

NEW STRAINS OF FUNGUS *SAPROLEGNIA PARASITICA* IN COMMON CARP (*CYPRINUS CARPIO* L.) FROM CYPRINID FISH BREEDING FACILITIES IN MACEDONIA

Dijana Blažeković Dimovska¹, Julijana Tomovska¹, Mohammad Ali Shariati²

¹University "St. Kliment Ohridski", Faculty of biotechnical sciences, Bitola, Macedonia;

²Islamic Azad University, Teheran, Iran;

Email: dijanablazekovic@yahoo.com

Received March, 2014; Accepted May, 2014

ABSTRACT

Saprolegniosis is an infectious fungal disease that is widespread in all stages of the life cycle of fish. The aim of this study was to determine the presence of mycoses in common carp (*Cyprinus carpio*) from eight larger and more significant cyprinid fish breeding facilities in Macedonia, by seasons and localities. For Saprolegnia isolation methodology of Njilloughbdz & Pickering (1977) was used. Identification of fungi was performed by direct microscopic method, according to the classification of Bergey (1994). We determined representatives of the genus *Saprolegnia* in an average 12.65 % in a total of 1134 examined fish. The identified fungus was determined as *Saprolegnia parasitica*, strain 111 and strain 222, which are first published findings in Macedonia.

Key words: common carp (*Cyprinus carpio*), *Saprolegnia parasitica*, cyprinid fish breeding facilities

INTRODUCTION

Aquaculture production is the fastest growing sector of the world food economy. According Van West (2006), over the past years, it has increased on average by 11% per year. The majority of global production comes from freshwater aquaculture (58%), followed by marine culture (36%) and brackish water (6%). Delgado et al. (2003) considered that aquaculture now represents more than 30 % of total fish production for consumption.

According Meyer (1991), disease is the single largest cause of economic losses in aquaculture. Bruno & Wood (1999) and Pickering & Willoughby (1982) considered that fungal infections are second only to bacterial diseases in economic importance and they are generally restricted to chronic, steady losses. Fish diseases constitute one of the most important problems and challenges confronting fish culturists.

Saprolegniosis is an infectious fungal disease that is widespread in all stages of the life cycle of fish. It is widespread in the freshwater fish's ecosystem and affect wild and cultured fishes, leading towards heavy mortality among fishes (Noga 1996; Bruno & Wood 1999; Hussein & Hatai 1999 and Hussein et al. 2001).

MATERIAL AND METHODS

The aim of this study was to determine the presence of mycoses in common carp (*Cyprinus carpio*) from eight larger and more significant cyprinid fish breeding facilities in Macedonia, by seasons and localities. In order to investigate

it, the fish were hunted from ponds, hatcheries and reservoirs, depending on age category and time of examination. For this purpose, examinations covered following cyprinid fish breeding facilities: fish ponds Žabeni - Bitola, Bukri - Bitola, Dolneni - Prilep, Železara – Skopje and reservoirs Mladost - Veles, Tikveš Lake, Gratče - Kočani and Globočica – Struga, which were encrypted as: P1, P2, P3, P4, K1, K2, K3 and K4. Collecting and examining the fish was done by seasons and localities, from autumn 2009 to summer 2012. Sabouraud dextrose agar (SDA) was used for isolation of fungi. Smears of infected fish skin and fins were inoculated on Sabouraud dextrose agar (SDA) and glucose - yeast agar (GY) (Hatai & Egusa, 1979) at temperature of 25°C. For inhibiting the growth of bacteria, 500 mg/ml ampicillin and streptomycin sulfate in the medium were added. For morphological observation, isolated mycoses are inoculated on GY broth and incubated at 25°C for a period of 3-4 days. Isolates were observed macroscopically (shape and color of the colonies, a way of growing) and microscopically (structure of genital organs, size and spore arrangement). For *Saprolegnia* isolation, methodology of Willoughby & Pickering (1977) was used. Identification of fungi was performed by direct microscopic method, according to the classification of Bergey (1994).

RESULTS

During the investigations for the presence of mycoses in common carp (*Cyprinus carpio*) from eight larger and more significant cyprinid fish breeding facilities in Macedonia, in a total of 1134 examined fish, we determined representatives of the genus *Saprolegnia* in an average 12.65 % of the examined fish. This fungus was determined on the skin and fins in *Cyprinus carpio* in winter and early spring, during the three years studies, in following cyprinid fish breeding facilities:

- fish breeding facility (P1) - in 13,82 % of examined fish;
- fish breeding facility (P2) - in 12,70 % of examined fish;
- fish breeding facility (K1) - in 13,33 % of examined fish;
- fish breeding facility (K4) - in 10,78 % of examined fish.

Table. 1. Percent (%) of infestation with *Saprolegnia parasitica* in *Cyprinus carpio* from cyprinid fish breeding facilities in Macedonia, by years and localities

| Fish breeding facilities | Percent (%) of infestation with <i>Saprolegnia parasitica</i> | | | Average value (%) |
|--------------------------|---|---------|----------|-------------------|
| | I year | II year | III year | |
| P1 | 13,64 | 12,38 | 15,45 | 13,82 |
| P2 | 13,02 | 12,95 | 12,15 | 12,70 |
| K1 | 12,74 | 12,33 | 14,92 | 13,33 |
| K4 | 10,78 | 11,54 | 10,03 | 10,78 |
| Total | 12,54 | 12,30 | 13,13 | 12,65 |

The identified fungus was determined as *Saprolegnia parasitica*, strain 111 and strain 222. Our findings of *Saprolegnia parasitica*, strain 111 and strain 222 in *Cyprinus carpio* from cyprinid fish breeding facilities are first published in Macedonia.

Bruno & Wood (1999) provide the following taxonomic classification for *Saprolegnia*:

Kingdom: *Protoctista*
 Division: *Oomycota*
 Phylum: *Heterokonta*
 Class: *Oomycotea*
 Order: *Saprolegniales*
 Family: *Saprolegniaceae*
 Genus: *Saprolegnia*
 Species: *parasitica* Coker

The pictures below show *Cyprinus carpio* infected with *Saprolegnia parasitica*:



Figure 1,2. *Saprolegnia parasitica* in common carp (*Cyprinus carpio*) from cyprinid fish breeding facilities in Macedonia (original)

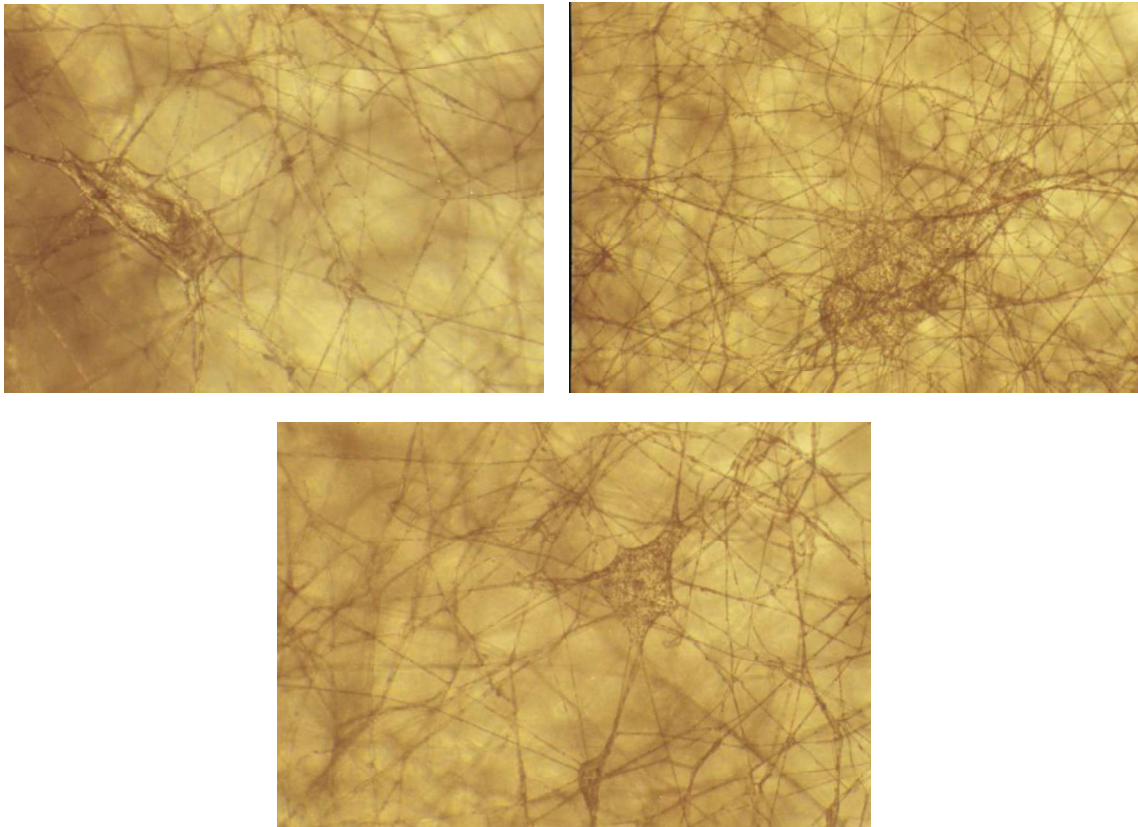


Figure 3,4,5. *Saprolegnia parasitica* in common carp (*Cyprinus carpio*) from cyprinid fish breeding facilities in Macedonia (original)

According Neish (1991) and Noga (1996) almost every freshwater fish is exposed to at least one species of fungus during its lifetime.

CONCLUSION

Saprolegnia is found in freshwater ecosystems. It is the main genus of water molds responsible for significant fungal infections of freshwater fish and eggs. *Saprolegnia* is characterized by an external, cotton-like appearance that radiates out in a circular, crescent-shaped or whorled pattern. Fungal spores may be transmitted by hatchery fish, wild fish, eggs, water supplies and equipment.

In our investigations of the presence of mycoses in common carp (*Cyprinus carpio*) from eight larger and more significant cyprinid fish breeding facilities in Macedonia, we determined representatives of the genus *Saprolegnia* in an average 12.65 % of the examined fish. During the morphological identification, two new strains (111 and 222) of fungus *Saprolegnia parasitica* are found, that is first published finding in Macedonia. We concluded that the seasonal variation plays an important role in spreading of *Saprolegnia* infections in freshwater fish especially during late autumn, common in winter months and early spring where the temperature was low.

REFERENCE

- Bergey, D.H., Holt, G.J. *et al.* (1994): Bergey's Manual of Determinative Bacteriology. 9th edition. Williams & Wilkins, Baltimore, USA.
- Bruno, D.W., Wood, B.P. (1999) *Saprolegnia* and other *Oomycetes*. (In:) P. T. K. Wood, D. W. Bruno (eds). Fish Diseases and Disorders. 3. Viral, Bacterial and Fungal Infections. CABI Publishing, Wallingford, Oxon, United Kingdom. pp. 599–659.
- Delgado, C.L., Wada, N., Rosegrant, M.W., Meijer, S., Ahmed, M. (2003) Outlook for Fish to 2020: Meeting Global Demand. Report by the International Food Policy Research Institute.
- Hatai, K., Egusa, S. (1979) Studies on visceral mycosis of salmonids fry -II. Characteristics of fungi isolated from the abdominal cavity of amago salmon fry. Fish Pathol. 11: 187–193.
- Hussein, M. M. A., Hatai, K., Nomura (2001) *Saprolegnia* in salmonids and their eggs in Japan. J. Wildl; Dis.37: 204-207.
- Hussein, M.M.A., Hatai, K. (1999) *Saprolegnia salmonis* sp. nov. isolated from sockeye salmon, *Oncorhynchus nerka*. Mycoscience 40:385–389.
- Noga, E.J. (1996) Fish Disease Diagnosis and Treatment. Mosby-Year Book, Inc. St. Louis, MO. pp. 367.
- Pickering, A.D. and Willoughby, L.G. (1982) In Microbial Diseases of Fish. Edited by R.J. Roberts. Academic Press, London, England. pp. 271-297.
- Van West, P. (2006) *Saprolegnia parasitica*, an oomycete pathogen with a fishy appetite: new challenges for an old problem. Mycologist 20: 1–6.
- Willoughby, L.G., Pickering, A.D. (1977) Viable *Saprolegniaceae* spores on the epidermis of the salmonid fish *Salmo trutta* and *Salvelinus alpinus*. Trans. Br. Mycol. Soc. 68: 91–95.