

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

**BY**

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# LIST OF CONTENTS

## CONTENTS

	Page
<b>1. INTRODUCTION</b>	1
<b>2. REVIEW OF LITERATURE</b>	5
2.1 Variance components , heritability, and genetic and phenotypic trends	5
2.1.1 Test day and RRM advantages	5
2.1.2 Variance components for test-day milk, fat and protein yields	6
2.1.3 Heritability estimates for test-day milk, fat and protein yields	11
2.1.4 Reviewed genetic and phenotypic trends for milk TD, fat and protein yields	13
2.2 Molecular analysis of milk, fat and protein yields	16
2.2.1 Lactoferrin and prolactin as major genes	16
2.2.2 Single Nucleotide Polymorphism (SNP) and molecular weights of lactoferrin and prolactin genes	17
2.2.2.1 SNP for lactoferrine gene	17
2.2.2.2 SNP for prolactin gene	19
2.2.3 Genotypic and allelic frequencies for lactoferrin and prolactin genes	20
2.2.3.1 Genotyping for lactoferrin gene	20
2.2.3.2 Genotyping for prolactin gene	21
2.2.4 Heterozygosis and fixation index ( $F_{IS}$ ) for lactoferrin and prolactin genes	22
2.2.5 Associations among milk yield traits and age at first calving and lactoferrin and prolactin genes	23
2.2.5.1 Associations among milk yield traits and age at first calving and Lactoferrin gene	23
2.2.5.2 Associations among milk yield traits and age at first calving and Prolactin gene	24
2.2.6 Associations among milk yield traits and another major genes	26

<b>3. MATERIALS AND METHODS</b>	35
3.1 Management and data structure	35
3.2 Measuring fat and protein percentages in milk	36
3.3 Test day statistical analyses	37
3.3.1 Estimating (co) variance components using random regression model	37
3.3.2 Predicting the breeding values of the genetic trend	41
3.3.3 Plotting the genetic and phenotypic trends	43
3.4 Genotyping of Lactoferrin and Prolactin genes	43
3.4.1 Experimental work and DNA extraction	43
3.4.2 Primers design and PCR performed for lactoferrin and prolactin genes	44
3.4.3 Digestion of PCR products using restriction enzymes	46
3.4.4 Characterization of Friesian and local Balai cattle in terms of LF and PRL genes	47
3.4.5 Model for determining the association between LF and PRL genes and milk yields and components and age at first calving	48
<b>4. RESULTS AND DISCUSSION</b>	49
4.1 Test day milk traits and random regression model	49
4.1.1 Means and variations	49
4.1.2 Variance components	50
4.1.3 Heritability Estimates	53
4.1.4 Predicted breeding value (PBV)	54
4.1.5 Phenotypic trend	55
4.1.6 Genetic trend	55
4.2 Genotyping of lactoferrin and prolactin genes	59
4.2.1 Molecular analysis for genotypes polymorphism of lactoferrin gene using <i>HinfI</i> restriction enzyme	59
4.2.1.1 Molecular weights	59
4.2.1.2 Genotypic and allelic frequencies	60

4.2.1.3 Heterozygosis and fixation index	61
4.2.1.4 Differences among milk traits in different <b>HinfI</b> genotypes of lactoferrin gene	62
4.2.2 Molecular analysis for genotypes of prolactin gene using <b>NaeI</b> restriction enzyme	66
4.2.2.1 Molecular weights	66
4.2.2.2 Genotypic and allelic frequencies	67
4.2.2.3 Heterozygosis and fixation index	67
4.2.2.4 Differences among milk traits in different <b>NaeI</b> genotypes of prolactin gene	70
4.2.3 Molecular analysis for genotypes polymorphism of prolactin gene using <b>SmI</b> restriction enzyme	72
4.2.3.1 Molecular weights	72
4.2.3.2 Genotypic and allelic frequencies	73
4.2.3.3 Heterozygosis and fixation index	74
4.2.3.4 Differences among milk traits in different <b>SmI</b> genotypes of prolactin gene	75
<b>5. SUMMARY</b>	79
<b>6. CONCLUSIONS</b>	82
<b>7. REFERENCES</b>	84
<b>ARABIC SUMMARY</b>	--

## LIST OF TABLES

Table No.		Page No.
1	The estimates of additive genetic ( $\sigma^2_a$ ), permanent environmental ( $\sigma^2_{pe}$ ), residual ( $\sigma^2_e$ ) and phenotypic variances ( $\sigma^2_p$ ) for test-day milk, fat and protein yields in dairy cattle as cited in the literature	8-10
2	Estimates of heritability for test-day milk, fat and protein yields as cited in the literature for dairy cattle	12-13
3	Genetic and phenotypic trends for test-day milk, fat and protein yields in dairy cattle as cited in the literature	14-15
4	Restriction enzymes, primers and molecular weights for lactoferrin gene as cited in literature	18
5	Genes associated with milk yield and milk components as cited in literature	28
6	Structure of the test_day data set for Friesian dairy cattle	36
7	The first six Legendre polynomials functions of standardized units of time, w	38
8	The number of cows in each herd and the number of lactation records in all data set	44
9	The primers sequencing for PCR of lactoferrin and prolactin genes	45
10	Number of observations, means, standard deviations (SD) and coefficients of variation (CV) for test_day milk (TDMY), fat (TDFY) and protein (TDPY) yields and age at first calving (AFC) in Friesian dairy cattle raised in Egypt	49
11	Minimum, maximum and ranges of predicted breeding values (PBV), predicted error variance (PEV) and accuracy of prediction ( $r_{AA}$ ) for TD milk, fat, protein yields and age at first calving in Friesian dairy cattle raised in Egypt	55
12	The observed and expected number of cows in <i>HinfI</i> genotypes polymorphism of lactoferrin gene , genotypic frequency, gene frequency and Chi square values ( $\chi^2$ ) in the three dairy cattle herds	61
13	The observed ( $H_o$ ) and expected ( $H_e$ ) heterozygosity and standard error (SE), PIC and $F_{IS}$ for <i>HinfI</i> polymorphisms of lactoferrin gene in three populations of Friesian and local Baladi.	62

<b>14</b>	Least squares means <sup>1</sup> and standard errors for milk, fat, protein yields and age at first calving in different patterns of <i>HinfI</i> restriction enzyme of lactoferrin gene for Friesian and local Baladi cattle.	<b>64</b>
<b>15</b>	The observed and expected number of cows in <i>Nael</i> polymorphism genotypes of prolactin gene, genotypic frequency, gene frequency and Chi-square values ( $\chi^2$ ) of the three dairy cattle herds	<b>68</b>
<b>16</b>	The observed ( $H_o$ ) and expected ( $H_e$ ) heterozygosity and standard errors (SE), PIC and $F_{IS}$ for <i>Nael</i> polymorphisms of prolactin gene in the three populations of Friesian and local Baladi cattle .	<b>69</b>
<b>17</b>	Least squares means <sup>1</sup> and standard errors for milk, fat, protein yields and age at first calving in different genotypes of <i>Nael</i> restriction enzyme of prolactin gene for Sakha and Elkarada Friesians and Elserw local Baladi cattle herds	<b>71</b>
<b>18</b>	The observed and expected number of cows in <i>Sm/I</i> polymorphism genotypes of prolactin gene, genotypic frequency, gene frequency and their Chi-square values ( $\chi^2$ ) in the three dairy cattle herds	<b>74</b>
<b>19</b>	The observed ( $H_o$ ) and expected ( $H_e$ ) heterozygosity and standard errors (SE), PIC and $F_{IS}$ for the <i>Sm/I</i> polymorphisms of prolactin gene in the three populations of Friesian and local Baladi cattle.	<b>75</b>
<b>20</b>	The least squares means <sup>1</sup> and standard errors for milk, fat, protein yields and age at first calving in different patterns of <i>Sm/I</i> restriction enzyme of prolactin gene in Sakha and Elkarada Friesian herds and Elserw local Baladi cattle	<b>77</b>

## LIST OF FIGURES

Figure No.		Page No.
<b>1</b>	Estimates of additive genetic ( $V_A$ ), permanent environmental ( $V_{Pe}$ ), residual variances ( $V_E$ ) and phenotypic variances ( $V_P$ ) for test day milk yield ( <i>kg</i> )	<b>52</b>
<b>2</b>	Estimates of additive genetic ( $V_A$ ), permanent environmental ( $V_{Pe}$ ), residual variances ( $V_E$ ) and phenotypic variances ( $V_P$ ) for test day fat yield ( <i>g</i> )	<b>52</b>
<b>3</b>	Estimates of additive genetic ( $V_A$ ), permanent environmental ( $V_{Pe}$ ), residual variances ( $V_E$ ) and phenotypic variances ( $V_P$ ) for test day protein yield ( <i>kg</i> )	<b>52</b>
<b>4</b>	Estimates of additive genetic ( $V_A$ ), permanent environmental ( $V_{Pe}$ ), residual variances ( $V_E$ ) and phenotypic variances ( $V_P$ ) for age at first calving ( <i>month</i> )	<b>52</b>
<b>5</b>	Estimates of heritability of test-day milk ( <i>TDMY</i> ), fat ( <i>TDFY</i> ) and protein ( <i>TDPY</i> ) yields and age at first calving ( <i>AFC</i> )	<b>54</b>
<b>6</b>	Phenotypic trend for test-day milk (a), fat (b), protein yields(c) and age at first calving (d) in Friesian cattle raised in Egypt	<b>56</b>
<b>7a</b>	Genetic trend for test-day milk and fat yields in Friesian cattle raise in Egypt	<b>57</b>
<b>7b</b>	Genetic trend for test-day protein yield and age at first calving in Friesian cattle raise in Egypt	<b>58</b>
<b>8</b>	Representative restriction pattern at <b>LF- <i>HinfI</i></b> locus on 3.0% agarose gel	<b>59</b>
<b>9</b>	Representative restriction pattern at PRL- <i>Nael</i> locus on 3.0% agarose gel	<b>67</b>
<b>10</b>	Representative restriction pattern at PRL- <i>Sm/I</i> locus on 3.0% agarose gel	<b>73</b>

## 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 *NaeI* and *SmaI* 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 *SmI* 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 *SmI* 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 and 0.33 for prolactin gene restricted by *NaeI* enzyme and 0.09 and 0.39 for prolactin gene restricted by *SmI* enzyme, respectively.

The values of PIC and  $F_{IS}$  in Elkarada Friesian 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 *SmI* enzyme, respectively. In Sakha Friesian 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 *NaeI* enzyme, and 0.62 and 0.36 for prolactin gene restricted by *SmaI* 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 *NaeI* enzyme, and 0.34 and 0.94 for prolactin gene restricted by *SmaI* 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 *NaeI* 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 *SmaI* 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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