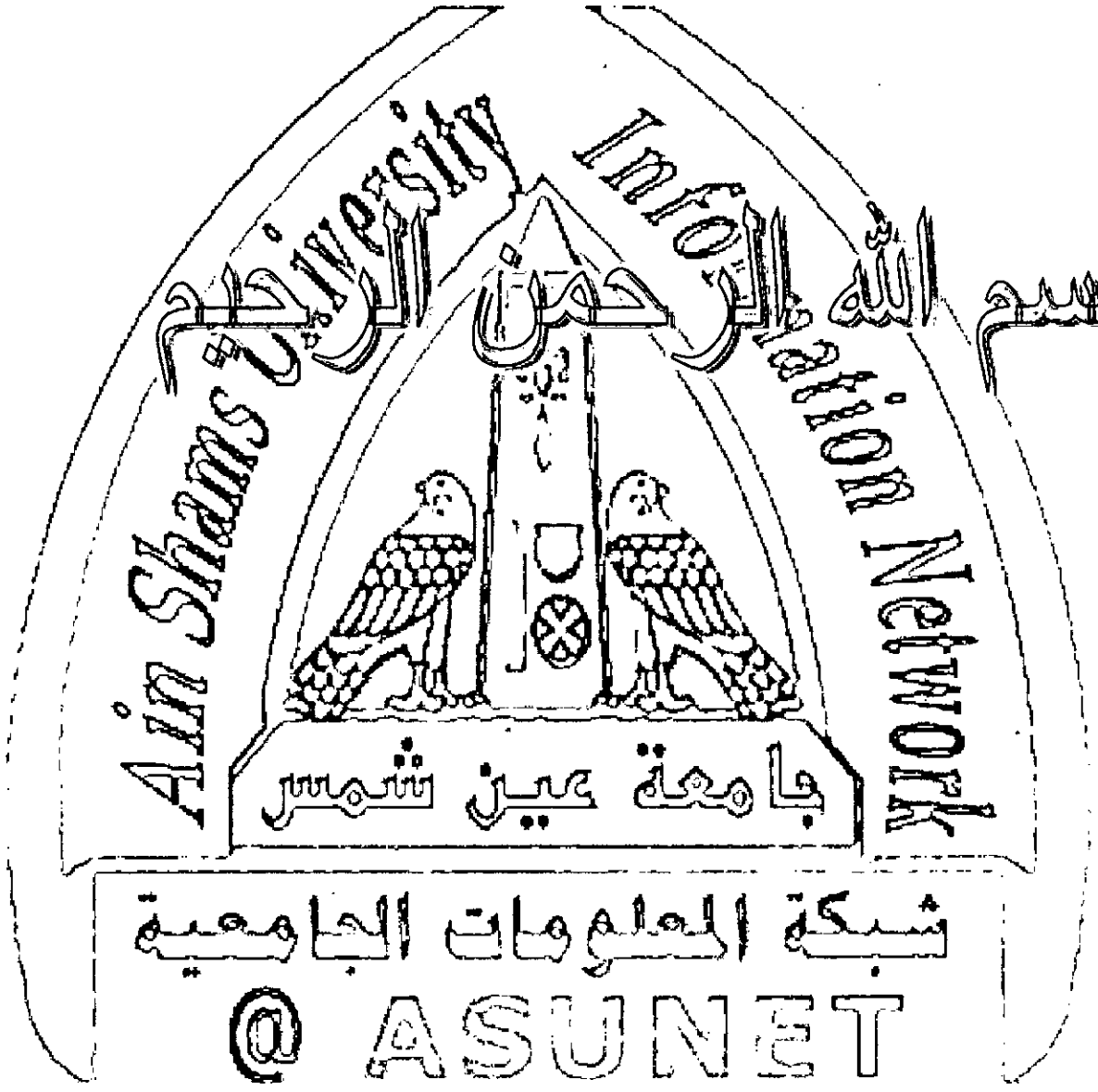
شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار
في درجة حرارة من ١٥-٢٥ منوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

بالرسالة صفحات لم ترد بالأصل

MOLECULAR CHARACTERIZATION OF HEAT TOLERANCE IN CHICKENS

BY

Mostafa Kamal Khalil Nassar

B.Sc. of Agricultural Sciences (Poultry Production)
Cairo University
1999

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of
MASTER OF SCIENCE

In
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Animal Production Department
Faculty of Agriculture
Cairo University

2005

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MOLECULAR CHARACTERIZATION OF HEAT TOLERANCE IN CHICKENS

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Dedication

To My Mother,

My Father

&

My Brother's Son (Adhm)

ACKNOWLEDGMENTS

All thanks are due to **ALLAH**, great lord, the creator of the universe, the most merciful and the most gracious.

I deeply wish to thank **Prof. Dr. Ahmed Mostageer**, Professor of Animal Breeding, Department of Animal Production, Faculty of Agriculture, Cairo University, who suggested the topic of research, for his keen supervision, parental encouragement, continuous guidance and constructive advices during the course of the study.

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Name of Candidate: Mostafa Kamal Khalil Nassar **Degree**: M.Sc.
Title of Thesis: Molecular Characterization of Heat Tolerance in Chickens
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Department: Animal Production
Branch: Animal Breeding **Approval**: 8/12/2005

Abstract

The genotype-environment interaction in relation to heat tolerance in chickens was studied based on the variation in growth and in molecular information. The genetic stocks used were of three breeds native to Egypt (White Baladi, Fayoumi and Sinai Bedouin) and a commercial broiler strain. Chicks of each stock were randomly divided into two equal groups, each was exposed to one of two thermal (heating and non-heating) treatments for eight weeks. Equal amounts of DNA of six individual samples within breed and sex were drawn and mixed together to get a mixed (pooled) DNA sample. The technique of random amplified polymorphic DNA-polymerase chain reaction (RAPD-PCR) analysis was applied to the pooled (bulk) samples using ten decamer primers.

The effect of breed on body weight was obvious and significant. This was shown in both non-heating and heating treatments. The breed differences in body weight were consistent as birds aged. The differences between breed males were typically in the same trend as shown for unsexed birds. Broiler and Sinai Bedouin female chicks, in general, showed somewhat more tolerance to heat than males. These results reveal the significant interaction between breed and temperature. The sex effect on heated birds was variable. The results of body weight gains did not differ in the trend from the results of body weights. The sex differences in growth rates in heated and non-heated birds, by breed, were similar. Therefore, the variations in growth rates between both sexes in heating conditions are due to the normal sex variation in growth.

All primers showed successful amplification of bands, with an average of 4.99 bands. Polymorphism represented 65.19% of the total bands. The amplified products varied in size from 118 to 2262 bp, overall primers. The heterozygosity estimates between breeds averaged 0.48, 0.45 and 0.44 for unsexed, male and female comparisons, respectively. The band sharing levels within breeds ranged between 0.60 and 0.81. More variability, less band sharing and more heterozygosity were observed in Fayoumi compared to the other breeds. An average genetic distance index, overall primers, of 0.42 was calculated between White Baladi and each of Fayoumi and Sinai Bedouin. The genetic distance between White Baladi and commercial broilers, however, was slightly further with an average of 0.45. Fayoumi was genetically the furthest from Sinai Bedouin with an average genetic distance of 0.53. The phylogenetic tree formed three distinct branches. Fayoumi and White Baladi formed a branch and each of Sinai Bedouin and commercial broilers formed a branch.

Our conclusion based on molecular genetics information agrees with that based on phenotypic variation.

Contents

INTRODUCTION

Poultry production in the developing regions depends, to variable degrees, on the commercial strains. However, the available facilities may not fully accommodate the intensive production using these strains. This is due to the existence of a variety of environmental stress conditions, causing poor performance of the birds. These conditions are such as the severe climates and the deficiencies in quality of feed, management and hygiene as well as the limited capital. The ability of birds to reproduce and produce under severe environments has been widely found to be breed-dependent, expressing genetic-environment interaction. The permanent and biologically-founded genetic-environment interaction can be employed to maximize the efficiency of poultry production in the regions that provide sub-optimal environments (Horst, 1985; 1989). The means to that is by identifying and exploiting genotypes specifically adapted to these environments. Therefore, to achieve ultimate improvement in the poultry production, breeding programs must target the genotypes that perform quite well in relevant regions. In this respect, high environmental temperature is a major factor restricting the efficient production of poultry meat in hot regions, using the contemporary commercial broiler strains. The negative effects of heat have been found to vary in magnitude among different breeds of chickens, settling existence of genetic basis for

resistance to heat (Washburn, 1985; El-Gendy, 1992 and Washburn *et al.*, 1992), and privileging the breeds local to the tropics and subtropics over the breeds developed in temperate regions (Horst, 1985 and El-Gendy *et al.*, 1995). On the other hand, recent molecular techniques allow detecting variation among individuals for a specific region of DNA. This variation can be used to construct genetic maps and to evaluate differences in gene expression in relation to the environmental conditions. Therefore, there is an increased interest in molecular assessment of the genetic resources and its relationship with the regional climates. In Egypt, there are many local breeds adapted to subtropical climates. These breeds need to be substantially characterized on genetic bases. So, they can be conserved as national genetic resources and can be targeted by appropriate breeding programs. The objectives of the present study were:

1. assessment of the variation in growth of some local breeds in response to heat stress conditions, and relating this variation to locality.
2. assessment of the molecular characterization of the local breeds, based on the results of random amplified polymorphic DNA analysis.
3. assessment of the phylogenetic relationship between the local breeds.

REVIEW OF LITERATURE

Variation in Growth in Relation to Heat Tolerance

Birds reach maximum growth rate when exposed to optimum ambient temperature. Berrong and Washburn, (1998) reported a temperature of 22°C for maximum growth of broiler chicks between four and six weeks of age. Ambient temperatures higher than the optimum temperature usually result in retarding growth of birds (Howlider and Rose, 1987; 1989; El-Gendy *et al.*, 1995 and Yalcin *et al.*, 2001). The increase in environmental temperature in the range of 29° to 35°C significantly decreased the body weight gain of broiler chicks (Washburn *et al.*, 1980; 1992; Cahaner and Leenstra, 1992; Cahaner *et al.*, 1993; Eberhart and Washburn, 1993 and Yalcin *et al.*, 2001). Smith (1993) reared Arbor Acres broiler chicks from 23 to 49 days of age at either a constant temperature of 23.9°C or a cyclic temperature of 23.9-35.0°C. A reduction in body weight of 21% was estimated for the chicks reared under the cyclic high temperature compared to those reared under the constant temperature. Also, body weight gain from 4 to 7 weeks of age of the broiler chicks significantly declined from 906 g for those raised in 21.2°C to 830 g for those raised in 26.7°C (Suk and Washburn, 1995). Yalcin *et al.* (1997) reported a decrease of 23% in body weight of broiler chicks reared in summer season, with diurnal temperatures ranging between 23° and 33°C, compared to the counterparts reared in