GENETIC EVALUATION OF HOLSTEIN CATTLE USING TEST DAY MILK YIELD AND MULTIPLE REGRESSION MODEL

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ABSTRACT

Milk production records (305-days and monthly day test) collected during 1998-2000 on 2442 Holstein cows at the Nasr Station , United Company for Animal Resources (45-50 km south of Baghdad) were analysed . The records included those for 305-days yield (Y_{305}) and monthly day tests (DT) T_1 , T_2 , T_3 , T_4 , T_5 , T_6 , T_7 , T_8 , T_9 , and T_{10} . The respective numbers being 4079 , 4079 , 4079 , 4077 , 3714 , 3415 , 3300 , 3118 , 2877 , 2448 and 1846 .

The objective of the analysis was to predict Y_{305} from DT using simple and multiple regression equations , and to evaluate the animals of the herd genetically .

General linear model (GLM) was used to estimate the effects of fixed factors (season and year of calving and parity) on DTMY and Y_{305} . Restricted Maximum Likelihood (REML) method was applied to estimate the effects of random variance components assuming the mixed model . Orthogonal polynomial Test Day (OpTD) was applied to investigate the shape of the lactation curve within each parity . Linear prediction equations were formulated using the highest R-square value according to the mathematical model used . The Animal Model (A.M.) was also applied to evaluate the Holsteins using one trait (TDMY , T_5 , Y_{305} and OpTD) to estimate the breeding values of the 2442 cows and their 705 dams and 26 sires . The values were ranked in descending order for selection purposes .

Results obtained may be summarised as follows :

1. The overall mean of Y_{305} was 4503.78 kg and of $T_1 - T_{10}$ was 19.67 , 19.23 , 17.99 , 16.85 , 15.45 , 13.59 , 11.50 , 10.37 , 9.51 and 7.99 respectively .
2. The heritability of Y_{305} was 0.08 and that of $T_1 - T_{10}$ was 0.10 , 0.09 , 0.11 , 0.13 , 0.10 , 0.08 , 0.12 , 0.12 , 0.11 and 0.15 in the same order .
3. The repeatability of Y_{305} and TDMY was 0.11 and 0.44 and that of T_1-T_{10} was 0.29 , 0.28 , 0.28 , 0.42 , 0.40 , 0.38 , 0.42 , 0.06 , 0.02 and 0.0 , respectively .
4. The highest coefficient of genetic correlation (0.49) was between T_1 and T_2 .
5. Lactation curve within each parity was linear .
6. The overall mean of average TDMY using OpTD was 0.79 kg .
7. The simple correlation between Y_{305} and T_3 was highest (0.79) when the linear prediction equation was applied .
8. Y_{305} could be predicted from T_3 owing to its highest R-square (0.62) within the following simple regression equation :

   $$\mathbf{Y_{305} = 1761 .08 + 152.44\ T_3}$$

9. Y_{305} could be predicted from the following multiple regression equation :

   $$\mathbf{Y_{305} = 828.9 + 85.9\ T_2 + 79.5\ T_6 + 79.8\ T_8}$$

10. Breeding values (B.V.) of sires and dams were respectively 0.56 and 0.05 kg for average TDMY , - 0.23 and 0.25 kg

for T_5 , 186.42 and 30.71 kg for Y_{305} , and 0.0006 and 0.004 for average TDMY using OpTD .

11. Significant ($p < 0.01$) rank coefficients of 0.95 and 0.99 were between breeding values (B.V.) for Y_{305} and average TDMY of sires and dams .
12. Average B.V. for TDMY , T_5 , Y_{305} and average TDMY using OpTD were 0.05 , - 0.09 , 30.64 and 0.004 , respectively .
13. Rank correlation coefficients between B.V. for TDMY and each of T_5 and Y_{305} were 0.58 and 0.99 respectively , and those between B.V. for T_5 and Y_{305} were 0.58 , the coefficients being highly significant .