POLYMORPHISM OF SOME GENES RELATED TO MEAT TRAITS IN SOME EGYPTIAN SHEEP BREEDS

A thesis submitted for award of the degree of Doctor of Philosophy in science (Ph.D) in Zoology (Genetics).

By

Heba Ibrahim Mohamed Shafey

Assistant Researcher

Cell Biology Department

National Research Center

Supervised by

Dr. Mohamed Abdelmordy Mohamed

Prof. of Genetics

Zoology Department

Faculty of Science

Ain Shams University

Dr. Karima Fathy Mahrous

Prof. of Animal Genetics

Cell Biology Department

National Research Center

Dr. Mohamed Saber Hassanane

Prof. of Animal Genetics

Cell Biology Department

National Research Center

Zoology Department

Faculty of Science

Ain Shams University

2014

POLYMORPHISM OF SOME GENES RELATED TO MEAT TRAITS IN SOME EGYPTIAN SHEEP BREEDS

A thesis submitted for award of the degree of Doctor of Philosophy in science (Ph.D) in Zoology (Genetics).

By

Heba Ibrahim Mohamed shafey
Assistant Researcher
Cell Biology Department
National Research Centre

Department of Zoology
Faculty of Science
Ain Shams University
2014

قال رسول الله صلى الله عليه وسلم

ما بعث الله نبيا إلا رعى الغنم ، فقال أصحابه : وأنت ؟ . فقال : نعم ، كنت أرعاها على قراريط لأهل مكة

رواه البخاري

Student Name	: Heba Ibrahim Mohamed Shafey.
Thesis Title	Polymorphism of some genes related to meat traits in some Egyptian sheep breeds.
Degree	**:** Ph.D (Zoology).

This thesis has been supervised by:

1-Prof.MohamedAbdelmordy Mohamed ……
Professor of Genetic
Zoology Department
Faculty of Science
Ain Shams University

2-Prof. Karima Fathy Mahrous
Professor of Animal Genetics ……
Cell Biology Department
National Research Center

3-**Prof. Mohamed Saber Hassanane** ……
Professor of Animal Genetics
Cell Biology Department
National Research Center

DECLARATION

I DECLARE THAT THIS THESIS HAS BEEN COMPOSED BY ME AND THAT THE WORK OF WHICH IS A RECORD HAS BEEN DONE BY ME. IT HAS NOT BEEN SUBMITTED FOR A DEGREE AT THIS OR ANY OTHER UNIVERSITY.

Heba Ibrahim Shafey

CONTENTS

ABSTRACT

POLYMORPHISM OF SOME GENES RELATED TO MEAT TRAITS IN SOME EGYPTIAN SHEEP BREEDS

The genetic polymorphism of some genes related to meat production in three Egyptian sheep breeds (Barki, Rahmani and Osseimi) was studied. Two main techniques were used for the study; the first was the restriction fragment length polymorphism for the polymerase chain reaction products (PCR-RFLPs) for the candidate genes: Calpastatin, Insulin-like growth factor binding protein-3, Myostatin, Diacylglycerol-acyltransferase1 and the Booroola fecundity gene. The second technique was the direct sequencing for the PCR products of Calpain gene. Polymorphisms were found in the genes: Calpastatin, Myostatin and Diacylglycerol-acyltransferase1, while no polymorphism was observed in the other two genes: Insulin-like growth factor binding protein-3 and the Booroola fecundity gene. Calpastatin locus digested with *MspI* had two genotypes MM and MN. The highest allelic frequency was for M allele. The same locus Calpastatin digested with *NcoI* also exhibited two genotypes MM and MN. The NN genotype was absent with both the *MspI* and the *NcoI* enzymes in all breeds. Myostatin digested with *DraI* had two genotypes AB and BB. The AA genotype wasn't present, the highest allelic frequency was for allele B. Diacylglycerol-acyltransferase1 digested with

AluI showed two genotypes CC and CT. The highest allelic frequency was for allele C. The detected CT genotype might explian the moderate intramuscular fat content and muscle marbling in the Egyption sheep breeds. Each of the remaining two genes (Insulin-like growth factor binding protein-3 and the Booroola fecundity) had only one genotype, BB genotype for Insulin-like growth factor binding protein-3 digested with *HaeIII* and ++ genotype for the Booroola fecundity digested with *AvaII* enzyme, therefore they are not recommended in the selection program.

The Calpain gene data showed that the genotype CT was of the highest frequency in the three breeds under study. Animals with TT genotype of Calpain gene had higher heavey birth weight, final weight and ADG than animals with CT genotype of the same gene and the low values were exhibited by animals with CC genotype. In addition, male animals showed values for birth weight, final weight and ADG higher than those in females. Rahmani breed had birth weight and final weight higher than Osseimi and the lowest values were in Barki, while Rahmani and Barki had higher ADG than Osseimi breed.

KEY WORDS: Genetic polymorphism, Sheep, PCR- RFLP, Sequencing.

Acknowledgment

*In the Name of **Allah**, the Most Gracious, the Most Merciful. May the peace, blessings, and mercy of Allah be upon **our prophet Mohamed**, the final of messengers, his family and companions in entirety, and those who follow him until the Day of Judgment.*

*First, foremost, and all thanks to **Allah** by whose grace this work had been completed and by whose grace all my life is arranged in the best, Nobody can imagine this way that had been drawn by the merciful of the God.*

*After thanking Allah, I would like to express my most deeply appreciation and sincere gratitude to my Professor Doctor, **Mohamed Abdelmordy Mohamed**, Professor of Genetics, Zoology Department, Faculty of Science, Ain Shams University, for providing me with his assistantship, advice, expertise, guidance and kind supervision.*
I would like also to thank him for his valuable advice, time and for guiding me through the difficulties in writing this thesis.

*Special thanks to Professor Doctor **Karima Fathy Mahrous**, Professor of Genetics, Cell Biology Department, National Research Center, for suggesting the research point of this*