



Study of dietary garlic induced effects on hematology and biochemistry of *Clarias batrachus* (Linnaeus, 1758)

Rodge SG^{1*}, Thakare VG¹ and PS Joshi²

¹Department of Zoology, Government Vidarbha Institute of Science and Humanities, Amravati, Maharashtra, India

²Department of Zoology, Shri. Dr. R. G. Rathod Arts and Science College, Murtizapur, Maharashtra, India

*Email: snehalrodge1996@gmail.com

Article Info

Received: 23-05-2018,

Revised: 23-06-2018,

Accepted: 02-07-2018

Keywords:

biochemistry, *Clarias batrachus*, formulated diet, garlic, hematology

Abstract

The present work was carried out to study the effect of dietary garlic on hematological and biochemical profile of *Clarias batrachus*. The fish were fed on control and experimental diet for 21 days. The collected samples were analyzed for hematology and biochemical profile by using automated analyzers. The results proved that dietary garlic improved the Hematological composition, lipid profile, protein and albumen content of serum. The obtained results cleared that dietary garlic (*Allium sativum*) improved the hematological and biochemical profile of *Clarias batrachus* so garlic should be added to the diets of fish.

INTRODUCTION

The species *Clarias batrachus* is locally known as Magur. It has an elongated body shaped and reaches almost 0.5 m in length and 1.2 kg in weight. It is mainly grey or grayish brown in colour; often covered laterally in small white spots. It has long based dorsal and anal fins, several pairs of sensory barbells. The skin is without scales but covered with mucous which protect the fish when it is out of water. This fish is normally lives in slow moving and stagnant water of ponds, swamps, streams and rivers, paddy fields or temporary pools (Joshi and Gulhane, 2015). The garlic supplementation to the diet of *Clarias batrachus* help to improve the growth performance. It is probably one of the earliest known medicinal plants. Garlic contains Alliin, Allicin and volatile oils. Allicin gives garlic its characteristic pungent smell. Also, it contains vitamins and minerals and trace elements like selenium and germanium (Hassaanet al., 2014; Joshi et al., 2015; Hassaan and Soltan, 2016; Joshi and Gulhane, 2017, Petropoulos et al., 2018).

The present work was carried out to study the effect of dietary garlic on hematological and biochemical profile of *Clarias batrachus*.

MATERIALS AND METHODS

The present investigation aimed to analyze the effects of dietary garlic on hematology and biochemical profile of *Clarias batrachus*. For the presented experiment, the following protocol suggested by Joshi (2017) was adopted

Experimental fish: The fishes measuring about 20±0.5 cm length and weighing ranges from 50±05g in weight were selected for the experimental study. Fishes were transferred to the place of experiment and acclimated for a week. During the acclimation, fish were fed the experimental 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 among density of 10 fish per tank. During experiment, the water quality, aeration and

light: dark cycle of 12:12 h was maintained (Joshi *et al.*, 2015).

Experimental diet and feeding regime: The basal experimental diets were formulated with the commonly available ingredients. The formula and analyzed proximate composition of the basal diet

are shown in Table 1. The ingredients were dried, grinded, milled, weighed, mixed and pelleted. After pelleting, the feeds were air dried and put in an airtight container. During the experiment, fish were fed the experimental diet to satiation third a day at 08:00, 12:00 and 16:00 hours.

Table 1: Formulation of experimental fish diets with different concentration of garlic powder (g/100g diet).

Sr.	Ingredients (g dry wt.)	Control	Experimental
1	Wheat flour	45	40
2	Soybean flour	25	25
3	Corn flour	10	10
4	Meat powder	15	15
5	Soybean oil	05	05
6	Garlic Powder	-	05



Hematology and Biochemical Analysis: After 21 days of feeding, the blood samples of fish were collected directly from heart with the help of syringe. The blood samples were preserved into the EDTA vials. The hematological and biochemical estimations were performed by using the automated analyzer (Kharat and Kothavade, 2012).

Statistical Analysis: Data were collected, organized and analyzed using one-way analysis of variance (ANOVA) through the general linear models (GLM) procedure of the Statistical Package for Social Sciences version 21.0 (SPSS for Windows 21.0, Inc., Chicago, IL, USA). The comparison of means was carried out with Duncan's multiple range tests (DMRT). Results were recorded as mean \pm standard deviation (SD) of triplicate. The value of $P < 0.05$ was used to indicate statistical significance.

RESULTS AND DISCUSSION

It is cleared that garlic is one of the main vegetable that extensively cultivated in many countries. It is used as food for humans as well as some animals and as remedy for several diseases, as reported in folk medicine. The effects of dietary garlic on hematology and biochemical profile of *Clarias batrachus* after 21 days were studied. The results related to hematology and serum biochemistry of *Clarias batrachus* fed on control and experimental diets for 21 days were as given below (Table 2 and

3). The results proved that dietary garlic improved the Hematological composition, lipid profile, protein and albumen content of serum.

Hematological and serum biochemical variables are good predictors for explaining the health status of fish (Hrubec *et al.*, 2000) and the improvement in hematological and biochemical profile of fish is mostly influenced by environmental factor and diet supplementation (Acharya and Mohanty, 2014; Rao *et al.*, 2017). Blood cell content in fish gives a guide to the health status of fish and can be helpful to determine any abnormalities arising from the use of feed additives. Accordingly, the elevate number of RBCs multiplies the concentration of hemoglobin ultimately resulting in a high capacity for oxygen carrying which improved the health of fish and consequently enhancing growth (Hassaan *et al.*, 2014). Furthermore, Fazlollahzadeh *et al.* (2011) assumed that the improved biochemical indices such as lipid profile, total protein, albumen attributable to the improved metabolic activities. The serum glucose and creatinine level was nor significantly different in control and experimental fishes. The present study is consistent with previous studies of Sahu *et al.*, (2007); Soltan and El-Laithy (2008); Talpur and Ikhwanuddin (2012); Yilmaz and Ergün (2012); Hassaan and Soltan (2016). Hence these findings suggested that the present improvement in hematological and biochemical profile is influenced by dietary garlic.

Table 2: Haematology of fresh water fish *Clarias batarchus* fed on control and garlic formulated diet for 21 days; Means within the same row carrying different superscripts are significant different at $P<0.05$ based on Duncan's Multiple Range Test (DMRT).

Sr. No.	Parameter	Control		Experimental	
		Mean	+SD	Mean	+SD
1.	Total Leucocytes Count (Count/ cumm)	12,200 ^a	69.5	16,400 ^b	92.0
	Neutrophils (%)	74.0 ^a	2.0	81.0 ^b	3.0
	Lymphocytes (%)	20.0 ^b	1.0	18.0 ^a	1.0
	Monocytes	06.0 ^b	1.0	01.0 ^a	0.0
2.	Red Blood Corpuscles Count (Mill./cumm)	4.20 ^a	0.35	4.80 ^b	0.30
3.	Hemoglobin (g/dl)	13.3 ^a	0.25	15.1 ^b	0.20
4.	Pack Cell Volume (%)	41.2 ^a	0.45	50.2 ^b	0.38
5.	Mean Corpuscular Volume (fl)	100.2 ^b	2.30	99.8 ^a	2.40
6.	Mean Corpuscular Hemoglobin (pg)	31.2 ^a	1.3	37.8 ^b	1.8
7.	Mean Corpuscular Hb Conce. (g/dl)	36.0 ^b	1.7	35.7 ^a	1.9
8.	Platelets (Count/ cumm)	4,70,000 ^a	683	6,20,000 ^b	708

Table 3: Serum biochemistry of fresh water fish *Clarias batarchus* fed on control and garlic formulated diet for 21 days; Means within the same row carrying different superscripts are significant different at $P<0.05$ based on Duncan's Multiple Range Test (DMRT).

Sr. No.	Parameter	Control		Experimental	
		Mean	+SD	Mean	+SD
1.	Serum Triglycerides (mg/dl)	230.7 ^a	0.68	300.1 ^b	0.70
2.	Serum Total Cholesterol (mg/dl)	335.2 ^b	1.36	310.2 ^a	1.92
3.	HDL- Cholesterol (mg/dl)	50.20 ^a	1.42	68.30 ^b	1.78
4.	LDL- Cholesterol (mg/dl)	168.1 ^a	1.64	199.1 ^b	1.94
5.	VLDL- Cholesterol (mg/dl)	35.20 ^b	1.20	31.00 ^a	1.50
6.	Total Serum Protein (g/dl)	7.8 ^a	1.20	9.0 ^b	1.10
7.	Serum Albumen (g/dl)	6.0 ^a	0.50	7.5 ^b	0.60
8.	Serum Glucose (mg/dl)	53.17 ^a	1.18	52.94 ^a	1.26
9.	Serum Creatinine (mg/dl)	1.11 ^b	0.21	1.09 ^b	0.29

The obtained results cleared that dietary garlic (*Allium sativum*) improved hematological and biochemical profile of *Clarias batrachus* so garlic should be added to the diets of fish.

REFERENCES

Acharya G, Mohanty P, 2014. Comparative haematological and serum biochemical analysis of catfishes *Clarias batrachus* (Linnaeus, 1758) and *Heteropneustes fossilis* (Bloch, 1794) with respect to sex. *J. Entomol. Zool. Stud.*, **2**(6): 191-197.

Fazlollahzadeh F, Keramati K, Saeed N, Shirian S, Samira S, 2011. Effect of garlic (*Allium sativum*) on hematological parameters and plasma activities of ALT and AST of rainbow trout in temperature stress. *Austr. J. Bas. Appl. Sci.*, **11**(5): 84-90.

Hassaan M, Soltan M, Ghonemy M, 2014. Effect of synbiotics between *Bacillus licheniformis* and yeast extract on growth, hematological and biochemical indices of the Nile tilapia (*Oreochromis niloticus*). *Egy. J. Aquat. Res.*, **40**(1): 199-208.

Hassan MS, Soltan MA, 2016. Evaluation of Essential Oil of Fennel and Garlic Separately or Combined with *Bacillus licheniformis* on the Growth, Feeding Behaviour, Hemato-biochemical Indices of *Oreochromis niloticus* fry. *J. Aqua. Res. Develop.*, **7**(4): 1-8.

Hrubec TC, Cardinale JL, Smith SA, 2000. Hematology and plasma chemistry reference intervals for cultured tilapia (*Oreochromis hybrid*). *Vet. Clin. Pathol.*, **29**(1): 7-12.

Joshi PS, Gulhane RA, 2015. Effects of dietary garlic on growth performance in the fresh water fish *Clarias batrachus* (Linn.). *Int. J. Res. Biosci., Agri., Tech.*, **2**(3): 244-246.

Joshi PS, Gulhane RA, 2017. Effect of Dietary Garlic on Whole Body Composition in the Fresh Water Fish *Channa Punctatus*. *Int. J. Adv. Res. Sci Eng.*, **6**(8): 01-04

Joshi PS, 2017. Dietary garlic induced growth performance, whole body composition and survival in *Clarias batrachus* (Linn.). *Proceeding of N.C.R.A.O.B.S.*, **2017**:36-37

Joshi PS, Tantarvale VT, Kulkarni KM, 2015. Dietary Garlic Induced Productive Performance in the fresh water fish *Clarias batrachus* (Linn.). *Proceeding of N.C.A.S.R.C.*, **2015**: 78-79

Kharat S, Kothavade S, 2012. Hematological study of *Clarias batrachus* with reference to Trypanosomiasis. *Trends Fish. Res.* **1**(1): 6-9.

Petropoulos SA, Fernandes A, Ntasitsi G, Petrotos K, 2018. Nutritional value, chemical characterization and bulb morphology of Greek garlic. *Molecule*, **23**(6): 1-14

Rao J, Nilima P, Rao K, 2017. A review on the toxicity and other effects of Dichlorvos an organophosphate pesticide to the freshwater fish. *Biosci. Discov.*, **8**(3): 402-415.

Sahu S, Das BK, Mishra BK, Pradhan J, Sarangi N, 2007. Effect of *Allium sativum* on the immunity and survival of Labeorohita infected with *Aeromonas hydrophila*. *Journal of Applied Ichthyology* **23**(1): 80-86.

Soltan MA, El-Laithy S, 2008. Effect of probiotics and some spices as feed additives on the performance and behaviour of the Nile tilapia, *Oreochromis niloticus*. *J. Aquat. Biol. Fish.*, **12** (1): 63-80.

Talpur AD, Ikhwanuddin M, 2012. Dietary effects of garlic (*Allium sativum*) on haemato-immunological parameters, survival, growth, and disease resistance against *Vibrio harveyi* infection in Asian sea bass, *Lates calcarifer* (Bloch). *Aquaculture*, **36**(4): 6-12.

Yilmaz S, Ergün S, 2012. Effects of garlic and ginger oils on hematological and biochemical variables of Sea Bass *Dicentrarchus labrax*. *J. Aquat. Anim. Health.* **24** (2): 219-224.

How to cite this article

Rodge SG, Thakare VG and PS Joshi, 2018. Study of dietary garlic induced effects on hematology and biochemistry of *Clarias batrachus* (Linnaeus, 1758). *Bioscience Discovery*, **9**(3):328-331.