INFLUENCE OF SOME HONEY BEE PRODUCTS AND GROWTH PROMOTERS ON IMMUNOLOGICAL AND PRODUCTIVE PERFORMANCE IN BROILER CHICKENS

By

AHMED HAMDY RABIE MOHAMED ALI
B.Sc. Agric. Sci. (Animal Production), Fac. Agric., Cairo Univ., 2000
M.Sc. Agric. Sci. (Poultry Production), Fac. Agric., Cairo Univ., 2011

THESIS

Submitted in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

In

Agricultural Sciences
(Poultry Production)

Department of Animal Production
Faculty of Agriculture
Cairo University
EGYPT

2018

Reviewer **Vice Dean of Graduate Studies**

APPROVAL SHEET

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Approval Committee

Dr. AZZA ABD-ALLAH EL-SEBAEI MOHAMED.....
Professor of Poultry Physiology, Fac. Agric., Alexandria University

Dr. FATEN ABD EL-FATTAH AHMED IBRAHIM.....
Professor of Poultry Husbandry, Fac. Agric., Cairo University

Dr. FARID KAMAL RAMZI STINO.....
Professor of Poultry Breeding, Fac. Agric., Cairo University

Dr. AHMED MOHAMED EL-KAIATY MOHAMED.....
Professor of Poultry Physiology, Fac. Agric., Cairo University

Date: 8 / 8 / 2018

SUPERVISION SHEET

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SUPERVISION COMMITTEE

Dr. AHMED MOHAMED EL-KAIATY MOHAMED
Professor of Poultry Physiology, Fac. Agric., Cairo University

Dr. FARID KAMAL RAMZI STINO
Professor of Poultry Breeding, Fac. Agric., Cairo University

Dr. MAGDY SAYED HASSAN HASSAN
Head Research of Poultry Husbandry, Animal Prod. Res. Inst., A.R.C.

Name of Candidate: Ahmed Hamdy Rabie Mohamed **Degree: Ph.D.**
Title of Thesis: Influence of Some Honey Bee Products and Growth Promoters on Immunological and Productive Performance in Broiler Chickens
Supervisors: Dr. Ahmed Mohamed El-Kaiaty Mohamed
Dr. Farid Kamal Ramzi Stino
Dr. Magdy Sayed Hassan Hassan
Department: Animal Production **Branch:** Poultry Science
Approval 8 / 8 / 2018

ABSTRACT

The present study was conducted to evaluate the effects of bee products (propolis, bee-pollen and bee-venom) and a growth promoter on immunological and productive performance in broiler chickens. A total of 408 straight-run one week old, Cobb 500 broilers were randomly divided into 8 experimental treatments (3 replicate, 17 chicks each). The first treatment was fed basal diet without any additives and served as a control. The second treatment was fed the basal diet supplemented with the growth promoter Biox-Y® 500 mg per kg of diet. The third and the fourth treatments were fed basal diet supplemented with propolis (200 or 400 mg/kg diet). The fifth and the sixth treatments were fed basal diet supplemented with bee-pollen (1000 or 2000 mg/kg diet). The seventh and the eighth treatments were fed the basal diet and their water was supplemented with bee-venom (1 or 2 mg/L water). Weekly body weight, body weight gain, feed intake and feed conversion ratio obtained. Blood samples were obtained at the end of the experiment (7 weeks of age) to determine blood parameters. The obtained results showed that the broiler chicks fed diet with propolis (400 mg/kg diet) had significantly higher body weight and total body weight gain compared to the control treatment. Also, all treated treatments had significantly lower average daily feed intake during the whole experimental interval and significantly improved total feed conversion ratio compared to the control and Biox-Y® treatments. The chicks fed diets containing propolis (200 or 400 mg/kg diet) or bee-venom (2 mg/L water) or bee-pollen (2000 mg/kg diet) showed significantly lower plasma cholesterol and LDL-cholesterol concentration compared to the control treatment. However, propolis (200 or 400 mg/kg diet) treatments and bee-pollen (2000 mg/kg diet) treatments had significantly higher plasma HDL cholesterol concentration than the control treatment. The chicks fed diet with propolis (400 mg/kg diet) showed significantly higher plasma T3, T4 concentration and T3/T4 ratio compared to the control treatment. The chicks fed diet with propolis (400 mg/kg diet) significantly higher breast muscles protein and moisture concentration had compared to the control and Biox-Y® treatments. At 35 days of age, the chicks fed diets containing propolis (400 mg/kg diet) or bee-venom (2 mg/L water) had significantly higher humoral immune response against sheep red blood cells compared to the control treatment. The chicks fed diets containing propolis (400 mg/kg diet) for 6 weeks had significantly higher cell mediated immune response compared to the control and Biox-Y® treatments. It was concluded to recommend adding propolis (400 mg/kg diet) or bee-pollen (2000 mg/kg diet) to broilers diets. This is an eco-friendly alternative to replace the use of antibiotics in broilers feed. This would result in improve productive, physiological performance and immune response for broiler chickens.

Key words: Broiler chicks, propolis, bee-pollen, bee-venom, productive performance, blood metabolites, immune response.

DEDICATION

I dedicate this work to whom my heart felt thanks; to my parents, my wife, my brothers and my sister for giving me their wholehearted support and great patience.

ACKNOWLEDGEMENT

Thanks to ALLAH.

I wish to express my sincere appreciation and my deep gratitude to ***Prof. Dr. Ahmed Mohamed El-Kaiaty Mohamed*** *Professor of Poultry Physiology, Animal Production Department, Faculty of Agriculture, Cairo University, for his counsel, close supervision, encouragement, help and interest as the author's advisor during the research study, and great help in reviewing and the preparation of the thesis.*

I wish also to express my deepest appreciation and deep gratitude to ***Prof. Dr. Farid Kamal Ramzi Stino,*** *Professor of Poultry Breeding, Animal Production Department, Faculty of Agriculture, Cairo University, for his kind supervision, his suggestion in the statistical analysis of the data, great help in reviewing this manuscript and his fruitful advice during this study.*

My deepest thanks to ***Prof. Dr. Magdy Sayed Hassan Hassan,*** *Head Research of Poultry Husbandry, Animal Production Research Institute (APRI), Agricultural Research Center (ARC) for his supervision and suggesting the design of this research work.*

I wish also to express my deepest thanks to ***Dr. Mohamed Abdel-Rahman El-Menawey,*** *who helped me during the statistical analysis.*

My gratitude, appreciation and geuine acknowledgment and thanks to ***Prof. Dr. Ehab Ahmed Abdallah*** *for his encouragement and valuble advice and his continuous help.*

LIST OF ABBREVIATIONS

ADFI	Average Daily Feed Intake
AI	Avian Influenza
ALT/GPT	Alanine aminotransaminase
AST/GOT	Aspartate aminotransaminase
BP	Bee-Pollen
BW	Body Weight
BWG	Body Weight Gain
CD4	Cluster of differentiation 4
cm	Centimeter
CP	Crude protein
DP	Dressing Percentage
EE	Economical efficiency
EEP	Ethanol Extract of Propolis
etc	Et cetera
FCR	Feed Conversion Ratio
FE	Feed Efficiency
FI	Feed Intake
g /dl	gram per deciliter
GIT	Gastric Intestinal Tract
Hb	Hemoglobin
HBV	Hone Bee Venom
Hct%	Hematocrit percentage
HDL-cholesterol	High-density lipoproteins cholesterol
Hi titer	Heamagglutinition inhibition titers
IBD	Infectious Bursal Disease
IgG	Immunoglobulin G
IgM	Immunoglobulin M
Kcal	kilogram calorie
LDL-cholesterol	Low-density lipoproteins cholesterol
MCD	Mast cell degranulating
ME	Metabolizable Energy
mg /dl	milligrams per deciliter
mg /L	milligrams per one litre water
ml	milliliter

ABBREVIATIONS (continued)

MOS	Mannan-oligosaccharides
NDV	Newcastle Disease Virus
NK cell	Natural killer cell
nm	nanometer
NRC	National Research Council
PBS	Phosphate buffered saline
PCV	Packed cell volume
PHA	Phytohemagglutinin
PUFA	Polyunsaturated fatty acid
RBC's	Red Blood Cells
SAS	Statistical Analysis System
SOD	Superoxide Dismutase
SRBC's	Sheep Red Blood Cells
T3	Triiodothronine
T4	Thyroxine
VLDL	very low density lipoproteins
w	weight
wk	week

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INTRODUCTION

Antibiotics have been added to poultry feed to improve growth performance, to stabilize intestinal microflora and to prevent infection by specific pathogenic microorganisms. However, concerns about antimicrobial resistance have existed for several decades, and recent concerns regarding the prevalence of antibiotic-resistant infections in humans have raised the controversy to new heights (Revington, 2002). For these reasons antibiotic growth promoters for poultry diets have been banned for use in the European Union and pressure from consumer groups and major poultry buyers has threatened their removal from diets in the US. Therefore, studies on alternate products that can result in promotion of growth, improved feed utilization, and maintenance of gut health are taking place (Zhang *et al.,* 2005). Hence, there is an urgent need to identify eco-friendly alternatives to reduce antibiotic use. One of the most promising methods of reducing antibiotics is to strengthen defense mechanisms of birds through prophylactic administration of natural immunostimulants (Jung *et al*., 2010). One of these alternatives the natural bee products is being investigated.

Studies showed that bee products (Honey, Propolis, Pollen, Venom, Royal jelly and Wax) have several biological and pharmacological properties, such as immunomodulatory, antiinflammatory, antimicrobial, antitumor, antioxidant, among others.

Several studies have emphasised the positive effects of bee pollen on the growth performance and internal functions of broiler chickens (Kačániová *et al*., 2013). Other apiculture products, such as propolis and honey, have gained attention due to their antibacterial (Basim *et al*., 2006), antioxidant (Morais *et al*., 2011) antiviral, hypolipidemic, hypoglycemic and an immunostimulating (Komosinska-Vassev *et al*., 2015) effects. Bee-pollen can also improve the cell immune response, the antibody production speed and reinforce the immunological system (Song *et al*., 2005).

Propolis has attracted researchers interest in the last decades because of several biological and pharmacological properties, such as immunomodulatory, antitumor, antimicrobial, antiinflammatory, antioxidant, among others (Bankova *et al*., 2000).

Bee-venom (BV) plays a major role in the defence of bee colonies. It is produced in the venom gland of the bee, located in the abdominal cavity. This natural toxin is a complex mixture of proteins (phospholipase A2 and hyaluronidase), peptides (melittin, apamine, mast cell degranulating and adolapine) and low molecular components (histamine, dopamine and norepinephrine) [Oršolić, 2012].

It has recently been demonstrated that whole BV, and some of its components particularly melittin, possess antinociceptive and anti-inflammatory activities in very small doses (Kwon *et al*. 2002). Moreover, BV possesses a number of beneficial biological effects, such as wound-healing (Han *et al*., 2011) and anticancer activities (Oršolić, 2012).