Cairo University
Faculty of Veterinary Medicine
Department of Fish diseases & management

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Effect of Some Pollutants on Tilapia Fish in Fayoum Governorate, Egypt.

Thesis Presented by

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(B.V.Sc. 2009, Beni-Suif University)

For the degree of
Master in Veterinary Medical Science
(Fish Diseases &Management)

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Dokki - Giza

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Abstract

Fish diseases are the result of interaction between host, pathogen and environmental conditions. The need to better understand the contribution of each element on the development of fish diseases has always been a priority to improve the fish aquaculture practices. In this work we evaluated the water parameters, bacterial fish pathogens and the potential relationships between them with special focus on the most prevalent bacterial pathogen in five different fish farms at Fayoum Governorate, Egypt. Water samples were analyzed and heavy metals levels were determined. Fish samples were examined for bacterial infections and its histopathological alterations in infected fish. Assessment of the most virulence of most prevalent bacterial strain has been studied via molecular detection of genetic determinants. The most prevalent bacterial spiecies were; *Aeromonas hydrophila* 18.8, *A.sobria* 13.2%, *Ps. putida* 14%, *Ps.fluresnence* 10% and *Flavobacterium* spp. 8.4% . Positive linear correlation between heavy metal levels and bacterial infections were detected with correlation coefficient r (Fe = 0.74, Zn =0.63, Ni = 0.58). *Aeromonas hydrophila* showed resistance to commonly used antibiotics Oxytetracyclin and Amoxicillin, however less commonly used antibiotics (trimethoprim– sulfamethoxazole, Ciprofloxacin, Kanamycin, novobiocin, and chloramphenicol) proved to be effective. PCR detection of virulence factors showed the presence of Act, Ast,Alt and Ela virulence genes in the isolated strains. Aerolysin phylogeny was studied in order to infer structural similarity between homologous toxins; it showed great similarity between toxins from Aeromonas and Vibrio. The drug discovery efforts revealed important potential natural compounds that can act as inhibitors for the aerolysin toxin that can further be studied clinically.

Keywords: Water pollution; Bacterial pathogens; Characterization; Diagnosis; Fish diseases, Bioinformatics.

TO WHOM I LOVE…….

FATHER, MOTHER, AND ALL MY FAMILLY

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

Introduction

In the context of continuous nutritional protein shortage crises which was aggravated lately in Egypt, fish arise to play an essential role as one of the main nutritional protein sources. Fish production industry in very recent years shaped its importance in economical development, stimulating local market economy and providing abundant source for foreign exchange featuring the sector importance in national economy as one of the most promising sources for national income **Soliman and Yacout (2016).**

The rapid growth in the fish production in Egypt can be considered as a promising success story helping to feed the Egyptian population. Farming Production has increased from about 92.5 thousand tons in 1971 to more than 1097,544 t in 2013, forming about 75.46 % of the total country's fish production **GAFRD (2014).**

Nile tilapia is the most native cultured fish in Egypt **Gilbert (2002)**. Egypt achieved advanced global rank in tilapia production in recent years **Hebisha and Fathi (2014)**. With earthen pond semi-intensive culture system being the most implemented culturing system in use, and the use of agricultural drainage in the aquaculture water input makes the quality of water arise to form a real concern in the advancement of fish production in Egypt **Canli (2000)**.

Many challenges are facing fish culturing sector, holding it back from achieving its intended goals. On the top of these problems comes the scarcity of water resources. Aquaculture in Egypt is not allowed to use irrigation/Nile water and is generally dependent on

water from agricultural drainage channels and ground water. Such limited resource is suffering from continuous pressure of decreasing quality due to elevated rates of pollution as well as increased pathogen load. **Soliman and Yacout (2016).**

Fish diseases has always been perceived as a result of interaction of three main factors; host, pathogen and environment. As it affects both pathogen load and host immunity; the environmental conditions has always been viewed as the principal determining factor in the development of disease **Saeed and Shaker (2008)**. However the bacterial load and host immunity and health state play a principal role in the prevention or advancement of the disease.

Bacterial pathogens particularly is considered one of the main causes of diseases in fish culture, where the virulent bacteria pathogen plays a vital role in the infection process, other factors may intensify the severity of the problem. Environmental and managemental factors play as important role as the presence of the pathogen in the formation of the disease.

Bacterial diseases are considered as one of the most important problems facing the aquaculture industry; it has been estimated that 10% of fish loss in aquaculture is due to disease and more than 50% of these losses are due to bacterial agents **Freund *et al.* (1990)**. For those bacterial diseases, the presence of specific bacterial agents is essential for the infection to happen. Many of fish bacterial pathogenic agents can present in the digestive tract of apparently healthy fish or even

naturally commensals in the ambient environment like the Aeromonas species; but their ability to cause a disease outbreak is always dependant on the weakening of the host organism and/or an increase in the organism virulence **Austin and Austin (2007)**.

The aim of this work is to assess the levels of heavy metals pollution and bacterial pathogens in some fish farms of Fayoum Governorate, as well as assessment of their role in the development of fish diseases as one of most devastating problems facing aquaculture industry in Egypt.