Assiut Vet. Med. J. Vol. 42 No. 84, January 2000

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Fac. Vet. Med., Assiut University.

PARASITIC GILL LESIONS IN NILE TILAPIA *OREOCHROMIS NILOTICUS* FROM FISH FARMS IN SAUDI ARABIA

(With 2 Tables and 7 Figures)

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(Received at 7/12/1999)

الإصابات الطفيلية لخياشيم أسماك البلطي النيلي المستزرعة بالمملكة العربية السعودية

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تم إجراء مسح وتقييم لأنواع الطفيليات التي قد تصيب أسماك البلطي النيلي المستزرعة في مياه ذات درجة ملوحة تتراوح مابين 4-7 جم/لتر خلال الفترة من ديسمبر حتى يناير 1999. تم التعرف على الأوالي التالية بالخياشيم وهي الأكثيوبودو ، الكريبتوكاريون ، الهيبنجايا ، التريكودينا والترايكفورا وذلك باستخدام تقنية الهستوباثولوجيا. كذلك لوحظ وجود التريماتودا في منطقة مابين الرقائق الثانوية للخياشيم مصاحبة بتنكرز الخلايا المبطنة لهذه المنطقة . تم مناقشة العلاقة مابين وجود هذه الطفيليات ودرجة الحرارة ، النيتريت والأمونيا ودرجة الملوحة لكل مزرعة على حدى . إستنتج من هذه الدراسة إن هذه الإصابات الطفيلية قد تكون عاملا مهيأ لحدوث الوفيات لأسماك المزارع وخاصة عندما تصل درجة حرارة المياه إلى 40-50 درجة مئوية.

SUMMARY

Histopathological assesment of different parasites affecting *Oreochromis niloticus* raised in 4-7 g/L saline water was conducted from September, 1998 to January, 1999. Protozoan infestation was represented by *Ichthyobodo sp.*, *Cryptocaryon sp.*, *Henneguya sp.*, *Trichodina sp.* and *Trichopherya sp.* Unidentified trematode was found attached to the interlamellar epithelium resulting in necrosis. The occurrence of these parasites in relation to the temperature, nitrite, ammonia, and salinity in

each farm was discussed. The study concluded that these parasitic infestations can be considered as prerequisite factor for the mortalities occurred when the water temperature increased to 40-50°C.

Key words: *Parasitic gill lesions in Nile Tilapia.*

INTRODUCTION

Some species of tilapia have been introduced to the aquaculture industry in the Kingdom of Saudi Arabia. These species include *Oreochromis niloticus*, *spilurus* (Spilurus Gunter) and hybrids of more than one type of tilapias (Osborre, 1979). The kingdom was successful raising these species under brackishwater, seawater, and hypersaline water (Al-Amoudi, 1987 a). Several reports have been described either on the occasional findings of protozoans and other helminthes or their association with outbreaks of diseases (Blanc et al., 1989; Paperna, 1982, 1984, 1991 and Speare et al., 1998).

The private farms located in the western region of Saudi Arabia are facing mortalities of *O. niloticus* raised under semi-intensive culture system, especially when the temperature reach 40-50°C. Consequentaly, the purpose of the present study is to describe the histopathology of gill lesions in *O. niloticus* associated with different parasites from September, 1998 to January, 1999.

MATERIAL and METHDS

Fish Farms:

Four different farms located in western region of Saudi Arabia were selected and assigned as F1, F2, F3, F4. The F1, F2, F4 consisted of concrete tanks, while F3 has both concrete tanks and earthen ponds. These farms use well water of 4-7 g/L salinity. The stocking density in these farms varried from 50-70 fih /m^3.

Fish:

Oreochromis niloticus are produced regularly in these farms for marketing. A total number of thirty fish were collected in each farm from September, 1998 to January, 1999. Three fish were randomly selected from each farm monthly for histopathological assesment.

Histopathology:

Fish were examined grossly for the presence of any gross lesions and killed by over exposure to clove oil. The gills of fish were fixed in

10% formlin dehydrated, embedded in parffin, sectioned at 4-6μ stained by haematoxylin and eosin, and examined by light microscopy. The intensity scale was based on the number of parasities per microscopic field at 400x with the range: 1-5(+); 6-10(++); 11-25(+++); 26-50(++++); 51-100(+++++); {100 (++++++) (Pellitero et al., 1995).

Water Quality:

Water sample of each farm was collected monthly and brought to the laboratory on ice. The nitrite and ammonia were analysed using colorimetric method (Boyd, 1979). The temperature was recorded monthly, while the salinity was measured by referactometer.

RESULTS

Gross Pathology:

The main predominant lesion observed in fish was the redness of the opercular area and gills. Whitish granules scattered in the gills were also observed.

Histopathology:

I) Protozoa:

Five major protozoa, namely Ichthyobodo sp., CryptrocaryonsSp., interlammellar form of Henneguya sp., Trichodina sp., and Trichohyera sp. were identified in the farms examined from September, 1998-January, 199 (Table 1). The intensity of Ichthyobodo sp. was highest in all the farms followed by the Cryptocaryon species. Henneguya, Trichodina sp. and Trichophyera sp. were less intense in the farms. Moreover, the intensity of Ichthyobodo sp. was high in temperatures of 25-26°C in F1, F2 and F4 (Table 1).

Ichthyobodo sp., appeared as rounded to elongated deeply stained organism between the interlamellar epithelium of the gill filament (Fig. 1). Trichophyera sp. appeared as stalk like-ciliated organisms and was found in close association with the interlamellar epithelium (Fig. 2). Epithelium lifting and necrosis of the interlamellar epithelium were observed in the gills infested with Ichthyobodo sp. and Trichophyera sp. (Fig. 1, 2).

The Cryptocaryon sp., appearing as pyramidal-shape in the lamellar trough which resulted in necrosis of the interlamellar epithelium (Fig. 3). The typical structure of Trichodina sp. was also noticed between the secondary lamellae with minimal tissue alteration (Fig. 4). Lamellar fusion was also observed, surrounding the interlamellar form of Henneguya species. Hyperaemia of the

blood sinusoids in the secondary lamellae and branchial blood vessels were also observed (Fig. 5).

II) Trematodes:

In F1 and F4 during November and January, necrosis, disappearance of the secondary lamellae and hyperplasia of the interlamellar epithelium were observed in association with an unidentified trematodes (Fig. 6). Pronounced eosinophilc granular cellular infiltration along the gill filament and degranulation of their contents were likewise observed (Fig. 7).

Water Quality:

Water quality parameters showed high values of nitrite (1.7-2 mg/1) in all farms, espeically when the water temperature ranged between 23-28°C. The salinity and temperatures values were recorded (Table 2).

DISCUSSION

This is the first report on the occurrence of these parasites in *O.niloticus* raised in Saudi Arabia. *Ichthyobodo nectator* is known to affect freshwater fishes. However, there have been several recent reports on the occurrence of this parasite in marine environment (Bullock and Robertson, 1982; Burno, 1992 and Urawa et al., 1991). In this study Ichthyobodo sp. was the main predominant protozoan observed in all farms. This result suggests that this parasite found in brackish water probably belongs to another species. The temperature of 25-26°C seems to be the optimal temperature for this protozoan in the semi-intensive culture system used in these farms. The interlamellar necrosis observed in the gills infested with Ichthyobodo sp. In the present study, results in weakness of *O.niloticus* to survive at high temperature, because the chloride cells located in the lamellar trough were damaged by the protozoan. The chloride cells in fishes are known to play a key role in osmoregulation and acclimation (Jonassen et al., 1997).

The cryptocaryon sp. observed in this study were less intense than Ichthyobodo sp. And also resulted in the necrosis of the interlamellar epithelium, which suggests damage of the chloride cells. Cryptocaryon is an ubiquitous ciliate with a very wide host range and considered a serious problem in tropical fishes (Pellitera et al., 1955). The life cycle of this protozoan is temperature dependent (Lom and Dykova, 1992). It is also sensitive to saline concentrations, as tomonts undergo cytolysis in salinities lower than 20 g/L (Colorni, 1985). In this

study, both the temperature and salinity were found to be optimal for the development of the infective stage.

In this study, Myxosporean protozoa was represented by the interlamellar form of Henneguya sp. and was shown to follow Ichtyobodo sp. and Cryptocaryon sp. in intensity. Wolf and Markiw (1984) reported that fish semi-intensive culture system plays an important role in the transmission of myxosporeans, because of the possible presence of the intermediate hosts for transmission. Myxosporean protozoa were found in a wide group of hosts and caused noticeable histopathological damage (Sitja-Bobadilla et al., 1992). In the present study, hyperaemia of the blood vessels and lamellar fusion were observed in the infested gills suggesting altered respiration may have occurred.

The unidentified trematode observed in this study induced necrosis and disappearance of the secondary lamellae and eosinophilic granular cellular infiltration with degranulation of their contents. These results suggest that a host reaction occurred in response to the invading trematode. Degranulation of eosinophilic granular cells has been reported in fish with Aeromonas salmonicida exotoxins, Ichthyobodo irritation of the skin, Plerocercoid infections of rainbow trout and myxosporidian infections (Ellis, 1985; Vallejo and Ellis, 1989 and Blacktock and Pickering, 1980).

The poor water quality recorded in the farms were expressed by high nitrite and ammonia levels, which could explain the high intensity of protozoan infestation. Boyd (1979) stated that the toxic level of nitrite poisoning varried in different fish species (0.5-2.5 mg/L).

CONCLUSIONS

The present study reported for the first time the occurrence of protozoa and tematode in fish farms producing *O.niloticus* in Saudi Arabia in the western region, and the parasites mentioned may be present also in other farms in other region. The infestation of the protozoa Ichthyobodo sp. and trematode could be a predisposing factor for the mortalities occurring at high temperature in the farms. Examination of the fish stocks before the high temperature period should be done. Application of chemical disinfectants should likewise be regularly made to minimise or if not avoid mortalities during the high

Table 1. The intensity of infestation of different protozoa in four different farms during September, 1998 - January, 1999

Farm No.	Month	Temperature °C	Ichthyobodo	Cryptocaryon	Henneguya	Trichodina	Trichophyera
F1	September	30	++	+++	0	0	0
	October	26	+++	0	0	0	0
	November	25.5	+++	0	+	+	0
	December	25	++++++	+	0	+	0
	January	26	+++	0	+	+	0
F2	September	31	++	0	0	+	+
	October	27	0	0	0	0	0
	November	27	0	0	0	+	0
	December	26	++++	+	+	+	0
	January	27	+	0	0	0	0
F3	September	30	0	+	0	+	0
	October	27	0	0	+	+	0
	November	27	0	0	+	+	0
	December	26	+	0	0	0	0
	January	28	+++	+	0	+	0
F4	September	30	+	0	+	0	+
	October	27	++	+	0	+	0
	November	25	+++++	+	+	+	0
	December	26	0	+	0	+	+
	January	28	0	++	+	0	++

Table 2: Water Quality parameters measured monthly in four different farms at the western region of Saudi Arabia from September, 1998 to January, 1999.

Farm No.	Salinity	Temperature °C		Nitrite (mg/L)	Ammonia (mg/L)
F1	4.5 - 5	30	September 98	1.2	0.6
		26	October 98	1.0	0.8
		25.5	November 98	1.5	0.5
		25	December 98	1.25	0.4
		26	January 99	2.0	0.7
F2	7	31	September 98	1.6	1.2
		27	October 98	1.9	1.0
		27	November 98	1.5	1.2
		26	December 98	1.8	1.01
		27	January 99	2.0	2.0
F3	5	30	September 98	1.1	1.0
		27	October 98	1.0	1.1
		27	November 98	0.82	1.2
		26	December 98	1.5	1.0
		28	January 99	1.8	1.6
F4	6	30	September 98	1.2	0.5
		27	October 98	1.2	0.4
		25	November 98	1.1	0.6
		26	December 98	1.3	0.45
		28	January 99	1.7	0.9

temperature period. Lowering the nitrite and ammonia levels in the culture should be done.

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FIGURE LEGENDS

Fig. 1: Gills of *O.niloticus* infested with Ichthyobodo sp. (i) showing epithelial lifting (L). Haematoxylin an Eosin. X 100.

Fig. 2: Gills of *O.niloticus* showing Trichophyera (T). Haematoxylin and Eosin. X 400.

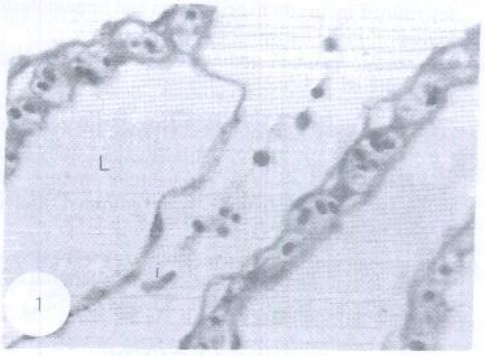
Fig. 3: Cryptocaryon Sp. (C) attached to the lamellar trough resulting in necrosis of the interlamellar epithelium (N). Haematoxylin and Eosin. X 400.

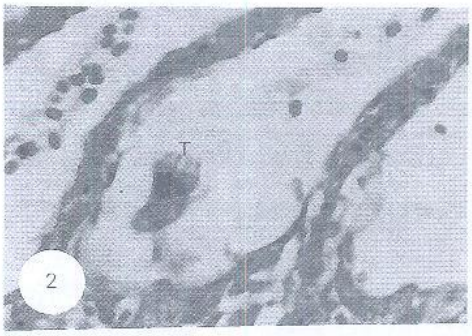
Fig. 4: Trichodina (Tr) in tissue section appeared as rounded structure with cilia, which aranged in circle and found between the secondary lamellae. Haematoxylin and Eosin. X 400.

Fig. 5: Gills of *O.niloticus* had the interlamellar form of Henneguya Sp. (he), lamellar fusion (F) and hyperaemia of the blood sinusoids. Haematoxylin and Eosin. X 100.

Fig. 6: Un-identified trematode invadingthe gill filament inducing necrosis of the interlamellar epithelium (N) and disappearance of the secondary lamellae. Haematoxylin and eosin. X 100.

Fig. 7: Degranulation of the eosinophilic granule cells (D). Haematoxylin and Eosin. X 400.

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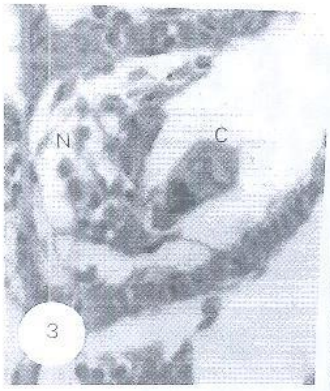
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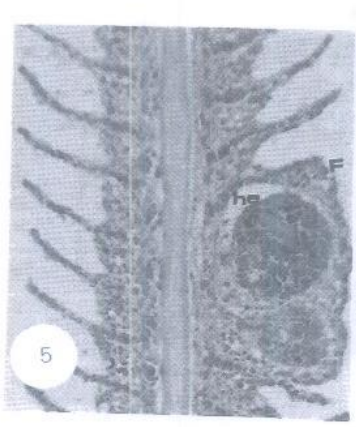

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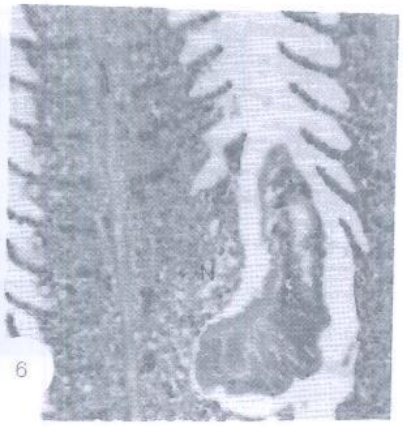

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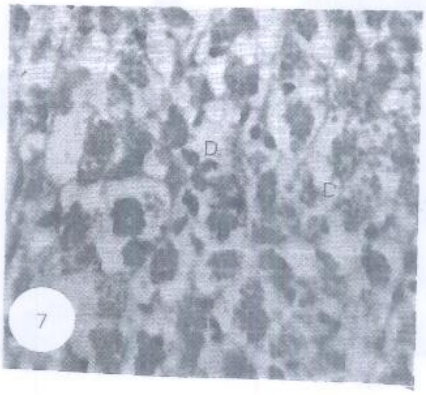

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