

The Effect of Commercial Probiotics on Histological Changes in the Muscle of *Catla catla*

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ABSTRACT: This research investigates the impact of commercial probiotics on the histological changes in the muscle tissue of *Catla catla* over a 90-day experimental period. The study is conducted at the Department of Fisheries in Rajnandgaon district, Chhattisgarh, utilizing three identical tanks to house the fish. A total of 45 *Catla catla*, collected from a hatchery, will be evenly distributed into these tanks with a stocking density of 15 fish per tank, ensuring proper population control to avoid overcrowding. The experimental design assigns two of the tanks (TR1 and TR2) as experimental groups, while the third tank (C1) serves as a control group. The fish in the experimental tanks will receive a specially formulated feed, prepared using the Pearson square method to meet their nutritional requirements, supplemented with commercial probiotics at regular intervals. The study aims to analyze the histological changes in the muscle tissue of *Catla catla*, providing insights into the benefits of probiotic supplementation in aquaculture.

Keyword: Commercial probiotics, *Catla catla*, muscle tissue.

INTRODUCTION

The use of probiotics can cause to various physiological and histological changes that are beneficial for the development of muscle tissue and the general well-being of fish (Kalaimani and Kandeepan 2017). Probiotics are live foods of microbes that have a beneficial effect on the host by improving the microbial balance of its gut” (Fuller *et al.*, 1988). Several previous reports have shown that the addition of probiotics can reduce disease by strengthening the immune structure of shrimp and fish, and reduce basic costs by improving fish growth and feed efficiency. The difficulties mentioned above and the current limitations of antibiotic use have led to the measurement of conventional immunostimulants, prebiotics and probiotics as another approach to control and prevent disease (Hassaan *et al.*, 2014). Aquaculture has used "probiotics", which are beneficial microbes or their products that have beneficial effects on the host, to control disease, promote growth, and roughly as a replacement for antimicrobials (Irianto and Austin 2002).

MATERIALS AND METHODS

Histopathological studies show the effects of toxicants on fish because they allow toxic xenobiotics to directly affect vital anatomical roles. Histological examination appears to be an identical complex parameter that then resolves the development of cellular variations that may occur in target organs such as gills, liver, muscle, and kidney (Dutta Meijer 1996). Gobinath and Ramanibai (2014) reported histological changes in gills, liver, muscles and kidneys in Rohu fish fed with probiotics,

but there are no studies on the effect of commercial probiotics on muscle histology in the freshwater fish *Catla catla*. Therefore, the main objective of this study is to investigate the histological changes in the skeletal muscles of *Catla catla* when treated with probiotics. This study objects to deliver a complete picture of how probiotics affect muscle tissue at a microscopic level, which may reveal the mechanisms by which probiotics exert their beneficial effects.

A. Fish collection and maintenance

The experimental animal chosen for this study Freshwater fish *Catla catla* (Plate 1).

Fish of equal size (weight 4.5 g and length 4.0 cm) were purchased from the Department of Fisheries, Rajnandgaon, Chhattisgarh, transported to the laboratory in plastic bags with oxygenated water and adjusted to laboratory conditions with continuous aeration scheduled two weeks before the beginning of the experiment. Case test *Catla catla* fingerlings were fed the formulated diet during the conditioning period.



Plate 1. Experimental fish *Catla catla*.

Commercial feed probiotics. Aqua prob is a soil & water Probiotic for Aquaculture, commercially available, and was purchased from Refit Animal Care, Fazilka, Punjab.

Each kg powder contains Lactobacillus sporogenous, Bacillus subtilis, *Saccharomyces cerevisiae*, seaweed extract, minerals, and Vitamins.

Supplementary feed ingredients:

Table 1: Supplementary feed ingredients.

Sr. No.	Ingredients	Percentage
1.	Fishmeal (dry)	23
2.	Soyabean Oil	10
3.	Soyabean meal	76.9
4.	Wheat flour	10
5.	Probiotics	20
6.	Vitamins & minerals	1

Experimental setup. The closed test was carried out in 3 plastic tubs. The tubs required a real bottom surface of 370.94 cm² and a volume of 60 liters. *Catla catla* of equal weight (4.5 grams and 4.0 centimeters) was selected in the present experiment. The initial weight and length of the fish remained documented. All tubs were adequately aerated and water changed daily. One tub was reserved for the control (C1) and the other two tubs were reserved for the experiment (TR1 and TR2). The control fish were fed only the supplement (without probiotics) and the fish in the experimental tank were fed with 0.2 g commercial nutritional probiotic "Aqua prob" once a day (6-7 am). Fish survival was assessed by regularly counting the number of live fish in each tub. Final length and weight were measured after 90th days.

Muscles were dissected from control and infected fingerlings of *Catla catla* for histologic studies. The isolated muscle samples remained fixed in Bouin's fixative for 24 hrs and washed with distilled water. The samples were dried up in different grades of alcohol and further processed. Sections 5–6 μm thick were occupied with a microtome and stained by hematoxylin and eosin. Therefore, mounted with DPX and observed with a compound microscope.

RESULT AND DISCUSSION

The atmosphere of water is an interconnected process. The usage of appropriate nutritional extracts (e.g. growth promoters, prebiotics, probiotics, and plant extracts) as aquatic nutrition promotes growth and immunity is an exciting area in freshwater fish farming. The positive effect depends on both the mechanism of action and the colonization ability. Among protein sources, bacterial origin seems to be a auspicious added for fishmeal, changing up to 25- 30% (Dharmaraj and Dhevendaran 2010). Freshwater fish *catla catla* were fed with the commercial probiotic "Aqua prob" with skeletal muscle histological sections taken at the end of the 30th and 90th days of the experimental period and introduced to different plates. Plates 1a and 1b show that the muscle tissue part of a control fish at the end of days 15th and 30th of the tentative period is a bundle of striated and peripherally nucleated skeletal muscle fibers (Gopinath *et al.*, 2014).

Plate 1a and b show histological changes in the muscle of control *Catla catla* after 30th days and 90th days of an experimental period.

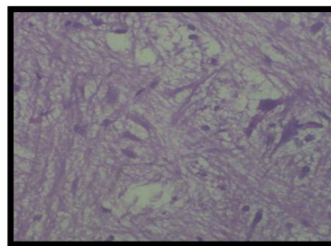


Plate 1a. Section of control fish muscle after 30 days.

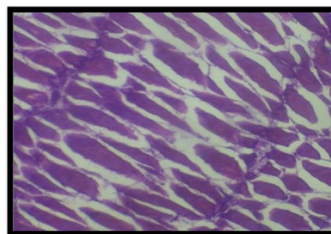


Plate 1b. Section of control fish muscle after 90 days.

Plate 2a and 2b show histological changes in the skeletal muscle of probiotic-fed fish *Catla catla* after 30th days and 90th days of an experimental period.

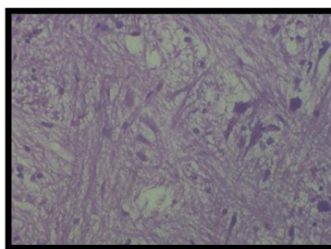


Plate 2a. Section of probiotic-fed fish muscle after 30 days.

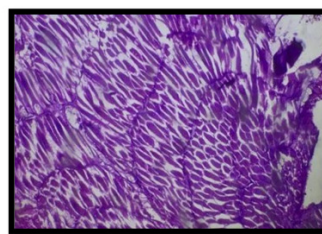


Plate 2b. Section of probiotic-fed fish muscle after 90 days.

Skeletal muscles of probiotic-fed fish (Plates 2a and 2b) show striation of myofibrillar bundles followed by heterotrophy, enlarged cytoplasm, and marginally located benign nucleus, and no signs of inflammation (Kalaimani and Parvathi 2017). Increased cell proliferation and cytoplasmic extent indicate increased growth. The conclusion is that commercial

CONCLUSIONS

The study has demonstrated that the application of commercial probiotics has a profound impact on the muscle histology of *Catla catla*. The use of commercial probiotics presents a promising strategy for enhancing the growth performance and health status of *Catla catla*.

probiotics Aqua prob improved water quality, promoting better growth and maintaining good health. Nevertheless, additional studies are required to comprehensively grasp the fundamental mechanisms and to perfect the dosage and delivery strategies for optimal results. This study opens up new avenues for sustainable aquaculture practices, contributing to the health and productivity of *Catla catla*, a species of significant economic importance in the aquaculture industry.

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