GENETIC ANALYSIS FOR ASSOCIATION OF SOME GENETIC MARKERS AND MILK YIELD IN DAIRY CATTLE

BY

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5. SUMMARY

The first aim of this study was to detect genetic and phenotypic trends for test-day milk (TDMY), fat (TDFY) and protein (TDPY) yields and age at first calving (AFC) in Frisian cattle raised in Egypt applying the random regression model (RRM). Data of 5237 test days (TD) milk yield traits were recorded for 953 Friesian cows, daughters of 208 sires and 944 dams from two herds belonging to the Animal Production Research Institute, Egypt. Ten-month classes of lactation days were considered for the test-day yields. The model included the random effects of direct additive genetic, permanent environment and error, while the fixed effects were herd-year-season of calving and parity, which was modeled by orthogonal Legendre polynomials.

The second aim of this study was to detect the associations among prolactin and lactoferrin genes and 305-day milk, fat and protein yields and age at first calving. Records of 180 milking cows (142 Friesian cows and 38 local cows) raised at three experimental herds (Elkarda, Sakha and Elserw) belonging to Animal Production Research Institute (APRI), Ministry of Agriculture, Egypt were used. **PCR-RFLP** method was used to get single nucleotide polymorphism (SNP). Three enzymes were used to restrict DNA PCR product***, HinfI*** restriction enzyme for lactoferrin gene and ***Nael*** and ***SM/l*** restriction enzymes for prolactin gene. A mixed model was used in analyzing each herd separately and this model including the fixed effects of year-season, parity and genotypes of lactoferrin and prolactin genes, the animal additive genetic effects and permanent environmental effects as random effects.

Results obtained in this study could be summarized as follows:

The additive genetic variance estimates at first test day for milk, fat, protein yields and age at first calving were 4.7 kg, 13.3 g, 5.3 g, respectively and 2.8 month increased until the fourth (7.6 kg, 38.7 g, 14.4 g and 5.5 months), decreased thereafter reaching the lowest value

at the tenth test day for milk yield and reaching the lowest value at the ninth test day for fat and protein yields. Age at first calving reached the lowest value at the sixth test day (1.5 month) then increased until the tenth test day (8 months). Heritability estimates at first test day were 0.12, 0.25, 0.25 and 0.05 for TDMY, TDFY, TDPY and AFC, respectively, and increased until the third test day for TDFY, TDPY and AFC, while the estimates for TDMY trait reached the highest value at the fourth test day (0.25, 0.32, 0, 32 and 0.08 for TDMY, TDFY, TDPY and AFC, respectively), then decreased at the tenth test day (0.14, 0.25, 0.25). But the estimate for AFC was reached the lowest value at sixth test day (0.04), and increased until the tenth test day to be 0.2.

The phenotypic trend for all traits decreased from year to year The genetic trends were slightly positive for all traits, indicating that the selection program performed correctly.

In the Friesian Elkarada herd, the values of observed (H_o) and expected (H_e) heterozygosity were 0.34 and 0.47 for lactoferrin gene restricted by ***HinfI*** enzyme, 0.36 and 0.44 for prolactin gene restricted by ***NaeI*** enzyme, and 0.23 and 0.39 for prolactin gene restricted by ***Sm/I*** enzyme, respectively. In the Friesian Sakha herd, the values of H_o and H_e were 0.14 and 0.26 for lactoferrin gene restricted by ***HinfI*** enzyme and 0.21 and 0.44 for prolactin gene restricted by ***NaeI*** enzyme and 0.23 and 0.39 for prolactin gene restricted by ***Sm/I*** enzyme, respectively, while in Elserw local Baladi herd, the values of 0.05 and 0.44 for lactoferrin gene restricted by ***HinfI*** enzyme, 0.18 and0.33 for prolactin gene restricted by ***NaeI*** enzyme and 0.09 and 0.39 for prolactin gene restricted by ***Sm/I*** enzyme, respectively.

The values of PIC and F_{IS} in Elkarada Freisian herd were 0.36 and 0.29 for lactoferrin gene restricted by ***HinfI*** enzyme, 0.12 and 0.07 for prolactin gene restricted by ***NaeI*** enzyme, and 0.82 and 0.23 for prolactin gene restricted by ***Sm/I*** enzyme, respectively. In Sakha Freisian herd, the values were 0.37 and 0.06 for lactoferrin gene

restricted by ***HinfI*** enzyme, 0.20 and - 0.15 for prolactin gene restricted by ***Nael*** enzyme, and 0.62 and 0.36 for prolactin gene restricted by ***Sm/l*** enzyme, respectively, while the values in Elserw loca lBaladi herd were 0.27 and 0.37 for lactoferrin gene restricted by ***HinfI*** enzyme, 0.28 and - 0.17 for prolactin gene restricted by ***Nael*** enzyme, and 0.34 and 0.94 for prolactin gene restricted by ***Sm/l*** enzyme, respectively.

The differences in milk yield among the three genotypes of lactoferrin gene restricted by ***HinfI*** enzyme (AA, AB, and BB) were not significant in Elkarada Freisian herd, but in Sakha Freisian herd the differences among the three genotypes were significant and the AB genotype was the highest in milk, fat and protein yields. Also, the differences in age at first calving among the three genotypes were significant in Elkarada Frisian herd and AA genotype was the best one, but the differences in Sakha Friesian herd were not significant. In the local Baladi cattle, there were no significant differences among the three genotypes for milk traits but age at first calving differed significantly among the three genotypes.

The genotypes of prolactin gene restricted by ***Nael*** enzyme were CD and DD in Elkarada and Sakha Friesian herds, where the differences between the two genotypes for milk, fat yields and age at first calving were non-significant, but for protein yield was affected. In the local Baladi cattle, there were no significance differences between all genotypes for milk traits, but AFC was significantly affected.

Genotypes of prolactin gene restricted by ***Sm/l*** enzyme were GG, GT and TT where the differences in milk and age at first calving traits among these genotypes were not significant in Elkarada Friesian herd, but both fat and protein were affected. In Sakha Friesian herd, the differences in milk, fat and protein yields among the three genotypes were non-significant, but age at first calving trait was affected. In the local Baladi cattle, the differences among the three genotypes in all traits were non-significant.

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