

TREATMENT OF THE COMMON CARP *Cyprinus carpio* INFESTED WITH THE CILIATED PROTOZOAN *Trichodina domerguei* BY USING SOME CHEMICALS

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ABSTRACT

The present study included a series of experiments to treat the common carp (*Cyprinus carpio*) infected with ciliated protozoan *Trichodina domerguei* by using four different chemicals: Table salt (sodium chloride), formalin, malachite green and potassium permanganate. The dip method was applied to treat the fishes with various concentrations of the above mentioned chemicals. Table salt was effective against this parasite in a concentration of 20000 mg / l for five minutes exposure. Formalin was also effective at a concentration of 500 ml/l for five minutes exposure. Malachite green was effective to kill all the parasites when used at the concentration of 10 mg / l. Potassium permanganate was effective at the concentration of 475 mg / l for five minutes exposure.

INTRODUCTION

Ectoparasitic protozoans often cause severe problems in intensive fish culture because they can rapidly multiply and be directly transmitted in such conditions (3,14). Among these parasites, the trichodinids are probably the most commonly encountered ciliophoran protozoan parasites on wild and cultured fishes in marine as well as freshwater environments (2). Hoffman (10) listed 74 trichodinid species from freshwater fishes of the United States, of which at least 19 were believed to cause considerable damage to their hosts under certain conditions. In 1968, high mortalities among chum salmon *Oncorhynchus keto* fry reared in Ichani hatchery, eastern Hokkaido, were due to trichodinid infection. The causative parasite was reported as *T. domerguei* (24). It is found on carp of all ages and in all seasons of the year (6). According to Mhaisen (16), a total of 10 species of *Trichodina* are found in Iraq, among which *T. domerguei* is the most distributed species, being recorded from many fish farms and natural water bodies in north, middle and south of Iraq with a total of 33 fish hosts in Iraq for this species. A large number of chemicals had been used to control ectoparasites which are classified into simple chemicals, staining dyes, insecticides, plant extracts and drugs (9,11,19).

The objective of the present study is to determine the efficacy of some commonly available chemicals (table salt, formalin, malachite green and potassium permanganate) to treat the common carp *Cyprinus carpio* that infested with *T. domerguei*.

MATERIALS AND METHODS

Common carps used in the present study were obtained from Al-Zaafaraniya fish farm, Baghdad. They measured 9.8-24 cm in length. Their weight varied from 8-500 gm. To obtain sufficient number of infected fishes, infected fishes were placed in non- infected concrete pond (2x2) for two months. Skin and gill smears were examined prior to the treatment of fishes.

Four types of chemicals were used in treatment. These were table salt (NaCl), 37- 40% formaldehyde solution (HCHO) supplied by BDH Ltd.

(England), 90% malachite green (C₉₈H₅₀N₄O₄.2C₂H₂O₄) from Merck Co. (Germany) and potassium permanganate (KMnO₄) from BDH Ltd. (England). The treatment doses were chosen according to Duijn (6), Hoffman and Meyer (11), Herwig (9) and Schmahl (19). The therapeutic trials were carried out by bathing infected fishes with various concentrations. Glass aquaria (60×30×30 cm) equipped with oxygenation device were employed. Also, recovery tanks of the same size were prepared and maintained with fresh water and oxygenation device. The dip method was applied in all experiments. Treated fishes were left for five minutes in the treatment tanks. After that, they were transferred to the recovery tanks where they were left for about 5-10 minutes. Smears from skin and gills were taken to determine, the effectiveness of the tested chemicals. Soon before and after fish exposure to therapeutics, some few water parameters were determined. These included water temperature, dissolved oxygen concentration, pH and salinity. Simple thermometer, Winkler method (Azid modification), pH meter (EIL 7020 type, England) and electric conductivity meter (S-C-T, model YSI 33, YSI Scientific, USA) were used and applied as recommended by Golterman *et al.* (8) and Khalifa (12).

After each run, the mortality rate of the trichodinids parasites was determined when skin and gills were examined under a high power magnification with the aid of an Olympus BH-2 microscope by subtracting the total number of alive parasites from the total number of dead parasites and multiplying the result by 100.

RESULTS AND DISCUSSION

Table (1) shows that the table salt at a concentration of 9000 mg/l was effective in killing some of the parasites. The letual dose for all population was achieved with a concentration of 20000 mg/l. Treated fishes behaved normally in all concentrations. Hoffman and Meyer (11) showed that dipping in 17500 mg/l for three minutes was effective in killing *Trichodina* spp. in skin and gills of fry of *Coregonus clupeaformis*. The eradication of *T. domerguei* achieved with table salt in the present study is expected as NaCl is one of the oldest remedies against external bacterial, fungal and parasitic diseases in commercial fish farm (9,12). In fact, it is sometimes referred to as the aspirin of aquaculture (23). It is remained popular in fish treatment due to low cost, availability and simple distribution in the water (11). Schmahl (19) reported that the therapeutic effects were based mainly upon an increased slime production during which the host gets rid of parasites and due to toxic effects of free Na ions (in fresh water only, where antagonistic K or Ca ions are absent).

Table 1: Treatment of the common carp infected with *T. domerguei* by dipping fishes for five minutes in table salt solution.

Salt concentration (mg/l)	Number of treated fishes	Observations on fishes and parasites
9000	10	Normal behaviour of fishes. 20% parasite mortality.
12000	10	Normal behaviour of fishes. 50% parasite mortality.
15000	10	Normal behaviour of fishes. 80% parasite mortality.
20000	10	Normal behaviour of fishes. 100% parasite mortality.

Conditions of experimentation:

Water temperature was 29 ±1 C°, pH was 7.7, Dissolved oxygen was 7.7 mg/l, Salinity was 1ppt (before treatment) and 14-26 ppt (after treatment), Fish total length was 9.5 – 23 cm, Number of replicates was three.

Table (2) indicates that exposure of treated fishes to increasing concentrations of formalin had resulted increasing mortality among *T. domerguei* with a total eradication at a concentration of 1000 ml/l. In the later concentration, fishes were also affected and required more than five minutes to recover in fresh water. Diggles (5) recommended 200 ml/l of formalin for 30 minutes to control *Trichodina* sp. on juvenile turbot *Colistium nudipinnis*. Al-Aubaidi (1) reported that monogenean elimination from young carps (*Cyprinus carpio*) occurred by treating such fishes with 1500 ml/l formalin for five minutes exposure. Formalin has a long history of applications in hatcheries to control external bacterial, fungal, protozoal, monogenean, hirudinean and crustacean diseases (21). The mode of formalin action on disease agents is by protein denaturation and enzymes inactivation of the cell and damage to cell membrane (19).

Table 2: Treatment of the common carp infected with *T. domerguei* by dipping fishes for five minutes in formalin.

Formalin concentration (ml/l)	Number of treated fishes	Observations on fishes and parasites
250	10	Normal behaviour of fishes. 15% parasite mortality.
500	10	Normal behaviour of fishes. 35% parasite mortality.
750	10	Normal behaviour of fishes. 65% parasite mortality.
1000	10	Vigorous behaviour of fishes. 100% parasite. mortality

Conditions of experimentation :

Water temperature was 31 ± 1 C°, pH was 7.5, Dissolved oxygen was 7mg/l (before treatment) and 6.4 mg/l (after treatment), Salinity was 1ppt, Fish total length was 10 -24 cm, Number of replicates was three.

The results obtained with malachite green in treating infected carps are indicated in table (3). The used concentrations (0.5-10 mg/l) were effective in killing the parasites. Higher concentration (10 mg/l) of this remedy was recommended to remove all parasites. Treated fishes showed normal behaviour. Madsen *et al.* (15) suggested that 1 ppm of malachite green was most effective to treat *Trichodina* infection in *Anguilla anguilla*. Durborow (7) reported that 0.1-0.15 ppm of malachite green was used as a bath for 12-24 hour treatments for freshwater fishes. Malachite green has an extensive use as a fungicide in fish farming (4). However, it was also used to control ectoparasitic protozoans (12). The therapeutic effects of malachite green in protozoans are due to complete breakdown of mitochondria and then the destruction of the outer cell membrane (13,17,18, 20, 22).

Potassium permanganate showed high parasitocidal effect when used in concentrations ranged from 325-475 mg/l. The last concentration (475 mg/l) for five minutes exposure was very affective to control *T. domerguei* with full eradication. Also, the intensity of the parasites decreased with the increase in the concentration of potassium permanganate (Table 4). Duijn (6) reported that trichodinids were eliminated from young carp (*C. carpio*) by treatment with 1 mg/l of potassium permanganate. Madsen *et al.* (15) showed that potassium permanganate was effective to remove of the trichodinid *T. jadranica* on skin and gills of eels *Anguilla anguilla* at 20 ppm concentration. Potassium permanganate is an effective aquatic medication for treating ornamental fishes. It kills most of exposed pathogenic bacteria, ciliated parasites and flukes (11,13).

Its effect is probably based on the production of monatomic oxygen and manganese- protein complexes in the parasites tegument or cell membrane (19).

Table 3: Treatment of the common carp infected with *T. domerguei* by dipping fishes for five minutes in malachite green solution

Malachite green concentration (mg/l)	Number of treated fishes	Observations on fishes and parasites
0.5	10	Normal behaviour of fishes. 2% parasite mortality.
1.5	10	Normal behaviour of fishes. 15% parasite mortality.
2.5	10	Normal behaviour of fishes. 30% parasite mortality.
5	10	Normal behaviour of fishes. 70% parasite mortality.
10	10	Normal behaviour of fishes. 100% parasite mortality.

Conditions of experimentation:

Water temperature was 28 ± 1 C°, pH was 7.8, Dissolved oxygen was 8.2 mg/l, Salinity was 0.98 ppt, Fish total length was 9.8 – 20 cm, Number of replicates was three

Table 4: Treatment of the common carp infected with *T. domerguei* by dipping fishes for five minutes in potassium permanganate solution.

Potassium permanganate concentration(mg/l)	Number of treated fishes	Observations on fishes and parasites
125	10	Normal behaviour of fishes. 25% parasite mortality.
250	10	Normal behaviour of fishes. 46% parasite mortality.
325	10	Normal behaviour of fishes. 78% parasite mortality.
475	10	Normal behaviour of fishes. 100% parasite mortality.

Conditions of experimentation:

Water temperature was 30 ± 1 C°, pH was 8, Dissolved oxygen was 7.4 mg/l, Salinity was 0.97 ppt, Fish total length was 12-22 cm, Number of replicates was three.

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معالجة أسماك الكارب الإعتيادي *Cyprinus carpio* المصابة بالإبتدائي الهدبي *Trichodina domer guei* باستخدام بعض المواد الكيميائية

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الملخص

إشتملت الدراسة الحالية على إجراء سلسلة معالجات لأسماك الكارب الإعتيادي المصابة بالإبتدائي الهدبي *Trichodina domerguei* وذلك باستخدام أربعة أنواع من المواد الكيميائية المختلفة: ملح الطعام (كلوريد الصوديوم)، الفورمالين، الملاكيت الأخضر (أخضر الملاكيت) وبرمنغنات البوتاسيوم. تم اعتماد طريقة التغطيس **Dip method** لمعالجة الأسماك بالتركيز المختلفة من المواد المذكورة أعلاه. كان ملح الطعام فعالاً في قتل الطفيليات عند استخدامه بتركيز 2000 ملغم/ لتر وبمدة تعريض أمدتها خمس دقائق، كما كان الفورمالين مؤثراً في هذه الطفيليات عند استخدامه بتركيز 500 مل/ لتر وبمدة خمس دقائق أيضاً. كما أثبتت صبغة الملاكيت الأخضر كفاءة عالية في القضاء على هذه الطفيليات عند التركيز 10 ملغم/لتر ولمدة خمس دقائق. وأظهرت برمنغنات البوتاسيوم كفاءة عالية عند استخدامها بتركيز 475 ملغم/لتر ولمدة تعريض أمدتها خمس دقائق.