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Ectoparasitic Diseases in Freshwater Ornamental Fish and Their Treatments

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Abstract: Fish parasites and their effects have become increasingly visible during the latest decades inconnection with the development of fresh water ornamental Fish industries troughout the world. Diseases problem including hazards caused by parasitic organisms are the main threat to further increase of the industry. Ectoparasites are the most common and widely distributed of freshwater ornamental Fish. Such as, protozoan ectoparasites of aquarium fish (*Ichthyophthirius multifiliis, Ichthyobodo necatrix, Chilodonella cyprini, Oodinium limneticum,* Trichodinids); external worms of fish (*Dactylogyrus extensus, Gyrodactylus bullutarudis*); external crustaceans (parasitic copepods, *Argulus japonicus, Argulus foliaceus, Lernaea cyprinacea*).The fish louse Argulus spp. is now the main problem in cage-cultured freshwater ornamental Fish in the fresh water environment in Europa countries. *Gyrodactylus bullatarudis* had caused the mortality in guppy ornamental fish. White Spot Disease (Ichthyophthiriosis) occurs in ornamental fish fry interprise caused the considerable economic loss. Ornamental fish were affected heavily by ectoparasites due to the very fine structure of the skin. Ectoparasites causing in ornamental fish only kills the fish but also reduces the market value of fish. The present work aim to the parasitic diseases of freshwater ornamental fish, how they are transmitted, which effects they have on ornamental fish, how they could be diagnosed, and how they could be controlled and treated.

Introduction

Fish parasites and their effects have become increasingly visible during the latest decades inconnection with the development of freshwater ornamental Fish industries troughout the world. Diseases caused by parasites are widespread and cause loses of fish in intensively stocked pond and aguarium. Ectoparasites of freshwater ornamental fish come in all sizes and shapes and inculude single-celled protozoan, and mullticellular trematodes (flatworms), crustaceans and artropods (kaynak).Parasites can infest the outer surface or penetrate the paranchyma of almaost any tissue of the host. Fish can serve as an intermediate, paratenic (transport) or definetive host for various stages of parasites. Ectoparasitic infections in freshwater ornamentals fishes are diagnosed by wet mount cytology preparations of skin scrapes, gills biopsies, and by direct observation (macroscopic parasites) (Woo 2006, Roberts 2010). Ectoparasites are the most common and widely distributed of freshwater ornamental Fish (Tab.1). These parasites, in crowded pools and aquariums, together with increasing water temperature when appropriate conditions are found to cause large losses. Ornamental fish were affected heavily by ectoparasites due to the very fine structure of the skin. Ectoparasites causing in ornamental fish only kills the fish but also reduces the market value of fish (Mousavi 2003,Tokşen 2006, Koyuncu 2009). In this review, treatment and control of ectoparasites of freshwater ornamental fish in the recent developments were reviewed.

The Study

Research Significance

In this study, ectoparasite of freshwater ornamental diseases and drug therapy are discussed. Ectoparasite freshwater ornamental that can be used in treatment of diseases and drugs are defined and explained the general features.

Important Fısh Ectoparasıte Groups Caused Loses ın Ornamental Fısh

In this section, the systematic groups that represent the most important examples are chosen.

Protozoa:

Protozoans are the most common ectoparasites encountered in ornamental fish. Although some authors consider them harmless, many serious fish losses are caused by protozoan ectoparasites (Krier and Baker 1987 Durborow et al.1998, Scholz 1999, Wildgoose 2001). Protozoans vary in shape and size and live mainly on the gills, fins, and skin of fish.

There are a number of protozoan ectoparasites long recognized as causative agents of severe diseases such as flagellates of the genus *Oodinium* sp, or *Ichthyobodo sp.* and the cilli protozoan ectoparasites, *Ichthyophthirius multifiliis*, *Chilodonella* sp. *Trichodina* sp. are some of the most significant pathogens in ornamental fish (Tab. 1). (Durborow 2003).

Oodinium sp. is a problem in freshwater ornamental fishes. Most reports of the parasite have been on aquarium fishes.(Lom et.al. 1983).

Ichthyobodo sp. - formerly (and still commonly) called Costia. A flagellated protozoal ectoparasite. A normal inhabitant of fish skin. Poor water quality and other stresses (especially crowding) may allow this normally mutualistic parasite to reproduce rapidly and overwhelm the host. Microscopically the protozoa are very small (5-10 microns), move rapidly, and are shaped like small sickles. They may be attached to host tissue or swimming free. Most common in freshwater species of fishes (Joyon et al., 1969).

Ichthyophthirius multifiliis - known commonly simply as "Ich." The largest protozoal parasite of fish and one of the most commonly encountered. Trophozoites may reach 1.0 mm in diameter. This interference will be placed into the skin. Protection against other pathogens in patients with low-grade infection destroys the system. Whereas in cases of severe infections can cause death quickly. Excessive growth of cysts on the pool floor and as such is a suitable environment for this group is very high virulence of the parasite infection
In particular, in the ornamental fish Ichthyophthiriosis loss caused millions of measured by dollars (Durborow et.al., 1998).

Chilodonella sp. - A ciliated protozoan which can cause high morbidity and mortality among freshwater tropical fishes at the wholesale and fish farming levels of the industry. Attacks skin and gills. Easily identified microscopically by its heart-shaped structure and slow circular motion when not crawling on the surface of the fish (Koyuncu, 2003).

Trichodina sp.- A disc-shaped ciliate protozoan found on the skin and gills of many freshwater fish. Circular rows of denticles and a ciliary girdle give this parasite a unique radial symmetry. Probably not harmful when present in small numbers (Ozer et al., 1998).

Monogenean Platyhelmınthes:

Monogeneans are parasitic flatworms or flukes with direct live cycle that infest the external surfaces of almost any species of ornamental fish. The mongeneans have an anterior oral sucker used for feding on mucus and sloughed epithelial cells, while the posterior end has a organ for attaching to host. These parasites cause focal irritation, increased mucus production, and hyperplasia of the epithelial tissues, and open a portal for secondary bacterial and fungal infections. Severe infections can cause erratic swimming behavior, 'flashing' respiratory activity, scattered hemorrhages with epithelial ulceration and frayed fin. Monogenea species the economic importance of fish in the severe loss causes: Common genera found in ornemantal fish inculude: *Dactylogyrus* sp. and *Gyrodactylus* sp. Fancy gold fish are commonly infected with 'gill' flukes, *Dactylogyrus extensus*, while *Gyrodactylus katherineri* skin flukes infestastion are more often observed in koi. *Gyrodactylus bullatarusdis* and *Gyrodactylus Turnbull* are guppy fish flukes (Tab. 1). (Woo 2006, Roberts2010).

Arthropoda (Crustacea):

Crustasea s play an important role in fish parasites is a group. There are a number of crustacean parasites that infect the skin and gills of tropical and ornamental fish (Tab. 1), *Lernaea* sp. or ' anchor form' is a copepod crustacean of pond-reared fish, especially gold fish, carp, koi and guupy. The infections larval stage of this particular parasite penetrates the skin of the fish and continues to develop. There is usually an intense focal inflammatory reaction at the site of penetration, which often results in hiperplasia of tissue around the site of parasites development(Roberts , 2010)

Ergasilus sp. is a species of another type of copepod parasite. The parasites are most commonly found attached to the gill filaments of many species of pond and ornamental fish. (Robert, 2010)

The 'fish louse', *Argulus* sp. is a common branchiurid crustacean parasite of many species of pond and ornamental fish. This parasite carwls over the surface of the fish and uses its stylet to pierce the outer epithelial cells of the fish and ingest the cell's contents. There is a severe inflammatory reaction at the site of stylet penetration, sugesstion that a substance is released by the parasite to facilitate feeding. Because of the this feding activity this parasite has also been imlicated in the mechanical transmission of several bacterial, viral and hemoprotozoal diseases (Toksen, 2006, Robert, 2010) The fish louse Argulus sp. is now the main problem in cage-cultured freshwater ornamental Fish in the fresh water environment in Europa countries (Woo, 2006).

Parasites	Size	Host	Position Location	Way of transsimition
Protozoa: Flagella				
Oodinium sp.	12-90 µm	Freshwater ornamentals fish	Skin	Of floating phase skin invasion
Icthyobodo sp.	5-18 µm	Freshwater ornamentals fish	Skin	Of floating phase skin invasion
Ciliate				
Ichthyophthirius multifiliis	50-1000µm (trophozoites)	Freshwater ornamentals fish	Skin, Epithelial tissues	Of floating theront invasion
Trichodina sp.	35-60 µm	Freshwater ornamentals fish	Skin and gills	Of floating phase skin and gills invasion
Chilodonella sp.	30-80 µm	Freshwater ornamentals fish	Skin and gills	Of floating phase skin and gills invasion
Monogenea:				
Gyrodactylus sp	350-460 µm	Freshwater ornamentals fish	Skin and fin	Body contact
Dactylogyrus sp.	990-1584 µm	Freshwater ornamentals fish	Gills and skin	Body contact
Arthropoda				
Lernaea sp.	5-20 mm	Freshwater ornamentals fish	Skin and fin	Body contact
Ergasilus sp.	1-2 mm	Freshwater ornamentals fish	Gills	Body contact
Argulus sp.	8-13 mm	Freshwater ornamentals fish	Skin and fin	Body contact

Table 1. Common Ornamental Fish Ectoparasites

Identification

Most ectoparasites are too small to be seen with the naked eye. It simply isn't possible to be certain that parasites are present without taking a mucus and gill sample for microscopic examination. This important procedure enables us to see which parasites are present on the skin and gills and determine the severity of the infestation. It is common to find more than one species present (Wildgoose 2001).

Medicaments Used in Treatment of Freshwater Ornamental Parasites:

The applied treatments for diseases are prevention and good health management. However, Chloramines-T Formaldehyde, Potassium permanganate, Acetic acid, Copper sulfate, Malachite green and salt are commonly used to control protozoan fish ectoparasites (Tab. 2). Salt, formaldehyde, and vinegar appeared to be the most effective chemicals to treat protozoan infestation (Stoskopf, 1993, Noga, 2001, Timur et.al ,2003 Kayis et. al,. 2005, Balta et al., 2008, Dörücü et.al., 2008, Kayis et al., 2009). Levamisol, Mebendazole Triclorphon and formalin are commonly used to control treat metazoan parasites (Lasee, 1995, Toksen, 2006). Among the chemicals that are used to treat or prevent parasitic fish diseases in Turkey, Acetic acid, Betadine, Chloramin-T, Copper sulfate, Formalin, Hydrogen peroxide, Malachite green, Levamisol, Mebendazole, Potassium permanganate and salt are authorized by the European Union by the council regulation (EEC) no. 2377/90 of the European Council.

In most countries, very few drugs and chemicals have been registered for treatment of food fish. Indeed, many biocides (e.g., malachite green) are banned from use in most countries and severe measures are taken against exporters of fish and shellfish that contain residues. Due to the carcinogenic and genotoxic potentials of malachite green, it has been prohibited for use in the production of consumer fish in the European Union by regulation no. 2377/90 of the European Council. Drugs and chemicals used to treat fish must be safe to the fish and the environment, as well as to human.

Used for the control of freshwater ornamental ectoparasites in the market are several chemical substances. These chemicals in general are also used in other hosts. Metabolism of fish is different, the effects of these substances in freshwater ornamenta ectoparasites is weak. Therefore, the fish farms to prevent excessive loss of fish to specific research and development antiparazit compounds are needed. Toltrazuril similar drugs are promising for broad spectra (Tab. 2). (Dörücü et.al , 2008).

Antiparasitic agent	*Chemical Dosage;time*	*Ectoparasite*	*Treatment*
Chloramin-T*	7-15 mg/l; 1 h	Protozoan, monogenetic trematodes	Bath treatment
Formaldehyde*	0.167-0.25 mg/l; 1 h 0.25 mg/l; indefinite	External parasites	Bath treatment
Hydrogen peroxide*	250-500 mg/l; 30-60 min	External parasites	Bath treatment
Copper sulfate*	0.5 mg/l	External parasites	Bath treatment
Acetic acid*	1-2 mg/l; 1-10 min	External parasites	Bath treatment
Betadine*	50 mg/l; 30 min	External parasites	Bath treatment
Malachite green*	0.1-0.15 ppm/12-24 h	External parasites	Bath treatment
Levamisol*	50 ml/l; 2 h	Monogenetic trematodes	Bath treatment
Mebendazole	1 mg/l; 24 h	Monogenetic trematodes	Bath treatment
Toltrazuril	4ml(1000 ml water)	Monogenetic trematodes	Bath treatment
Qunine hydrochloride	13.5 ppm for several days	Artropoda ectoparasites	Bath treatment
Atebrine	10 ppm for sevaral days	Artropoda ectoparasites	Bath treatment
Potassium permanganate*	2-5 mg/lt 1h	Artropoda ectoparasites	Dip treatment
Dimilin	0.01 mg/lt	Artropoda ectoparasites	Bath treatment
Triclorphon	0.25-5 ppm for several hours	Artropoda ectoparasites	Bath treatment
DTHP	2.5 ppm 1hour	Artropoda ectoparasites	Bath treatment
Salt*	3% solution; 15-30 min 0.5% solution; indefinite	External parasites	Bath treatment

* Chemicals authorized by council regulation (EEC) no. 2377/90 of the European Council

Table 2. Control and Treatment of Ectoparasitic Diseases in Freshwater Ornamental Fish

Conclusions

Hundreds of fish parasites in their natural environment type has been found infected, although rarely leads to death of fish. In tropical fish culture reduces the number of common parasites, but they do influence is great. Parasites of fish death, loss of appetite, the slowdown in growth, deterioration of reproductive ability, reduce resistance to other pathogens, and cause marketing with unpleasant views. Despite these negative effects on the market for the treatment of fish parasites in a small number of drugs are used. Of this review, the treatment of diseases in tropical fish culture, fish ectoparasites shed light manufacturers believe.

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