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**Effect of Using Chitosan and Mannan-oligosaccharides
on Productive and Physiological Performance of Laying
Hens**

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ABSTRACT	
<p>This experiment was conducted to study the effects of chitosan (COS) and mannan-oligosaccharides (MOS) supplementation on productive, reproductive and physiological performance of Mandarah chicken strain. A total number of 210 laying hens and 21 cocks of Mandarah chicken strain at 34 to 50 weeks of age were randomly chosen and distributed into 7 groups (30 hens and 3 cocks each). The 1st group was served as a control group, which fed only on a basal diet. The 2nd, 3rd and 4th experimental groups were fed a basal diet supplemented with three levels of chitosan oligosaccharides: 0.1, 0.2, and 0.5 g/kg diet, respectively. The 5th, 6th and 7th experimental groups were fed a basal diet supplemented with three levels of mannan-oligosaccharides: 0.1, 0.2, and 0.5 g/kg diet, respectively. Results of this study revealed that there were significant differences among treatment groups in most studied traits. The hens fed COS and MOS at different levels had significantly increased laying rate, egg mass, serum levels of IgG, IgM, and antibodies to AI and ND, improved feed conversion ratio and significantly decreased serum cholesterol, ALT levels and total mortality rate compared to the control group. Hens fed chitosan at level of 0.2 g/kg diet had significantly increased number of ovarian yellow follicles and serum concentration of E₂ compared to control and all treatment groups except with COS at level of 0.1g/kg diet. The highest percentage of fertility and hatchability were recorded in eggs laid from birds fed COS at level of 0.2 g/kg diet, but the lowest values were detected in eggs laid from control birds. Economic efficiency was increased, and relative economic efficiency was improved in all chitosan groups compared with control and other MOS treatment groups. It could be concluded that using chitosan at levels of 0.1 and 0.2 g/kg diet increased significantly productive performance, reproductive efficiency, and economic efficiency of Mandarah chicken strain.</p> <p>Key words: chitosan, mannan, productive, reproductive traits, Mandarah chicken strain.</p>	

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LIST OF ABBREVIATIONS

Abbreviations	Description
AGP	Antibiotic growth promoters
AI	Avian Influenza
ALP	Alkaline phosphatase
ALT	Alanine aminotransferase
AST	Aspartate aminotransferase
BW	Body weight
BWG	Body weight gain
C3	Complement component 3
C4	Complement component 4
Ca⁺⁺	Calcium
CBW	Change in body weight
CD	Crypt depth
CD4	Cluster of differentiation 4
ChNP	Chitosan nano particles
cm	Centimeter
COS	Chitosan oligosaccharides
CS	Chitosan
CWP	Cell wall proteins
DA	Degree of acetylation
DDA	Degree of deacetylation
DDGS	Dried distiller's grains with solubles
E2	Estradiol
EDE	Early dead embryo
EE	Economic efficiency
EM	Egg mass
EN	Egg number

EOB	Essential oil blend
EP	Egg production
ESI	Egg shape index
EW	Egg weight
FBW	Final body weight
FC	Feed consumption
FCR	Feed conversion ratio
FI	Feed intake
FimH	Lectins
FOS	Fructo-oligosaccharides
GALT	Gut associated lymphoid tissue
GIT	Gastrointestinal tract
GlcNAc	N-acetyl glucosamine
H/L	Heterophils and lymphocytes
Hb	Hemoglobin
HDL	High density lipoprotein
HU	Haugh unit
IBD	Inflammatory bowel disease
IBV	Infectious bronchitis virus
IBW	Initial body weight
IgA	Immunoglobulin A
IgG	Immunoglobulin G
IgM	Immunoglobulin M
LBW	Live body weight
LBWC	Live body weight change
LDE	Late dead embryo
LDL	Low density lipoprotein
LY	Live yeast
MOS	Mannan oligosaccharides
mRNA	Messenger ribonucleic acid

µm	Micrometer
ND	Newcastle disease
NDV	Newcastle disease virus
No.	Number
NRC	National Research Council
P	Phosphor
PAMP	Pathogens associated molecular patterns
PIP	Pipped
RBC	Red blood cell
SCFA	Short-chain fatty acids
T	Testosterone
TMR	Total mortality rate
TP	Total protein
VH	Villus height
VLDL	Very low-density lipoprotein
WBC	White blood cell
YSI	Yolk shape index
ZnB	Zinc bacitracin