and especially because feeding and other management practices are almost certain to have differed considerably from herd to herd. The estimates of heritability of milk yield during the first and second lactations were 0.127 ± 0.15 and 0.18 ± 0.27 respectively. Malossani and Pilla (1965) while analysing 829 lactations records from 193 buffaloes obtained the estimate of 0.13 which is quite close to the one reported in the study.

Differences in Heritability Estimates of First and Second Lactation

The estimates of heritability and their standard errors obtained from the data are summarised in Table 2.

TABLE 2.—*Estimates of heritability and their standard errors*

Method	Lactation	No. of observations	Heritability estimates	Standard errors
Half-sib correlation ..	1	199	0.113	0.152
Half-sib correlation ..	2	134	0.132	0.216
Intra-sire regression ..	1	121	0.127	0.150
Intra-sire regression ..	2	70	0.180	0.274

It is obvious that the heritability for second lactation is consistently higher for both the methods. The standard errors of these estimates also appear to increase. It may further be noted that the number of observations for second lactation was found to be non-significant (t=0.355). The low value of 't' is apparently due to higher standard error of the difference between the two regressions. Not much reliance can, therefore, be put on the test in generalizing the result based on the small sample. Yet a fairly reasonable general conclusion can be made that the heritability estimates of the first and second lactation are not very much different from each other. It may be suggested on the basis of this conclusion that the efficiency of selection will not be considerably affected if culling of buffaloes is done on the basis of first lactation yield alone.

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