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Effect of adding turmeric, ginger and black pepper on biochemical parameters of *Cyprinus carpio*

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ABSTRACT: The study was conducted with the aim to find out the effect of ginger and turmeric supplementation on the growth performance of common carp (*Cyprinus carpio*) fingerlings. A total of 270 fingerlings were divided into 6 groups including control (C). The group C was fed with basal feed and the treatment groups T5, T5B5, G2, G5, G8 were fed with turmeric powder @ 0.5%, turmeric @ 0.5% + black pepper powder @ 0.5 %, ginger powder @ 2%, 5% and 8% respectively. Different biochemical parameters ALT, AST, total protein, albumin, globulin and cholesterol content were estimated after 60 days of feeding. T5B5 group had higher ALT (23.62±4.269) and AST (261±26.845). No significant difference in total protein and globulin contents amongst different treatments was observed, however, the control treatment had significantly ($p<0.05$) higher albumin (1.008±0.0634) content. The results suggest that dietary supplementation with ginger and turmeric influences biochemical responses in *C. carpio* fingerlings, highlighting their potential role as functional feed additives in aquaculture.

Keywords: Biochemical, commoncarp, fingerlings, ginger, growth, turmeric

Fisheries and aquaculture are one of the world's fastest expanding businesses (Tacon, 2020). Fish is important source of omega fatty acids. The role of these fatty acids in vision, reproduction, and prenatal and postnatal brain development is well recognized (Lauritzen *et al.,* 2001; Curtis *et al.,* 2004; SanGiovanni and Chew, 2005). Herbs as feed additives play an important role in health and nutrition. Due to rise in antibiotic resistance and its negative impact on human health, there is a growing interest in using herbal feed additives in livestock production. Turmeric (*Curcuma longa L.*) belongs to the Zingiberaceae family and has been used as a spice and medicinal herb in India for thousands of years. It has long been used as a beauty and health enhancer (Rema devi *et al.,* 2007). Turmeric has been shown to have antitoxic, antitumor, anti-inflammatory, hepatoprotective, antimutagenic, antiangiogenic, immunomodulatory, antibacterial, anticancer, and wound healing properties in recent studies (Prasad and Aggarwal, 2011). Ginger (*Zingiber officinale*) belongs to the family Zingiberaceae. The rhizome of this plant used as a spice. Natural antioxidants like as gingerols, shogaols, and zingerone are abundant in ginger (Shakya, 2015). *Zingiber officinale* is a plant that is used as a flavouring, culinary herb, and medicinal. The bioactive components found in ginger rhizomes have been shown to have immune system functions (Sukumaran *et al.*, 2016), antibacterial qualities (Hasan *et al.*, 2012), and antioxidant activities (Si *et al.*, 2018). Certain fish species' immune and antioxidant systems, haematological and biochemical parameters, growth performance, and

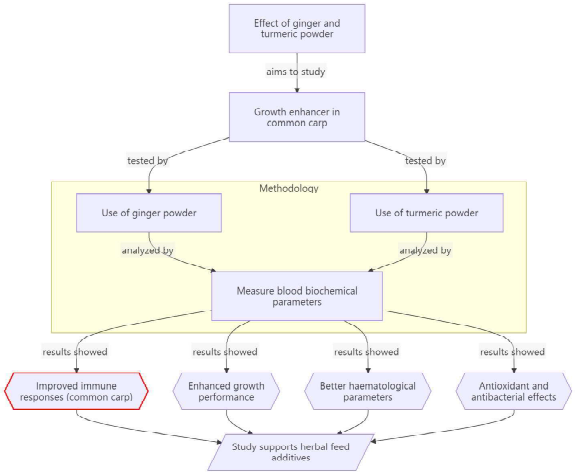


Fig.1: Flow diagram showing the effect of use of ginger and turmeric in feed on fish

disease resistance have all been shown to benefit from powdered ginger (Ahmadifar *et al*., 2019, Nya and Austin, 2009, Sukumaran *et al*., 2016, Talpur *et al*., 2013). Additionally, the treatment of ginger extract improved body composition, immunological functions, haematology, biochemical parameters, and growth in common carp (*Cyprinus carpio*) (Mohammadi *et al*., 2020) as well as the immune responses in young beluga sturgeon (*Huso huso*) (Vahedi *et al*., 2017)

Ginger and turmeric are available in every household of Himachal Pradesh, as they are grown in kitchen gardens and as commercial crops. So, they are available either free of cost or at very low prices. As no research work has been done on the use of ginger and turmeric powder as growth enhancer in common carp under humid sub tropic conditions of H.P., this study was planned with the objective, to study the effect of ginger and turmeric powder, on blood biochemical parameters.

MATERIALS AND METHODS

The research work was carried out in the fisheries farm of the Department of Fisheries, Dr. G.C. Negi, College of Veterinary and Animal Sciences CSK HPKV, Palampur in year 2021. Total 270 fingerlings (40-45g) were procured from Govt Fisheries Farm Gagreat, Una. They were transported in plastic drums. On arriving at the farm, fish were given prophylactic treatment with 0.2 percent $KMn0_4$ for two minutes for removing any dermal infection. After that the fingerling was transferred to tank of length 14 feet 3 inches width 7 feet 3 inches and depth 3 feet 7 inches containing bore-well water. After acclimatization for 14 days they were divided into 6 groups including control (C). The feeds were formulated as suggested by FAO (fao.org). The group C was fed with basal feed and the treatment groups T5, T5B5, G2, G5, G8 were fed with turmeric powder @ 0.5%, turmeric @ 0.5% + black pepper powder @ 0.5 %, ginger powder @ 2%, 5% and 8%, respectively. Water quality parameters such as pH, alkalinity, dissolved oxygen, temperature, and total dissolved solids (TDS) were regularly monitored three times per week throughout the experimental period. The blood samples were collected to estimate biochemical parameters at the end of two months.

The experimental feeds offered to the fingerlings were isoproteinous and isocaloric. The CP content of the feeds ranged from 30.85 to 33.04 per cent and EE content varied from 4.20 to 5.60 per cent. Average pH, TDS, temperature, alkalinity and dissolved oxygen was 7.1, 52.08 ppm, 220 C and 50 mg/l as $CaCO_3$, respectively. After 2 months of feeding turmeric, black pepper and ginger, blood was collected aseptically from caudal vein of live fish by using 2ml syringe (plate 10). The blood was transferred to the serum collection vial for separation of serum. The serum was collected in eppendorf tube and stored at minus 20 degree Celsius for estimation of following biochemical parameters by using Agape diagnostic kits in Erba Mannheim CHEM 5X Analyzer (plate 11) in the Department of Animal Nutrition, COVAS, Palampur (Himachal Pradesh). Albumin, Globulin, Total protein, ALT(Alanine Aminotransferase), AST (Aspartate Amino-transferase), and Cholesterol were the parameters estimated under biochemical parameters.

RESULTS AND DISCUSSION

The biochemical parameters in fish are the indicator of physiological status and health condition of an organism (Gharaei *et al.,* 2016). The biochemical parameters of fingerlings at the end of the trial have been given in figure 2.

ALT values differed significantly amongst the treatment and T5B5 had significantly ($p<0.05$) higher ALT level in the serum and it did not vary significantly ($p<0.05$) that of C group. AST values of fingerlings of all the treatment groups did not vary significantly from that of C. ALT concentrations of T5B5, G2 and G5 did not vary significantly and T5B5 group had the highest serum AST concentration.

The total protein and globulin concentration of all the treatment groups did not vary significantly. However, there was significant ($p<0.05$) difference

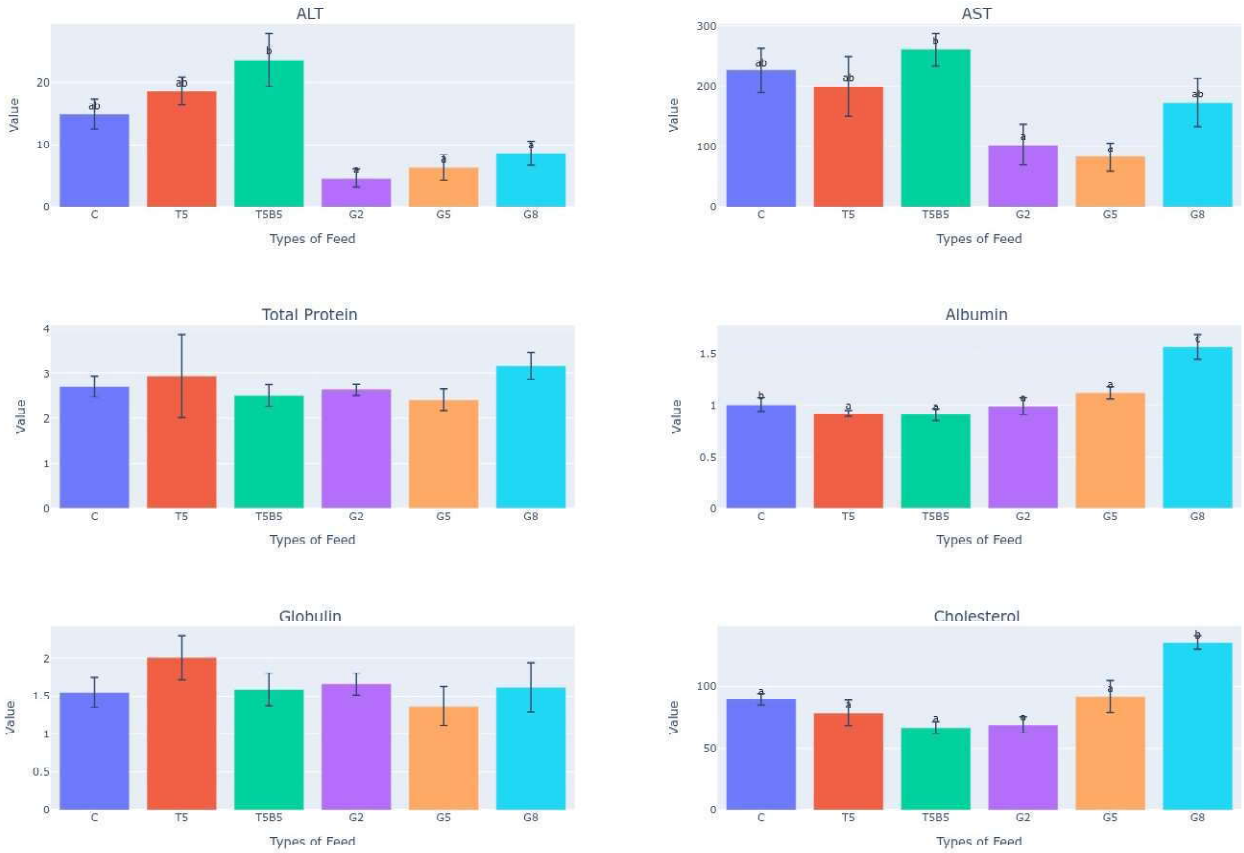


Fig.2: Effect of turmeric, ginger and black pepper on blood biochemical parameters*C: Basal feed; T5: Basal feed + turmeric @0.5 per cent; T5B5: Basal feed + turmeric @0.5 per cent +black pepper @ 0.5 per cent; G2: Basal feed + ginger @ 2 per cent; G5: Basal feed + ginger @ 5 per cent; G8: Basal feed + ginger @ 8 per cent; Figures bearing different superscripts within a row are statistically different (p<0.05)*

in albumin concentration amongst the treatments. Serum concentration of all the treatments (including control) except G8 were statistically similar and G8 had significantly ($p<0.05$) higher serum albumin concentration compared to rest of the treatments. No effect of turmeric, turmeric + black pepper and ginger supplementation on total protein and globulin was observed. The supplementation of turmeric, ginger and black pepper resulted in significantly ($p<0.05$) higher cholesterol concentration in fingerlings of G8 group whereas all the rest of treatments had similar serum concentration of cholesterol.

Ashrey *et al.* (2021) reported no effect of curcumin supplementation on ALT, AST and total cholesterol. The oxidative stress on an organism is increased with malnutrition and imbalance/ poor quality of feed. This stress causes impaired liver function and lipid metabolism (Dawood and Koshio 2020) resulting in altered AST, ALT and ALP values. Ajeel and Alfaragi (2013) reported a significant decrease in AST and ALT compared to the control group upon supplementation garlic 10 gm per kg and ginger 2.5 gm per kg + garlic 7.5 gm per kg. The active components in herbs/spices result in stabilization of cell membrane and provide protection to the liver cells from damage of toxic products and free radical (Ajeel and Alfaragi, 2013) which is usually reflected by lowering in liver enzyme. Kanani *et al.* (2014) reported decreased AST and no effect on ALT in ginger fed fish. Shalabay *et al.* (2006) also reported decrease in AST level in Nile tilapia on garlic supplementation. Conflicting reports on liver enzyme level might be due the differences in fish species size water quality parameters, feeding and rearing conditions etc.

The higher serum proteins concentration is associated with the innate immune response of the organism (Wiegertjes *et al.,* 1996). Ashry *et al.* (2021) reported curcumin supplementation has significant increase in total protein. Kanani *et al.* (2014) also reported increase in Total protein content on supplementation 1 per cent ginger in *Huso huso.* They attributed higher total plasma protein level to the increased protein synthesis in liver tissue upon feeding ginger powder. Kanani *et al.* (2014) also reported higher albumin and globulin content in ginger fed fish. Globulins are the source of most of immunological active protein in the blood (Jha *et al.,* 2007).

Najem *et al.* (2020) reported that total protein, albumin did not show any significant difference in treatment groups as compared to control when fed with ginger @ 1, 1.5, 2 per cent whereas globulin showed significant increase when ginger was fed @ 2 per cent in diet. Cholesterol significantly decreases when fed @ 2%. Similarly, Dugenci *et al*. (2003) also reported elevated serum protein level in ginger fed Nile tilapia. Ajeel and Alfaragi (2013) reported significant increase in total protein, albumin and globulin upon supplementation of garlic @ 10 gm per kg and ginger 2.5 gm per kg + 7.5 gm per kg garlic in feed of common carp. Arulvasu *et al.* (2013) also reported that ginger supplementation increased total serum protein in *Catla catla*.

CONCLUSION

Overall, the results indicate that dietary supplementation of turmeric (0.5%) and ginger modulates biochemical responses in *C. carpio* fingerlings, thereby indicating its potential to improve the physiological performance and nutritional quality of the fish. Therefore, turmeric and ginger may be considered effective functional feed additives for improving fish health and metabolic status in aquaculture.

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