IDENTIFYING SOME GENES AFFECTING PRODUCTION TRAITS OF THE MAGHRABY CAMEL BREED

By

IBRAHIM SHAWKI RAMADAN ABOU SOLIMAN

B.Sc. Agric. Sc. (Animal production), Zagazig University, 2006

A thesis submitted in partial fulfillment
of
the requirements for the degree of

MASTER OF SCIENCES
in
(Animal Production)

Department of Animal Production

Faculty of Agriculture

Ain Shams University

2014

Approval Sheet

IDENTIFYING SOME GENES AFFECTING PRODUCTION TRAITS OF THE MAGHRABY CAMEL BREED

By

IBRAHIM SHAWKI RAMADAN ABOU SOLIMAN

B.Sc. Agric. Sc. (Animal production), Zagazig University, 2006

This thesis for M.Sc. degree has been approved by:

Dr. Mohamed Serag Eldeen Abdel-Sabour **……**

Prof.Emeritus of Genetics, Faculty of Agriculture, Benha University

Dr. Abdel-Halim Anis Ashmawy **……**

Prof.of Animal Breeding, Faculty of Agriculture, Ain Shams University

Dr. Mohamed Abdel-Salam Rashed **……**

Prof. Emeritus of Genetics, Faculty of Agriculture, Ain Shams University

Dr. Mohamed Mosaad Mourad **……**

Prof.of Animal Husbandry, Faculty of Agriculture, Ain Shams University

Date of Examination: 31 / 8 / 2014

IDENTIFYING SOME GENES AFFECTING PRODUCTION TRAITS OF THE MAGHRABY CAMEL BREED

By

IBRAHIM SHAWKI RAMADAN ABOU SOLIMAN

B.Sc. Agric. Sc. (Animal production), Zagazig University, 2006

Under supervision of:

Dr. Mohamed Mosaad Mourad

Prof.of Animal Husbandry, Department of Animal Production Faculty of Agriculture, Ain Shams University (Principal Supervisor)

Dr. Mohamed Abdel-Salam Rashed

Prof. Emeritus of Genetics, Department of Genetics, Faculty of Agriculture, Ain Shams University

Dr. Ismail Mohamed Ismail

Researcher, Department of Animal Breeding, Desert Research Center

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Ibrahim Shawki Ramadan Abou Soliman: Identifying some Genes Affecting Production Traits of the Maghraby Camel Breed. Unpublished M.Sc. Thesis, Department of Animal Production, Faculty of Agriculture, Ain Shams University, 2014.

Twenty-three Maghraby camels (*Camelus dromedaries*) were identified and used to detect some genes that affected some growth traits by estimating some productive traits and by using molecular genetics techniques (gene isolation and sequencing)**.** Estimation of live body weights as birth weight, weaning weight, yearling weight and dam weights in the present study revealed that these weights were not high in maghraby camel breed compared with other breeds. Also estimation of daily growth rate for calves from birth to yearling age was less than the other breeds. Genetic analysis of growth hormone gene (GH) in maghraby camel breed showed that sequence of this gene was resulted in 1726 bp by using four specific primers of Sudanese camel breed. Comparison of sequence of GH gene in maghraby breed with the reference of Genbank identified one single nucleotide polymorphism (SNP) in a non coding region (intron 1) in position g.419C>T where there are two alleles (C or T) in this position of SNP. GH sequence also identified 14 position for restriction enzymes. Sequence of Myostatin gene in maghraby breed can also be detected by using a specific primer of Pakistanian camel breed and showed no polymorphism between individuals which mean that this gene was conserved.

Key Words: Camels, Maghraby breed, production traits, growth hormone gene, Myostatin gene, polymorphism, SNP.

ACKNOWLEDGMENT

Many thanks to our merciful **God** who helps me to finish this work.

I wish to express my great thanks and deepest gratitude to**. Prof.Dr. Mohammed Mosaad Mourad,** Prof. of Animal husbandry, Faculty of Agriculture, Ain Shams University, for his stimulating supervision, guidance and kind advice. His valuable suggestions and continuous help are very valuable and benefit to terminate this work in short time.

I wish to express my deepest gratitude to**. Prof.Dr. Mohamed Abdel-Salam Rashed** , Prof. of Genetics, Faculty of Agriculture, Ain Shams University, for his continuous encouragement, valuable and scientific advices and for the continuous support for thesis requirements.

I owe special debts of gratitude to **Dr. Ismail Mohamed Ismail**, Department of Animal Breeding, Desert Research Center, for his scientific suggestions, continuous encouragement and valuable opinions.

Great thanks should be offered to **Dr. Hassan Elsayed**, Head of camel breeding and researches station, ARC for his offering the possibility of data collection and support during the experimental period of the study.

I owe special debts of gratitude to every one of the department of animal production and sincere thanks to every one of department of Genetics especially **Dr. Mahmoud Magdy** for his help and continuous support at the laboratory.

Special thanks to all staff members of Department of Animal Breeding, Desert Research Center for their assistance.

Finally I want to offer my great thanks to my parents, my wife, my uncles, my brothers and my sisters for their continuous support.

1. INTRODUCTION

Camels are advantageous farm animals because they adapt themselves physiologically and anatomically to be good producers of meat and milk in harsh conditions. They are also considered as work animals in valleys and deserts.

Dromedary camels (Camelus dromedaries) are distributed in arid and semi-arid areas of North Africa, south- East Asia and India ***(Mason, 1979);*** in areas characterized by bad pastures and insufficient water. They are particularly well adapted to deserts and are better suited to these areas than are cattle, sheep and goats (***McKnight, 1969 and Wilson, 1984***). The camels represent an important source of income in terms of meat and milk production in the arid and semi-arid regions including Arab world and Africa and it is expected that camels continue this role during 21st century **(*Gahlot, 1998).***

According to statistics of **(FAO, 2009)** there are about 110000 camels (Camelus Dromedaries) in Egypt. It is important to genetically improve our camels in Egypt because it is a great problem faced camel breeders. It is well known that the tools of the classic breeding such as selection can't be used because they take long times and many generations to attain the target. So, the use of molecular genetics and the identifying of some specific genes affected meat performance of animals are very useful to get the objective in very short times.

In some instances, variation can be genetically controlled by the action of single gene with a major effect or interaction between groups of genes. Studying farm animals at the phenotypic level only is not enough for giving real measurements. Genetic markers such as Random Amplified Polymorphic DNA (RAPD), Restriction Fragment Length Polymorphism (RFLP) and microsatellite markers or Simple Sequence Repeats (SSR) are used to genetically characterize the production traits and growth traits of the farm animals in order to assist in making a

decision related to improving these animals or breeds (***Sallam et al., 2012***).

Growth traits are physiological functions under the control of several genes. The application of DNA markers for improving these traits through MAS is a powerful and efficient tool. The association between the candidate genes markers should be studied (***Lan et al., 2009).***

The objectives of the present study are the following:

1- Estimation of some productive traits in maghraby camel breed under the semi-intensive system, like birth weight, weight at three months of age, weaning weight at six months of age, yearling weight and daily growth rate from birth to yearling age.

2- Whereas the genetic improving in camels (selection) takes a long time and whereas the generation period is relatively long in camels than other farm animals , so it should using molecular genetics techniques to make a rapid and direct activation of selection in the next generation and to improve meat production trait in camels.

3- Identifying some genes like Growth hormone gene and myostatin gene that affect growth performance.

2. REVIEW OF LITERATURE

The early evolution of the family Camelidae occurred in North America over 60 million years ago. Camelidae had been descended from an animal which had got the size of a Capricorn. **Smuts and Bezuidenhout (1986)** reported that during the ice ages, a solid bridge between Alaska (in North America) and a Siberia (in Asia) enabled the early migration of camels to Europe.

The previous opinion was not the same for **Schwartz and Dioli (1992)** who indicated that Camels were domesticated about 3000 years ago, often in the arid areas of Africa (approximately, 11.5 million animals in 1992), particularly in the arid lowlands of Eastern Africa (Somalia, Sudan, Ethiopia, Kenya and Djibouti).

2.1. Classification of Camels:

Mason (1979) classified Camels to:

Order Artiodactyla

Suborder Tylopoda

Family Camelidae

Genus *Camelus* (old world camels)

Species 1. Camelus dromedaries which has got one-hump

2. *Camelus bacetrianus* which has got two humps and live in Africa and Asia.

Genus: *Lama* includes

- *Lama*
- *Lama alpaca*,
- *Lama guanicoe*
- *Lama vicugna* which live in South America.

Novoa and Wilson (1992) and Kohler- Rollefson (1995) also classified camels

1. Mountain Camels

a. Baggage Camels

b. Riding Camels

2. Plains Camels

a. Desert Camels

b. Riverine Camels

2.2. Camel breeds in Egypt

In Egypt, **Gehad, (1995)** reported that there are mainly five camel breeds including Sudany, Maghrabi, Falahy, Somali and Mowaled. The first one has relatively light body weight (340 kg). It is used for riding and racing in Sudan whereas, it is imported to Egypt to enrich the meat camel market. Maghrabi breed is a dual purpose camel (milk and meat production) that is imported to Egypt and managed by the tribes of the Northern Eastern Coast of Egypt. They are raised for their milk and meat. Later, **Ismail (2006)** described genetically the preceding breeds.

Falahy breed is originated at the Nile Delta region. It has a large body size that encouraged the farmers of Delta to use them in transportation, agricultural operations and meat production. Somali breed has got a heavy body weight equal to 750 kg. Camels of this breed are not famous and numerous in Egypt but breeders of Upper Egypt raise them for their meat. Mowaled breed has actually the origin of Maghrabi and Falahy breeds. Farmers raise the animals of this breed for field works, carrying crops and persons and meat production. Whereas, the bedouins use them for carrying persons from a place to another place besides, they benefit from their milk and meat.

2.3. Live body weights

It was important to weigh regularly dams and calves and calculate the average daily gains of calves aiming to find a relationship between calves and their dams.

2.3.1.Birth weight:

Hansard and Berry (1969) summarized the factors influencing the birth weight of camels and estimated that the largest component of variation (36%) is attributed to the combined genotypes of the dam (20%), fetus (17%), parity (7%), nutrition (6%), sex (2%) and the maternal age (1%).The exact role of these factors in the camel has not been investigated.

There are also other factors that influenced camel birth weight, including nutritional status of the dam **Hammadi *et al*. (2001)**, gender **(Burgemeister, 1975 and Zhao *et al*., 1999),** health status of dam, season of year and parity **(Mutairi, 1999 and Khan *et al*., 2003).**

2.3.1.1. Effect of nutrition on birth weight

Russel (1975) confirmed later by **Musa (1984)** reported that birth weight and average daily gains of camel calves were affected by the quantity of dam milk**.**

Later**, Zeleke and Bekele (1999)** studied the effect of malnutrition of dams during the last period of pregnancy on the birth weight of the new born calves. They indicated that mal-nutrition of dam during the last phase of gestation increased the cases of abortion and reduced the birth weight of camel calves and resulted in a low growth rate between birth and weaning.

Hammadi *et al*. (2001) agreed with the previous authors that malnutrition during the last months of gestation resulted loss of body weight in dams ,increased abortion rate and caused low rates of body weight gains of calves after birth, they also added that the season has a significant effect on birth weight of camel calves. Under traditional management, it exerts its effect through the availability of feed in the pastures on one way and the management conditions of the camel herd on the other way.

In the same direction, **Hammadi *et al*. (2001)** assured that the pre-weaning weights of camel calves were affected by the milk quantities of dams and the additional nutrition given to them. They also noted that the nutritional supplementation of dams had a great role on birth weight

of calves (30.3 and 23.4 kg for supplemented and non-supplemented dams, respectively).

Moreover, comparing systems of production and their effect on birth weights of camel calves, **Bakheit *et al*. (2009)** reported no significant difference in birth weight of calves raised under semi-intensive and traditional system in Sudanese camels. They also studied the effect of gender on birth weight, then they observed that the birth weight of male Sudanese calves (39 ± 0.31 kg) was significantly heavier than the female ones (36 ± 0.34 kg)

Shawket Safinaze *et al*. (2010) studied the effect of the nutritional treatment on the weight of the new born calves by dividing dams into two groups, the first one received *ad libtum* Berseem hay and the second one grazed the Atriplex halimus on a natural pasture with concentrate diet of ground barley grains added equally to the two groups to cover their energy requirements at the last 12 weeks before parturition. They concluded that the birth weight of calves of the two groups were not significantly affected by the nutritional treatment being 33.1 and 34.6 kg, respectively.

2.3.1.2. Effect of location on birth weight

Bhargava *et al*. (1965) studied factors affecting birth weight of camel calves. They noted that the birth weight of Indian Bikaneri breed ranged from 37.3 kg to 41 kg, and the average birth weight of males was 38.19 kg and that of females was 37.19 kg, with a pooled average of 37.3 kg.

Zhao et al. (1999) resulted that the heredity and geographical location are factors affecting prenatal growth of calves, directly via the genotype of the fetus or for nutritional reasons related to the availability of natural grazing.

2.3.1.3. Effect of gender on birth weight

Yagil (1985) reported that male camel calves (38.2 kg) were slightly but not significantly heavier than female ones (37.2 kg). More recently,