

## IMPACT OF LEMONGRASS SUPPLEMENTATION ON SOME BIOCHEMICAL PARAMETERS OF FRESHWATER FISH *CHANNA PUNCTATUS* (BLOCH, 1793)

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### Abstract

The present study was aimed to assess the effects of lemongrass supplementation on biochemical profile of freshwater fish *Channa punctatus* (Bloch, 1793). The *Channa punctata* is one of the commonly cultivated fish in India known for its deliciousness and nutrient contents. *Cymbopogon citratus* is commonly known as lemongrass is pharmacological properties in traditional medicine of India. Control and experimental feed were formulated with using easily available ingredients and lemongrass powder. The improved serum biochemical profile of fish fed on lemongrass based formulated feed was observed. In the present study, total protein, albumin, globulin and albumin/globulin ratio increased. The serum triglycerides, Total cholesterol and LDL-cholesterol decreased while HDL-Cholesterol increase. The increased level digestive enzymes (amylase and lipase) while decreased level of metabolic enzymes (SGOT and SGPT) were observed. The control and test feed groups were significantly different ( $P < 0.05$ ). In considering the overall observations, lemongrass supplementation in diet is recommended for successful aquaculture of this important fish species.

**Keywords:** Biochemistry, *Channa punctatus*, feed, herb, lemongrass, supplementation.

### Introduction

The *Channa punctata*, the spotted snakehead, is a species of snakehead fish. It is a highly nutritive and rich source of animal proteins. During culture, provided an artificial feed, by which fish grow rapidly and attain maximum weight in shortest possible time. One approach is to include new substances into fish diets to improve feed conversion efficiency or elevate general conditions for fish growth and maintenance (Bhosale *et al.*, 2010). The hormones, antibiotics and several other chemicals have been tested as growth promoters, antibacterial and for other purposes in aquatic animals, but their use in aquatic animal production cannot be recommended due to the residual effects in the muscle of fish (Shrivastava *et al.*, 2012)

Plants are natural sources of safer and cheaper chemicals. The beneficial effects of bioactive plant substances in animal nutrition may include the stimulation of appetite and feed intake, growth promotion, the improvement of endogenous enzyme secretion, and activation of immunostimulation and antioxidant actions in aquaculture practices (Joshi, 2017). A lemongrass (*Cymbopogon citratus*) is well known for its cytoprotective, antioxidant, and anti-inflammatory

properties. In traditional medicine of India, the leaves of the plant are used as stimulant, sudorific, antiperiodic, and anticatarrhal, while the essential oil is used as carminative, depressant, analgesic, antipyretic, antibacterial, and antifungal agent (Shah *et al.*, 2011, Joshi *et al.* 2022).

In this concern, present study aims to study the effect of lemongrass supplementation on some biochemical parameters of freshwater fish *Channa Punctatus* (Bloch, 1793)

### Materials And Methods

**Experimental diets:** For the experiment, Lemongrass from conventional organic farm was used. A mature lemongrass trimmed to 1/2-inch above the soil. Then the fresh meat was thin sliced. The harvested grass blades and meat slices were laid on a clean baking sheet separately and placed into food dehydrator. The temperature was set to 150<sup>o</sup> F for eight hour or until dry; then grinded in food processor. The ingredients were weighed, mixed and pelleted. After pelleting, the feeds were air dried and put in an air-tight container. The composition of experimental diet is given in Table 1.

**Table 1: Ingredient composition of the experimental feeds (on % basis)**

Ingredients (%)	LG 0	LG 1	LG 2	LG 3	LG 4	LG 5
Wheat flour	45	44	43	42	41	40
Soybean flour	24	24	24	24	24	24
Corn flour	10	10	10	10	10	10
Meat powder	15	15	15	15	15	15
Soybean oil	05	05	05	05	05	05
Watrmin <sup>®</sup> Forte*	01	01	01	01	01	01
Lemongrass Powder	00	01	02	03	04	05

\* Vitamins, Minerals and Amino Acids supplements for Aquatic feed. Manufactured by Virbac Animal Health India Pvt. Ltd.

**Experimental fish and feeding:** *Channa punctatus* is commonly known as the spotted snakehead murrel. For experiment, the specimens were collected from the local sources. They were disinfected with 0.1% KMNO<sub>4</sub> solution to avoid fungal infection. These collected fishes were acclimatized for 2 weeks and maintained in specially designed closed re-circulating system tanks in groups (control and test feeds). During acclimation, fish were fed the control diet to satiation twice a day at 09:00 and 15:00 hours. After acclimation, fish were fasted for one day; batch weighted and randomly distributed. During the experiment, fish were fed on experimental diet to satiation third a day at 08:00, 12:00 and 16:00 hours.

**Experimental system:** The closed recirculation aquaculture system was used for the experimental trailer. The culture system composed of different tanks with specific volumes. System primarily composed of rearing tanks of 200L volume of each. The fish were maintained in these tanks. The rearing tank also aerated by air pump for supply of oxygen to individuals. The drain settled in tanks is collected by drainage pipe is transferred to filtration unit. The filtration unit composed four different chamber settling tank, gravel filter, sand filter and bio-filter of 250 each.

**Water quality standards:** Water quality was maintained during the feeding trial with light: dark cycle of 12:12 h during study. The water analysis is performed according to APHA (2000). The water composition and characteristics were maintained within the effective range (Bhatnagar and Devi, 2013). During the experimental period, water temperature was 28.5±2.5°C; pH 8.1±0.5; total dissolved solids 240.5±19.5 mg/L; dissolved oxygen 4.42±0.24 mg/L; biological oxygen demand 1.70±0.20 mg/L; free CO<sub>2</sub> 13.4±1.3 mg/L; alkalinity 65.3±5.0 mg/L; hardness 123.20±16.76 mg/L; ammonia 0.55±0.01 mg/L; nitrate

0.136±0.28 mg/L; nitrite 11.39±0.37 mg/L; salinity 0.3±0.1 ppt in the experimental tanks (Joshi *et al.*, 2022).

### Biochemical analysis

The serum biochemical analysis of experimental fishes were carried out at the end of 60 days. The blood samples of fish were collected directly from heart with the help of syringe for Biochemical analysis (Hassaan and Soltan, 2016; Joshi *et al.*, 2021). Blood samples were collected 18 h after the final feeding for the biochemical assay. The samples were collected in non-heparinized tubes and stored in freezer at 4-8°C up to 24 hrs. The blood samples were allowed to clot and then centrifuged at 4000 rpm for 10 minutes to separate the serum (Hassan and Sotan, 2016; Pradhan *et al.*, 2021). The parameters were estimated with help of Automated Analyzer (Mispa Ace Clinical Chemistry Analyser, Agappe Diagnostic Ltd. India).

### Statistical analysis

Results were recorded as Mean ± Standard Deviation of triplicate. One way ANOVA followed by Tuckey's post-hoc test analysis used for comparison of means. Differences between means were considered as significant at  $P < 0.05$  (Joshi *et al.*, 2015).

### Results and Discussion

The present study was aimed to assess the effects of lemongrass supplementation on enzyme activity in freshwater fish *Channa punctatus* (Bloch, 1793). In the present study, total protein, albumin, globulin and albumin/globulin ratio increased. The serum triglycerides, Total cholesterol and LDL-cholesterol decreased while HDL-Cholesterol increase. The increased level digestive enzymes (amylase and lipase) while decreased level of metabolic enzymes (SGOT and SGPT) were observed. The control and test feed groups were significantly different ( $P < 0.05$ ).

**Table 1: Effects of lemongrass supplementation on some biochemical parameters of freshwater fish *Channa punctatus***

Parameter		LG 0	LG 1	LG 2	LG 3	LG 4	LG 5
Total Protein (g/dl)	Mean	7.095	7.265	8.016	8.334	9.051	9.881
	±SD	0.421	0.512	0.569	0.603	0.671	0.750
Albumin (g/dl)	Mean	3.911	4.014	4.468	4.673	5.071	5.571
	±SD	0.512	0.352	0.296	0.114	0.523	0.478
Globulin (g/dl)	Mean	3.195	3.252	3.547	3.661	3.980	4.309
	±SD	0.011	0.011	0.023	0.011	0.045	0.011
Albumin/Globulin Ratio	Mean	1.387	1.399	1.433	1.455	1.444	1.467
	±SD	0.034	0.011	0.034	0.023	0.034	0.102
Triglycerides (mg/dl)	Mean	232.4	224.1	215.5	199.5	187.0	182.4
	±SD	6.697	6.799	7.879	8.800	7.811	7.129
Total Cholesterol (mg/dl)	Mean	239.5	232.9	219.7	221.6	212.2	201.9
	±SD	9.255	8.425	9.551	9.710	7.766	6.140
HDL- Cholesterol (mg/dl)	Mean	36.18	43.42	46.89	50.99	55.24	59.19
	±SD	1.023	1.228	1.319	1.319	1.433	1.444
LDL- Cholesterol (mg/dl)	Mean	172.8	161.0	145.5	143.6	131.5	125.2
	±SD	4.286	4.525	4.639	4.559	4.662	4.150
Amylase (U/mg protein)	Mean	0.375	0.307	1.194	2.081	1.615	2.308
	±SD	0.114	0.034	0.409	0.330	0.239	0.466
Lipase (U/mg protein)	Mean	0.387	0.284	0.637	0.955	0.785	1.194
	±SD	0.057	0.114	0.102	0.296	0.273	0.398
SGOT (U/L)	Mean	11.36	11.57	11.05	10.56	10.64	10.40
	±SD	0.580	0.659	0.296	0.637	0.432	0.443
SGPT (U/L)	Mean	7.788	8.311	7.220	6.947	7.038	6.072
	±SD	1.455	0.637	1.217	0.978	1.069	1.148

Biochemical parameters are useful tool for assessing fish health and nutritional status as well as other physiological disturbances in intensively farmed fish (Satheeshkumar *et al.*, 2011; Rodge *et al.*, 2018). As biochemical changes help to detect different types of stress conditions like exposure to pollutants, diseases, and hypoxia. Hence, it could be suggested that any unhealthy condition caused by poor nutrition could affect the biochemical characteristics of fish (Hassaan *et al.*, 2014; Lee *et al.*, 2016).

Proteins present in blood that serve many different functions, including transport of lipids, hormones, vitamins, and minerals in the circulatory system and the regulation of acellular activity and functioning of the immune system. Albumin functions primarily as a carrier protein for steroids, fatty acids, and thyroid hormones in the blood and plays a major role in stabilizing extracellular fluid volume by contributing to oncotic pressure of plasma. Globulins are a group of proteins in your blood. They are made in your liver by your immune system. Globulins play an important role in liver function, blood clotting, and fighting infection. Low ratios may also increase the risk of death for those with cancer or heart disease. In present investigation, biochemical parameters analyzed were within normal range. In fishes, albumen

account for more than 50% of total serum protein and normal A/G ratio is between 1.1 and 2.5.

Elevated triglycerides may contribute to pancreatitis or hardening of the arteries. This increases the risk of stroke, heart attack and heart disease. Healthy Cholesterol (HDL) plays a vital in many of the body's processes, including building cellular membranes, making hormones. HDL (high-density lipoprotein), or good cholesterol, absorbs cholesterol and carries it back to the liver. The liver then flushes it from the body. LDL stands for low-density lipoproteins. It is sometimes called the bad cholesterol because a high LDL level leads to a build-up of cholesterol in arteries. High levels of VLDL cholesterol have been associated with the development of plaque deposits on artery walls, which narrow the passage and restrict blood flow.

The SGOT and SGPT are liver enzymes and they have the function of transferring the amino group from alpha-amino acids to alpha-keto acids. A large amount of GOT and GPT is released in the blood mostly during liver cell damage. Thus, detection of the serum level of GOT and GPT allows monitoring liver cell damage. Application of phytochemically potent herbs in diet may cause stabilization cell membrane and protect the liver against deleterious agents and free radical-mediated toxic. This is reflected in the reduction of liver

enzymes. Hence supplementation do not affect metabolic enzyme status in freshwater fish *Channa punctatus*. The quality food helped to maintain serum biochemical characteristics of fish.

The quality food helped to maintain serum biochemical characteristics of fish. These views are in well agreement with the findings of earlier researchers (Thongprajukaew *et al.*, 2011; Hassaan and Soltan, 2016; Baldissera *et al.*, 2019; Amanda *et al.* 2020; Pradhan *et al.*, 2021).

### Conclusion

An experimental study was carried out successively to evaluate the effects of lemongrass supplementation on biochemical profile of freshwater fish *Channa punctatus* (Bloch, 1793). The improved serum biochemical profile of fish fed on lemongrass based formulated feed was observed. The control and test feed groups were significantly different ( $P < 0.05$ ). In considering the overall performance, lemongrass supplementation in diet is recommended for successful aquaculture of this important fish species.

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