Gross and histopathological study on common carp Cyprinus carpio L. diseases in rearing culturing ponds in Kirkuk Province – Iraq

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Summary

The present study aimed to investigate the infection ratio and pathological lesions in common carp fish in Kirkuk province. To achieve these goals, a survey study was conducted from 01/12/2015 to 01/04/2016. Results of the survey study showed that the infection ratio of acidity and alkalinity of pond’s water 27.88% (46/165), bacterial kidney infection 20% (33/165), water mold (saprolegniasis) 12.12% (20/165), spring viremia of common carp 11.52% (19/165), Coccidiosis 11.52% (19/165), fungal gill rot infection 7.27% (12/165), hemorrhagic septicemia 6.67% (11/165) and enteric parasite infection 3.03% (3/165).

The pathological study showed that lesions in acidic and alkaline of pond’s water consisted from necrosis with sloughing of scales and intestinal mucinous degeneration as well as necrosis of intestinal villi. In bacterial kidney infection lesion consisted of diphtheric membrane covering abdominal cavity and presence of microorganisms in renal cortex and medulla. In Saprolegnia sp. infection the pathognomic lesions were recorded which consisted of fungal hyphae extended from fish body into water. In spring, viremia of common carp lesions consist from exophthalmia and pinpoint hemorrhage on the fish body with presence of pseudodiphtheric membrane associated with hemorrhagic exudate as well as extensive necrosis of intestinal villi. In Eimeria sp. infection lesions were composed from presence of infective stages of coccidian parasites in enterocytes. In fungal gill rot infection the mosaic appearance lesion was observed consisted from necrotic area (white color) and health area (red color). In hemorrhagic septicemia infection lesions consisted from ulcers surrounded by areas of hyperemia with extensive necrosis of intestinal lining. In enteric parasites infection we noted the presence of large numbers of worms in intestinal lumen, also there is nodule in intestinal mucosa contain nematods of 2 cm in length, in other cases there is presence of worms inserted in intestinal mucosa of 30 cm length covered with fibrous membrane. It concluded from this study that the infection ratio with different diseases in common carp varied in compared with other countries and depends upon changes in climate and breeding habits as well as the gross and microscopic lesions are identical to that recorded worldwide.

Keywords: Common carp, Pathological lesions, Breeding Ponds, Kirkuk.

Introduction

Animal welfare is considered important part of national economy of each country, as well fish industry form one of the important joints of animal welfare in Iraq which share about 3% of entire economic returns and produce up to 113 million tons of fish meat each year (1). Fish breeding sector in Iraq has recently a huge revolution in quality and quantity in breeding techniques represented by increasing numbers of investors who are interested in fish breeding industry with an increase in types of fish that are breed, these increase was accompanied by establishment of new fish ponds using new breeding techniques such as cages and breeding equipment of foreign origin as well as increase in number of fish hatcheries in Iraq that provide fish fingerlings (2). Common carp (Cyprinus carpio L.) consider the most common type of fish cultured in Iraq, this fish species have many characteristics made it suitable for breeding in aquatic environment of Iraq included rapid increase in weight during short time as well as resistance to many pathogens in aquatic environment of Iraq (3). Increase in fish production in Iraq combined with increase in diseases occurrence in culture ponds, these diseases may be due to errors in ponds management (either feed or water quality issues) or due to infectious agent such as...
viruses, bacteria, fungus and parasites (4). This study was designed to investigate the infection ratio of different diseases affect fish and their pathological lesions in rearing ponds in Kirkuk province.

**Materials and Methods**

A survey study was conducted on diseased fish brought to Veterinary hospital in Kirkuk province for the period 1/12/2015-1/04/2016. Fish samples were subjected to gross and microscopic examination.

Tissue samples were obtained from affected organs; after, tissue fixed in 10% neutral buffered formalin for 72 days, dehydrated in increased concentration of ethyl alcohol, cleared by Xylene, infiltrated and embedded in paraffin wax, then sectioned at 4-6 microns using rotary microtome. Slides were stained by Harris hematoxylin, tissue Giemsa and Periodic acid Schiff reagent as described by (5).

**Results and Discussion**

The results of current study showed that the highest infection ratio of diseases in common carp fish were recorded in acidity and alkaline of pond’s water with total infection ratio as 27.88% (Table, 1). These cases are considered as management disease of common carp fish which resist a wide range of pH between 5.5 to 7. The acidity of pond’s water occurs as a result of high quantities of feed fermentation in water leading to produce CO₂ gas. This gas is dissolved in water to form carbonic acid and leads to decrease in pH less than 5.5 (6), while alkaline of pond’s water occur due to insufficient water drainage leading to accumulation of fish biological waste product that causes a release of nitrogen gas in water causing an increase in nitrogen ion concentration which leads to an increase in pH of water more than 8 (7). The results of current study agreed to studies (8-10) which pointed to that the main cause of this condition is high daily amount of unconsumed feed with bad drainage of pond water. Also the results showed that the main gross lesion was the damage to scales and gills. Later these lesions extend to fins. Microscopic lesions consisted from mucinous degeneration and hyperplasia of goblet cells (Fig. 1). In bacterial kidney infection the results showed that the total infection ratio was 20% (Table, 1), the result of current study not agreed to the infection ratio of other studies (11-13), and this due to differences in survey period and change in temperature between winter and summer months lead to increase in stress that considered a predisposing factor for infection, also these studies agreed with current study in record presence of diphtheric membrane which considered a significant lesions in these cases with peritonitis and necrosis in the renal tubules in both posterior and anterior kidney (Fig. 2).

In water mold disease the results showed that the total infection ratio was 20% (Table, 1), these result is higher than other studies (14-16) due to endemic status of Saprolegnia spp. in Iraqi water especially northern area as well as the temperature of water less than 10 Celsius degree act as predisposing factor for infection (17), also result of saprolegniaisis agreed with (18) which indicated that the gross lesion is pathognomic for Saprolegnia sp. infection which composed from fungal hyphae represented the infective stages form of Saprolegnia spp. which extended from head to dorsal fin, with time lesion reach the tail fin (19) (Fig. 3).

In spring viremia infection the results showed that the total infection ratio was 11.52% (Table, 1), these result were not agreed with (20 and 21) which they recorded higher infection ratio than our study, these may be due to epidemiology and endemic status of these viral pathogens, but these studies agreed with our study in describe the pathological lesion that composed from exophthalmia with pin point hemorrhage on dorsal part of fish body with pseudodiphtheric membrane cover abdominal cavity (22) (Fig. 4). The result of Eimeria spp. infection showed that the total infection ratio was 11.52% (Table, 1), which approach to result of (23-25) whom explained that the elevation in infection ratio increase during spring may be due to humidity and temperature which help in sporulation of coccidial oocyst the infective stage of Eimeria spp. The gross examination of current study described two form, the first form was hemorrhagic enteritis that observed in acute infection with Eimeria spp., while the
second form was nodular enteritis that composed from flat white nodular lesions in mucosal layer of intestines which observed in chronic infection with *Eimeria spp* (26) (Fig. 5).

The result of fungal gill rot showed that the total infection ratio was 7.27% (Table, 1), the result of this study were less than other studies (27-29) because these studies collect all type of gill rot (bacterial, viral and fugal) under one descriptive term “gill rot”, also agreed with our study in describe the gross pathognomic lesion known as mosaic appearance which composed from red normal gill filaments and white necrotic gill filaments may be due to ischemic necrosis of gill vessels by fungal emboli which lead to necrosis and death of affected areas (30) (Fig. 6).


In hemorrhagic septicemia infection the total infection ratio was 6.67% (Table, 1). These results are less than (31-33) which recorded highly infection ratio in summer months not included in our study. These increase in infection ratio during summer months may be related to the elevation in water temperature which act as predisposing factor to facilitate the infection with Aeromonus hydrophilia, the pathological changes recorded by this study agreed with study done by (34) in describe the gross lesions that composed from ulcerative lesion with necrotic center surrounded by red hyperemic area (Fig.7).
Figure 2: Bacterial Kidney infection of common carp. Grossly show [1] present of diphtheric membrane which cover all internal organs (arrow), and [2] peritonitis and fibrinous enteritis (arrow), with [3] present of diphtheric membrane on anterior kidney (arrow), and [4] congestion of posterior kidney. Microscopically [5] there is sever hemorrhage (arrow) and congestion (arrow) in kidney tissue with coagulative necrosis (arrow), [6] microorganisms in kidney tissue (arrow) with infiltration of inflammatory cells (arrow).

Figure 3: Saprolegniasis (Water mold disease). Grossly [1] and [2] show presence of white cotton like lesions at gills, dorsal fin and extended to tail fin (arrows).

The result of enteric parasite infection showed that the total infection ratio was 3.02% (Table, 1), the result of current study was less than in Babylon province (35) Al-Qadsiya province (36) Nineveh province (37) and Basra province (38), this may be related to using of concentrated formalin by pond’s owner in Kirkuk province to disinfecting the ponds that lead to destroyed many intermediated, final hosts and infective stages of these parasites (38) (Fig. 8).
Figure 4: Spring viremia of common carp. Grossly [1] there is exophthalmia (arrow) and pin point hemorrhage on fish body (arrow), also [2] there is pseudodiphtheric membrane in abdominal cavity with hemorrhagic exudate. Microscopically [3] there is necrosis, sloughing and fusion of intestinal villi (arrow), [4] there is vacuolar degeneration around central vein (arrow) with hemorrhage in hepatic tissue (arrow) and infiltration of inflammatory cells (arrow) in portal area.

Figure 5: Coccidiosis in common carp. Grossly [1] there is congestion and sever hemorrhage in intestines (arrow) at first stages of infection, which converted with time into flat nodular white lesions in intestinal lumen known as nodular coccidiosis [2] (arrow). Microscopically [3] there is different reproductive stages of coccidian parasite in the enterocytes (arrow), [4] these reproductive stages of coccidian parasite present in submucosal layer of intestines (arrow).
Figure 6: Fungal Gill rot infection in common carp. Gross examination [1] showed severe congestion of gills with present of normal congested area (arrow) and other necrotic area (arrow), which known as [2] mosaic lesions consisted from white necrotic area (arrow) and other red normal appearance of gills (arrow).

Figure 7: Hemorrhagic septicemia in common carp. Grossly [1] there is ulcerative lesions surrounded by hemorrhagic area (arrow). Microscopically [2] there is hemorrhage (arrow) and necrosis (arrow) in intestines.

Figure 8: Enteric Parasite infection in common carp. Grossly [1] there is huge number of tapeworms inside the intestines (arrow), which [2] its length reaches up to meter (arrow), in other cases [3] there is nodular lesion in intestine (arrow) contain trematodes of 2 centimeters in length, in other cases [4] there is lesions in intestines contains tapeworms covered with fibrous membrane (arrow).
Table 1: Diseases in common carp fish at different months of survey study.

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<th>Diseases</th>
<th>2015</th>
<th>2016</th>
<th>Total</th>
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<td>4</td>
<td>12</td>
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<tr>
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<td></td>
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<td>(4.85)</td>
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<td>3</td>
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<td></td>
<td>(4.24)</td>
<td>(4.85)</td>
<td>(1.83)</td>
</tr>
<tr>
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<td>1</td>
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<tr>
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<td>(0.61)</td>
<td>(2.42)</td>
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<tr>
<td>5 Coccidiosis</td>
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<td>(2.42)</td>
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<tr>
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<td>(15.15)</td>
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References

دراسة عيانية ونسجية مرضية لأمراض أسماك الكارب اعتيادي في أحواض اليربية في محافظة كركوك-العراق

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الخلاصة

هدفت الدراسة الحالية إلى التحري عن نسبة الإصابة بالأمراض المختلفة التي تصيب أسماك الكارب اعتيادي في مقاطعة كركوك. أجريت دراسة مرضية لمدة من 12/01/2015 إلى 04/01/2016. أشارت نتائج الدراسة إلى أن نسبة الإصابة بمرض حموضة وقلوية الماء بلغت 27.88%، ومرض بكتريا الكلية 20%، ومرض عفن الماء البقري 12.12%، ومرض فيروسية دم أسماك الكارب الاكسيديي 14.52%، بالإضافة إلى مرض السمية النيزكية 7.27%، ومرض عفن الماء الفطري 7.27%، ومرض فيروسية يم أسماك الكارب الريسيديي 3.03%. أظهرت نتائج الدراسة أن نسبة الإصابة بمرض بكتريا الكلية تقدمت في مرض السمية النيزكية، ومرض فيروسية دم أسماك الكارب الريسيديي. وحُددت نسبة الإصابة بمرض السمية النيزكية والتغير في المناخ، كلاهما عاملاً أساسياً في تطور الأمراض في الأسماك في محافظة كركوك.:

الكلمات المفاتيح: الباري البكري، أمراض الأسماك، مراقبة وأنشطة، كركوك.