Monogeniasis in African Catfish "Clarias gariepinus" and Common Carp "Cyprinus carpio"

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Abstract

Over a one-year period, the gills of Clarias gariepinus and Cyprinus carpio were examined for the presence of monogenean parasites. Three monogeneans were found: quadriacanthus sp, macrogyrodactylus sp and dactylogyrus sp. The prevalence of monogeniasis was 56% and 57.5% in Clarias gariepinus and Cyprinus carpio respectively. Grossly, the lesions developed were congested or pale colored gills which covered by hypersecretion of mucus. Histopathological examination showed cross-sections from one or more parasites in-between the gill filaments. PAS positive parasite elements were detected. Moreover, fusion of secondary gill lamellae and mononuclear cellular infiltration were also noticed. Treatment trials showed that Metrifonate, Mirazid, Fresh minced garlic, Potassium Permanganate, Mebendazole and Copper sulphate were effective in treating monogeniasis.

Introduction

Fish parasites play an important role in determining the healthy status of fish, they may act either as a primary source of disease or as secondary invaders to other infections (10 and 11). Parasitic diseases in warm water fishes are considered serious problems rather than bacterial diseases (6). They may lead to economical losses in body weight as well as public health significance in certain circumstances (29). Fish gills are multifunctional organs which are responsible for respiration, digestion, excretion of nitrogenous waste and osmoregulation. However, they are often the primary site of infection (21). Quadriacanthus Kearni and Q. clariadis clariadis, monogeneans from the gills of Clarias lazera inhibiting Nile Delta water in Egypt in Dakahlia (13) and Sharkia provinces (12 and 20). In addition the disease was recorded in African catfish by several investigators (1, 9, 14,
Moreover, *Dactylogyrus spp.*, were recorded in *Cyprinus carpio* in other previous studies (5, 1, 11, 29 and 22). The present work was conducted to study the problem associated with monogenean gill infestation and trails for treatment.

**Materials and Methods**

**Fish samples**

A total number of 200 African Catfish, *Clarias gariepinus* (*C. gariepinus*) and 320 Common Carp, *Cyprinus carpio* (*C. carpio*) were collected during the period from January 2005 to December 2006 from their natural sources (El- Riah El-Tawfiki, and private fish farms). The fishes were transported safety (21) to the Fish Diseases Laboratory, Faculty of Vet. Medicine, Banha.

**Examination of fishes**

The fishes were subsequently subjected to thorough investigation of the gills. The fish were clinically examined and signs observed were recorded. Then, the fish were killed and subsequently the gills were dissected and lesions noticed were reported. The gills examined microscopically and the live parasites were isolated, fixed and mounted in glycerine-gelatine (21).

**Histopathological examination:**

Specimens for histopathological studies were taken from gills of naturally infected fish. The specimens were fixed in 10% buffered formalin. Sections of 3-5 micron were prepared and stained with hamatoxylin and eosin (25). Moreover, Periodic acid Schiff reaction (PAS) was used for detection of parasitic elements.
Treatment Trails:

Fish used

Sixty *C. gariepinus*, weighted $130 \pm 10$g and naturally infested with monogenia were collected El- Riah El-Tawfiki, its tributaries. In addition, one hundred and twenty *C. carpio*, weighted $15 \pm 5$g, suffered from monogeniasis were obtained from private farm. They were transported safety (21) and were kept in well prepared glass aquaria, each measured 100 x 30 x 50 cm and were supplied with sufficient aeration by using electric air pump (Rena, Italy). The fish were divided into 6 groups each of 10 and 20 fish for *C. gariepinus* and *C. carpio* respectively and stocked separately in aquarium.

Compounds used for treatment:

1. Chemicals:
   1. Potassium permanganate (EL-Nasr Pharmaceutical Chemicals Co.)
   2. Copper sulphate (EL-Gomhorya Pharmaceutical Chemicals Co.)
   3. Mefronate powder (ADWIA) 10th of Ramadan City.
   4. Milbendazol (PHARCO Pharmaceutical Chemicals Co.)

2. Natural products
   1. Mirazid (PHARCO Pharmaceutical Chemicals Co.)
   2. Fresh minced garlic.

Experimental design:

Number of groups, Number of fish per group, type of compound used, concentration of used drug and exposure time were presented in table 1. The fish were kept under observation for 7 days. Number of dead fish was recorded. Both dead and survivors were examined for evidence of disease and the presence of monogenean at the end of the experiment.

<table>
<thead>
<tr>
<th>Group No.</th>
<th>Treatments</th>
<th>Concentration (mg/L)</th>
<th>Exposure Time</th>
<th>Fish No.</th>
<th>C. gariepinus</th>
<th>C. carpio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Metribphonate [Negm-Eldin and Salah (20)]</td>
<td>0.33</td>
<td>72 hr</td>
<td>10</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Mirazid [Mai Ibrahim (18)]</td>
<td>10</td>
<td>1 hr /3days</td>
<td>10</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fresh minced garlic [Ebtisam and Younis (8)]</td>
<td>300</td>
<td>48 hr</td>
<td>10</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Potassium Permanganate [Osman (23)]</td>
<td>2.5</td>
<td>1 hour</td>
<td>10</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Cupper sulphate [Noga (21)]</td>
<td>3</td>
<td>24 hr</td>
<td>10</td>
<td>Non</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Mebendazol [Noga (21)]</td>
<td>1</td>
<td>24 hr</td>
<td>Non</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Control (infested group)</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

Each Fish species in separate aquarium.

Non: not used  
* two aquaria per each group
Results and Discussion

Monogenasis was recorded among the examined *C. gariepinus* and *C. carpio* in a rate of 56% and 57.5% respectively. The infested fish showing no obvious signs, internally the gills showed fading color with hyper-secretion of mucous on the gills (Fig.1). Some gill filaments showed pale patches alternated with reddish ones. Microscopically the gills harbored monogenea (Fig.4). Similar Observations were recorded in previous studies (19, 20, 9, 1 and 26).

Three monogenea sp. were detected in the present study, *Quadriacanthus* sp., *Macrogyrodactyurus clarii* and *dactylogyrus* sp.

*Quadriacanthus* species found in the gills of infested *C. gariepinus* (Fig. 2 A, B). The parasite appeared flat, short worm and had many oval or spherical pigmented eye granules scattered in its anterior part. The opisthaptor was equipped with two pairs of central large anchors and numbers of small marginal hooklets (Fig.2: A; B). The common features of recorded monogenea were agreed with that described by previous authors (19, 20, 23 and 22).

*Macrogyrodactyulus clarii* (Fig.3: A; B) was identified from the gills of infested *C. gariepinus*. The parasite was characterized by transparent bodies, without eyes pots, and with large medially located uterus containing embryos. They were relatively large elongated flattened flukes of average body length 2mm. The head was bilobed with a pair of head organs. The cirrus appurature was oval shaped, contained 16 small spines arranged in one row. The haptoral sclerites composed of one pair of large anchors and 16 marginal hooklets. The same descriptions were previously reported in several studies (27, 11 and 23).
Fig. (1): C. garepinus gills showing congestion of gill filament and slimness.

Fig. (2): Photo of Quodriacanthus sp. (A) x 4 and (B) x 10

Fig. (3): Photo of Macrogyrodactylus (A) x 4, and posterior end (x10), (B)

Fig. (4): Photo of Dactylogyrus sp. X20
Fig. (5): Gill of *C. carpio* infested with *Dactylogyrus sp.* x 4

Fig. (6): (A) Gills of *C. gariepinus* showing cross sections of monogenea in-between gill filament (H & E x 100).

(B) Positive PAS cross section of one monogenea in-between gill filament (PAS x 200).

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Dactylogyrus species recorded in the gills of C. carpio (Fig.4). The parasite was flat and elliptical and possesses at its anterior end four anterior eyespots. The fixation apparatus or haptor consists of two large hooks surrounded by up to 16 smaller hooklets. The same parasite was recorded in other works (17, 11).

The prevalence of Monogentic trematodes among the examined C. gariepinus was 56%. These results were agreed with that recorded by El Bouhy (12), but lower than that observed by Osman (23) who mentioned the prevalence was 77.2% in C. gariepinus, meanwhile it has been higher than that reported in other previous studies (4, 7, 16, 2, 1, 3 and 9). Concerning the seasons, the highest prevalence of disease recorded during spring (82%) and the lowest in winter (36%). Similarly, other researchers (19) found the maximum monogenetic infestation during autumn and spring. On the other hand, monogeneosis was recorded in highest rate during summer in several studies (1, 9, and 23). Regarding to C. carpio, monogeneosis was recorded in a rate of 57.5% and the disease mainly found during summer (80%). Nearly similar findings were reported in previous studies (1 and 23)

Histopathological examination showed cross-sections from one or more parasites in-between the gill filaments (Fig.6 A). Fusion of secondary gill lamellae due to epithelial hyperplasia and mononuclear cellular infiltration were also recorded. PAS positive parasitic elements were observed in between the gill filaments (Fig. 6 B). These proliferative gills lesions could be attributed to continuous irritation of monogenea and the action of its hooks (27). The recorded lesions in the present investigation were similar to those observed previously in Clarias lazera (4 and 16) and tilapia (1, 24, and 22). Moreover, congestion and focal hemorrhages were also noticed in gill arch. In the same respect, gills infested with monogenea showed malaromacrophages and eosinophilic granular cells in the primary gill lamellae (14, 3) as well as, edema of the gill arch with necrosis in the adductor muscles and gill lamellae were recorded in previous work (15).

Treatment trials for monogeniasis, revealed that Metaphonate, potassium permanganate, fresh minced garlic, mirazid and copper sulphate were highly effective against monogeniasis in C. gariepinus (table.2) and the
survival rate reached 100% except in group treated with metophonate and cupper sulfate, it was 90% compared with control group (70%). These results were in a harmony with that reported in previous studies (20, 21, 8, and 18). Moreover, as presented in table 3, metophonate, potassium permanganate, fresh minced garlic, mirazid and Mebendazole were highly effective in treatment of C. carpio. These results were nearly agreed with the findings given by several investigators (20, 21, 8, and 18). In conclusions monogenea infestation induced health hazard and had determined effects on function of the affected gills which represented by fusion of the gill lamellae. Potassium permanganate is the cheapest and highly effective antiparasitic agent.
Table (2): Effect of natural and chemical compounds in treatment of monogeniasis in *Cl. gariepinus*

<table>
<thead>
<tr>
<th>Group No.</th>
<th>Compound</th>
<th>Concentration</th>
<th>Exposure time</th>
<th>No. of fish</th>
<th>% of survival</th>
<th>Fish Behaviour</th>
<th>Microscopic examination of gills at the end of exposure</th>
<th>Microscopic examination of gill 2 days post exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mc rophonate</td>
<td>0.33 mg/L</td>
<td>72 hr</td>
<td>10</td>
<td>90</td>
<td>Mostly normal</td>
<td>Dead monogenea</td>
<td>Gill free from monogenea</td>
</tr>
<tr>
<td>2</td>
<td>Pot. permanganate</td>
<td>2.5 mg/L</td>
<td>1 hr</td>
<td>10</td>
<td>100</td>
<td>Mostly normal</td>
<td>Dead monogenea</td>
<td>Gill free from monogenea</td>
</tr>
<tr>
<td>3</td>
<td>Fresh minced garlic</td>
<td>300 mg/L</td>
<td>48 hr</td>
<td>10</td>
<td>100</td>
<td>Mostly normal</td>
<td>Dead monogenea</td>
<td>Gill free from monogenea</td>
</tr>
<tr>
<td>4</td>
<td>Mirazid</td>
<td>10 mg/L</td>
<td>1 hr / 3 days</td>
<td>10</td>
<td>100</td>
<td>Mostly normal</td>
<td>Dead monogenea</td>
<td>Gill free from monogenea</td>
</tr>
<tr>
<td>5</td>
<td>CuSO₄</td>
<td>3 mg/L</td>
<td>24 hr</td>
<td>10</td>
<td>90</td>
<td>Mostly normal</td>
<td>Dead monogenea</td>
<td>Gill free from monogenea</td>
</tr>
<tr>
<td>6</td>
<td>Control (infested)</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>70</td>
<td>Fish were lethargic and swim near the water surface</td>
<td>Alive gill fluke</td>
<td>Alive gill fluke</td>
</tr>
</tbody>
</table>
Table 3: Effect of natural and chemical compounds in treatment of monogeniasis in C. carpio.

<table>
<thead>
<tr>
<th>Group No.</th>
<th>Compound</th>
<th>Concentration</th>
<th>Exposure time</th>
<th>No. of fish</th>
<th>% of survival</th>
<th>Fish Behaviour</th>
<th>Microscopic examination of gills at the end of exposure</th>
<th>Microscopic examination of gill 2 days post exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M-trophonate</td>
<td>0.33 mg/L</td>
<td>72 hr</td>
<td>20</td>
<td>100</td>
<td>Mostly normal</td>
<td>Dead monogenea</td>
<td>Gill free from monogenea</td>
</tr>
<tr>
<td>2</td>
<td>Potassium permanganate</td>
<td>2.5 mg/L</td>
<td>1 hr</td>
<td>20</td>
<td>100</td>
<td>Mostly normal</td>
<td>Dead monogenea</td>
<td>Gill free from monogenea</td>
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<td>3</td>
<td>Fresh minced garlic</td>
<td>300 mg/L</td>
<td>48 hr</td>
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<td>Mostly normal</td>
<td>Dead monogenea</td>
<td>Gill free from monogenea</td>
</tr>
<tr>
<td>4</td>
<td>Mirazid</td>
<td>10 mg/L</td>
<td>1 hr / 3 days</td>
<td>20</td>
<td>100</td>
<td>Mostly normal</td>
<td>Dead monogenea</td>
<td>Gill free from monogenea</td>
</tr>
<tr>
<td>5</td>
<td>Metbendazole</td>
<td>1 mg/L</td>
<td>24 hr</td>
<td>20</td>
<td>100</td>
<td>Mostly normal</td>
<td>Dead monogenea</td>
<td>Gill free from monogenea</td>
</tr>
<tr>
<td>6</td>
<td>Control (infested)</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>80</td>
<td>All fish were lethargic &amp; swim near the water surface</td>
<td>Alive gill fluke</td>
<td>Alive gill fluke</td>
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</tbody>
</table>
References


المتخصص العربي

أجريت هذه الدراسة على مرض المونوجينيا التي تصيب خياديم أسماك القراميط، والمبروك.

وقد بنت الدراسة ما يلي:

- كانت معدلات الإصابات في أسماك القرمبوت الأفريقي وأسماك المبروك بالمونوجينيا هي 70% على التوالي.

- كانت أهم الأعراض الإكلينيكية الظاهرة في الأسماك المصابية وجودة اختلاف وجوه لون الخياشيم مع زيادة في كمية الخراط على الخياشيم.

كانت الطفيفات التي تم عزلها تنتهي إلى الديدان المفلكة وحيدة العسل (المونوجينيا الأوربية) وتشمل الكوارديكينس والماكروجيرودكينس والدكيسيرودكينس.

- أظهر الفحص الهيستوباثولوجي للخياشيم المصابية بالمونوجينيا وجود مقطع عرضي أو أكثر بين خيوات الخياشيم مع التحام صفائح الخياشيم الثانوية نتيجة فرط التنسج للخلايا "طلبية وترام الخلايا الالتهابية أحادية النواة.

- أظهرت المحاولات العلاجية لأسماك القرمبوت الأفريقي وأسماك المبروك المصابية بالمونوجينيا باستخدام أي من المتروبوتيوم أو برمينجات البروتاسيوم أو النفايات المطرد أو النيازيمات، أو كبريتات النحاس أو ميبرانون نتائج فعالة.


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