HOMEOSTATIC RESPONSES OF SHEEP TO SALINITY AND HEAT STRESS CONDITIONS

By

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B.Sc. Agric. Sci. (Animal Production), Fac. Agric., Cairo Univ., 2002
M.Sc. Agric. Sci. (Animal Physiology), Fac. Agric., Cairo Univ., 2009

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APPROVAL SHEET

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Title of Thesis: Homeostatic Responses of Sheep to Salinity and Heat Stress Conditions.
Supervisors: **Dr**. Gamal Ashour Hassan
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Department: Animal Production **Branch:** Animal Physiology
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ABSTRACT

This study was carried out at Faculty of Agriculture Experimental Research Station to assess and evaluate the integrated physiological, blood biochemical profile, immunological and productive performance of Barki ram lambs under salinity or heavy heat stress either alone or in combination in Egypt. In addition, to investigate the functions and histopathological examination of both liver and kidney as good indicators of animal health. Twenty growing Barki ram lambs (10-12 months old and 35 kg average live body weight) were randomly assigned into two equal groups (10 each). The 1st group drank tap water (TWG, 275ppmTDS) and served as control. The 2nd group drank salty water (SWG) contains 2886 ppm TDS, on average. Results indicated that the lowest drinking water intake was observed in SWG. Blood biochemical analysis indicated that SWG had lower values of PCV, TP, Glb, A/G ratio, Glu, T_3, T_4, and higher values of creatinine, AST, ALT, K^+ and cortisol. Moreover, salinity in water tended to decrease Alb, TL, TG and increase Na^+, Ca^{++}, Mg^{++}, Cl^-, T_4 and Ald than that found in TWG. The histological study showed that there was no histopathological alterations in the liver and kidney of TWG, while there was fibrosis with inflammatory cells infiltration in the liver of SWG, and there was congestion in the cortical blood vessels associated with inflammatory cells in the kidney of SWG. In addition, swelling was noticed in lining endothelium of the glomerular tuft with fibrosis and hemorrhages between the degenerated tubules. There was no difference in the productive performance of the two groups in most of the studied parameters, except for the hide, liver, fore and quarter weights. Also there was a significant difference in fat % and the color (brightness, redness, and yellowness) of the mutton. It could be concluded Barki sheep have excellent adaptive mechanisms enable them to sustain their biological processes and productive performance. Also, results proved that Baki sheep are accustomed to drinking salty water and exposing to heat stress as they originated in harsh desert conditions. Barki sheep have great capabilities to develop some adaptive mechanisms enable them to withstand salt loading or heavy heat stress, either alone or in combination.

Keywords: Barki lambs; Salty water; Heat stress; Blood metabolites; Hormones; Plasma enzymes; Plasma electrolyte; Kidney and liver histolopathology; Productive performance; Carcass characteristics.

DEDICATION

I dedicate this dissertation work to my family. A special feeling of gratitude to my husband, Yasser, ,my precious mother, Mona, whose words of encouragement, and push for tenacity ring in my ears and my wonderful sons, Ahmed and Omar.

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LIST OF ABBREVIATIONS

A/G ratio	Albumin/globulin ratio
ADG	Average daily gain
ADH	Anti-diuretic hormone
Alb	Albumin
Ald	Aldosterone
ALP	Alkaline phosphatase
ALT	Alanine amino transaminase
AST	Aspartate amino transaminase
AT	Ambient temperature
BRL	Barki ram lambs
BW	Body weight
Ca^{++}	Calcium ion
CFM	Concentrate feed mixture
Cho	Cholesterol
CK	Creatine kinase
Cl^{-}	Chloride ion
Cort	Cortisol
Cr	Creatinine
D%	Dressing percentage
dl	Desi liter (= 10^{-2}liter)
DMI	Dry matter intake
EBW	Empty body weight
ELISA	Enzyme linked immunosorbent assay
ESTW	Egyptian standards of tap water
FBW	Final body weight
FC	Feed consumption
FCR	Feed conversion ratio
FDW	Free drinking water
FQ	Fore quarters
g	Gram (= 10^{-3} kilogram)
GH	Growth hormone
GIT	Gastrointestinal tract
Glb	Globulin
Glu	Glucose
Hb	Hemoglobin
HQ	Hind quarters
HSC	Heat stress conditions

IBW	Initial body weight
IGF-1	Insulin like growth factor - 1
IgG	Immunoglobulin G
IRMA	Immunoradiometric assay
IU	International unite
K^+	Potassium ion
L	Liter (= 10^3 cm)
LBW	Live body weight
LDH	Lactate dehydrogenase
mg	Milligram (= 10^{-3}gram)
Mg^{++}	Magnesium
Na^+	Sodium ion
P^{--}	Phosphorus ion
PCV	Packed cell volume
resp.	Respectively
RH	Relative humidity
RIA	Radioimmunoassay
rpm	Revolution per minute
RR	Respiration rate
RT	Rectal temperature
SSC	Salinity stress condtions
SW	Salty water
SWG	Salty water group
TBG	Total body gain
TDS	Total dissolved solids
TFS	Total fat store
TG	Triglycerides
THI	Temperature humidity index
TL	Total lipids
TNC	Thermoneutral conditions
TNCF	Total non-carcass fat
TNZ	Thermo-neutral zone
TP	Total protein
TT_3	Total triiodothyronine
TT_4	Total thyroxine
TW	Tap water
TWG	Tap water group
WHC	Water holding capacity