GENETIC STUDIES ON EGYPTIAN CAMEL

By

AL-SAYED AL-SOUDY MOHAMED MOSTAFA

B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Al-Azhar Univ., 2010

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of

MASTER OF SCIENCE

In

Agricultural Sciences

(Genetics)

Department of Genetics
Faculty of Agriculture
Cairo University
EGYPT

2017

APPROVAL SHEET

GENETIC STUDIES ON EGYPTIAN CAMEL

M.Sc. Thesis
In
Agric. Sci. (Genetics)

By

AL-SAYED AL-SOUDY MOHAMED MOSTAFA

B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Al-Azhar Univ., 2010

APPROVAL COMMITTEE

Dr. KARIMA FATHY MAHROUS…….....
Researcher Professor of Animal Genetics, Cell Biology Department, National Research Center

Dr. SALAH EL-DIN SAYED MOHAMED EL-ASSAL ……
Professor of Genetics, Faculty of Agriculture, Cairo University

Dr. EBTISSAM HUSSEIN ALY HUSSEIN ……
Professor of Genetics, Faculty of Agriculture, Cairo University

Date: / /

SUPERVISION SHEET

GENETIC STUDIES ON EGYPTIAN CAMEL

M.Sc. Thesis
In
Agric. Sci. (Genetics)

By

AL-SAYED AL-SOUDY MOHAMED MOSTAFA
B.Sc. Agric. Sci. (Biotechnology), Fac. Agric., Al-Azhar Univ., 2010

SUPERVISION COMMITTEE

Dr. EBTISSAM HUSSEIN ALY HUSSEIN
Professor of Genetics, Fac. Agric., Cairo University.

Dr. ASHRAF ABD-ELHALIM EL-SAYED
Associate Professor of Animal Physiology, Fac. Agric., Cairo University.

Dr. HANAIYA ABBAS EL-ITRIBY
Head of Research of Genetics (Emeritus) - Head of National Gene Bank, Agric. Res. Center

DEDICATION

I dedicate this work to my parents, brothers and my wife, as well as my beloved daughter, ***Maryam****, for all the support and encouragement they lovely offered during my post-graduate studies.*

ACKNOLEDGMENT

First and above of all, I would like to express my great thanks to ***Allah****, who gave me the ability and patience to accomplish this work.*

I would like to express my sincere thanks, deep gratitude and appreciation to ***Dr. Ebtissam H. A. Hussein****, Professor of Genetics, Faculty of Agriculture, Cairo University for her supervision, support, encouragement, patient, continued assistance, criticism and guidance through the course of my study and for her careful, critical and important review of my papers and dissertation. Moreover,* ***Dr. Ebtissam*** *gave me a lot of her valuable time to provide me with a sincere and endless help whenever I ask. Her advices give me a whole new direction.*

I would like to express my sincere thanks ***Dr. Ashraf A. El- Sayed,*** *Associate Professor of Animal Physiology, Animal Production Department, Faculty of Agriculture, Cairo University for his kind supervision, guidance, assistance and teaching me a lot of the techniques during my experiment at the embryology laboratory. Cairo University Research Park (CURP).*

Special thanks to ***Dr. Hanaiya A. El-Itriby*** *Head of National Gene Bank, Agriculture Research Center, who taught me a lot of information about how to get things done. Her enthusiasm, support, scientific insight and infinite patience contributed immensely to my research and ensured that I completed my thesis.*

I am also grateful to all staff members of National gene bank, the Department of Genetics, Faculty of Agriculture, Cairo University and Cairo University Research Park for their friendship.

Name of Candidate: Al-Sayed Al-Soudy Mohamed Mostafa **Degree**: M.Sc.
Title of Thesis: Genetic Studies on Egyptian Camel
Supervisors: Dr. Ebtissam Hussein Aly Hussein
Dr. Ashraf Abd-Elhalim El-Sayed
Dr. Hanaiya Abbas El-Itriby
Department: Genetics **Approval:** / /2017

ABSTRACT

The genetic diversity, relationships and population structure of sixty Egyptian camels derived from four breeds (Baladi, Sudani, Somali, and Maghrabi) were investigated using 18 microsatellite (SSRs) loci. In addition, the four breeds were genotyped using 16 Start Codon Targeted (SCoT) primers. Moreover, an attempt has been made to establish a reliable cryopreservation protocol for camel oocytes using the open pulled straw (OPS) vitrification strategy. A total of 346 SSR alleles were detected across the four camel breeds with an overall mean of 9.3±0.66 alleles / locus. The mean number of alleles (MNA) and effective number of alleles (Ne) ranged from 9.2 ± 1.45 in the Baladi to 9.5 ± 1.27 in the Maghrabi breeds and from 6.5 ± 0.82 in the Maghrabi to 7.1 ± 0.93 in the Somali breeds, respectively. The values of observed and expected heterozygosity per breed varied from 0.82 ± 0.07 in the Maghrabi to 0.87 ± 0.07 in the Sudani camel breeds, and from 0.75 ± 0.03 in the Sudani to 0.79 ± 0.03 in the Maghrabi breeds , respectively. The genetic diversity estimated as the Shannon's information index (I) revealed that the highest value (1.88 ± 0.14) in the Maghrabi breed and the lowest value (1.78 ± 0.18) in the Sudani breed. Each of the four camel breeds was identified by unique or private alleles, i.e., 45, 63, 51 and 49 private alleles for the Baladi, Sudani, Somali and Maghrabi breeds, respectively. The values for fixation indices (F_{IS}, F_{ST} and F_{IT}) were -0.07284, 0.12364 and 0.05981, respectively. Thus indicating a moderate level of differentiation among the four breeds and a random mating process within each breed. The genetic structure revealed that the three breeds (Baladi, Sudani and Maghrabi) were genetically distinct and look like pure breeds, while the Somali breed showed some degree of admixture. A total of 153 amplicons were generated by the 16 SCoT primers, with an average of 9.56 amplicon/ primer and a polymorphism rate of 49 %. The phylogenetic tree based on microsatellite and SCoT markers revealed that Maghrabi was separated in one cluster while, the second cluster comprised two subclusters. Sudai and Somali formed one subcluster and Baladi was in the second subcluster. Thus, the closest phylogenetic relationship was between the Sudani and Somali breeds.

For oocyte vitrification, a total of 540 cumulus oocyte complexes (COCs) were collected. Non-significant differences were detected between the vitrified immature oocytes using 20 % DMSO and 20 % EG and control group as indicated by cumulus expansion of oocytes (88.0 % and 85.3 %, respectively).However, the extrusion of the first polar body was significantly reduced in the vitrified- thawed immature oocytes (20.3 %) compared to the control group (40.1 %). In addition, the morphological abnormalities occurred at higher rate in the vitrified immature (GV stage) oocytes than in the vitrified mature oocytes (13.6 % *vs* 6.4 %). Therefore, the sensitifity of the camel oocytes to cryoinjuries was more accentuated at the immature than the mature stage. Nevertheless, the cryoinjuries in both stages were within the range previously reported in other animals.

Key Word: Genetic diversity, Population structure, Animal Genetic Resources (AnGR), Microsatellite, Start Codon Targeted (SCoT), Oocyes. Open Pulled Straw (OPS).

CONTENTS