A STUDY OF ASSOCIATION BETWEEN GENETIC MARKERS AND PRODUCTIVE TRAITS IN LAYER CHICKEN

By

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B.Sc. Agric. Sc. (Poultry Production), Ain Shams University, 1992
M.Sc. Agric. Sc. (Poultry Breeding), Ain Shams University, 2008

A thesis submitted in partial fulfillment

of

the requirements for the degree of

DOCTOR OF PHILOSOPHY
in
Agricultural Sciences
(Poultry Breeding)

Department of Poultry Production
Faculty of Agriculture
Ain Shams University

2017

Approval Sheet

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ABSTRACT

Saadeya Saad El-Dein Mekky Mohamed: A Study of Association between Genetic Markers and Productive Traits in Layer Chicken. Unpublished Ph. D. Thesis, Poultry Production Department, Faculty of Agriculture, Ain Shams University, 2017.

The aim of this study was to measure the genetic variability in two commercial layer strains Hy-line (brown) and Hy-line (W-36) using five microsatellite markers and evaluation of their productive performance under Egyptian environmental conditions. The present study was carried out using a total of 663 layer chickens to determine egg production characteristics (447 brown Hy-line layers and 216 W-36 Hy-line layers). Egg production traits were recorded throughout the first three months of production period. However, egg quality traits were conducted at 24 weeks of age. Results indicated that brown Hy-line layers had heavier body weight than white ones. Brown layers commenced to lay at an earlier age. Brown eggs were heavier than white eggs. There was insignificant effect of strain on egg number and egg production percentage. However, egg mass was highly significant for brown layers than white ones. Data of egg quality showed that the brown Hy-line eggs were highly significant for egg weight, egg shape index, shell thickness, wet and dry shell weight and shell percentage than w-36 Hy-line eggs. Concerning internal egg quality, results indicated that brown eggs were higher than white eggs for albumen weight. However, Brown layers had higher Haugh units and yolk index than the white ones, but the differences were not statistically significant. Concerning genetic diversity of brown and white Hy-line strains, results showed that there were 18 alleles found at five loci across the two strains. The mean number of alleles per locus for the studied loci was 3.6 alleles ranged from 2 for MCW0246 to 5 for MCW0241. A total of 8 common alleles were detected versus five microsatellite loci overall genotypes. Regarding specific alleles, a total of 10 out of 18 alleles (56 %) were

noticed overall loci for the two genotypes studied. 5 specific alleles were observed in HY-line (Brown). Also, 5 ones were obtained in the case of HY-line (White) strains. the microsatellite MCW0241, ADL0273, MCW0246, MCW0258 and ADL0188 gives number of alleles 5, 3, 2, 4 and 4 with a size range from 295-355, 161-183, 250-280, 161-194 and 164-200bp, respectively. The value of expected heterozygosity (He) was quite high ranging from 0.5556 to 0.6444 with the average of 0.6121 while, observed heterozygosity (Ho) was 1.000 with the average of 1.000. The mean FST values of 0.1748 measured the degree of differentiations within and between strains. Where, the FST value indicated a lack of genetic differentiation between the chiken strains. The highest allele frequency overall loci was (0.50), while the lowest one was (0.100) in brown and (W-36) Hy-line strains. In addition, the highest average of allele frequency estimated was(0.50) in HY-line (W-36) strain, the lowest one was (0.33). (PIC) value for HY-line (W-36) ranged from (0.50) to (0.58) with mean 0.548 for all loci. Meanwhile, it ranged from 0.50 to 0.62 with mean of 0.556 for HY-line (Brown) strain. These differences reflect high genetic variability within HY-line (Brown) strain.

Key words: Microsatellite markers, genetic diversity, Brown Hy-line, W-36 Hy- line strain, productive performance, egg quality.

ACKNOWLEDGEMENTS

In the lead, I would like to express my prayerful thanks to **"ALLAH"** who helped me in everything.

My deepest gratitude is extended to **Prof. Dr. A. Zein El-Dein**, Emeritus Professor of Poultry Breeding, Poultry Production Department, Faculty of Agriculture, Ain Shams University for his supervision, revising the manuscript and continuous support.

I wish to express my deepest appreciation to **Dr. A. Galal**, Professor of Poultry Breeding, Poultry Production Department, Faculty of Agriculture, Ain Shams University for his supervision, interest, encouragement and revising the manuscript.

I want to express the extent of my gratitude and appreciation to **Dr. H. I. Zaky,** Professor of Poultry Breeding, Desert Research Center for his supervision, encouragement and revising the manuscript.

Many thanks for **Dr. M.Y. Mahrous,** Associate Professor of Poultry Breeding, Poultry Production Department, Faculty of Agriculture, Ain Shams University for his encouragement and valuable advices during this study.

Special thanks for **Dr. M.A. El-Sayed,** Researcher of Biotechnology, Animal Genetic Resources Department, National Gene Bank, Agriculture Research Center for his valuable advice and help.

I would like to express thanks to Habiba H. Rezk and all staff members of Poultry Production Department Faculty of Agriculture, Ain Shams University.

I'd like to thank Dr. Afaf A. El-Sheref Researcher of Animal Nutrition, Animal and Poultry Nutrition Department, Desert Research Center.

Finally, I want to thank every member of my family specially my parents, my brother, my sister and their families and my niece Dr. Randa I. Mahmoud for their continuous support and encouragement during this study.

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LIST OF ABBREVIATIONS

AFE	Age at First Egg
cM	CentiMorgan
DNA	Deoxyribonucleic acid
EN	Egg number
ES	Egg shell strength
EW	Egg weight
FiS	Fixation indices(Among populations)
FiT	Fixation indices(Within individuals)
FST	Fixation indices(Among individuals within populations)
HE	Expected Heterozygosity
Ho	Observed Heterozygosity
HU	Haugh-unit
Ng	Nano gram
PCR	Polymerase chain reaction
RAPD	Random amplified polymorphic DNA
RFLP	Restriction fragment length polymorphisms
SSR(s)	Simple sequence repeat(s)
STRs	Simple tandem repeats

INTRODUCTION

Poultry industry is considered to be one of the most important economic industries, which contribute significantly the national income of Egypt. Poultry breeding also provides a source of high protein and high nutritional value costs less compared to other meat. Where, the total number of consumed chicken eggs in the year is estimated by 55 million metric tons **(Muir *et al*., 2008).**

Chickens are good converters of feed into useable protein both in meat and egg. Eggs of the chicken are considered to be one of the finest foods which provide balance nutrients from proteins, vitamins, minerals and fatty acids with a great biological value. Layers of commercial strains commence to lay eggs at 20 weeks of age. Furthermore, commercial hens produced about 0.9 eggs per day **(Kekeocha, 1985).**

Egg quality is important characteristics for consumers and producers; the internal egg quality is very important for consumers but for producers the external egg quality is very important. The economic success of poultry production is measured by the total number of produced eggs that have a good quality **(Monira *et al*., 2003).** Egg shell quality is an important factor to poultry industry; it has direct effects on prices in poultry industry of commercial strains. Where, the percentage of egg shell breakage reached to 7- 8% during transport from producers to consumers. Consequently, the total number of broken and cracked eggs causes dangerous economic problems for both producers and traders **(Hamilton, 1982).** Hence, egg shell breakage result in annual losses of millions of dollars, therefore it is very important to evaluate the egg quality traits.

There is a strong relationship between poultry breeding and poultry genetics, where poultry genetics provide the biological base for poultry breeding. Poultry genetics has a proud history of achievements, in providing modern Knowledge as in facing the global need of food. The genetic variation which exists in the basic economic traits may due