STUDY OF DIETARY GARLIC INDUCED EFFECTS ON HEMATOLOGICAL PROFILE OF *Clarias batrachus* (LINNAEUS, 1758)

Rodge SG[1] and Thakare VG[1]

1Department of Zoology, Shri Shivaji Arts, Commerce and Science College, Akot, Maharashtra, India
2Department of Zoology, Government Vidarbha Institute of Science and Humanities, Amravati, Maharashtra, India

Abstract

The present work was carried out to study the effect of dietary garlic on hematological profile of *Clarias batrachus.* The fish were fed on control and experimental diet for 30 days. The collected samples were analyzed for hematology profile by using automated analyzers. The results proved that dietary garlic improved the Hematological composition in fish. The obtained results cleared that dietary garlic (*Allium sativum*) improved the hematological profile of *Clarias batrachus* so garlic should be added to the diets of fish.

Keywords: *Clarias batrachus, formulated diet, feeding, garlic, hematology*

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 (Hassaan*et 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 profile of *Clarias batrachus.*

Material and methods

Materials and Methods

The present investigation aimed to analyze the effects of dietary garlic on hematological 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 air-tight 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 and oil (g/100g diet).

Sr. No.	Ingredients (g dry wt.)	Control	Garlic Powder		Garlic Oil	
		G1	G2	G3	G4	G5
1.	Wheat flour	45	42.5	40	43.75	42.5
2.	Soybean flour	25	25	25	25	25
3.	Corn flour	10	10	10	10	10
4.	Meat powder	15	15	15	15	15
5.	Soybean oil	05	05	05	05	05
6.	Garlic Powder	-	2.5	5	1.25	2.5

Table 2: Haematology of freshwater fish *Clarias batarchus* fed on control and garlic formulated diet for 30 days.

Sr. No.	Parameter	Control		Garlic Powder				Garlic Oil			
		G0		G1 (2.5 %)		G2 (5%)		G3 (1.25 %)		G4 (2.5 %)	
		Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD
1.	Total Leucocytes Count (Count/ cumm)	12,200	69.5	15,860	90.35	20740	118.15	18300	104.25	23180	132.05
2.	Red Blood Corpuscles Count (Mill./cumm)	4.2	0.35	5	0.455	7.14	0.595	6.3	0.525	7.98	0.665
3.	Hemoglobin (g/dl)	13.3	0.25	17	0.325	22.61	0.425	19.95	0.375	25.27	0.475
4.	Pack Cell Volume (%)	41.2	0.45	54	0.585	70.04	0.765	61.8	0.675	78.28	0.855
5.	Mean Corpuscular Volume (fl)	190.38	4.37	170.34	3.91	130	2.99	150.3	3.45	100.2	2.3
6.	Mean Corpuscular Hemoglobin (pg)	31.2	1.3	41	1.69	53.04	2.x`	46.8	1.95	59.28	2.47
7.	Mean Corpuscular Hb Conce. (g/dl)	68.4	3.23	61.2	2.89	47	2.21	54	2.55	36	1.7
8.	Platelets (Count/ cumm)	4,70,000	683	6,11,000	887.9	799000	1161.1	705000	1024.5	893000	1297.7

Hematological Analysis: After 30 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 vials. The hematological estimations were performed by using the automated analyzer (Kharat and Kothavade, 2012).

Statistical Analysis: Data were collected, organized and analyzed by using Microsoft Excel program. Results were recorded as mean ± standard deviation (SD) of survived individuals.

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 hematological profile of *Clarias batrachus* after 30 days were studied. The results related to hematology of *Clarias batrachus* fed on control and experimental diets for 30 days were as given below (Table 2). The results proved that dietary garlic improved the Hematological composition in fish.

Hematological 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). The present study is consistent with previous studies of Sahu*et al.*, (2007); Soltan and El-Laithy (2008); Fazllolahzadeh *et al.*(2011); Talpur and Ikhwanuddin (2012); Yilmazand Ergün (2012); Hassaan and Soltan (2016), Adineh, *et al.* (2020); Akter and Hossain (2021); Edeh *et al.* (2022) and name a few. Hence these findings suggested that the present improvement in hematological profile is influenced by dietary garlic.

Conclusion

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

References

1. 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.
2. Adineh, H., Harsij, M., Jafaryan, H., Asadi, M. 2020. The effects of microencapsulated garlic (Allium sativum) extract on growth performance, body composition, immune response and antioxidant status of rainbow trout (Oncorhynchus mykiss) juveniles. Journal of Applied Animal Research, 48(1), 372-378.
3. Akter T., Hossain A. 2021. Effects of spirulina (Arthrospira platensis) as a fishmeal replacer in practical diets on growth performance, proximate composition, and amino acids profile of pabda catfish (Ompok pabda) Journal of Applied Aquaculture 35(1) 69-82.

4. Edeh IC, Olise CS, Ononye BU, Ikechukwu CC, Nwankwo CG, Okoli IK 2022. Nutraceutical Role of Honey and Garlic (Allium sativum) on Haematological and Plasma-Antioxidant Profile of African Catfish (Clarias gariepinus) Asian Journal of Biology, 16(3): 43-52.
5. Fazllolahzadeh 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.
6. 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.
7. 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.
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.
9. 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
10. 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.
11. 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
12. Joshi PS, Tantarpale 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
13. Kharat S, Kothavade S, 2012. Hematological study of Clarias batrachus with reference to Trypanosomiasis. Trends Fish. Res. 1(1): 6-9.
14. Petropoulos SA, Fernandes A, Ntasitsi G, Petrotos K, 2018. Nutritional value, chemical characterization and bulb morphology of Greek garlic. Molecule, 23(6): 1-14
15. 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.
16. 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.
17. 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.
18. 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.
19. Yılmaz 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.