Abbassa Int. J. Aqua., V0l.7 No.(2) 2014. *410-433*

CAUSES OF EYE AFFECTION IN CAGED CULTURED NILE TILAPIA (*OREOCHROMIS NILOTICUS*) IN DAMIETTA GOVERNORATE, EGYPT.

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Received 24/ 8/ 2014 *Accepted 2/ 10/ 2014*

Abstract

The present study was carried out on two hundred and fifty naturally diseased male monosex Nile tilapia (*Oreochromis niloticus*) with an average 130 ± 5 gm body weight collected from floating cages in El-Bostan Damietta Governorate. The collected fish submitted to full clinical, postmortem, bacteriological, mycological, parasitological and histopathological examination. In addition, some water quality analysis was measured. Clinical signs were random swimming near to water surface, sluggish movement, exophthalmia, general darking of body color, hemorrhage around the head, ventral aspect of the body, tail rot, parasitic eye cataract which appear as white dots, blindness, eye rupture outside (unilateral or bilateral), emaciation, appearance of cotton-like tufts on eye, skin and behind the head, as well as the post mortem finding were congested gills, liver, kidney, spleen and appearance of white caseated material around the heart. Gall bladders distended with bile and hemorrhagic intestine free from any food particles. In chronic cases with eye cataract and ruptured eye showed, pale gills, grayish liver with normal size, pale kidney and spleen and internal organs were anemic. The bacteriological investigation revealed the isolation of *Aeromonas hydrophila* and *Pseudomonas fluorescens* with prevalence 46.12% and 28.6% respectively. From the macroscopic and microscopic examination of isolated fungi, it was cleared that the isolated fungi was *Saprolegnia parasitica* with prevalence 25.25%. The parasitological examination of eye lens revealed infestation with the metacercarae *Diplostomum sp*. with infestation rate 25%. The antibiogram sensitivity test of isolated bacterial strains were done and showed that, *A. hydrophila* and *P. fluorescens* were sensitive to florefenicl, ciprofloxacin, nalidixic acid and tetracycline and resistant to ampicillin. Prevention and control trails were performed**.**

INTRODUCTION

Aquaculture has an important role in development of many natural economic and play a key role in rural development, also has a main role in meeting demand for aquatic animal production Hoylor and Bland (2001).

Cage culture practices have numerous advantages over other culture systems. By integrating the cage culture system into the aquatic ecosystem, the carrying capacity per unit area is optimized because the free flow of current brings in freshwater and removes metabolic wastes, excess feed and fecal matter Beverdge (1983).

Aquaculture industry is gradually developed in the world as well as in Egypt. The healthy keeping fish depend upon the relationship between environment and pathogens. Increased demands for fish production have resulted in intensive culture of cultured fish. Out breaks of bacterial, viral or parasitic diseases are more common when fish are raised in high densities. Diseases outbreaks can occur and are problems in cage cultured fish, increased production, pressure on faster growth, high densities and structure efficiency can create conductive to outbreaks of infectious diseases. Infectious diseases in fish culture are not only accentuated by waste pollution but exacerbated by crowding, befouling improper harvest or handling as trauma and transporting high fish densities accompanied by high feeding rates (contribution to poor water quality) or parasites. So, tilapia under one or more of these stressful factors can become more severely affected by bacterial, fungal or parasitic causes Mitchell *et al.* (1977); Meyer (1991); Aguirre-Macedo *et al*. (2001).

Fish eye considers a very important organ, and adapted for vision in air as well as water and considered as indicator of health state Noor El–Deen *et al*. (2013).

Eye affection of fish especially in cage cultured fish with high stocking densities cause of sever problems and losses among cultured fish because the eye affection leads to off food followed by retardation of growth, emaciation, immuno suppression and finally death occur. Eye cataract may be nutritional deficiency Deb *et al*. (1990) and Bjerkas and Bjornestad, (1999); bacterial causes Eissa *et al*. (2000); Stojanove *et al*. (2010) and Abou El Atta (2013), fungal causes El-khatib (1998) and Nayak (2008) and parasitic Voutilainen *et al*. (2008) physical causes Stephens *et al*. (2002) and Ferguson *et al*. (2004) and finally may be chemical causes Delthlefsen (1984) and Williams *et al*. (1992).

So, the present study is to identify the causes of eye affection in caged cultured (*Oreochromis niloticus*) including clinical, postmortem, bacterial, mycotic, parasitic and histopathological examinations and possible trials for control and treatment.

MATERIAL AND METHODS

Water quality analysis:

Water quality analysis was done in the field immediately, for measuring the water parameters in cage culture holding Nile tilapia (*Oreochromis niloticus*). The water parameters are (temperature, dissolved oxygen, pH, nitrate, nitrite, salinity, hardness and ammonia). The tests were done according to techniques described by American Public Health Associated standard methods (APHA, 2005).

Fish samples:

Two hundred and fifty diseased monosex (male monosex) *Oreochromis niloticus* fish showed eye lesions were collected from floating cages (40 fish per cage) with an average 130± 5 gm. The stocking rate 60.000 fish/cage (10 m. × 10 m. × 8 m.) in El-Bostan Damietta Governorate. The collected fish were transported in ice box to the Central Laboratory for Aquaculture (CLAR) Abbassa Abou Hammad

Sharkia, Egypt. The collected fish subjected to full clinical, postmortem, bacteriological, mycotic, parasitological and histological examination.

Clinical examination:

The clinical investigation of affected fish was done out as described by Schäperclaus *et al*. (1992) to determine the clinical alternation on skin, eye, abdomen, tail and fins Also, abdominal behavior due to eye cataract.

Postmortem examination:

Postmortem examinations were done on living or freshly dead fish and the examination of internal organs was done according Schäperclaus *et al*. (1992).

Bacteriological examination:

Under aseptic conditions samples of (eye, gill, liver, spleen and fins) were taken for bacteriological examination. The samples inoculated onto Tryptic Soy Broth (TSB) and Brain Heart Infusion (BHI) and incubated at 25 - 29°C for 48 hrs. After that, streaked over (TSA) at the same temperature and time then on selective agar base (Pseudomonas base agar media and aeromonas base agar media). The identification of isolated bacteria was carried out according to Bergey's Manual of Determinative Bacteriology (1994) using routine study of the morphological characters and biochemical reaction.

Mycological examination:

1- Isolation of fungi:

Isolation of fungi was carried out from naturally infected fish. Samples which taken from fish showing eye lesions and skin lesions were collected and inoculated onto Sabroud Dextrose Agar (SDA) (Adwic SCG) and incubated at 20± 2°C for 3-4 days, subculture was done on same media for purification.

2- Identification of isolated fungi:

All positive cultures were examined for colonial growth, morphological feature and microscopic characteristics. The morphological features include cultures appearance, rate growth, texture of surface colonies, colonies colour according to Frey *et al*. (1979). Microscopical examination was done for wet mount preparation from eye lesions, skin and mycelia cultured on (SDA) to detect septation of hyphae according to Willoughby (1994).

Parasitological examination:

The collected fishes were transported to the laboratory, where the eye were examined with naked eye for detection of metacercarae then eye balls completely removed from eyehole by using a scissor or surgery blade. The eyeball is placed inside a glass and the pupil is pressed to be squashed and then it is spread on the smear and the core is removed by adding a drop of physiological solution. Immediately, it will be examined under a dissection microscope according to Overstreet and Curram (2004).

Antibiogram sensitivity:

The antibiogram sensitivity test was performed by using of different chemotherapeutic discs as shown in Table (6) to the isolated strains as described by Schäperclaus *et al*. (1992) using disc diffusion method on Muller's Hinton agar medium.

Histopathological examination:

Specimens of eye, gills, liver, spleen and kidney were taken from affected fish and fixed in neutral buffer formalin, embedded in paraffin wax, sectioned in 0.5 microns and stained with Haematoxylin and Eosin (H and E) according to Roberts (2012).

Trials for control of the disease:

1- Using Bafry D50/500 in adose 0.75 ml/l (375 ppm) as a bath 10-12 minutes.

2- Addition of vit. AD_3E and vit. E+selenium in a dose of 1 ml/l for AD3E and 1 gm/l for E+selenium to the food.

RESULTS

Water quality analysis:

The results of water analysis revealed low dissolved oxygen, slight increased in pH and ammonia in comparison with good water quality as shown in Table (1).

Table (1). Results of water quality analysis.

Water parameters	Result
Temperature	29°c
Dissolved oxygen (DO)	2.6 (mg/l)
pH	8.4
Nitrate (NO3)	0.2 (mg/l)
Nitrite (NO2)	0.01(mg/l)
Ammonia (NH3)	1.9 (mg/l)
Hardness	130 (mg/l)

Clinical examination:

The mortality rate of *Oreochromis niloticus* in floating cages in El- Bostan, Damietta reached 380 fish/cage/day (nearly 50 kg daily losses). The clinical investigation showed off food, random swimming near to water surface, loss of balance, sluggish movement, exophthalmia, general darking of body colour, hemorrhage around the head, ventral aspect of the body, tail rot, cloudy eye, parasitic eye cataract which appear as white dots, blindness, eye rupture outside (unilateral or

bilateral), emaciation, appearance of cotton-like tufts on eye, skin and behind the head Plate (1).

Postmortem finding:

Acute cases showed congested gills, liver, kidney, spleen and appearance of white caseated material around the heart. Gall bladder distended with bile and intestine hemorrhaged and free from any food particles. In chronic cases with eye cataract and ruptured eye showed, pale gills, grayish liver with normal size, pale kidney and spleen and internal organs were anemic as shown in Plate (2).

Bacteriological studies:

The bacteriological examination of affected *Oreochromis niloticus* showed that the isolation of gram negative bacteria identified as *Aeromonas hydrophila* and *Pseudomonas fluorescens* according to morphological characters and biochemical reaction as shown in Table (2). The prevalence of infection with bacteria was (75%) as shown Table (3). The prevalence of *A. hydrophila* was 137 (46.12%) strains while the *P. fluorescens* was 85 (28.6%) strains as shown in Table (4).

Distribution of Isolated Strains:

The distribution of isolated strains in different organs and tissue as shown in Table (5). *A. hydrophila* was highly percentage of isolation from skin, gill, eye, liver and kidney and was low percentage of isolation from spleen, while *P. fluorescens* showed highly percentage of isolation from skin, gill, eye, liver, kidney and spleen.

Table (2). Result of morphological character and biochemical reaction of isolated bacteria**.**

Test	*A. hydrophila*	*P. fluorescens*
Shape	Rod	Rod
Motility	+ve	+ve
Gram stain	-ve	-ve
O/F	F	O
Growth on 0. 5% Na Cl	+ve	-ve
Indole	+ve	-ve
V.P	+ve	-ve
M.R	-ve	-ve
H2s production	-ve	-ve
Gelatin liquefaction	+ve	+ve
Nitrate reduction	+ve	+ve
Citrate utilization	+ve	+ve
Arginis hydrolysis	+ve	+ve
Catalase	+ve	+ve
Fermentation of sugar		
Glucose	+ ve	+ ve
Arabinose	+ ve	- ve
Sucarose	+ ve	- ve
Lactose	- ve	- ve
Cephalothin 3omg disc	Resistant	Sensitive

Table (3). The obtained data about infection and infestation.

Total No. of examined fish	No. of infected fish with bacteria	No. of infested fish with parasite
200	150	50
%	75	25

Table (4). The percentage of the identified fish pathogens.

	A. hydrophila	***P. fluorescens***	***Saprolegnia parasitica***	**Metacercariae**
No.	137	85	75	50
%	46.12	28.61	25.25	25

Table (5). Distribution of isolated bacteria and fungus in different organs and tissues.

Fish pathogen	**Strain no. of isolates**	**skin**	**gills**	**eyes**	**liver**	**spleen**	**kidney**
A. hydrophila	137	32 23.35 %	28 20.43 %	25 18.24 %	22 16.05 %	14 10.21 %	16 11.67 %
P. fluorescens	85	23 27.05 %	18 21.17 %	13 15.29 %	12 14.11 %	8 9.41 %	11 12.94 %
Saprolegnia parasitica	75	34 45.33 %	13 17.33 %	28 37.33 %	-	-	-

Mycological examination:

The wet mount preparation from cotton like tufts from morbid fish and colonies growth on SDA under microscope showed long branched, non septated hyphae carrying black cysts of spores according to morphological of clinical lesions, macroscopic and microscopic characteristic it was identified as *Saprolegnia parasitica.* It was isolated in a total number 75 isolates with prevalence 25.25% as shown in Table (4). The highly percentage of isolation from skin 34 isolates (45.33%) followed by eye 28 isolates (37.33%) and low percentage of isolation was from gills 13 isolates (17.33%) as shown in Table (5).

Parasitological examination:

The parasitological examination of eye lens of *O. niloticus* revealed infestation with the metacercarae *Diplostomum sp.* The metacercariae of *Diplostomum* were found to be free inside the eyes of infected fish causing corneal opacity (cataract) which appeared as whitish condition of the lens of the eyes and in some cases the infested eye were completely white. The prevalence of infestation was 25% as shown in Table (3 and 4).

Antibiogram sensitivity:

As shown in Table (6), *A. hydrophila* and *P. fluorescens* were sensitive to florefenicol, ciprofloxacin, nalidixic acid and tetracycline and resistant to ampicillin. So, florefenicol were the drug of choice against *A. hydrophila* and *P. fluorescens***.**

Table (6). Antibiogram of sensitivity of isolated strains from affected fish.

Antbiotic disc	Code symbol	Concentration (µg)	Reaction	
			A. hydrophila	*P. fluorescens*
Ciprofloxacin	Cip5	**5**	+++	+++
Tetracycline	T30	**30**	++	++
Nalidixic acid	NA30	**30**	++	++
Ampicillin	A10	**10**	-	-
Florefenicol	Ffc30	**30**	++++	++++

Histopathological examination:

The histopathological findings in the eye of *O. niloticus* naturally infested with parasitic encysted metacercariae were seen in Fig (1).

The results of control trials, Bafry D50/500 gave a good result in the treatment and disappearance of saprolegnial growth in affected fish in a dose of 0.75 ml/L (375ppm) as a bath for 10-12 minutes for 3

successive days with no affect on behavior of treated fish. Bafry D50/500 considered as antiviral, antibacterial, antifungal, anti parasitic and antiprotozoal. The addition of vit. AD3E and vit. E+selenium in a dose of 1 ml/l for AD3E and 1 gm/l for E+selenium gave a good result in eye recovery and healing state of affected eye in infected *O. niloticus*. The addition of vit. AD3E and vit. E+selenium were persist for 3-5 days reduced the eye cataract between infected fish. Addition of florefenicol in a dose 30mg/kg body weight fish for 11 days for control the bacterial infection.

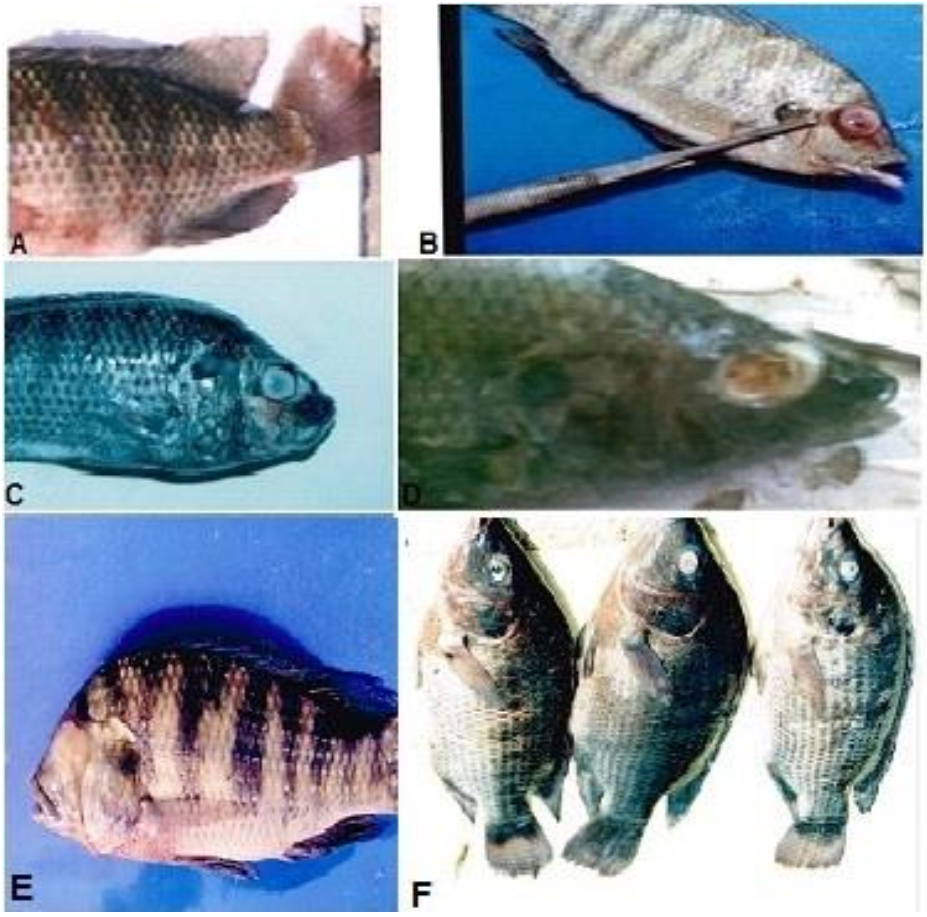

Plate (1).

A- *O. niloticus* showing skin hemorrhage and skin darkness.

B- *O. niloticus* showing exophthalmia.

C- *O. niloticus* showing cloudy eye with clear opercula .

D- *O. niloticus* showing rupture eye.

E- *O. niloticus* showing Saprolignia cover the eye which appeared as cotton like tuft.

F- *O. niloticus* showing uninfested eye, sucking eye and infested eye with metacercaria and parasitic cataract.

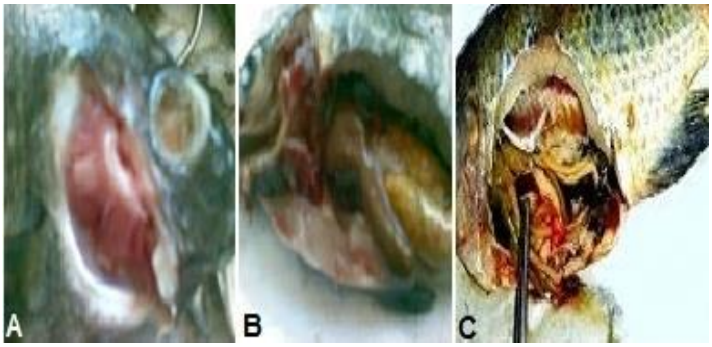

Plate (2).

A- *O. niloticus* showing pale gills.

B- *O. niloticus* showing congested liver and kidney.

C- *O. niloticus* showing intestine hemorrhaged and free from any food particles.

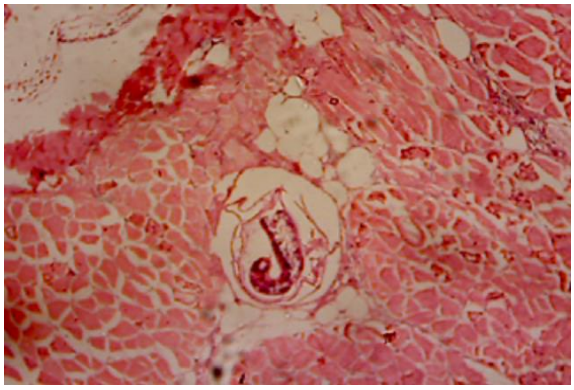

Fig (1). Eye of *O. niloticus* infected naturally with parasitic cyst showing parasitic cyst surrounded by basophilic necrotic depress.

DISCUSSION

Fish eye is considered as a very important organ, it is adapter for the vision in air as well as water Lee (2002) ocular diseases of fish are common and represented a significant problem with in the aquaculture industry. Cataract is opacities in the eye lens or lens capsule that mediate an abnormal dispersion of light through the lens and so cause reduced

visual ability and ultimately blindness these results agree with Benedek (1997). The majority of cataracts are irreversible but osmotic and physical cataracts have been reported to be reversible Hargis (1991). Stress factors as temperature, overcrowding and poor water quality plays an important role in the incidence of infection Woo and Bruno (1999).

In the present study the results of water analysis as shown in Table (1) revealed low dissolved oxygen, slight increased in pH and ammonia in comparison with good water quality. These results may be attributed to the high stocking rate and high organic matters which come from the unconsumed feed in the bottom of the cage, also increasing faecal droplet which lead to increase in total ammonia and decrease of dissolved oxygen these leading to increase the activity of nitrogenous bacteria which change ammonia to nitrate and nitrite leading to autointoxication. The increased in ammonia level leads to leucopenia and decreasing in resistance of fish against the causative organism of diseases. This obtained form is similar with results recorded by Plumb (1994).

Regarding to the clinical signs, it was revealed that the naturally infested fish suffered from off food, random swimming near to water surface, sluggish movement, general darking of body colour, hemorrhage around the head, ventral aspect of the body, tail rot. Similar results were reported by Plumb (1994); Enany *et al*. (1995); Sakr and Abo El Atta (2006) and Abo El Atta *et al*. (2013). Exophthalmia, cloudy eye and eye cataract (uni or bilateral), blidness may be due to powerfull bacterial toxins and ulteration in blood circulation also, may be attributed to inflammatory local odema due to increase premeability of capillary endothelium leading to escape of plasma protien under the effect of exotoxins produced by infected bacterial organisms these results agree with Sakr and Abo El Atta (2006) and Abo El Atta *et al*. (2013). The parasitic eye cataract which appear as white dots agree with El Bouhy

(1995) and Ramadan (2012). The rupture of the eye uni or bilateral leading imbalance, off-food, emaciation and death occur. Apperance of cotton wool like tufts on the eyes and mouth leading opacity of the eye, cataract, ended with blindness, emaciation and death occur, these results agree with these recorded by Hussein *et al*. (2001) and Abo El Atta (2008).

The common postmortem lesions observed of the diseased fish were congested gills, liver, kidney, spleen Gall bladder distended with bile and intestine hemorrhaged and free from any food particles. In chronic cases with eye cataract and ruptured eye showed, pale gills, grayish liver with normal size, pale kidney and spleen and internal organs were anemic The congested liver, kidney and spleen are due to bacterial septicemia Amlacher (1970). Congestion and odema play a role in the enlarged of kidney and spleen. Bile duct distended with bile secretion due to constriction of the common bile duct by the periductal fibrosis or hyperplasia of the epithelial lining. Emaciation of fish leading to anemia which followed by death

These results were recorded also by Sakr and Abou El Atta (2006) and Abou El Atta *et al*. (2013).

The bacteriological examination of affected *O. niloticus* showed the isolation of gram negative bacteria which identified as *Aeromonas hydrophila* and *Pseudomonas fluorescens* these results in agreement with El Ashram *et al*. (2007); Abo El Atta (2008) and Abou El Atta *et al*. (2013). The both organisms were lives commensally with the fish but under stress factors as high stocking density leading to immune suppression and the immune state of fish decreased and these organisms becomes virulence and pathogenic to fish and causing the disease. Table (4) showed the prevalence of *A. hydrophila* was 137 (46.12%) strains while the *P. fluorescens* was 85 (28.6%) strains. The high prevalence of *A. hydrophila* may attributed to its presence as a part of intestinal flora of

healthy fish. These results agree with that mentioned with Enany *et al*., (2011). *P. fluorescens* which isolated in low percentage in comparison with *A. hydrophila*. These results accepted with those recorded by Plumb 1994; Enany (1995); Sakr and Abo El Atta (2006) and Abo El Atta *et al*., (2013).

With the respect to the distribution of isolated strains in different organs and tissue as shown in Table (5) *A. hydrophila* was highly isolated from skin, gill, eye, liver and kidney and with low percentage of isolation from spleen, while *P. fluorescens* was highly recovered from skin, gill, eye, liver, kidney and spleen these results agreed with that recorded by Abo El Atta *et al*. (2013).

Mycotic infection eye with (Saprolegnia) appear as cotton wall tuft growth on eye give rise to corneal opacity ocular morbidity and blindness include keratitis, orbital cellulites, endophthalmit and corneal blindness El khatib (1998); Nayak (2008) and Noor El Deen *et al*. (2011). Regarding the results of mycological examination which showed isolation of *Saprolegnia parasitica* characterized by branched non septated tubular hyphae according to macroscopic and microscopic characterizan. *Saprolegnia* considered as secondary invader accompanied by opportunistic bacteria. *Saprolegnia parasitica* was isolated with high prevalence from skin, eye and low prevalence from gills these results agree with; Marzouk *et al*. (1990); Hussein *et al*. (2001); Marzouk *et al*. (2003) and Abo El-Atta (2008).

Parasitological examination revealed the presence of the *Diplostomum sp.* metacercaria are known as eye worms it is the cause of diplostomiasis (Cataracta Parasitica) which cause eye abnormalities, impaired blood circulation and longitudinal axis of eye. Gratzyk (1991). The most common symptom is cataract and blindness which are seen in the infected fish Marcogliese *et al*. (2001). The effect of *Diplostomum sp.* metacercaria in eye of infected *O. niloticus* leads to severe ocular lesion

and results in fish mortalities. In the present study parasitic cataract of the eye was seen among examined effected fish as white dots which appeared in advanced cases as cloudy, opacity ended with blindness and finally rupture of the eye. These findings are similar to the results given by El Bouhy (1995); Noor El Deen (2007) and Noor El –Deen *et al*. (2013). The prevalence of diplostomatid metacercaria isolated from freshwater caged cultured *O. niloticus* was 25% this result was nearly similar to that reported by El-Gohary and Samaha (1997) who recoded that the diplostomatid metacercaria prevalence was 27.4% from *Oreochromis sp*. and lower than that recorded by El Bouhy (1995) who isolated *D. spathaceum* with prevalence 72% from *Tilapia spp* and Ramadan (2012) who isolated *D. spathaceum* metacercaria in a rate of 58-60% during June and 32% in March from the same host .

The result of antibiogram sensitivity of *A. hydrophila* and *P. fluorescens* showed that they were sensitive to florefenicol, ciprofloxacin, nalidixic acid and tetracycline which resistant to Ampicillin, these results agree with that reported by Sakr and Abo El Atta (2006); Abo El Atta and Saleh (2010); Enany *et al*. (2011) and Abo El Atta *et al*. (2013).

The histopathological changes of naturally infected fish revealed the presence of parasitic encysted metacercaria surrounded by basophilic necrotic depress. Similar result was obtained by El Bouhy (1995).

Treatment and removal of the causative agent are considered to be the most important factor in treating these diseases. So, for prevention and control of eye affection quarantine of new fish and good sanitation practices should be used at all times. Tanks and culture facilities should be kept clean and free of any unnecessary wastes. On suspension of nutritional deficiency as a cause of eye lesion, it is advisable to change the diet Noga (2010). Aerating the water sources in a reservoir to allow it to equilibrate with air or stripping of excess gas by using vaccum

degassers were also recommended Colt *et al*. (1986). Also prevention of diseases can be best done through good farm management, environmental stresses and associated disease problems are minimized by excellent nutrition Noor El Deen *et al*. (2013). Control of Saprolegnia among infected *O. niloticus* by Bafry D50/500 in adose 0.75 ml/l (375ppm) as a bath 10-12 minutes in the best concentration for elimination of saprolegnial growth with no affect on behavior of treated fish. Bafry D50/500 considered as antiviral, antibacterial, antifungal, anti parasitic and antiprotozoal. These results agree with Abo El Atta (2008). Dealing with eye affection associated with bacterial infections, addition of florefenicol in a dose 30mg/kg body weight fish for 11 days for control the bacterial infection. The addition of vit. AD3E and vit. E+selenium in a dose of 1 ml/l for AD3E and 1 gm/l for E+selenium gave a good result in eye recovery and healing state of affected eye in infected *O. niloticus*. The addition of vit. AD3E and vit. E+selenium were persist for 3-5 days were reduce the eye cataract between infected fish.

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مسببات أصابات العين فى البلطى النيلى المستزرع فى الأقفاص بمحافظة دمياط ـ مصر

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الملخص العربى

أجريت هذة الدراسة على عدد ٢٥٠ سمكة من اسماك البلطى النيلى (وحيد الجنس) بمتوسط وزن ١٣٠جرام للسمكة. تم تجميعها من مزارع اقفاص تربية الاسماك فى منطقة البستان بمحافظة دمياط حيث خضعت للفحص الظاهرى، الداخلى، البكتريولوجى، الفطرى، الطفيلى والهستوباثولوجى. بالاضافة الى قياس معايير جودة المياة. كانت من علامات الفحص الظاهرى للأسماك المصابة السباحة العشوائية بالقرب من سطح الماء، والحركة البطيئة، جحوظ العين، غمقان لون الجسم، ونزيف حول الرأس و الجانب البطني من الجسم وتعفن الذيل، وعتامة العين الطفيلية التي تظهر كبقع بيضاء، والعمى، وتمزق خارج العين (أحادية أو ثنائية)، الهزال، ظهور خصلات تشبه القطن على العين والجلد وخلف الرأس، وكذلك أظهرت الصفة التشريحية احتقان بالخياشيم والكبد والكلى والطحال وظهور مادة بيضاء حول القلب. تضخم المرارة و نزيف بالأمعاء وخالية من أي طعام. اما فى الحالات المزمنة المصاحبة لعتامة وتمزق العين اظهرت شحوب بالخياشيم والكبد و الكلى والطحال وفقر دم الأعضاء الداخلية. ومن الفحص البكتريولوجى تم عزل الإيروموناس هايدروفيلا و السيدوموناس فلورسنس وكانت نسبة الاصابة٤٦.١٢% ، ٢٨.٦% على التوالى. ولقد اظهر الفحص الظاهرى والميكروسكوبى لعينات الفطريات ان الفطر المعزول هو السابرولجنيا براسيكا بمعدل الاصابة ٢٥.٢٥%. و لقد كشف الفحص الطفيلى لعدسة العين الاصابة بدبلوستومم ميتاسركاريا بمعدل اصابة ٢٥%. وقد أجريت اختبار حساسية المضادات للسلالات معزولة وأظهرت أن الإيروموناس هايدروفيلا والسيدوموناس فلورسنس كانتا حساسة للفلورفينيكول ، سيبروفلوكساسين، حمض الناليديكسيك والتتراسيكلين ومقاومة للأمبيسلين. و قد تم مناقشة طرق الوقاية والعلاج.