Sudan University of Science and Technology

College of science and technology of Animal production

Department of Fisheries and Wildlife Science

Effect of Incorporation Different LIPIDOL levels on Growth Performance and Chemical Composition of *Oreochromis niloticus* fry.(Linnaeus 1758)

اثر استخدام مستويات مختلفة من الليبيدول في مستوي النمو و التركيب الكيميائي ليرقات اسماك البلطي النيلي.

Thesis Submitted in partial Fulfillment of The Requirements of The Degree of The Bachelor (honors) Fisheries and Wildlife Science

By:

Fatima Amin Abdalrazeg

Rbiaa Hamad Awad

Hanady Adil Khaleefa

Supervisor: Dr. Sara Boshara Almagboul

October 2017

Quran

بسم الله الرحمن الرحيم

قَالَ تَعَالَىٰ:

﴿ وَهُوَ ٱلَّذِى سَخَّرَ ٱلْبَحْرَ لِتَأْكُلُوا۟ مِنْهُ لَحْمًا طَرِيًّا وَتَسْتَخْرِجُوا۟
مِنْهُ حِلْيَةً تَلْبَسُونَهَا وَتَرَى ٱلْفُلْكَ مَوَاخِرَ فِيهِ وَلِتَبْتَغُوا۟ مِن
فَضْلِهِۦ وَلَعَلَّكُمْ تَشْكُرُونَ ١٤ ﴾

سورة النحل الاية(14)

Dedication

This work is dedicated to our fathers and our mother's

To our brothers and Sisters

To our friends and Colleagues

To Any person helps us during our Study

Acknowledgment

Our greatest thanks to Allah, the most merciful who gave us the health, strength and patience to conduct this study. Grateful thanks to our supervisor D. Sarra Bushara El-Magboul department of fisheries Science and wildlife, College of Animal Production Science and Technology, Sudan University of Science and Technology for these guidance and provision of scientific knowledge. Finally our thanks to all there who helped us.

ABSTRACT

This study was carried out to evaluate the effect of LIPIDOL on feed of experimental fish. On growth rate ,food conversion efficiency and water characteristic of *O. niloticus* fingerlings . The study was done at the university of Sudan kuku experimental from of department of fisheries sciences and wildlife. The study was carried out in the 8 experimental plastic aquarium each stoked with 20 fish ,Aeration was provided by air pump for each aquarium. These types of feed together with accounted were formulated using 1% ,2.5% and 4% lipidol fish were fed 10% of their body weight divided into three times a day for four weak. Then it was reduced to 7% of the body weight for the rest of the experiment. Data were statistically analyzed using ANOVA one away analysis.Results showed that fish fed 4% lipidol had the highest final weight .and fish fed 1% lipidol had the lowest final weight.

Key words: lipidol,growth, body weight , *O. niloticus,* water characteristic.

الخلاصة

اجريت هذه الدراسه لمعرفة تاثير اضافة الليبيدول لعلائق الاسماك على النمو و كفاءة التحويل الغذائي والتركيب المائي في احواض صغار اسماك البلطي النيلي تمت هذه الدراسة في جامعة السودان بقسم علوم الالسماك والحياة البريه بحلة كوكو. احتوت التجربه على ثمانيه احواض و في كل حوض عشرون سمكه مقسمة الى اربعة معاملات مع ثلاثة تغيرات في نسبة اضافة الليبيدول (1%و2.5%و4%) وتمت التغذية بمعدل 10% من وزن الجسم ومن ثم تم تغيرهذة النسبة الى 7%من وزن الجسم تم تحليل النتائج باستعمال برنامج التحلل الاحصائي SPSS باستعمال طريقة ANOVA one away analysis واظهرت النتائج ان التغذيه بالعليقة المحتوية على نسبة ليبدول 4%اعطت اعلى وزن نهائي مكتسب وكان اقل وزن مكتسب في التجرة المحتوية على نسبة 1%

كلمات مفتاحية : ليبيدول , النمو,وزن الجسم,*O. niloticus*, تركيب الماء.

.

List of contents

List of tables

List of Figure

CHAPTER ONE

INDRODUCTION

World aquaculture production continued to grow in 2013, reaching 97.2 million tonnes (live weight) with an estimated value of USD157 billion. A total of 575 aquatic species and species groups grown in freshwater, seawater and brackish water have been registered in the FAO Global Aquaculture the production of farmed food fish (finfish, crustaceans, molluscs and other aquatic animals) was 70.2 million tonnes in 2013, up by 5.6 percent from 66.5 million tonnes in 2012. The production of 27 million tonnes of farmed aquatic plants was a 13.4 percent jump on the 23.8 million tonnes of 2012(**FAO 2015**).

Aquaculture accounts for a growing share of the global aquatic food production. The term aquaculture covers all forms of farming of aquatic animals and plants in freshwater, brackish water and saltwater. Aquaculture has the same objective as agriculture – the controlled production of food to improve the supply for our consumption. In the case of aquaculture, the products are aquatic animals and plants that grow in the water (**FAO, 2014)**

Aquaculture for food production in Africa was introduced over 50 years ago, Tilapia were successfully produced in ponds for the first time in Democratic Republic of Congo (DRC) in 1946 (**Vincke, 1995**). By the end of the 1950s, there were almost 300 000 ponds in production in Africa (**Satia, 1989**).

Raising fish for sport purposes has even a longer history, with trout introduced in South Africa between 1859 and 1896, as well as the late 1920s in Kenya (Vincke, 1995) and the 1930s in Zimbabwe. According to Vincke (1995), rice/fish farming has existed in Madagascar since the turn of the century. Initial production was based on fish that naturally found their way into rice fields through waters supplying these fields; these were captured and raised in cages (Randriamiaran et al., 1995).

Sudan's capture fisheries production was estimated to be about 34 000 tonnes in 2012, 29 000 tonnes from inland water catches and 5 000 from marine catches. The aquaculture sector is still incipient and the annual production was estimated at 2 000 tonnes in 2012. Capture fisheries activities are centered around the River Nile and its tributaries, seasonal flood plains and four major reservoirs as well as the territorial waters of Sudan on the Red Sea. Freshwater fish culture is primarily based on the pond culture of the Nile tilapia Oreochromis niloticus.

The country is also dependant on imports of fish and fishery products (USD 5.2 million in 2012) to satisfy the limited per capita fish consumption (about 1.1 kg in 2012). Exports are very small and were valued at USD 0.2 million in 2012.

The institutions directly involved in fisheries management are the Federal Ministry of Animal Resources and Fisheries and its Fisheries Administration, the Fisheries Training Institute (Ministry of Animal Resources and Fisheries) and the Fisheries Research Centre (Ministry of Science and Technology). Following independence in July 2011 the Government of South Sudan (FAO 2014).

The increased cost of energy (due primarily to soaring petroleum prices), El Niño effects, and increasing demand have resulted in a global increase in fishmeal price. The world price for fishmeal ranged between US$500 and US$700 per ton during the period 2000–2005. In May 2008, the price of fishmeal was US$1 210 per ton. The average price of other feed ingredients commonly used in aquafeed rose by 20–92 percent during the period between June 2007 and June 2008. The increasing price of feed ingredients (fishmeal, fish oil and cereal) and increasing manufacturing and transportation costs were, therefore, likely to have had a compound effect on global production and the price of aquafeed **(FAO 2009).**

The essential nutrients for fish are amino acids, fatty acids, vitamins, minerals and energy-yielding macronutrients (protein, lipid and carbohydrate). Diets for fish must supply all essential nutrients and energy required to meet the physiological needs of growing animals. Guidelines for nutrient adequacy for some farmed fish species suggest the minimum nutrient requirement to promote growth and prevent signs of nutrient deficiency **(Stefanie M Hixson 2014).**

1.2 Objectives:

1. To determine the effect of incorporated LIPIDOL on growth performance and feed utilization by Nile tilapia, Oreochromis niloticus fingerlings.
2. To determine the effect of different LIPIDOL concentration on chemical composition of Nile tilapia *(Orechromis niloticus*) fingerling.
3. To determine water quality of each experimental group of fish.

CHAPTER TWO

LITERATURE REVIEW

2.1 Aquaculture

Aquaculture for food production in Africa was introduced over 50 years ago. Tilapia were successfully produced in ponds for the first time in Democratic Republic of Congo (DRC) in 1946 (**Vincke, 1995).** By the end of the 1950s, there were almost 300 000 ponds in production in Africa **(Satia, 1989).**

-In aquaculture, feed accounts for over 50 percent of the production cost. Although considerable variation exists, cereal grains are the usual sources of carbohydrates in most of the aquafeeds and these cannot be economically supplemented with other sources. Fishmeal is the single most important source of protein in fish feed. The increased cost of energy (due primarily to soaring petroleum prices), El Niño effects, and increasing demand have resulted in a global increase in fishmeal price. The world price for fishmeal ranged between US$500 and US$700 per tonne during the period 2000–2005. In May 2008, the price of fishmeal was US$1 210 per tonne. The average price of other feed ingredients commonly used in aquafeed rose by 20–92 percent during the period between June 2007 and June 2008. The increasing price of feed ingredients (fishmeal, fish oil and cereal) and increasing manufacturing and transportation costs were, therefore, likely to have had a compound effect on global production and the price of aquafeeds **(FAO 2009).**

2.2 NILE TILAPIA:

2.2.1 Taxonomy of tilapia

Kingdom: Animalia

Phylum: Chordata

Class: Actinopterygii

Order: Perciformes

Family: Cichlidae

Genus: Orechromis

Species: O. niloticus (**Linnaeus 1758**)

Nile tilapia can live longer than 10 years (**GISD 2012**). Food availability and water temperature appear to be the limiting factors to growth for O. niloticus **(Kapetsky & Nath 1997)**. Optimal growth is achieved at 28-36°C and declines with decreasing temperature (**Teichert-Coddington et al. 1997, FAO 2012**). In aquaculture ponds, O. niloticus can reach sexual maturity at the age of 5-6 months **(FAO 2012)**.

2.2.4 Environmental requirements

Tilapia can tolerate a wider range of environmental conditions—including factors such as salinity, dissolved oxygen, temperature, pH, and ammonia levels than most cultured freshwater fishes can. In general, most tilapia are highly tolerant of saline waters, although salinity tolerance differs among species. Nile tilapia is thought to be the least adaptable to marked changes (direct transfer, 18 parts per thousand in salinity); Mozambique, blue, and redbelly (T. zilli) are the most salt tolerant (**El-Sayed 2006**). With the exception of Nile tilapia, other tilapia species can grow and reproduce at salinity concentrations of up to 36 parts per thousand, but optimal performance measures (reproduction and growth) are attained at salinities up to 19 parts per thousand (**El-Sayed 2006**). Tilapia are, in general, highly tolerant of low dissolved oxygen concentration, even down to 0.1 mg/L (**Magid and Babiker, 1975**), but optimum growth is obtained at concentrations greater than 3 mg/L (**Ross, 2000**).

Temperature is a major metabolic modifier in these fish. Optimal growing temperatures are typically between 22° C (72° F) and 29° C (84° F); spawning normally occurs at temperatures greater than 22° C (72° F). Most tilapia species are unable to survive at temperatures below 10° C (50° F), and growth is poor below 20° C (68° F). Blue tilapia are the most cold tolerant, surviving at temperatures as low as 8° C (46° F), while other species can tolerate temperatures as high as 42° C (108° F; (**Sarig, 1969; Caulton, 1982; Mires, 1995**).

Other water quality characteristics relevant to tilapia culture are pH and ammonia. In general, tilapia can tolerate a pH range of 3.7 to 11, but best growth rates are achieved between pH 7 to **9 (Ross, 2000)**. Ammonia is toxic to tilapia at concentrations of 2.5 and 7.1 mg/L as unionized ammonia, respectively, for blue and Nile tilapia (**Redner and Stickney, 1979; El-Sherif et al., 2008**) and depresses feed intake and growth at concentrations as low as 0.1 mg/L (**El-Sherif et al., 2008**). Optimum concentrations are estimated to be below 0.05 mg/L (**El-Sherif et al., 2008**).

2.3 Chemical composition:

Chemical composition of fresh fish greatly differs from one fish species and from one individual to another depending on age, sex, season and environmental condition (**F A O, 1986**).

The study of chemical composition of fish is an important aspect of fish flesh quality since it influences both keeping quality and the technological characteristics of the fish (**Huss, 1988**).

Data on chemical composition of many of the freshwater fishes of our country is not available and hence an attempt has been made to analyze as many as thirty-six species. The chemical composition of fish varies widely from species to species and season to season. There is also individual variation in the same species. Knowledge of chemical composition is essential in order to compare its value as food with other protein foods (**Stansby, 1954)** has elaborated on the importance of chemical analysis.

Various studies have examined the effects of temperature, light, salinity, pH and oxygen concentration on the proximate composition of fish but these factors would seem to have very limited effects. On the other hand, endogenous factors are genetic and linked to the life stage, age, size, sex and anatomical position in the fish (**Huss, 1995**).

The variations in the chemical composition of fish are closely related to the environment of rearing in ponds or nature and completely depend on feed intake. During periods of heavy feeding, at first the protein content of the muscle tissue will decrease very slightly and then the lipid content will show a marked and rapid increase. Fish will have starvation periods for natural and physiological reasons (**Bendall, 1962**).

The fish´s chemical composition can be affected by many factors, including species, environmental conditions, fish size, level of protein in the diet, and feeding rate (**OGATA & SHEARER, 2000).**

Numerous studies on tilapia show that body composition approximates the diet composition, but little information has been produced by comparing the entire and the fillet composition of different genetic groups (**LUGO et al., 2003**).

Proximate composition of body muscles of *Puntius stigma* (male and female) analyzed shows that the moisture content was found to be higher in female, while protein, fat, ash, carbohydrate and minerals contents were higher in male. Moreover, different sexes were observed to have varying chemical composition (Biro *et al*., 2009).

2.3.1. Moisture Content:

Moisture content of fish body does not seem to be constant in view of the inter relationship with many biological and physiological factors. Early instability the juvenile stage and subsequent stability was mentioned by (**Parker and Vanstone, 1966).Remijo (1992)** reported that the moisture content of fresh *labeo spp* fish was (70.4-71.2%). Clucas and Ward (1996) reported that flesh from healthy fish contained (70-80 % water).Ali *et al* (1996) stated that the moisture content in deep frozen fish of *labeo spp.* was 76.7%.

2.3.2Crude protein:

The crude protein content of fish ranges from less than 8 to more than 25% of fresh weight. However, most fin fish muscle tissue contains about 18-22% protein (Sidwell, 1981).

Clucas and Ward (1996) reported that flesh from healthy fish contained (15-24%) protein.

Remijo (1992) reported that the protein content in fresh *labeo spp* fish was 20-21%. Johnston (1994) found that fresh fish protein is about 15.2%.

2.3.3. Fat Content:

The lipids present teleost fish species may be divided in two major groups; the phospholipids and the triglycerides. The phospholipids make up the integral structure of the unit membranes in the cells; thus they are often called structural lipids. The triglycerides are lipids used for storage of energy in fat depots, usually within special fat cells surrounded by a phospholipids membrane and a rather week collagen network **(Ackman, 1980).**

The lipid content (% body weight) in fish tends to increase with age (and size), decline during the winter, migration and spawning and reach its maximum value at the end of the primary feeding period of the year. As an energy stock, it tends to be in the form of neutral fats - triglycerides. Phospholipids, free fatty acids, sterols etc. comprise only a small fraction of lipids **(Weatherley & Gill, 1987).**

Some tropical fish also showed a marked seasonal variation in chemical composition. West African shad (Ethmalo sadorsalis) showed fat range of 2.7%(wet weight)over the year with maximum in July (**Watts,1957).**

Nile Tilapia exhibits sexual dimorphic growth where males grow significantly faster, larger and more uniform in size than females. Males and females had significantly different final weights owing to supplementations of three different oils **(Biro et al., 2009).Clucas and Ward (1996)** reported that flesh from healthy fish contained 1-22% fat. **Remijo (1992**) reported that the fat content in fresh labeospp fish is 3.5-5.4%. **Johnston (1994)** found that fresh fish fat content varied widely from species to species and from season to another. It was 5.6% in lean fish.

2.3.4. Ash content:

Most of the known inorganic elements or minerals can be detected in the human and fish body, but only fifteen of those known to be essential to man need to be derived from food **(Clucas and Ward,1996).**

2.3.5 Other Chemical composition (ash – protein –moisture – and fat)

reported that the protein content was in the range between 18.9 – 20.5 %.

carried out comparison of nutritive value of *Fassiekh* using *Hydrocynus spp.* and *schilbe spp*. She mentioned that the moisture content of the fresh fish was in the range of (72.9 – 81.92 %).   found that fat content ranged between1.4-2.2%   .The ash content of the   fresh fish ranged between 1.1 – 1.7%.(**Ahmed (2006).**

2.4. Application animal:

The benefits of using lipidol in animal feed have been proven through the many trials conducted in the world. Such as improve performance (weight gain and feed conversion of pigs 0.01   Treatment was improve by 13% (Dan kook university 2009).

Layer: energy saving and ileal digestibility improve weight gain and feed conversion ratio (FCR) (**Dan Kook University 2010)**

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study area

The experiment was carried out a period of 45 days from 19/1 to 4/ 3/ 2017. The experiment design developed at the fish hatchery department of fisheries science and wildlife, college of animal production science and technology, Sudan University of science and technology.

3.2 Materials

The Materials used to conduct experiment: pH meter for measuring hydrogen ion concentration (pH), Thermometer for measuring water temperature,) and ammonia determining kit in the water. Plastic containers were used as experimental units. Air pumps, air stones plastic pipes. Digital balance for weighing fish and sensitive balance nano weights were also used. Basin, big plate , chopper , mill, small net, crucible, air pump, spoon, thermometer and poylar.

3.3Experimental feeds

3.3.1Feed preparation

The components of the blackberry are: fishmeal, wheat bran ,bread flour, communal flour, vitamins, minerals and vegetable oil, groundnut cake and added to LIPIDOL at different rates for both control free of LIPIDOL and

D1. Add 1% LIPIDOL and 2% D2 by 2.5% and by 4%

The mixture was mixed with an addition of one liter of hot water per kilogram of blackberries. It was mixed together until it reached the cohesion and homogenization stage. Then the vitamins, salts and vegetable oil were added after mixing them outside the blackberry and then adding them and mixing them. Well, the paste was chopped by a grinder and placed for drying for 48 hours, after drying was taken for grinding and then sifted for the second time,

The food was weighed by multiplying 10% of the weight of the fish body for one month from the start of feeding. The ratio was then changed by 7% of the body weight to the end of the experiment. After the experiment was completed, samples were taken of the fish and the control and the compounds containing the different levels of LIPIDOL

Table (3-1): Formulation and composition of the experimental diets (dry matter basis) and proximate composition of the commercial feed with different level of LIPIDOL

	Control	D1	D2	D3
Fish meal	40%	40%	40%	40%
Sorghum meal	10%	10%	10%	10%
Bread flour	10%	9%	9%	8%
Vegetable oil	6%	6%	6%	6%
Vitamin mix	3%	3%	3%	3%
Mineral mix	1.5%	1.5%	1.5%	1.5%
Wheat bran	10%	10%	8.5%	9%
Communal flour	5%	5%	5%	4%
Groundnut cake	14.5%	14.5%	14.5%	14.5%
Lipidol	0	1%	2.5%	4%
Moisture	6.0±1.0	5.50±0.5	5.0±1.0	7.5±0.50
DM	94.0±1.0	94.5±0.5	95.0±1.0	92.0±0.5
ASH	12.50±0.5	13.5±0.5	11.50±0.5	11.0±1.0
C P	29.90±0.28	29.55±0.05	30.35±0.25	30.15±0.15
E E	4.05 ± 0.05^{a}	4.05 ± 0.05^{a}	3.70 ± 0.1^{ab}	3.45 ± 0.05^{b}
C F	2.71 ± 0.05^{ab}	2.57 ± 0.04^{b}	2.81 ± 0.02^{a}	2.61 ± 0.03^{b}

3.3.2LIPIDOL composition

According to LIPIDOL producing company (path way intermadentce internatiol) extracted from soybean and contains: Lysophosphatidic acid (LPA), Lysophosphatidylethanolamine (LPE), Lysophospholipids (LPS) Lysophosphatidylcholine (LPC) and Lysophosphatidylinositol (LPI).

The Lecithin (acetone insoluble) minimum 20.0 %, moisture maximum 6.0% and total Lysophospholipids (LPC LPI LPE LPA minimum3.5%)

3.3.3Characteristic and general effects

I. Maximizes enzyme digestion of feed
II. Improves feed conversion ratio and animal performance
III. Provide an economic value in feed formula.

Highly thermal stability at 120c for 15

3.4Experimental design

One hundred and sixty Nile tilapia fingerlings were obtained from outdoor ponds of fish hatchery.

Fish were distributed in 8 plastic aquaria. Fingerlings acclimatized to the hatchery conditions for 3 days and before the beginning of the experiment, weak up abnormal fish were excluded and the remaining fish redistributed on aquarium at 20 fingerlings / aquarium. The experiment included 4 treatments with 3 add of lipidol . Feeds D_0, D_1, D_2 and D_3 (D_0 without lipidol.,D_1 add 1% lipidol ⁄kg diet,D_2 add 2.25% lipidol ⁄kg diet ,D_3 add 4% lipidol ⁄kg diet). Fish were fed 10% of body weight daily three times (8 am, 1pm and 5 pm). About 15% of aquarium water was changed daily before morning feeding to remove the Waste digestion.

Fish were weighed are measured every 15 days and feed ration was adjusted accordingly. Fish survival was monitored also during this experiment which lasted for 6 weeks.

3.5 Growth and feed utilization:

Initial body weight (IBW), final body weight (FBW), specific growth rate (SGR), feed intake (FI), feed conversion ratio (FCR), survival rate, protein efficiency ratio (PER), protein productive value (PPV) and energy retention (ER) were measured using the following equations:

SGR = [In final body weight - In initial

Body weight/time (days)] X 100

FI= fish weight x feeding level /100

FCR= Feed consumed / Weight gain

WG = FBW (g) - IBW (g)

PER = Weight gain (g) / protein fed (g)

PPV= [Protein gain (g) / protein fed (g)] x 100

ER (Kcal/kg) = [Energy gain (g) /Energy fed (kcal)] x 100

3.6Determination of Chemical composition

The proximate composition for experimental diets and fish carcass were measured according to AOAC (1990). As follows:

3.6.1 Moisture Content Determination:

The samples were first weight (Initial weight) then dried in an electric oven at 1050C for 24-30 hours to obtain a constant weight. The moisture content was calculated as follows:-

Moisture content (%) = $$\frac{\text{Initial weight} - \text{Dry weight} \times 100}{\text{Initial weight}}$$

3.6.2 Crude Protein Determination:

The Kjeldal method for estimation of nitrogen was applied. Nitrogen content was converted to protein percentage by multiplying by 6.25 as follows:

$$\textbf{Protein \%} = \frac{(Va - Vb) \times N \times 14 \times 6.25}{1000 \times Wt} \times 100$$

Whereas:

Va = volume of HCL used in titration

Vb = volume of sodium hydroxide of known normality used in back titration

14 = conversion factor of ammonium sulfate to nitrogen

6.25= conversion factor of nitrogen to protein

Wt= weight of sample

N= normality of NaoH

3.6.3 Crude Fat Determination:

Fat content of each sample was determined according to Soxhlet method by ether extract using 2 gm of fish samples. Extraction continued for 5 hours at 100 0C before finding the weight of the extract fat. Fat percentage was then calculated as follows:

$$\textbf{Fat \%} = \frac{\text{Extracted fat weight}}{\text{Sample weight}} \times 100$$

3.6.4 Ash Content Determination:

Ash was determined by heating 1 gm at 5500C in muffle furnace until a constant weight was obtained. Ash content percentage was given by the following formula:

$$\textbf{Ash \%} = \frac{\text{Ash weight} \times 100}{\text{Sample weight}}$$

3.7 Water quality

Temperature, pH, nitrate, nitrite and ammonia were estimated by aqua sol kits during the experimental period according to water as follows:

3.7.1. pH:

- A clean test tube was filled with 5 ml of water to be tested (to the line on the tube).

- 5 drops of high range pH Test solution were added, holding dropper bottle upside down in a completely vertical position to assure uniformity of drops.

- The test tube was caped and inverted tube several times to mix solution.

-The test result was readied by comparing the color of the solution to the appropriate High Range pH Color Card (freshwater or Saltwater was choosed). The tube was viewed in a well- lit area against the white area of the card. The closest match indicaters the pH of water sample.

3.7.2 Nitrite test:

- A clean test tube was filled with 5mill of water to be tested .

- 5 drops of nitrite test solution were added ,holding dropper bottle upside down in a completely vertical position to assure uniformity of drops added to the water sample .

- The test tube was caped and shacked the tube for 5 seconds .

- 5 minutes for the color to develop waited .

- The test result was readed by matched the color of the solution against those on the nitrite color chart .

3.7.3 Nitrate test:

- A clean test was filled with 5mill of water to be tested .

- 10 drops from nitrate test solution bottle #1 were added ,holding dropper bottle upside down in a completely vertical position to assure uniformity of drops added to the water sample .

- The test tube was caped and inverted tube ceveral times to mixed solution .

- 10 drops from nitrate test solution bottle #2 were added ,holding dropper bottle upside down in a completely vertical position to assure uniformity of drops added to the water sample .

- 5minutes for the color to develop were waited .

- The test result was readed by matched the color of the solution against those on the nitrate color chart .

3.7.4 Total ammonia (NH3/NH4)

- A clean tube was filled with 5 ml of water to be tested (to the line tube).

- 8 drops from Ammonia Test Solution Bottle #1were added, holding the dropper bottle upside down in a completely vertical position to assure uniform drops.

-8 drops from Ammonia Test Solution Bottle #2 were added, holding the bottle upside down in a completely vertical position to assure uniform drops.

- The test tube was caped and shacked vigorously for 5 seconds.

- 5 minutes were waited for the color to develop.

-The test result was readied by compared the color of the solution to the appropriate Ammonia Color Card (the fresh water color card was used). The tube was viewed in a well – lit area against the white area of card. The closest match indicates the ppm (mg/l) of ammonia in the water sample.

3.8 Statistical analysis

The data were analyzed by one-way analysis of variance (ANOVA, F test) and LSD for significantly different means at a significance level of 0.05 using SPSS version 16.

CHAPTER FOUR

RESULTS

Table 4.1 below show the mean weight gain of experimental fish groups fed with D 0% (control), 1% (D1), 2.5% (D2) and 4% (D3) LIPIDIL. Fish fed with Treatments D 3 (4% LIPIDIL) show statistically the highest mean weight gain (34.31±15.69). The lowest value mean weight gain was recorded for D1 1% lipidol.

Table (4-1): Growth performance and conversion efficiencies of O.niloticus fry fed with feed contains different level of Lipidol.

Parameters	**D0 (0%)**	**D1 (1%)**	**D2 (2.5%)**	**D3 (4%)**
Average Initial weight (g)	8.10±0.40	9.15±0.35	9.95±0.15	10.50±0.30
Average final weight(g)[1,2]	10.55±1.25	8.70±0.30	10.85±0.85	14.15±2.05
Live weight gain(%)[1,2]	30.25±9.02	-4.09±12.22	10.05±6.95	34.31±15.69
Absolute weight gain(g/fish)[1,2]	2.45±0.85	-0.45±0.95	1.00±0.7	3.65±1.75[b]
Feed conversion ratio (dry basis)[1,2]	2.16±0.75	10.68±15.42	10.96±7.67	2.55±1.22[b]
Protein efficiency ratio [1,2]	14.35±11.41	0.42±0.43-	1.47±1.46	38.25±35.06
Specific growth rate%[1,2]	0.57±0.15	-0.11±0.16	0.21±0.14	0.64±0.26
Per cent survival	100	97	98	97

Table (4-2): chemical composition of O.niloticus fry fed with feed contains different level of Lipidol.

Treatments / Parameters	**Control**	**D1**	**D2**	**D3**
Moisture%	73.5±0.5[bc]	72.5±0.5[c]	75.5±0.5[ab]	77.5±0.7[a]
D.M%	26.5±0.5[ab]	27.5±0.5[a]	24.5±0.5[bc]	22.5±0.5[c]
Ash%	5.0±0.00	4.5±0.5	3.5±0.5	3.5±0.00
C.P%	31.25±0.05[a]	30.7±0.1[b]	31.25±0.05[a]	30.55±0.05[b]
E.E%	7.1±0.1[a]	7.25±0.05[a]	6.75±0.50[bc]	7.30±0.57[a]
N.F.E%	30.15±0.55[b]	30.05±0.21[b]	34.0±1.55[a]	37.30±0.57[a]

Table (4-3): physio-chemical parameters of different treatments.

Treatments Parameters	**Control**	**D1**	**D2**	**D3**
NO_3	20.0±0.00	31.65±1.65	30.85±9.15	45.0±1.7
NO_2	0.38±0.05	0.67±0.25	0.45±0.13	0.63±0.21
NH_4	0.25±0.00[b]	0.25±0.00[b]	0.23±0.03[b]	0.50±0.00[a]
pH	8.30±0.10	8.50±0.00	8.23±1.7	8.45±0.05
Temperature	20.0±0.00	20.0±0.00	20.0±0.00	20.0±0.00

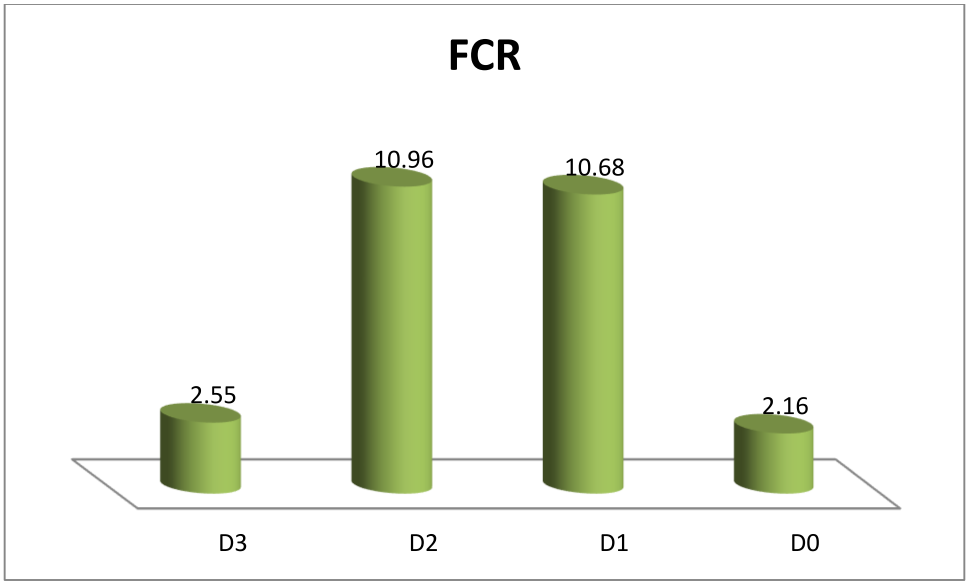


Figure (1): FCR of different treatments

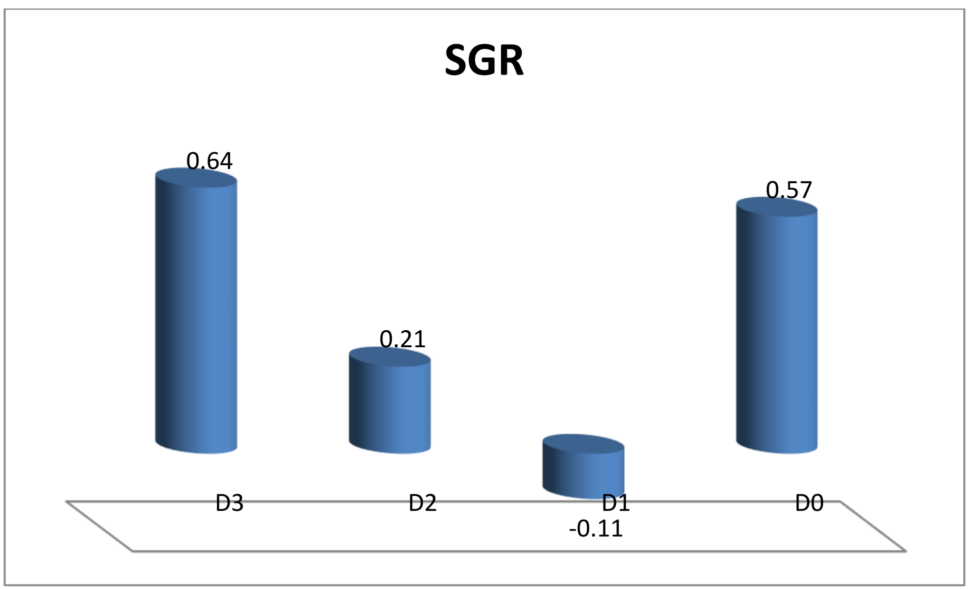


Figure (2): SGR of different treatments

CHAPTER FIVE

DISCUSSION

Table (4.1) decrease in the final average weight in treatment indicate that feed weight be two little 10% of the body weight or the size of food was two large for the fish , decreases in the absolute fish gain was also noted , protein efficiency ratio was also little , it increase in (D3) although reduction of carp hydrated was higher in (D3) , increase in protein efficiency ration , fish average final weight and increases specific growth rate in treatment (D3) is due to the percentage of Lipidol (4%) in the feed this more or less agreed with (Mubarak et al, 2017) a though Mubarak used Lipidol as catalyst without reducing any of feed components .

Table (4.2) no difference in protein was noted when different 4% Lipidol was used for feeding the fish form the prevision studies it was noted that Lipidol is beneficial in animal feed used in pigs improved performance (weight gain and feed conversion important was noted to be 13% (Dan kook university 2009).Who stated that energy was saving and ideal digestibility increased whish leaded to weight gain)

Cow milk production was also increased according to (ingrate company 2011) by feeding 0.05 % Lipidol.

Table (4.3) no adverse effect was noted in the water quality when adding Lipidol.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

It could be concluded that Lipidol as additive show positive effect on growth performance of fish compared to control diets where found to be efficiently utilized by *O.niloticus* fingerlings as will the effect was clear throughout the experimental period (45 day). The performance of fish fed with 4% Lipidol additive was best diet in growth performance.

6.2 Recommendation:

- Further studies were needed to determine effect of Lipidol on blood chemistry of *O.niloticus* fingerling
- More work should be carried out in using different percentage of Lipidol on other fresh water species.
- Further studies were needed to determine effect of Lipidol on immune system response of *O.niloticus* fingerling

References:

Ahmed, I. O. (2006). Comparison of the nutritive value of Fasseikh using Hydrocynus spp.and schilbe .spp.Ph.D. Thesis, Al Neelain University.

Ali, M. E., Babiker, S. A and Tibin, I. M. (1996). Body Characteristics, yield indices and proximate composition of commercial fish species of Lake Nubian.Processing of FAO Expert Consultation on fish technology in Africa, Kenya and FAO Fisheries Report No. 574:211-214.

Ackman R.G. 1980 Fish lipids.Part 1. In: Advances in Fish Science and Technology,
J.J. Connell (Ed.), Fishing News Books Ltd. Farnham, Surrey, pp 86-103

Biró, J., Hancz, C., Szabó, A. and Molnár, T. (2009). Effect of sex on the fillet quality of Nile tilapia fed varying lipid sources. Ital.J.Anim.Sci. 8:225-227.

Borreson1992. Woody plants in agro-ecosystems of semi-arid regions: with an emphasis on the Sahelian countries. *Woody plants in agro-ecosystems of semi-arid regions: with an emphasis on the Sahelian countries.* xiv + 340 pp.

Boyd, E.C. 2004. Farm-Level Issues in Aquaculture Certification: Tilapia. Report commissioned by WWF-US in 2004. Auburn University, Alabama 36831.

Bwanika, G.N., Makanga, B., Kizito, Y., Chapman, L.J. & Balirwa, J. 2004. Observations on the biology of Nile tilapia, Oreochromis niloticus, L., in two Ugandan Crater lakes. African Journal of Ecology 42: 93–101

Bendall JR (1962).
The Structure and Composition of Muscles. In Recent Advances in Food Science, Vol. 1:58
–
67. eds. J. Hawthom and J.
Muilleitch London, butter Worths

Caulton, M. S. 1982. Feeding, metabolism and growth of tilapias - some quantitative considerations. pp. 157–184. In: Pullin R.S.V. and Lowe-McConnell R.H. (eds), The Biology and Culture of Tilapia. ICLARM, Manila, The Philippines

Clacus, I. J. and Ward, A. R. (1996). Post harvest fisheries development: Aguide to handling, preservation, processing, and Quality Chatham Maritime.UnitedKingom.

d'Orbcastel E, Blancheton J, Aubin J (2009) Towards environmentally sustainable aquaculture: Comparison between two trout farming systems using life cycle assessment. AquacultEng 40:113-119.

Duaa A,O.Ekram ,M,A and Nugood,A,H 2016 EFFCT OF PUMPKIN SEED MEAL ON GROWTH PEFORMANCE ,FEED UTILZATION AND PROXMIMATE COMPOSITION OF O.NILOTICUS FINGERLINGS SUTS.

El-Sayed, A.M. 2006. Tilapia culture in salt water: Environmental requirements, nutritional implications and economic potentials. Eighth Symposium on Advances in Nutritional Aquaculture. November 15–17, Nuevo Leon, Mexico.

El-Sherif, M. S., and A. M. EL-Feky. 2008. Effect of ammonia on Nile Tilapia (O. niloticus) performance and some hematological and histological measures. EighthInternational Symposium on Tilapia in Aquaculture.Cairo, Egypt.

FAO (1995a). Quality and Changes in Fresh Fish, FAO Fisheries Tech. Pap. 348, Iss. No. 429 – 9345.

FAO 2005-2012. Cultured Aquatic Species Information Programme. Oreochromis niloticus. Cultured Aquatic Species Information Programme. Text by Rakocy, J. E. In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 18 February 2005. [Cited 11 September 2012].

FAO 2014 The State of World Fisheries and Aquaculture Opportunities and challenges FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS Rome, 2014 ISSN 1020-548

FAO, 2015. FAO Global Aquaculture Production database updated to 2013 – Summary information. http://www.fao.org/fishery/statistics/en .Fish-Statistics-Inquiries@fao.org

FAO. 2009. Guidelines for the Ecolabelling of Fish and Fishery Products from Marine Capture Fisheries. Revision 1. Directives pour l'étiquetage écologique du poisson et des produits des pêches de capture marines. Révision 1. Directrices para el ecoetiquetado de pescado y productos pesqueros de la pesca de captura marina. Revisión 1. Rome/Roma. 97 pp.

FAO.(2004). The composition of fish. Available from http://www.fao.org/wairdoes/tx5916e/×5916co1.htm.pp1-80.

Faucomeau , L.E, Wang, S.S, Altman, A & Hütterman, A. 1995. Effect of Nacl on growth, photosynthesis, ion and water relation of four poular genotypes. Forest Ecology and management 107;135-146.

Food and Agric. Org. (1985). World catch and trade of fisheries and products Food and Agriculture Organization, FAO. (1986). The production fish meal and oil. Fisheries Technical paper. 142.

Food and Agriculture Organization, FAO. (1986). The production fish meal and oil. Fisheries Technical paper. 142.

Foran, J.A., Carpenter, D. O., Hamilton, M.C., Knuth, B.A., and Schwager, S.J., (2005): "Riskbased consumption advice for farmed Atlantic and wild pacific salmon contaminated with dioxins and dioxinlike compounds". Environmental health perspective 33:552-556.

GISD 2012. Global Invasive Species Database – Oreochromis niloticus – Available from: http://www.issg.org/database/species/ecology.asp?si=1322&fr=1&sts=sss&lang=EN

Huss HH (1988). Fresh Fish Quality and Quality Changes.FAO Fisheries No. 29, Italy 132 pp.

Huss, H.H.(1995). Quality and Quality changes in fresh fish. Rome: FAO Fisheries Technical Paper, No. 348.

in 1984. Info fish Marketing Digest. No. 25. Hardy R, Smith, JGM (1976). The

Johnston, A.S. 1994. Kjeldahl method for nitrogen determination , published by Micro- Macro Publishing Inc, Athen- Georgia, USA, 79pp.

Kapetsky, J.M. & Nath, S.S. 1997. A strategic assessment of the vpotential for freshwater fish farming in Latin America. COPESCAL Technical Paper. No. 10. Rome, FAO. 128p

Magid, A., and M. M. Babiker. 1975. Oxygen consumption and respiratory behavior of three Nile fishes. Hydrobiology 46: 359–367.

Meske, C. (1985). Fish Aquaculture Technology and Federal Research Center for Fisheries, Institute for Costal and Inland Fisheries, Hamburg, Federal Republic of Germany. Edited and translated by Fredrick Vogt. .Formally of the polytechnic of Central London, U. K

Mires, D. 1995. The tilapias. pp. 133–152. In: Production of Aquatic Animals: Fishes (eds Nash, C. E., and A. J. Novotony. Elsevier, New York,

Ogata and sheawer (2000). Comparative study of proximate composition, amino acid and Fatty acids of some economically important fish species in Lagos, Nigeria, Af. *J. Food Sci.*, **5**, 2011.

Parker and Vanstone. 1966. Alien and Invasive Animals – A South African Perspective. Randomhouse/Struik, Cape Town, South Africa. 240 pp.

Picker, M.D. & Griffiths, C.L. 2011. Alien and Invasive Animals – A South African Perspective. Randomhouse/Struik, Cape Town, South Africa. 240 pp.

Redner, B. D., and R. R. Stickney. 1979. Acclimation to ammonia by Tilapia aurea. Trans. Am. Fish. Soc. 108: 383–388.

Remijo, F.O. (1992). Meat, yield and Nutritional Value Determination of Labeospp (Labeoniloticus) and (Forskaliii.eLabeohorrie) B.Sc. (honor) Dissertation .Department of fisheries, College of Natural Resources and Environmental studies, University of Juba, Sudan.

Ross, L. G. 2000. Environmental physiology and energetics. pp. 89–128. In: M. C. M. Beveridge and B. J. McAndrew (eds.) Tilapias: Biology and Exploitation, Fish and FisheriesSeries 25, Kluwer Academic Publishers, Dordrecht,The Netherlands.

Sadiku SOE, Oladimeji AA (1991). Relationship of proximate composition of Latesniloticus (L), synodontisschall. Res. Commun., 3: 29- 40.

Sarig, S. 1969. Winter storage of tilapia. FAO Fish CultureBulletin. 2:8–9.

SATIA, B, 1989. A Regional Survey of the Aquaculture Sector in Africa South of the Sahara. Food and Agricultural Organisation: Rome.

Schneider O, Amirkolaie A, Vera Cartas J, Eding E, Schrama J, et al. (2004) Digestibility, faeces recovery, and related C, N, P balances of five feed ingredients evaluated as fishmeal alternatives in Oreochromisniloticus L. Aquaculture Research 35:1370-1379.

Sidwell, v. d. (1981). Chemical and Nutritional composition of fin. Fishes, Whales, Crustaceans , Molluscus ,and their products , NOAA . T ECHNICAL Memorandum, NMFSF/SEC-11. United states Department of Commerce, Washington, DC, pp 432.

Stansbly1954. Salt tolerance in Eucalyptus camaldulensis Dehnn from three seed sources. Australian Forest Research 11, 93-100.

Stefanie M, Hixson. (2014) *Fish Nutrition and Current Issues in Aquaculture: The Balance in Providing Safe and Nutritious Seafood, in an Environmentally Sustainable Manner*. Journal of Aquaculture Research and Development, 5 (3). ISSN 2155-9546

Teshima, S., A. Kanazawa, and Y. Uchiyama. 1985. Optimum protein levels in casein-gelatin diets for Tilapia nilotica fingerlings. Mem. Fac. Fish. Kagoshima Univ. 34: 45–52.

Teichert-Coddington, D.R., Popma, T.J. & Lovshin, L.L. 1997. Atributes of tropical pond-cultured fish, pgs 183-198. In: Enga H.S. & Boyd, C.E.(eds.), Dynamics of Pond Aquaculture. CRC Press, Boca Raton, Florida, USA.

Ugoala C, Ndukwe G and Audu T(2003). Investigation of the constituent fatty acids of some freshwater fishes common in Nigeria, Braz. *J. Aquat. Sci. Technol.*, **13** (1):65-70.

VINCKE, M.M.J. 1995. The Present State of Development in Continental Aquaculture in Africa. In: SYMOENS, J.J. and MICHA, J.C. (eds). The Management of Integrated Freshwater Agro-Piscicultural Ecosystems in Tropical Areas. Food and Agricultural Organisation: Rome.

Watts, J.C.D. 1957. The chemical composition of West African fish. 2. The West African Shad (Ethmalosa dorsalia) from the Sierra Leone river estuary.Bull. Inst. Fondam. Afr. Noire (A Sci Naat.), 19: 539–547

Weatherley, A. H. and Gill, H. S.(1987). The Biology of Fish Growth.London:Academic Press.

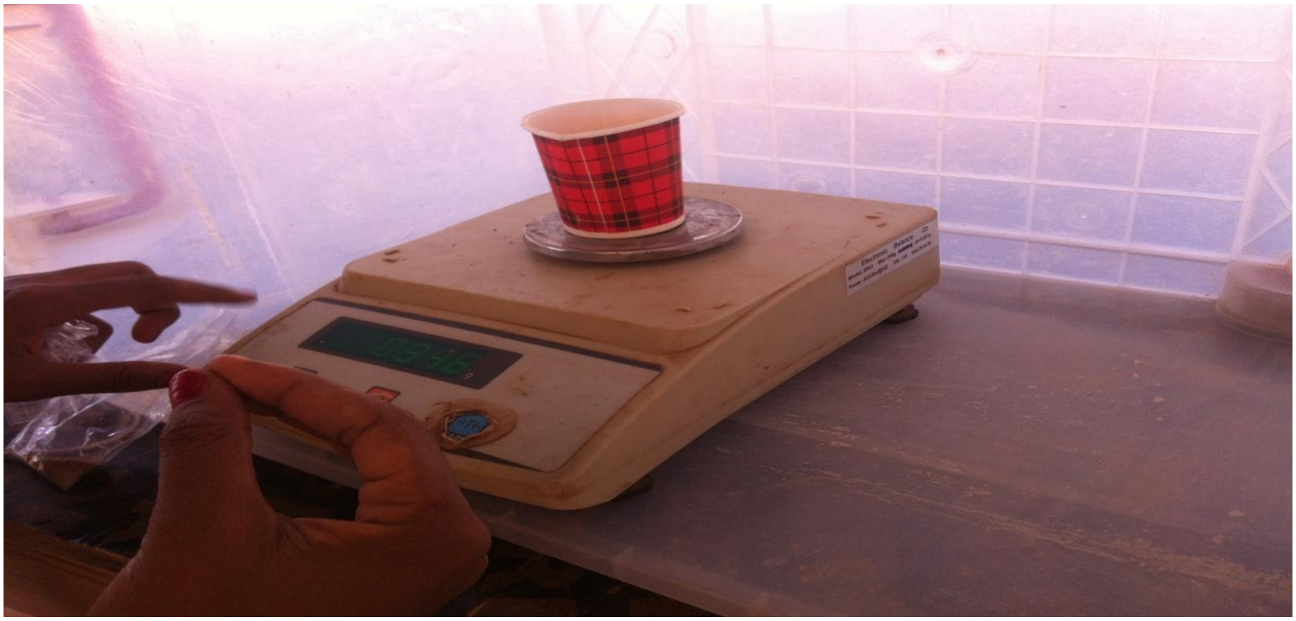
Linnaeus, 1758 Oreochromis niloticus Cultured Aquatic Species Information Programme: Food and Agriculture Organization of the United Nationsfor a world without hunger © FAO, 2017.

Dankook University (2010) P. Y. Zhao, H. L. Li, M. Mohammadi, and I. H. Kim1 Department of Animal Resource & Science, , Cheonan, Chungnam 31116, South Korea Effect of dietary lactulose supplementation on growth performance, nutrient digestibility, meat quality, relative organ weight, and excreta microflorain broilers

Plates :

Plate 1) plets of feed formulted with 4% lipidol

Plates2) of aquariums Treatment



Plates 3 sensitive balance

Plates 4 shape of powder used to feeding fry *O.niloticus*

Plates 5 experimental design

Plates 6 water quality kids