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INTEGRATED AQUACULTURE AS A CONTROL METHOD FOR SOME PARASITIC FISH DISEASES

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ABSTRACT

A total number of four hundred fishes were collected from private farms of different rearing systems, including one hundred from mono culture and the same number from integrated cultured ponds of freshly caught Nile Tilapia; Oreochromis niloticus, and two hundred cultured catfish; Clarias gariepinus, one hundred from mono culture and the same number from integrated cultured ponds to be clinically, parasitologically and histopathologically investigated. It could be concluded that the prevalence of encysted metacercaria and larval Nematodes of mono culture ponds was higher than integrated ponds which may be attribute to the presence of low load of intermediate hosts in integrated than mono culture rearing systems. Infested fishes showed emaciation, bulging of gill cover, respiratory manifestations, heart displacement and inflammatory reactions. While histopathological alterations included degenerative changes, oedema, accumulation of mononuclear inflammatory cells and pressure atrophy on many vital organs.

INTRODUCTION

Aquaculture in Egypt is variable and of many methods and either mono culture or integrated either with plants and/or animal species (Salah, 2003). The repeated aquaculture of a certain area without dry periods leads to uncontrolled wild vegetation of australis phragmites (common read) and other wild plants, the propagation of some intermediate hosts as snails and outbreaks of many uncontrolled diseases (Hu Baotong, 1984). Parasitic diseases are considered serious problems rather than other diseases in warm water fish (Axelrod and Snieszko,1980). The internal parasitic diseases have the upper hand in fish regarding the low body gain, high mortality, immarketability; some of these diseases may have zoonotic importance (Eissa and Hala,1993). The shortage of animal protein sources, grazing lands, water and in some field crops necessitates for integrated aquaculture (Tambi, 2001). Moreover, the need for applying friendly

preventive measures of disease control to public health and to the environment (Fernandes and Mazon 2003 and Stefan 2004). The aim of the present work is to illustrate suitable rearing systems that over comes some diseases and supplies safe fish production.

MATERIALS AND METHODS

The study had been done in a private farm in Tollumbat number 7 in Riyad area, Kafr El-Sheikh governorate, Delta district at the Northern part of Egypt. The source of water is fresh agriculture drainage water. The fish samples were taken from two rearing systems:

a- Integrated farming:

The integrated blend will include the following components: earthen ponds, source of water, sheep, fish and some field crops as the recommendations of Hu Baotong, (1984)

b- Mono culture ponds, reared fish only

1-Clinical and parasitological examinations of fishes:

A total number of four hundred fishes were collected from private farms of different rearing systems, including one hundred from mono culture and the same number from integrated cultured ponds of freshly caught Nile Tilapia; Oreochromis niloticus, and two hundred cultured catfish; Clarias gariepinus, one hundred from mono culture and the same number from integrated cultured ponds for parasitological investigations according to Stoskopf, (1993); for skin darkening, discoloration, paleness or presence of any cloudiness, skin congestion, ragged or torn fins, raised scales, haemorrhage, erosions or ulcers and or sunken eyes. The abdomen was examined for enlargement and or distention. Mouth and gills were examined. All fishes were grossly examined for detection of any visible cyts, larvae or whole parasites. The identification of the detected parasites was carried out according to Lom and Dykova (1992) and Woo (1995) .

2-. Histopathological examination:

Specimens of kidneys, liver, and musculature of infested fishes were taken. Tissue specimens containing cysts were fixed immediately in 10% neutral buffered formalin for 24-48 hours, then dehydrated in ascending grades of ethanol,

embedded in paraffin wax, sectioned at 4-5 micron thickness and stained with haematoxlin and eosin (H&E), according to Bancroft and Stevens, (1982).

RESULTS AND DISCUSSION

1. Prevalence:

Prevalence of parasitic infection in both studied cultured summarized in table (1). Results are close to the remarks of Hu Baotong, (1983a and 1983b). Mono culture ponds showed higher parasitic infection than integrated ones, which may be attribute to the presence of low load of intermediate hosts in integrated than mono culture rearing systems.

2-Clinical and parasitological examinations of fishes:

The examined Tilapia either mono culture or integrated showed no pathognomonic lesions. The degree of pathogenicity depends on the number of encysted metacercarae and on their place of attachment. In case of the yellow to orange pea like cysts of Clinostomum, the attached cysts or cyst-like (may reach up to 10/fish in number) attaching to the branchiostegal musculature, leading to bulging of gill cover, respiratory manifestations, heart displacement and inflammatory reactions in the branchial tissue; figure (1). Infested fish showed excessive mucus (sliminess) of the skin, large head, exophthalmia and gather at the water inlets with decreased feed intake and loss of body weight. Such inflammatory signs were nearly close to the observations noticed by Basiony (2002) and Ibtsam Diab (2004). Encysted Metacercariae of Euclinostomum were embedded in the renal tissue in severely infested cases; up to 5 cysts/fish led to massive mortalities, figure (2) and degenerative changes in the kidney occurred. Regarding theses findings, the results nearly met what recorded by Sinha *et al* (1988) and Soliman (1994). In Clarias gariepinus the encysted Metacercarae appeared as pin point nodules of various sizes in the musculature and internal organs, reaching to hundreds in number in heavily infested cases from mono culture ponds, figure (3).Concerning the intinisity and clinical picture, it was closely similar to the results recorded by Dugan, (2002) and Amal Atwa (2006).

Concerning Nematodiosis, Fish seemed normal except heavey infested fishes suffered emaciation. Internal examinations showed many larval nematodes on the

abdominal musculature, body cavity, liver, intestine and in severe infestations all the internal structure of fish were infested, figure (4) and (5). The prevalence of larval Nematodes of mono culture pond was higher than integrated ponds which may be attribute to the presence of low load of interneiate hosts in integrated than mono culture ponds. Such remarks are somewhat in agreement with those of Hu Baotong, (1983a and 1983b). These clinical findings are close to what reported by Schaperclaus, (1992). Emaciation may be due to the feeding of larvae on host tissues and lowering liver fat content seriously reduced by such parasitism which leads to a weight decrease in affected fish; this explanation neerly meets what was reported by Sinderman, (1990). The presence of larvae in the body cavity and internal organs of our examined fishes was also found by Sohn and Lee, (1996) and Abollo *et al*, (2001).

Examination of the branchial cavity of Tilapia revealed, macroscopic visible yellowish cysts. Based on the morphological and parasitological findings, the isolated parasites were related to Phylum Platyhelminthes, class Malacobothrii, family Clinostomidae and genus Clinostomum while; the isolated cysts from the kidneys were of genus Euclinostomum; Clinostomum tilapiae or C.complanatum. This description neerly met with Eissa (2002). Clarias gariepinus showed heavy infestation in the musculature and internal organs of unidentified encysted Metacercariae. They were light grayish in colour, spherical to oval in shape, of thin double wall and of different sizes. Such findigs are some what similar to that recorded by Amany *et al.* (2006).

Examining the larvae isolated from the abdominal cavity and organs of fishes showed, the typical structure and morphology of nematodes in which, the larvae were thin, elongated up to 20mm, without segmentation, the mouth was surrounded by three lips with marked projections and having pointed tail without reproductive system in such larval stage. Based on the morphological and parasitological findings, the isolated parasites were belonged to order Ascaridida. This met the description recorded by Fomena and Boux, (1997) and Mattiucci *et al.* (1998).

3-. Histopathological examination:

Infested mono culture Tilapia showed the parasitic cyst in between the muscle bundles of the branchiostegal musculature; surrounded by slight oedema, figure (6). This result nearly met the findings of Paperna (1980), Eissa (2002) and Wallaa El-Shaer (2008). The Kidney showed focal interstitial nephritis, infiltration of a huge number of mononuclear inflammatory cells in the intertubular and periglomerular areas, figure (7).The present description were more or less in agreement with the alterations found by Yoakim and El-Naffar (1986), Aly *et al.* (1998) and Maather Elamie (2001). Cross-section of the musculature revealed encysted Metacercaria in between the muscle bundles with mild oedema, figure (8). The Liver showed the presence of encysted Metacercariae with fibrous C.T capsule completely encircling the parasite, with pressure atrophy on the surrounding hepatic parenchyma, congestion of the central vein and the hepatic sinusoids with nucleated RBCs and mononuclear cell infiltration. figure (9).The above mentioned alterations are in accordance with those obtained by Salah *et al.* (2005) and Amany *et al.* (2006).

Table1: Prevalence of parasitic infection in both studied cultured systems:

Culture system	metacercariosis	Nematodiasis	Total	%
Mono	52/200	61/200	113/400	28.25
integrated	35/200	17/200	52/400	13.00

Fig. (1): Oreochromis niloticus showing multiple cysts of Clinostomum on the

brachial cavity (yellow grub disease)

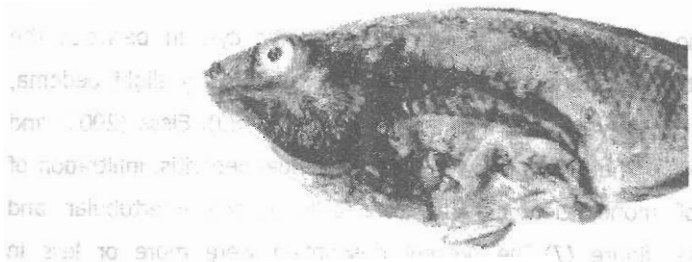

Fig. (2): *O. niloticus* showing encysted *Euclinostomum* on the kidneys.

Fig. (3): *Clarias gariepinus* showing numerous encysted metacercariae on the musculature, liver and other internal organs.

Fig. (4): nematodes on all the internal structure of *O. niloticus*

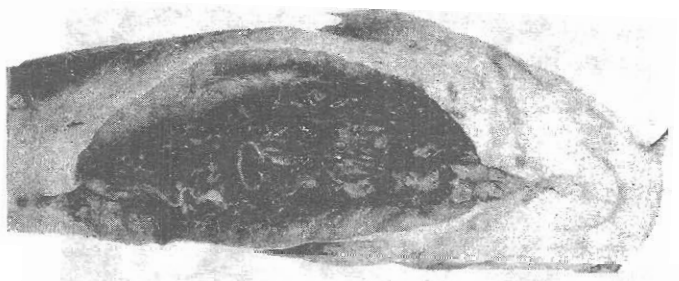

Fig. (5): nematodes on all the internal structure of *Clarias gariepinus*

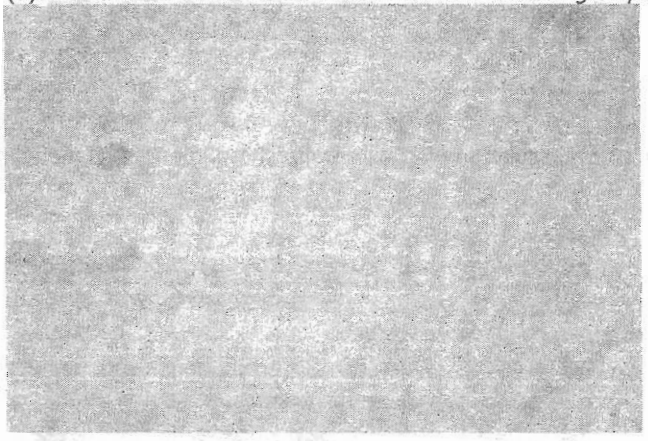

Fig. (6): musculature of O. niloticus (yellow grub disease) showing cysts of Clinostomum (H&E stain X 200)

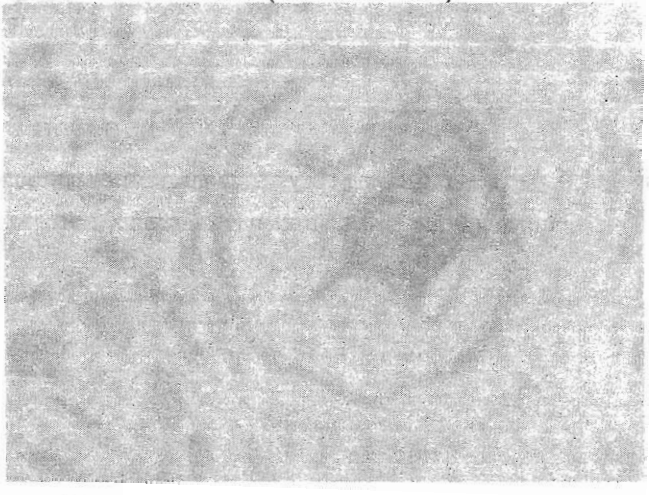

Fig. (7): kidneys of *O. niloticus* showing an encysted *Eulinostomum* (H&E stain X 200)

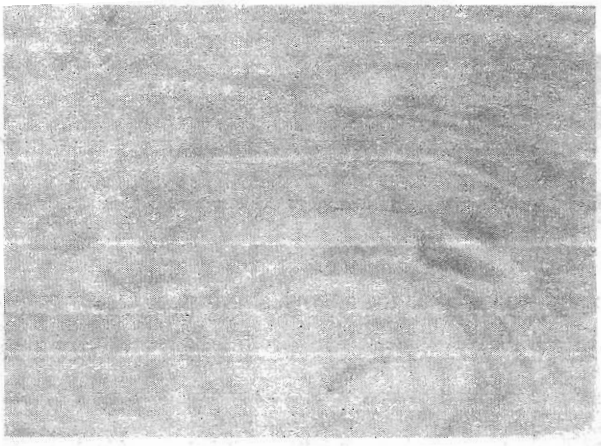

Fig. (8): musculature of *C. gariepinus* showing encysted metacercariae

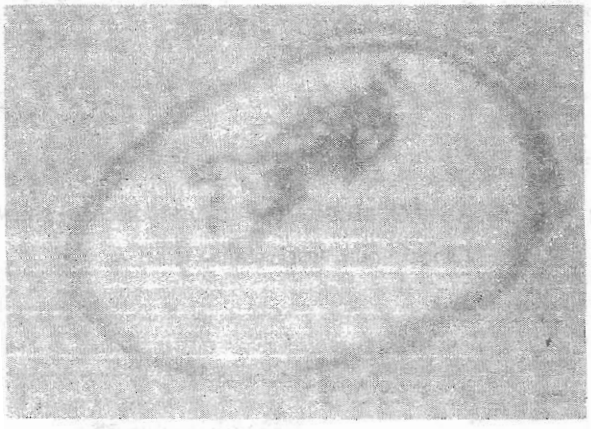

Fig. (9): liver of *C. gariepinus* showing encysted metacercariae surrounded with slight mononuclear cell infiltration (H&E stain X 200)

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الاستزراع السمكى التكاملى كوقاية من بعض الامراض الطفيلية فى الاسماك

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الملخص العربى

أجريت هذه الدراسة على أحواض استزراع متكامل (أغنام ومحاصيل شتوية) وأخرى استزراع منفرد (اسماك فقط) . تم اخذ ٤٠٠ عينة على النحو التالي ٢٠٠ بلطي نيلي (١٠٠ من أحواض الاستزراع المتكامل و١٠٠ أخرى من الاستزراع الفردي) و ٢٠٠ قرموط (١٠٠ من أحواض الاستزراع المتكامل و١٠٠ أخرى من الاستزراع الفردي). تم فحص الأسماك طفيليا واخذ عينات للدراسات النسجومرضية. أظهرت الدراسة أن الديدان الاسطوانية وحويصلات الديدان ثنائية العائل كانت منتشرة أكثر في اسماك الاستزراع الفردي وذلك قد يكون بسبب انخفاض تعداد العائل الوسيط داخل أحواض الاستزراع التكاملي. ومن خلال هذه الدراسة يمكن أن نتوصل إلى ملحوظة علمية وهى أن الاستزراع السمكي المتكرر بدون فترات تجفيف للأحواض يؤدى إلى انتشار نباتات مثل الغاب (البوص) ونباتات برية أخرى قد تكون ضارة وانتشار العائل الوسيط (القواقع) داخل أحواض المزارع السمكية الترابية معطيا الفرصة لانتشار أمراض عديدة من ضمنها الأمراض الطفيلية.