# STUDIES ON MYXOSPORIDIOSIS IN SOME FRESH WATER FISHES

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**ABSTRACT**

The objective of this investigation was to study the total prevalence, seasonal Dynamics and diagnosis of Myxosporidiosis in different freshwater fishes. The present study was carried out on five fish species (wild and cultured) *Oreachromis niloticus*, *Clarias gariepinus*, *Mugil cephalus*, *Lates niloticus* and *Ctenopharyngodon idella* which were collected from different localities from February to November (2013). The infested fishes showed no pathognomonic clinical signs except macroscopic creamy whitish nodules, oval in shape and its number varied from 3-5 cysts. These nodules contained milky fluid filled with mature spores. The total prevalence of myxosporidiosis was 24.00, 43.65, 57.9, 65.2 and 47.2% for *O. niloticus*, *C. gariepinus, M. cephalus, L. niloticus* and *C. idella,* respectively. In addition, the highest seasonal prevalence of myxosporidiosis was found in winter (43.4, 56.1, 71.4, 85 and 66.7%) while the lowest rate was recorded in summer (8, 30.8, 30, 37.1 and 20%), respectively. The results concluded that the highest prevalence of myxosporidiosis was observed in *L. niloticus* followed by *M. cephalus* then *C. garipinus, O. niloticus* and *C. idella.* The seasonal prevalence of myxosporidiosis was the highest rate in winter followed by spring then autumn and summer.

**Keywords:** Freshwater fishes, Myxosporidiosis, parasitic diseases, prevalence.

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## 1. INTRODUCTION

Fish is one of our most valuable sources of protein. Worldwide, people obtain about 25% of their animal protein from fish and shellfish. Fish industry also offers employment opportunities to many people as well as income at household and national levels (1). By increasing intensification of fish production and lack of health management measures have lead to many disease problems of bacterial, viral, fungal and parasitic origin. In Egypt, about 80% of fish diseases are parasitic especially in warm water fish (2). Fish parasites can be used as biological indicators for environmental impact and changes (3). Climate change might have a direct affect on the parasite species but also indirect effects through changes in the distribution and abundance of their intermediate and final hosts (4). The phylum Myxozoa represents a diverse group of multicellular parasites with more than 1,300 species found in marine and freshwater environments. There are microscopic spore forming parasites that have indirect, fresh water like cycles with two spore stages that develop alternately in fish and worms. (5).The taxonomy of the myxosporea is based solely on spore structure, including spore size, shape, the number and position of polar capsules(6). Myxozoans are one of the economically important groups of microscopic metazoan parasites as they infect fish harvested for food. New myxosporean pathogens are

continually emerging and threatening the development of pisciculture allover the world. They cause production losses and some fish have to be discarded because they are unsightly and not considered to be fit for human consumption. Myxozoans undergo a complex, multicellular development, culminating in the formation of a multicellular spore that is resistant to the external Environment. (7). *Myxosporea* infestations which make fish unmarketable and had detrimental effects on the function of affected organs in addition to induce health hazard. (8). The objective of this investigation was to study the total prevalence, seasonal Dynamics and diagnosis of Myxosporidiosis in different freshwater fishes.

## 2. MATERIALS AND METHODES

### *2.1. Examined Fishes:*

A total number of (835) fishes; including (228) wild *Oreachromis niloticus*, (120) cultured *Oreachromis niloticus* ,(219) *Clarias gariepinus*, (79) *Mugil cephalus*, (76) *lates niloticus* and (41) *Ctenopharyngodon idella* were collected from different localities of El – Riah El-Tawfiki and its tributaries and fish farms in Kafr Elshikh Governorate during the period from February to November (2013). The collected fishes were transported in polyethylene bags containing about 30% of its volume water and fish while the remaining volume was pumped with air. The freshly dead fishes were packed in an ice boxer and carried to the laboratory of Fish Diseases and Management Department, Faculty of Veterinary Medicine, Moshtohor, Benha University as quickly as possible where clinical and parasitological examinations were carried out.

### *2.2. Clinical and postmortem examination:*

The collected fishes were subjected to clinical and postmortem examinations, according to the method described by (6).

### *2.3. Parasitological examination:*

Nodules found in gills, kidneys, intestine, inner surface of operculum and eyes were examined by making compression between two clean slides to release milky fluid from these nodules to make smears. The smears were air dried, fixed with absolute methyl alcohol and stained with Giemsa's stain according to (5).

## 3. RESULTS

Clinical and postmortem examination of infested fishes with myxosporidiosis showed no pathognomonic clinical signs except macroscopic creamy whitish nodules were observed in the infested fish. These nodules are oval in shape and its number varied from 5-8 cysts per fish and filled with milky white fluid containing mature spores (Plate,1). Some heavily infested fish revealed respiratory manifestation, sluggish swimming, loss of appetite, anemia and slight abdominal distension. Myxosporidia spores were isolated from eye of wild *O. niloticus*; it appears as ellipsoidal, ovoid or round in shape. Each spore contains two equal pyriform polar capsules which appeared coiled. In addition, a single binucleate sporoplasm was present (Fig.1.A). The total prevalence was (24%) allover the year (table 1) with seasonal prevalence of 28.3, 8.0, 16.4 and 43.3% in spring, summer, autumn and winter, respectively. (Table 2). The mature spores of *Henneguya* species was found in dentritic organ of *C. gariepinus* which appeared as spermatozoon like, elongated in anterior view with a protruding and rounded anterior end. The polar capsules are elongated, parallel and tapered (Fig. 2. A, B). The total prevalence was (43.65 %) all over the year (table 1) with seasonal

prevalence of 50.6, 30.8, 37.1 and 56.1% in spring, summer, autumn and winter, respectively. (Table 2). On the other hand, *L. niloticus* showed spherical small nodules containing suspension of mature *Henneguya* spores. The spore was oval with rounded anterior and attenuated posterior ends with bifurcated tail. The two polar capsules were pyriform and small. (Fig. 2. C, D). The total prevalence of *Henneguyasis* in *L. niloticus* was (65.2 %) all over the year (table 1) with seasonal prevalence was 80, 37.1, 58.5 and 85% in spring, summer, autumn and winter, respectively. (Table 2). The Myxosporean spores recorded from *M. cephalus* appeared as oval to subspherical in frontal view and the polar capsules are pyriform, almost equal and fills the all extra capsular space (Fig. 1B). The total prevalence of Myxosporidiosis in *M. cephalus* was (57.9%) allover the year (table 1) with seasonal prevalence of 69.2, 30, 60.9 and 71.4 % in spring, summer, autumn and winter, respectively. The Myxosporean spore recorded from *C. idella* appeared ovoid in shape with two pear- shaped polar capsules, spores can be detected in cysts in many tissues especially kidney and gills of grass carp (Fig. 1C). The highest prevalence rate of Myxosporidiosis in *C. idella* was found in winter (66.7 %) followed by spring (63.6%), autumn (38.5%) while the lowest rate was recorded in summer (20.0 %). (Table.2). The total prevalence reached up to (47.2%) all over the year (table1).

Table (1). Total prevalence of myxosporidiosis among examined fish species.

| Fish | N. of examined | | N. of infested | | prevalence% | |
|---|---|---|---|---|---|---|
| | Wild | Cultured | Wild | Cultured | Wild | Cultured |
| *Oreachromis niloticus* | 228 | 120 | 55 | - | 24.00 | - |
| *Clarias gariepinus* | 219 | - | 96 | - | 43.65 | - |
| *Mugil cephalus* | - | 79 | - | 52 | - | 57.9 |
| *Lates niloticus* | 76 | - | 44 | - | 65.2 | - |
| *Ctenopharyngedon idella* | - | 41 | - | 20 | - | 47.2 |

Table (2). Seasonal prevalence of myxosporidiosis and most susceptible organs among examined fish species.

| Fish | Seasonal prevalence% | | | | | | | | Most susceptible organs |
|---|---|---|---|---|---|---|---|---|---|
| | spring | | summer | | autumn | | winter | | |
| | W | C | W | C | W | C | W | C | |
| *O. niloticus* | 28.3 | - | 8.00 | - | 16.4 | - | 43.3 | - | Eye, inner surface of operculum |
| *C. gariepinus* | 50.6 | - | 30.8 | - | 37.1 | - | 56.1 | - | Dentritic organ, intestine |
| *M. cephalus* | - | 69.2 | - | 30.00 | - | 60.9 | - | 71.4 | Intestine |
| *L. niloticus* | 80.00 | - | 37.1 | - | 58.5 | - | 85.0 | - | Liver, intestine |
| *C. idella* | - | 63.6 | - | 20.0 | - | 38.5 | - | 66.7 | Gills, kidneys |

W: Wild C: Cultured

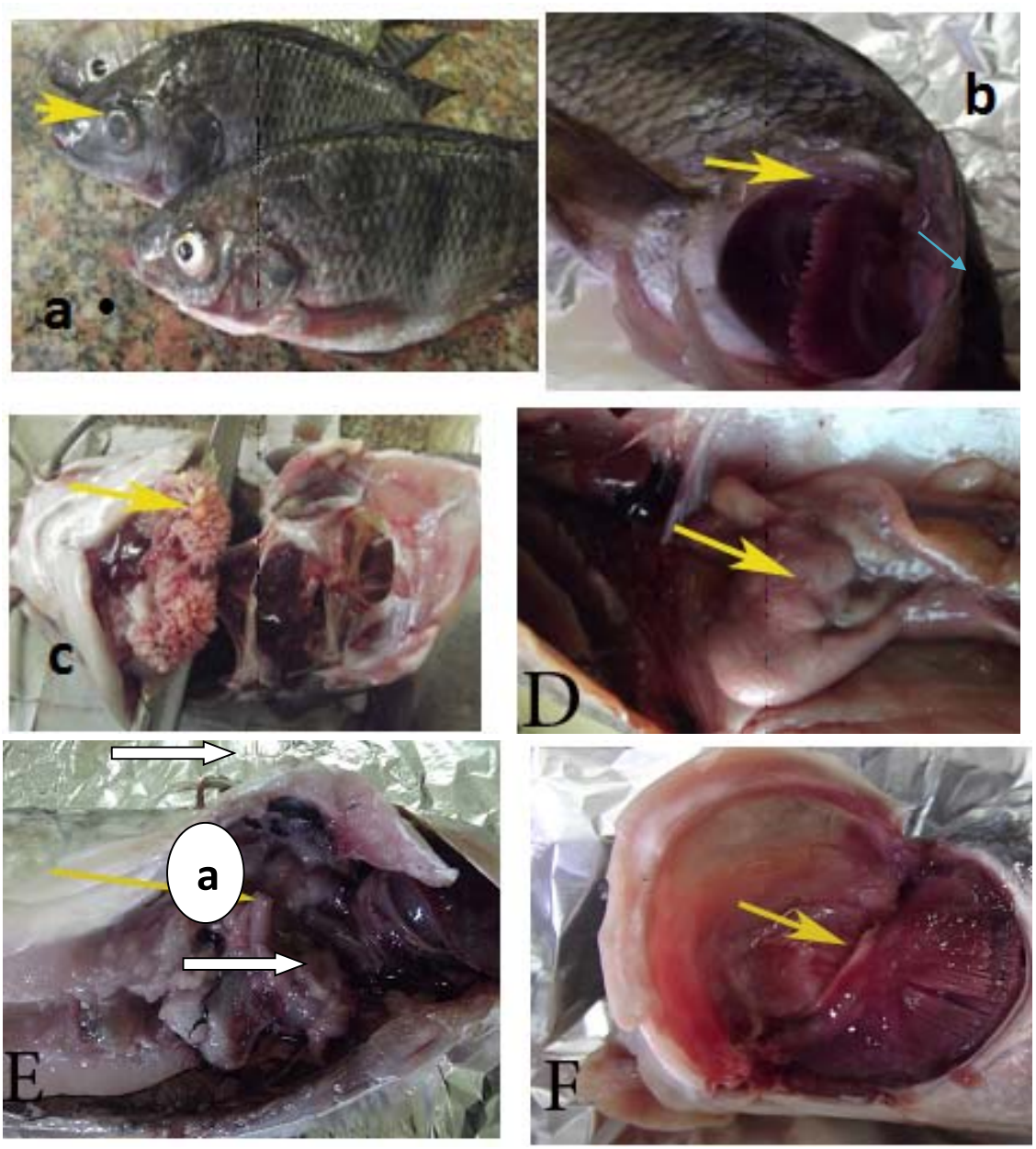


Plate 1.a) Eye of *O.niloticus* showing white nodules around iris
b) Branchial cavity of *O.niloticus* showing white nodules under operculum
c) Dentritic organ of *C. gariepinus* showing yellowish nodules
d) Liver of *L. niloticus* showing yellowish white nodules
e) Intestine of *Mugil cephalus* showing white nodules
f) Gills of grass carp showing white nodules embedded on gill filaments

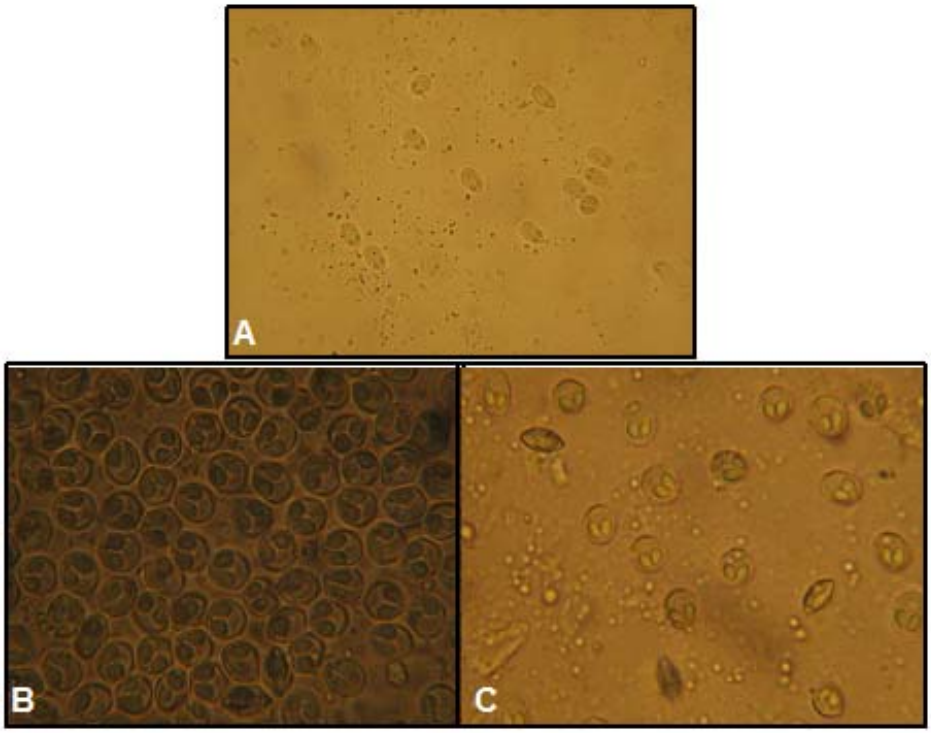


Fig (1): wet mount preparation of myxosporidis spores taken from A) eye nodule in *O. niloticus.* B) Intestine nodules of *Mugil cephalus.* C) Gill filaments of grass carp

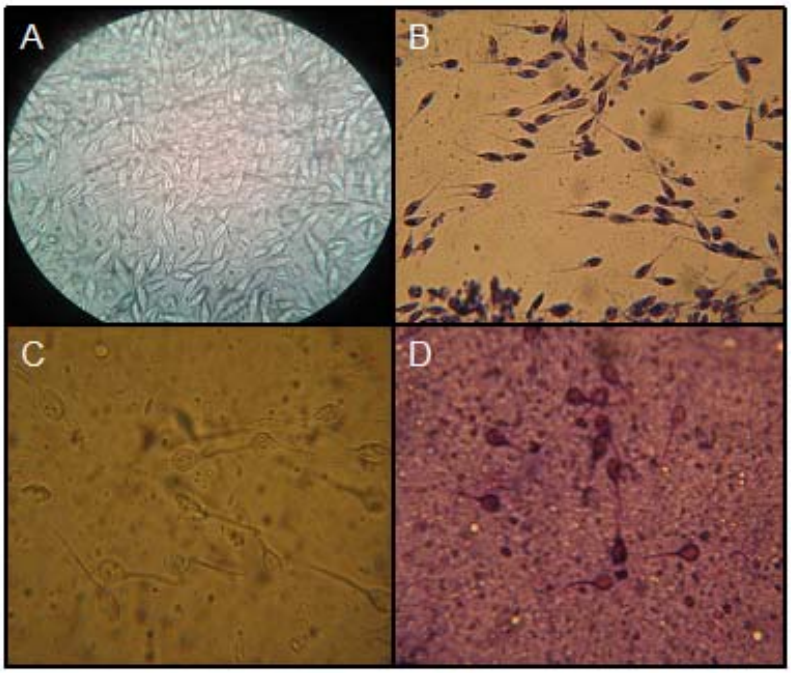


Fig (2): A) wet mount preparation of henneguya spores from dentritic organ of *C. gariepinus*. B) Henneguya spores from dentritic organ of *C. gariepinus* stained with Geimsa. C) henneguya spores obtained from liver of *L. niloticus* (wet mount). D) henneguya spores from liver of *L. niloticus* stained with Geimsa.

## 4. DISSCUSION

Heavily infested fish with *Myxobolus* spp. caused locomotory disturbances coupled with emaciation, sunken eyes, damage to the gills by dense infestation resulted in respiratory problems. Fish were swimming near the surface with distended opercula, trials for jumping outside the water and mortality in a heavy cardiac infection. (2), (5). Therefore, the investigation of the prevailing of Myxosporidiosis affecting *O.niloticus*, *C. garipinus*, *M. cephalus, L. niloticus* and *C. idella* was the main target of our present study. Regarding the clinical and postmortem lesions of Myxosporidiosis in different fish species, *O. niloticus* infested with Myxosporidiosis showed no pathognomonic lesions. The infested fish showed macroscopic nodules, creamy whitish cyst, oval in shape and its number various about 5-8 cysts per fish that found at the base of gill arch, inner surface of operculum, kidneys and eyes around irris. These results nearly agreed with the findings recorded by (10), (2), (11). In addition, *C. gariepinus* infested with *Henneguyosis* seemed apparently healthy, while the branchial cavity showed many oval to round nodules, which attached to the dentritic organ. These nodules appeared yellowish in color, filled with milky fluid white in color containing a suspension of mature spores. Heavily infested fish revealed respiratory manifestation, sluggish swimming and loss of appetite. These results nearly agreed with the descriptions of the clinical signs noticed by (12), (13), (5), (14), (15). Presence of respiratory manifestation in the fish, which infested with *Henneguyosis* is due to structure damage, surface inflammation of gills leading to difficulty in osmoregulation and causing decrease in oxygen up take that cause hypoxia. In addition, there were congestion on gills with excessive sliminess due to irritation of gills by movements and fixation of the parasites, (15). While *L. niloticus* infested with *Henneguyosis* that were recovered from liver and intestinal wall that appeared as nodules of various sizes. These nodules were yellowish white in color, filled with milky fluid white in color containing a suspension of mature spores. These results were nearly agreed with (16), (17), (18), (19). The clinical signs and P.M examinations of *Mugil cephalus* infested with Myxosporidiosis revealed the presence of white nodules embedded in the mesenteries which filled with fluid milky fluid white in color containing a suspension of mature spores. These findings are closely to what reported by (20), (21), (22). Concerning *C. idella* infested with Myxosporidiosis in gill filaments and embedded in kidneys tissue appeared as pin point yellowish white cysts. Heavy infestation of carp gills with *Myxobolous spp.* caused congestion due to rupture of cysts containing spores. Damage to the gills by dense infestation resulted in respiratory problems; fish were swimming near the surface with distended opercula. These clinical findings are closely to what reported by (20), (23), (24). Concerning the morphological description Myxosporia spores which infested some freshwater fishes; firstly, *O. niloticus* infested with Myxosporidia spores appeared as nearly the same morphological descriptions given by (25), (26), (2), (27), (11) while the mature spores of *henneguya species* which infest *C. gariepinus* are similar to the morphological descriptions were recorded by (28), (29),(2), (18), (30),(31) while *Henneguya species* was infested liver and intestine of *Lates niloticus*. Their morphological description was nearly similar to that recorded by (12), (16), (32), (18), (19). In *Mugil cephalus*; The morphology of the collected Myxosporea spores were nearly similar to the result given by (22). *Myxobolus* Spores which were isolated from *C. idella* has a very similar appearance to myxosome which described by (13). Regarding the prevalence of

Myxosporidiosis in different fish species; the highest infestation rate was recorded in *Latus niloticus* (65.2%) which could be attributed to its feeding behavior as carnivorous fish that assists in the transmission of more enteric parasites through feeding on aquatic animals that harbour the infective stage of these parasites or even young infested fish. These result nearly met the findings recorded by (33), (34), (14), (35), (17). Followed by *M. cephalus*; with total infestation rate was (57.9%). It could be attributed to its feeding behavior as omnivorous fish (scavenger). These results were nearly similar to the result given by (22). Then the infestation rate of *C. gariepinus* with Myxosporidiosis was 43.65% could be attributed to its feeding behavior as a carnivorous fish that assists in the transmission of more enteric parasites through feeding on aquatic animals that harbour the infective stage of these parasites or even young infested fish. Nearly similar results were reported by (2), (29), (33). The seasonal prevalence of Myxosporidiosis in all examined fishes showed the highest prevalence in winter followed by spring then autumn and the lowest rate was found in summer. This is may attributed to the annual cycle of infestation included a reduction of mean intensity in spring, an absence of cysts in summer followed by reappearance of cysts in autumn and winter due to rupture of cysts in summer and begin to appear at autumn so the highest rate in winter and spring. These results were nearly met the findings recorded by (33), (34), (14), (35), (17). These results disagreed with (15) who found that in the spring, the highest prevalence of Myxosporidiosis then followed by winter then summer and autumn, which parasite start forming nodules from winter reaching the maximum number in spring then start decrease by rupture of cysts to release spores on the environment to start infestation. In *Lates niloticus*; the total prevalence of Myxosporidiosis was (65.2%) with seasonal prevalence of 80, 37.1, 58.5 and 85 %in spring, summer, autumn and winter, respectively. Followed by *Mugil cephalus*; the total prevalence of Myxosporidiosis was (57.9) allover the year with seasonal prevalence of 69.2, 30.0, 60.9 and 71.4 %in spring, summer, autumn and winter, respectively. Then *Ctenophayrngodon idella*; the total prevalence of Myxosporidiosis was (47.2%) allover the year (table, 11) with seasonal prevalence of 63.6, 20.0, 38.5 and 66.7 %in spring, summer, autumn and winter, respectively. In *C. gariepinus*; the total prevalence of Henneguyasis was (43.65%) allover the year with seasonal prevalence of 50.6, 30.8, 37.1and 56.1%in spring, summer, autumn and winter, respectively. In wild *O.niloticus*; the total prevalence of Myxosporidiosis was (24%) allover the year with seasonal prevalence of 28.3, 8.0, 16.4 and 43.3% in spring, summer, autumn and winter, respectively. These findings was disagreed with (36) who recorded that in wild *O.niloticus*, and the total prevalence was 52.3% all over the year with seasonal prevalence of 0, 0, 72.9 And 74% in winter, spring, summer and autumn, respectively. While the current work showed that absence of Myxosporea cysts in cultured *O.niloticus*. These results disagreed with (35), who recorded that in cultured *O.niloticus*, the total prevalence of *Myxosporidiosis* was 70.4% all over the year with seasonal prevalence of 82.7, 72.7, 60 and 51.6% in winter, spring, summer and autumn, respectively and disagreed with (20) who noticed that the heavy infestation with *Myxosoma spp*. has been recorded among cultured *O.niloticus* means that the infestation is endemic in the ponds used for rearing of the fish.

## 5. CONCLUSION

Fish infested with Myxosporidiosis showed no clinical signs. The infested fish showed macroscopic nodules, creamy whitish cyst, oval in shape and its number various about 3-5 cysts. The nodules content is milky color containing a suspension of mature spores. Some heavily infested fish revealed respiratory manifestation, sluggish swimming and loss of appetite. The seasonal prevalence of Myxosporidiosis was highest in winter followed by spring then autumn and the lowest rate at summer season and may be disappeared. It was concluded that, the highest prevalence of myxosporidiosis was found in *Lates niloticus* followed by *Mugil cephalus, Clarias garipinus, Oreachromis niloticus* and *Ctenopharyngodon idella.* Along the period of study, cultured *O. niloticus* was not infested with *Myxosporidiosis*

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## دراسة عن مرض الميكسوسبوريديا فى بعض أسماك المياه العذبة

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قسم أمراض ورعاية الأسماك- كلية الطب البيطرى- جامعة بنها

## الملخص العربي

يهدف هذا البحث الى دراسة معدل الاصابة بمرض الميكسوسبوريديا فى بعض أسماك المياه العذبة حيث تم اجراء هذه الدراسة على البلطي النيلي (برى ومستزرع)، القرموط الأفريقي، البوري، قشر البياض ومبروك الحشائش، تم تجميعها خلال الفترة من فبراير الى نوفمبر 2013 من اماكن مختلفة من الرياح التوفيقي وفروعه ومزارع سمكية من محافظة كفر الشيخ. أظهر الفحص الخارجى لمعظم أنواع الأسماك المصابة بالميكسوسبوريديا عدم وجود علامات مرضية مميزة أو تشوهات ماعدا وجود انتفاخ طفيف في البطن. بينما الصفحة التشريحية للاسماك كشفت عن وجود عقيدات بيضاء متفاوتة الحجم فى العين، العضو التنفسي الزائد، الخياشيم والأعضاء الداخلية (الكليتين والأمعاء والكبد). هذه العقيدات مملوءه بسائل لبنى أبيض يحتوي على ابواغ ناضجة بينما اظهرت اسماك أخرى عالية الاصابة بهذا المرض علامات ضيق تنفس، خمول وفقدان للشهية. توصل هذا العمل الى أن أعلى معدل اصابة وجد فى سمكة قشر البياض تليها سمكة البوري ثم القرموط الأفريقي، البلطي النيلي ومبروك الحشائش ويرجع سبب هذا الى طبيعة تغذية كل نوع وايضا لوحظ اثناء الدراسة ان اعلى معدل موسمى للاصابة بهذا المرض يكون فى فصل الشتاء يليه الربيع ثم الخريف وأقل معدل اصابة فى فصل الصيف.

**(مجلة بنها للعلوم الطبية البيطرية: عدد 25(2):316–325, ديسمبر 2013)**