بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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Metagenomic Studies on Microbial Community Structure of Biofloc System

A thesis presented by

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Abstract

This work aimed to investigate the effect of *Aeromonas sobria* challenge on the microbial community structure of water and fish gut and histopathological alterations of gills and skin in Nile tilapia reared under biofloc system compared to clear water system. The fish were distributed into four groups: two biofloc groups (*A. sobria* challenged group and control group) and two clear water system groups (*A. sobria* challenged group and control group). The fish were challenged by an I/P injection of the *A. sobria* strain. Genomic DNA was extracted from water and fish gut samples in both systems and subjected for metagenomic 16S rRNA sequencing using Illumina Novaseq 6000 sequencing platform. Severe histopathological alterations were noticed in gills in CWS, while mild

histopathological alterations were noticed in gills in BFT. The predominant phyla were Firmicutes, Proteobacteria, Actinobacteria, Verrucomicrobia, Bacteriodetes, and Fusobacteria. Interestingly, Firmicutes was found significantly higher in the gut of fish reared in BFT than in CWS, but after the infection significantly decreased in BFT. The results of this work concluded that BFT could protect the gills of Nile tilapia against the *A. sobria* challenge. Genera Gemmobacter, Akkermansia, and Cetobacterium increased after infection. So that the use of these genera as probiotic agents competing against the *A. sobria* challenge needs further studies.

Dedication

To My lovely Father and mother.

To my great wife (Yasmine).

To my baby (Farida), brother, sisters, and friends.

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Contents

List of abbreviations

µl	Microliter.
16S rRNA	16S ribosomal ribonucleic acid.
A.sobria	*Aeromonas sobria*.
AHRI	Animal Health Research Institute.
AOB	Ammonia oxidizing bacteria.
BFT	Biofloc technology.
℃	Degree Celsius.
C: N	Carbon: Nitrogen.
CFU/ml	Colony-forming unit/milliliter.
COD	Chemical oxygen demand.
CWS	Clearwater system.
DGGE	Denaturing gradient gel electrophoresis
DNA	Deoxyribonucleic acid.
EDTA	Ethylenediamine tetraacetic acid.
EU	European Union.
FAO	Food and Agriculture Organization.
GIT	Gastrointestinal tract.

I/P	Intraperitoneal.
IACUC	Institutional Animal Care and Use Committee.
LAB	Lactic acid bacteria.
MAS	Motile aeromonas septicemia.
mg/l	Milligram/ liter.
mgNaco3/l	Milligram Naco3/ liter.
Ml	Milliliter.
NGS	Next-generation sequencing.
NH4+-N	Ammonium- nitrogen.
No2-N	Nitrite- nitrogen.
NOB	Nitrogen oxidizing bacteria.
OTUs	Operational taxonomic units.
PCR	Polymerase chain reaction.
Ppt	Part per thousand.
RAS	Recirculating aquaculture system.
SE	Standard error.
TAE	Tris-acetate EDTA.
TAN	Total ammonium nitrogen.