بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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MONA MAGHRABY

Effects of Chitosan Nanoparticles on the Growth Rate and Reproductive Performance of the Nile Tilapia, *Oreochromis niloticus*

A THESIS

"submitted for the award of Ph.D. Degree of Science in Zoology"

By

Marwa Medhat El-Sayed Mostafa Kamal El-Naggar

M.Sc. in Zoology, 2016

Assistant Lecturer,
Zoology Department, Faculty of Science,
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ABSTRACT

Chitosan (CS) is drawing a lot of attention and starts to play a significant role in the sustainability of aquaculture. It meets the environmental criteria, as an eco-friendly compound, helps the efficient use of reagents and reduces the possible waste as well. The current study was conducted to evaluate the effect of dietary supplementation of CS and chitosan nanoparticles (CSNP) on the Nile tilapia growth performance, feed utilization growth, health, immune response and histopathology of gonads as well as gills and liver. In the present study, chitosan was extracted from the exoskeleton wastes of ***Procambarus clarkii*** with degree of deacetylation 87%.

The experimental design was completely randomized with three replicates in a 2 x 3 factorial design; with two different based diets; fishmeal-based diet (FM) and gluten meal-based diet (GM), and with three forms of chitosan (zero-chitosan as a control, CS and CSNP). A total of 270 ***O. niloticus*** fingerlings (with an average initial body weight of 15.3 ± 0.08 g) were randomly distributed into six different treatments with a triplicate of 15 fish each. The experiment lasted for 82 days.

Results indicated that the addition of CS and CSNP to GM-based and FM-based diets promoted the innate immunity, health status, antioxidant activity and biochemical parameters of all experimental fish. The growth performance parameters and feed utilization of fish fed GM-based diets were improved by the addition of CSNP. On the contrary, the addition of CS and CSNP affected negatively the growth and utilization of the FM-based diets.

On the other hand, total substitution of fishmeal-based diet by gluten-meal-based diet affected the histological structure of both the gills and liver. However, CSNP fortification to GM-based diets improved the architecture of both of them. Concerning the histopathological studies of ovaries and testes, neither the protein source nor the chitosan forms affected the reproductive status or stages of ***O. niloticus***. CSNP increased the omega 3 level in all experimental fish that will make it safe for human consumption.

So, the present study recommends addition of supplementary CSNP to the plant-based protein diet of the Nile tilapia for better growth performance, health and disease resistance, as well as augmentation of nutritional value for fish, as well as human being.

Key words: ***Oreochromis niloticus***, Nile Tilapia, Chitosan Nanoparticles, Gluten, Fishmeal, Growth Performance, Immunity.

LIST OF ABBREVIATIONS

Abbreviation	Meaning
ALT	Alanine aminotransferase
ANOVA	Analysis of variance
AST	Aspartate aminotranseferase
At.fo	Atretic follicle
ATP	Adinosine triphosphate
B.f	Biological filter
Bl.b	Balbini's body
Bs.m	Basement membrane
BWG	Body weight gain
CAT	Catalase
Ce.v	Central vein
Cg	Congestion
CH_3-CO	Acetyl group
Ch.nu.oc	Chromatin nucleolar oocyte
CO	Cholesterol oxidase
CS	Chitosan
CSNP	Chitosan nanoparticles
CT	Collecting tank
Cy	Cyst
DDA	Degree of deacetylation
D.p.c	Degenerated pavement cell
DTNB	Ellman's reagent
E	Edema
EDTA	Ethylenediamine tetraacetic acid
Ep. Li	Epithelial lifting
FCR	Feed Conversion Ratio
FI	Feed intake
FMCNP	Fishmeal supplemented with chitosan nanoparticles
FMC	Fishmeal supplemented with chitosan
FTIR	Fourtier-transform infrared
G.F	Gill filament
G.l	Gill lamella
GM	Gluten meal

GMCSNP	Gluten meal supplemented with chitosan nanoparticles
GMCS	Gluten meal supplemented with chitosan
GPx	Glutathione peroxidase
GR	Glutathione reductase
GSH	Glutathione
H	Hepatocyte
Hct	Hematocrit
Hd	Head
In.se	Interlobular septum
K.c	Kupffer cell
L.vc	Lamellar vacuolation
Li.d	Lipid depletion
MCH	Mean corpuscular hemoglobin
MCHC	Mean corpuscular hemoglobin concentration
MCV	Mean corpuscular volume
MF	Mechanical filter
N	Nucleus
NAD	Nicotinamide adenine dinucleotide
NADPH	Nicotinamide adenine dinucleotide phosphate
Na OCl	Sodium hypochlorite
Nc	Necrosis
NH_3	Un-ionized form of ammonia
NH_4^+	Ionized ammonia
NH_3-N	Total ammonia nitrogen
Ns.ot	Nucleolar outpocketing
Nu	Nucleolus
Og	Oogonium
Op	Ooplasm
PA	Phagocytic activity
P.c	Pavement cell
PER	Protein efficiency ratio
PI	Phagocytic index
Pi.c	Pillar cell
Pi.ca	Pillar capillary
Pnu.oc	Perinucleolar oocyte