# EFFECTS OF FEEDING DIETS CONTAINING DIFFERENT ALGAE SOURCES ON FISH GROWTH UNDER INTENSIVE CULTURE CONDITIONS

By

**ZEINAB MOHAMMED ALI ABD EL- AZEEM**

B. Sc. Agric. Sc. (Animal Production), Ain Shams University, 2005

M. Sc. Agric. Sc. (Animal Nutrition), Ain Shams University, 2011

**A Thesis Submitted in Partial Fulfillment**

**Of**

**The Requirement for the Degree of**

## DOCTOR OF PHYLOSOPHY
## in
## Agricultural Sciences
## (Animal Nutrition)

**Department of Animal Production**

**Faculty of Agriculture**

**Ain Shams University**

**2019**

**Approval Sheet**

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## ABESTRACT

**Zeinab Mohammed Ali Abd El-Azeem. Effects of feeding diets containing different algae sources on fish growth under intensive culture conditions. Un-published PhD. thesis, Department of Animal Production, Faculty of Agriculture, Ain Shams University, 2019.**

The study was carried out in Faculty of Agriculture, Ain Shams University to assess the effect of two types of algae (*spirulina platensis* and *Nannochloropsis oculata*) on growth performance of monosex Nile tilapia fish *(Oreochromis niloticus)* which supplemented in based experimental diet at (3,5, 7%) for each alga species. seven experimental treatments were performed in three replicates each, and designed as follows: The 1st treatment was the control (34% protein), The 2nd treatment was basal diet supplemented with 3% spirulina (spiru 3), The 3rd was basal diet supplemented with 5% spirulina (spiru 5), The 4th treatment was basal diet supplemented with 7% spirulina (spiru 7) , The 5th treatment was basal diet supplemented with 3% nannochloropsis (nanno 3), The 6th treatment was basal diet supplemented with 5% nannochloropsis (nanno 5) and the 7th treatment was basal diet supplemented with 7% nannochloropsis (nanno 7). Experimental tanks were part of closed recirculating system, where environmental conditions were kept constant throughout the experimental period. Twenty-one quadrate fiber glass tanks 60 × 60 × 30 cm, width, depth, height, respectively each was stocked with 15 fish per tank. The average individual initial body weight (2.7 g) was recorded at the beginning of the experiment. All fish in each tank were weighed every two weeks during the whole experimental period. The experimental fish were fed 34%±0.4 crude protein-based diet for 93 days. At the end of the experimental period; twelve O. *niloticus* juveniles from each experimental group were randomly taken for blood sampling and three fish were taken and dissected from each tank to obtain the liver, stomach and intestine to make histological investigation. The rest were taken for carcass analysis.

Results indicate that treatment nanno 5 had a significant difference ($P<0.05$) in final body weight (FBW), average weight gain (AWG) and average daily gain (ADG) and it was noticed that the highest specific growth rate (SGR), feed conversion ratio (FCR) and feed efficiency ratio (FER) found in nanno 7. Also, it was observed that spiru 7 have a significant difference ($P<0.05$) in protein efficiency ratio (PER) and protein productive value (PPV). On the other hand, the result shown that the lowest AWG, ADG and (FER) appeared in spiru 7%. It was found that no mortality in nanno7 and spiru 7. In blood parameters experiment the result showed that supplementing dietary with *spirulina* and *Nannochloropsis* had a high significate effect on all the measured parameters ($P < 0.05$) among the treated groups. The examination of intestinal and stomach tissue sections revealed no striking macroscopic differences between control and treated groups. In addition, the liver tissue transverse sections examination showed the control hepatocytes exhibit mild lipid deposition vacuoles and peripheral displacement of the nuclei.

**Key words:** Microalgae, *Spirulina platensis*, *Nannochloropsis oculata*, Feed additive and Tilapia.

## ACKNOWLEDGEMENT

First and foremost, all praise to Allah; the Magnificent, the merciful, without whose bless and guidance this work would never have been started nor completed.

I want to thank **Dr. Mohamed Fathy Mohamed Osman**, Prof. of Fish Nutrition, Department of Animal Production, Faculty of Agriculture, Ain Shams University, for his supervision, support, and valuable suggestion throughout the course of this study.

Deep gratitude is due to **Dr. Amin EL-Gamal,** (May God have mercy on him**)** Professor Emeritus of fish production, Department of Animal Production, Faculty of Agriculture, Ain Shams University for kind help, close supervision, continued encouragement throughout the research study Until his death.

I would like to thank my supervisor, **Dr. Tarek Abo El Makarem Ali**, Lecturerure of fish nutrition, Department of Animal Production, Faculty of Agriculture, Ain Shams University, for his supervision, support, and his advices throughout the course of the study.

I would like to express my sincere gratitude to **Dr. Kareem Mohamed Ahmed**, Fish Production Branch, Animal Production Department, Faculty of Agriculture, Ain Shams University; for his contribution in the histological study, hematological analysis and interpretation of data.

Special thanks to my mother for her patience, unlimited support and enthusiasm throughout my life especially during the journey to complete this work.

To my husband and my kids, who I would dedicate this work to them to be proud of me.

Finally, I would also like to express my great thank to all my colleagues and friends who supported me during my work.

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## INTRODUCTION

Microalgae play an important role in aquatic food chain and are popularly used in rearing of aquatic animals like mollusks, shrimps and fishes at different growth stages **(Borowitzka 1988**). They are required for larvae nutrition during a brief period of life cycle and are used either for direct consumption or indirectly as prepared feed. In most instances, the whole algae are used as feed or feed supplement. Live algae also improve the water quality. Data on chemical composition of algae give the basic information on the nutritive potential of the algae biomass **(Brown *et al.,* 1997)**. So, it has a multiple potential to produce high-valued products and there is an urgent need of awareness makes these biomolecules popular in the world to meet the increasing demands with respect to population. Most of these biomolecules are not produced in the animal/human body but termed as essential; therefore, it is highly recommended to make these biomolecules available for food and feed purposes**. (Yaakob *et al.*,2014)** Microalgae for aquaculture applications can be distinguished in (1) natural populations of phytoplankton, either as they are found in nature or from mass cultures enriched by adding nutrients, and in (2) algal monocultures, grown outdoors or indoors, when it is necessary to produce a high-quality feed with known nutritional properties and/or bacteria-free algal cultures that reduce the risk of introducing pathogens into the aquacultures. **Wolfgang (2013).**

Spirulina, *Arthrospira platensis* is a freshwater blue-green filamentous alga, and it is receiving increasing attention for its bioactive components such as vitamins (especially vitamin A and B12), minerals, polyunsaturated fatty acids, carotenes and other pigments that have antioxidants activity **(Lin *et al.,* 2007).** It is also containing high protein contents (up to 70% in dry weight) and lipids (7–16%) **(Vonshak 1997).** These nutritional elements make Spirulina as a potential food items for persons suffering from coronary illness and obesity. Spirulina is suitable for animal feeding **(Cohen, 1997**) and as supplement nutrients for humans **(Qureshi *et al.,* 1995)**. In addition, Spirulina is considered one of the

most concentrated natural sources for nutrition to both terrestrial and aquatic animals. Therefore, it could be an excellent source of useful nutrients **(Glombitza and Koh, 1989)** as well as a good energy source that can be used as crucial component for animal feeding **(Kishimoto *et al.*, 1994; Kim *et al.*, 2013).**

*Nannochloropsis* represents a genus of marine green microalgae with high photosynthetic efficiency and can convert carbon dioxide to storage lipids mainly in the form of triacylglycerols and to the ω-3 long-chain polyunsaturated fatty acid eicosapentaenoic acid (EPA). Recently, *Nannochloropsis* has received ever-increasing interests of both research and public community **(Xiao *et al.*,2016**). This microalga is an important food source and feed additive in the commercial rearing of many aquatic animals, especially live food organisms such as rotifers which, in turn, are used to rear the larvae of marine finfish. **Durmaz (2007).** The microalgal genus *Nannochloropsis* has been receiving ever-increasing research interest owing to its ability to synthesize not only neutral lipids for biodiesel production but also EPA for functional food **(Hoffmann *et al.*,2010** and **Ma *et al.*,2014).**

So, the specific aims of the present study were to examine the effect of two types of microalgae (*spirulina platensis* and *nannocholoropsis oculata*) with different levels on growth performance, hematological and immuno-physiological indices of Nile tilapia.