



Tanta University
Faculty of Agriculture
Animal Production Department

Productive and reproductive performance of local sheep as affected by bee pollen supplementation.

By

Mohamed Mohamed Ahmed Fodail

B.Sc. Agric. (animal production) Al-Azhar University. (2011)

THESIS

Submitted to the Graduate Division
in Partial Fulfillment of the Requirements
for the Degree of

Master of Science in Agricultural Science
In
(Animal Production)

Department of Animal Production

Faculty of Agriculture

Tanta University

2019



Tanta University
Faculty of Agriculture
Animal Production Department

Productive and reproductive performance of local sheep as affected by bee pollen supplementation.

By

Mohamed Mohamed Ahmed Fodail

B.Sc. Agric. (animal production) Al-Azhar University.(2011)

SUPERVISION COMMITTEE

Prof. Dr. Sherief Gaber

Professor of Animal Physiology.
Animal Production Department
Faculty of Agriculture
Tanta University

Prof. Dr. Essam El-deen Shehata

Prof. of Animal Husbandry.
Animal Production Research Institute
Agriculture Research Center

Abstract

The aim of this study was to evaluate the effect of oral administration of different levels of bee pollen (BP), during pre- and post-partum, on productivity and reproductive of Rahmni ewes as well as growth performance of offspring. Total of 21 ewes, at last six weeks of pregnancy, were divided into three groups (7 per group). Ewes in the 1st group were fed a basal diet without treatment (control, G1), while those in the 2nd (G2), and 3rd (G3) groups were fed the same basal diet beside a daily oral dose of 100 and 200 mg BP/gk BW, respectively. Feeding period started 4-6 weeks pre-partum until mating. Live weight (LBW) of ewes and lambs was recorded. Colostrum was analyzed and milk yield and composition were determined. Hematological parameters including, count of blood cells, red (RBCs) and white (WBCs), packed cell volume (PCV%), hemoglobin (Hb), mean cell volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), and differential leukocyte percentages were determined at weaning and mating. Concentrations of total proteins (TP), albumin (AL), urea and creatinine, and activities of alanine aminotransferase (ALT) and aspartate amino-transferase (AST) as well as Antioxidant status including MDA, GSH and CAT assayed in blood serum and some reproductive traits. Results showed that LBW of ewes during pre-partum, at lambing, suckling, weaning and post-weaning was not affected by BP. Contents of fat, protein, organic matter and total solids were the highest ($P<0.05$) in G3, while the lowest in G1. Average daily milk yield (ADMY) of ewes was not affected by BP. The ADMY decreased ($P<0.05$) only at the 7th week, showing the highest ADMY at the 3rd week. The milk fat and total solids contents only increased ($P<0.05$) in G2 and G3, being the highest in G3. Count of RBCs, and erythrocytic indices, except MCHC, were higher ($P<0.05$) in G3 than in G1 and G2, while WBCs count, lymphocyte percentage ($P<0.05$), GSH ($P<0.01$) and catalase ($P<0.01$) increased in G2 and G3 than in G1, being the highest in G3. Meanwhile, there was a decrease in neutrophils percentage, urea-N and MAD concentration in G3 than in G1 and G2. Post-partum 1st estrus/mating interval was affected significantly ($P<0.05$) by BP treatment, being the shortest in G3. Overall mean of P4 concentration was the highest insignificantly in G3, followed by G2, and the lowest in G1. BP treatment, especially at G3, was better on estrus/mating rate, lambing rate and litter size of ewes during May breeding season than G1 and G2. All growth performance parameters of lambs were not affected by treating ewes with BP.

In conclusion, oral dose of 200 mg bee pollen /kg LBW pre- and post-partum period has impact on milk yield, milk composition, blood parameters, antioxidant capacity and reproductive performance of ewes as well as on colostrum composition and subsequently improved growth performance of produced lambs.

CONTENTS	Page
INTRODUCTION	1
REVIEW OF LITERATURE	3
1. Bee pollen.....	3
<i>1.1 Properties of bee pollen</i>	4
<i>1.2 Chemical composition of bee pollen</i>	5
<i>1.3. Vitamins, minerals and amino acids in bee pollen</i> ...	6
2. Effect of bee pollen on antioxidant defense system.....	9
3. Use of bee pollen in animal production.....	13
4. Effect of bee pollen on animal growth performance.....	14
<i>4.1. Live body weight and weight gain</i>	14
<i>4.2. Feed intake and feed conversion</i>	16
5. Effect of bee pollen on viability rate	17
6. Effect of bee pollen on milk production	18
7. Effect of bee pollen on reproductive performance	18
8. Effect of bee pollen on blood constituents.....	20
<i>8.1. Immunoglobulin concentration</i>	20
<i>8.2. Hematological parameters</i>	23
<i>8.2.1. Erythrocyte indices</i>	23
<i>8.2.2. White blood cells (WBC's) and their differentiation</i>	24
<i>8.3. Blood biochemical</i>	25

8.3.1. <i>Protein metabolites</i>	25
8.4. <i>Kidney function</i>	28
8.4. <i>Enzyme activity</i>	29
MATERIALS AND METHODS	31
1. Animals.....	31
2. Experimental groups.....	31
3. Feeding system.....	32
Experimental procedures:	
4. Live body weight.....	33
5. Milk production and composition.....	33
5.1. <i>Milk yield</i>	33
5.2. <i>Milk composition</i>	33
5.3. <i>Management of suckling lambs</i>	33
6. Blood samples.....	34
7. Blood Biochemical Parameters	34
8. Hematological Parameters.....	35
9. Evaluation of oxidative stress and antioxidant biomarkers ...	35
10. Progesterone (P4) analysis	35
11. Environmental conditions	35
12. Statistical analysis.....	36
RESULTS AND DISCUSSION	37
1. Live body weight ewes	37
2. Colostrum characteristics	39

3. Milk production	42
3.1. Average daily milk yield.....	42
3.2. Milk composition.....	44
4. Hematological parameters	47
4.1. Erythrogram.....	47
4.2. Leuckogarm	49
5. Biochemical parameters.....	51
6. Enzyme activity.....	56
7. Antioxidant status of ewes.....	59
8. Reproductive performance of ewes (May season).....	63
8.1. Reproductive measurements.....	63
8.2. Progesterone profile.....	65
9. Growth performance of lambs.....	67
Appendix of ANOVA Tables	69
SUMMARY AND CONCLUSIONS	77
REFERENCE	80
ARABIC SUMMARY	-

LIST OF TABLES

Table No.	Title	Page
Table 1 :	Chemical composition of ingredients and experimental diets (% on DM basis).....	32
Table 2 :	Average values of ambient temperature (°C), relative humidity (%) and Temperature humidity index (THI) of ewes during mating season (16 th May to 10 th July)...	36
Table 3 :	Average live body weight (kg) of ewes during different physiological stages as affected by bee pollen treatment.....	38
Table 5 :	Colostrum composition of ewes in experimental groups at lambing and after 48 h of lambing as affected by bee pollen.....	40
Table 7 :	Average daily milk yield (ADMY) of ewes in experimental groups as affected by bee pollen at different lactation weeks.....	42
Table 9 :	Milk composition of ewes in experimental groups as affected by bee pollen at different lactation weeks.....	44
Table 11:	Red blood cells (RBCs) count, hemoglobin (Hb) concentration, packed cell volume (PCV %) and erythrogram in blood of ewes in experimental groups at weaning and mating.....	48
Table 13:	White blood cells (WBCs) count and leukocyte differentiation (%) in blood of ewes in experimental groups at weaning and mating.....	50
Table 15:	Biochemical constituents in blood serum of ewes in	53

	experimental groups at different physiological statuses...	
Table 17:	Enzyme activity of AST and ALT in blood serum of ewes in experimental groups at different physiological statuses...	58
Table 19:	Antioxidants level in blood serum of ewes in experimental groups during all periods as affected by BP.....	60
Table 21:	Reproductive performance of ewes in experimental groups during mating period (May season) as affected by bee pollen treatment.....	64
Table 23:	Progesterone level in blood serum of ewes in experimental groups during suckling and mating periods.....	65
Table 25:	Growth performance of lambs of ewes in experimental groups.....	68

Appendix of ANOVA Tables

Table No.	Title	Page
Table 4 :	Analysis of variance of LBW of ewes during different physiological stages as affected by bee pollen treatment...	69
Table 6 :	Analysis of variance of colostrum composition of ewes at lambing and 48 h after lambing as affected by bee pollen treatment.....	70
Table 8 :	Analysis of variance of ADMY of ewes as affected by BP treatment, lactation week and their interaction.....	71
Table 10 :	Analysis of variance of milk composition of ewes as affected by BP treatment, lactation week and their interaction.....	71
Table 12:	Analysis of variance of erythrogram in blood of ewes as affected by BP, time and their interaction.....	72
Table 14:	Analysis of variance of leukogram in blood of ewes as affected by BP treatment, sampling time and their interaction.....	73
Table16:	Analysis of variance of biochemical constituents in blood serum of ewes as affected by treatment, period and their interaction.....	74
Table18:	Analysis of variance of serum AST and ALT activity of ewes as affected by treatment, period and their interaction.....	75
Table 20:	Analysis of variance of antioxidants level in blood serum of ewes as affected by treatment, period and their interaction.....	75
Table 22:	Analysis of variance of reproductive performance of ewes	76

	in experimental groups during mating period (May season) as affected by bee pollen.....	
Table 24:	Analysis of variance of progesterone level in blood serum of ewes as affected by treatment, period and their interaction.....	76
Table 26:	Analysis of variance of productive performance of lambs during suckling period (60 days) as affected by bee pollen treatment.....	76

LIST OF FIGURE

Fig. No.	Title	Page
Figure 1:	Change in live body weight of ewes in experimental groups at different physiological stages.....	38
Figure 2:	Change in colostrum contents of ewes in experimental groups at lambing and 48 h post-lambing.....	41
Figure 3:	Change in ADMY of ewes in the experimental groups at different lactation weeks.....	43
Figure 4:	Change in fat content in milk of ewes in the experimental groups at different lactation weeks.....	45
Figure 5:	Change in protein content in milk of ewes in the experimental groups at different lactation weeks.....	45
Figure 6:	Change in lactose content in milk of ewes in the experimental groups at different lactation weeks.....	46
Figure 7:	Change in TS content in milk of ewes in the experimental groups at different lactation weeks.....	46
Figure 8:	Change in SNF content in milk of ewes in the experimental groups at different lactation weeks.....	46
Figure 9:	Change in ash content in milk of ewes in the experimental groups at different lactation weeks.....	47
Figure 10:	Change in level of serum total proteins, albumin and globulin in the experimental groups at different physiological stages.....	54
Figure11 :	Change in level of serum urea in the experimental groups at different physiological stages.....	55
Figure 12:	Change in level of serum creatinine in the experimental	56

	groups at different physiological stages.....	
Figure 13:	Change in serum AST and ALT activity in the experimental groups at different physiological stages....	58
Figure 14:	Change in serum MDA concentration in the experimental groups at different physiological stages.....	61
Figure 15:	Change in serum GSH activity in the experimental groups at different physiological stages.....	61
Figure 16:	Change in serum catalase activity in the experimental groups at different physiological stages.....	62
Figure 17:	Concentration of serum P4 level in ewes of experimental groups during suckling and mating period.....	66

LIST OF ABBREVIATIONS

ADMY	Average daily milk yield
AETG	The Agriculture Engineering Technology Guide
AL	Albumin
ALT	Alanine aminotransferase
APRI	Animal Production Research Institute
AST	Aspartate aminotransferase
AT	Air temperatures
BB	Bee bread
BH	Berssem hay
BP	Bee pollen
BS	Black seed
BW	Body weight
CF	Crude fiber
CFM	Concentrate feed mixture
CP	Crude protein
<i>db °F</i>	Dry bulb temperature in Fahrenheit
DCP	Digestible crude protein
DM	Dry matter
EE	Ether extract
FB	Fresh berssem

GL	Globulin
GSH	Glutathione
Hb	Hemoglobin
IgA	Immunoglobulin A
IgG	Immunoglobulin G
IgM	Immunoglobulin M
IU	International unit
LBW	Live body weight
MCH	mean corpuscular hemoglobin
MCHC	mean corpuscular hemoglobin concentration
MCV	mean cell volume
MDA	Malonaldehyde
MS	Mean Square
NFE	Nonfat extract
NRC	National Research Council
NS	Not significant
OM	Organic matter
P4	Progesterone
PCV	Packed cell volume
PP	post-partum
PS	Polysaccharides

RBCs,	Red blood cells
RH	Relative humidity
S.O.V.	Source of variance
SNF	Solids not fat
SRBCs	Sheep red blood cells
TDN	Total digestible nutrition
THI	the temperature-humidity index
TS	Total solids
UN	Urea nitrogen
WBCs	White blood cells