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Infection outbreak for *Piscinoodinium pillulare* in *Piaractus brachypomus* from aquaculture farm in Brazilian cerrado

Abstract

The Brazilian aquaculture stands out due to the climate and water availability, and grows along with the world fish production, due especially to the human population growth. The *Piaractus* spp. shows great participation in production due to the high economic value and productive performance, and because species of the genus are native from South America, including Brazil. Fish are susceptible to parasitizing infection by *Piscinoodinium pillulare*, a protozoa that causes a disease known as "rust disease", even more at high population densities and stressful circumstances. An outbreak was observed in a semi intensive aquaculture farming property of *Piaractus* spp. for preservation, and without any commercial interest, in the municipality of Jataí, Goiás, Brazil, where the main characteristics were: dying fish on the water surface; petechiae in the ventral region of the body, especially in the abdomen; ulcers in the cranial portion; inappetence; and high mortality rates. Three specimens of *P. brachypomus* were captured and a scraped was performed on the body surface and gills and subjected to microscopic analysis. After microscopic analysis, *P. pillulare* was observed in slides of all samples. The diagnose was based only on the visualization of *P. pillulare* trophons (protozoa) in the skin and gills of the fish. The populational and climate conditions that *P. brachypomus* were exposed at Brazilian Cerrado are equivalent with those required to lead fish to stressful conditions and thus, make them susceptible to parasites infections, such as *P. pillulare.*

Keywords: disease, fishes, gills, parasitism, pisciculture, skin

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Dirceu Guilherme de Souza Ramos,[1] Reiner Silveira de Moraes,[1] Cecília Nunes Moreira,[1] Henrique Trevizoli Ferraz,[1] Dyomar Toledo Lopes,[1] Ísis Assis Braga,[2] Klaus Casaro Saturnino[1]

[1]Academic Unit of Agricultural Sciences, Federal University of Jatai, Brazil

[2]Institute of Biosciences, University Center of Mineiros, Brazil

Correspondence: Dirceu Guilherme de Souza Ramos, Federal University of Jatai, BR 364, km 195, n°3800, Jatai, Goias, Brazil, Tel +55 64 3606 8212, Email dguilherme@ufg.br, dgramos_vet@hotmail.com

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Introduction

Aquaculture represents an area of agribusiness with great ascendency, being the larger in world protein production and consumption.[1] According FAO[2] the growth rate of aquaculture in the world is around 5.8% per year, especially caused by human population growth. Brazil has a wide water availability, favorable climate and big water diversity what makes the country very benefited in the activity.[3] Among the relevant species, the *Piaractus* genre has a great economic importance for commercial scale production in Brazil, other countries in South America and Central America.[4] Therefore, wrong handling and the lack of sanitary measures make the environment susceptible to the introduction of pathogens and diseases that leads to big losses and even the unfeasibility of fish farming.[5] Despite the direct losses due to wrong water handling and operations on daily production, the infestation by parasites, bacteria and other pathogenic agents also has caused significative losses to fish farmers.[6]

According to Pavanelli et al.,[7] *Piscinoodinium pillulare* represents a common dinoflagellate protozoan of freshwater fish in a tropical climate. This protozoan became popular for causing diseases known as "rust disease" or "velvet disease".[8] It is commonly found parasitizing gills and the fish body surface.[9] Structures named rhizocysts play a role in fixing the parasite to the host once these structures penetrate the host cells causing structural changes and so, cell death.[10] This fixation causes hypertrophy, irritation and intense mucus production, causing the parasitosis velvet aspect.[11,12] The parasite shows low specificity and has a piriform or bag shape presenting a length of 160µm, and a yellowish-brown color.[7] The infected fish usually show lower feed intake, lower oxygen absorption, weight loss and a skin rubbing behaviour against stones. Thus, fish with a high level of parasitism tends to die.[13]

This study aimed to report a *P. pillulare* infection outbreak in *Piaractus brachypomus* in an aquaculture farm from Brazilian Cerrado (Savannah) biome, at August 2019.

Materials and methods

An outbreak was observed in a semi intensive aquaculture farming property of *Piaractus* spp. for preservation, and without any commercial interest, in the municipality of Jatai, Goias, Brazil (latitude 17°52'53'', longitude 51°42'52'', and altitude 696m), on Brazilian Cerrado Biome, at August 2019. The reservoir presented high density of animals from *Piaractus* spp. which had approximately 8 years old each. The main characteristics of the outbreak were: dying fish on the water surface; petechiae in the ventral region of the body, especially in the abdomen; ulcers in the cranial portion; innapetence; and high mortality rates. Three specimens of *P. brachypomus* were captured and a scraped was performed on the body surface and gills. The material was sent to the Veterinary Pathology and ParasitologyLaboratory at the Federal University of Jataiand the sample was set between the slide and the coverslip at NaCl 0,9% solution. After that, the sample was analyzed by using bright field microscopy (Nikkon Eclipse E200).

Results

After microscopic analysis, *P. pillulare* was observed in slides of all samples. The diagnose was based only on the visualization of *P. pillulare* trophons (protozoa) in the skin and gills of the fish.

Discussion

The Cerrado biome, is a tropical savanna with unique and distinct characteristic from other savannahs feature, with high dimensions, extend across all the Brazilian Central Plateau.[14] The outbreak occurred in August 2019, a period when temperatures vary between 11 e 35ºC, and considered a dry season, which reduces the levels of rivers and water reservoirs also.[14] According to the owner, fish not used to commerce and be raised only for preservation and so, they were not removed from the reservoir. Thereby, old fish showed higher weight. The fish clinical signs, from the owner's perspective were the staying on the water surface and the viewing of great amount of mucus with a rust coloring through the whole-body extension. Clinically, the fish size and age, added to the reservoir low level, due to the dry season, increases the likelihood of parasite infection outbreak occurrence and fish illness.

The farm of fish from *Piaractus* spp. in piscicultures on southwest region of Goias, stands out due to the great local demand, the aggregated value to the product, good reproductive performance and high potential of production. Therefore, stressful situations such as high populational density can lead to infections by pathogenic agents in tanks.[5] As they represent a group of native fish species from Brazil, especially in the Amazon, Pantanal (UNESCO World Natural Heritage and World Biosphere Reserve, is the largest tropical wetland area of the world, with similar fauna and flora to Cerrado)[15] and Cerrado biome, due to high extractive exploitation, there are farming sites for fauna replacement, preservation, in addition to commercial farmers. The aquaculture where the outbreak occurred is destined for preservation without withdrawal to nature, however, outbreaks like this, if occur in reservoirs intended for environmental replacement, can mean a massive spread *P. pillulare* in river fish, and consequently damage to natural resources. It should be noted that several species of *Piaractus* spp. are already scarce in Brazilian rivers.

The fish species in study is natural from tropical climate area which is adapted to temperatures around 30ºC. Considering that in August 2019, temperatures up to 11ºC were identified; fish were undergone to thermal stress during some parts of the day, making them susceptible to the outbreak occurrence. *P. pillulare* is permanently recurrent on the Southwest region of Goias and in spite of its occurrence, more studies are needed to verify the parasite extension and associated losses, since it represents a risk to the preservation and animal production.

Conclusion

The populational and climate conditions that *P. brachypomus* were exposed at Brazilian Cerrado are equivalent with those required to lead fish to stressful conditions and thus, make them susceptible to parasites infections, such as *P. pillulare*. The mentioned parasite is still circulate in Brazilian Cerrado and data survey has to be performed in order to verify the extension of its occurrence and related losses to aquaculture, in general, as well as, the adoption of prophylactic measures for the parasitizing occurrence prevention.

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Conflicts of interest

There is no conflict of interest between the authors.

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