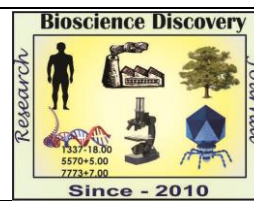


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Research Article



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

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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, Fazllolahzadeh *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.

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