

Impact of Garlic (*Allium sativum*) on Glycogen Level of Fresh Water Fish *Channa Striatus* (Bloch, 1793)

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ABSTRACT

The present work was conducted to study the effect of garlic (*Allium sativum*) on glycogen content of fresh water fish *Channa striatus*. Live specimens of *Channa striatus* were collected from local market of Amravati city. The controlled fishes were fed with normal diet and experimental fishes were fed with garlic pellets. Fishes were randomly selected from each control and experimental tanks, anesthetized, sacrificed after day 7, 14 and 21 days and muscle tissue were taken for glycogen estimation. The glycogen levels in the muscle of the controlled and experimental fishes were estimated by Nelson-somogy's method. The glycogen level of controlled and experimental was compared. The present investigation indicated that the glycogen contents in muscle of experimental fish decreased 29.07 ± 0.833 , 26.18 ± 0.904 , 23.78 ± 1.784 as compared to control 30.45 ± 1.18 , 28.73 ± 0.591 and 30.33 ± 0.498 . Thus, *Allium sativum* fed to *Channa striatus* showed significant decreased in the glycogen level of muscle tissue.

Keywords: *Channa striatus*, *Allium sativum*, glycogen

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I. INTRODUCTION

Plants have been used as medical practice since prehistoric times. Modern approaches to determine the medical properties of plant involve collaborative efforts that can include ethnobotanist, anthropologists, pharmaceutical chemists and physicians. Many antibiotics are commonly used to promote growth and health in carp, trout and Nile tilapia (Essa et al., 1995). Also artificial feeds supplemented with antibiotic were used to prevent the spread of disease and

improve food conversion ratio (FCR) by Reilly and Kaferstein (1997).

Approximately 25% of the prescribed drugs sold in United States are plant based. Medicines that come from plants include willow bark (*Salix* species) and foxglove (*Digitalis purpurea*). Garlic (*Allium sativum*) is one of the most commonly used plants, both for medicinal and culinary purposes as providing flavour and taste to the final product. However, whole garlic as well as its components/fractions are used in medicines since long time and depict its presence in the Chinese medicines 3000 years ago. Garlic based

medications were also famous in India about 5000 years ago.

Garlic contains at least 33 sulphur compounds, several enzymes and minerals like germanium, calcium, copper, iron, potassium, magnesium, selenium, and zinc; vitamins A, B1 and C, fiber and water. It also contains 17 amino acids; lysine, histidine, arginine, aspartic acid, threonine, serine, glutamine, proline, glycine, alanine, cysteine, valine, methionine, isoleucine, leucine, tryptophan and phenylalanine (Josling, 2005). The most abundant sulphur compound in garlic is alliin (s-allylcysteine sulfoxide), which is present at 10 and 30 mg/g in fresh and dry garlic, respectively (Lawson, 1994).

Fishes are one of the most important dietary animal protein sources in human nutritional status. Fish is the excellent substitute for the meat and is the excellent source of protein. *Channa striatus* is commonly called as “spotted murrel” and distributed throughout South East Asia and also known for its taste, high nutritive value and medicinal value. It is naturally distributed in India and other neighbouring countries.

Liver is the main store of carbohydrates that are the biggest source of blood glucose. The ratio of the carbohydrates utilization in fish varies according to feeding habits of fish. The basic energy reserve glycogens consists 1% of total body weight. This source is sufficient to provide the energy need for a short time, but not for a long time. The glycogen amount stored in liver depends on the physical, chemical and biological factors faced by the fish rapid movement, stress factors or environmental hypoxia causes carbohydrates reserves to diminish (first glycogen in liver and muscles). The glycogen level in muscles may reflect the glycogen level in liver which is the main storage place for glycogen. The glycogen stocks in striated muscles of fish have an important role. After physical activity, the glycogen in muscle is

converted into lactic acid and causes the pH of the muscles to decrease.

Kumar and Reddy (1999), studied that feeding mice with garlic, induce significant decrease in serum glucose levels. Lower levels of plasma glucose in fish have also been reported in the assessment of biochemical effects of *Allium sativum*. Sheela and Augusti (1992) studied that glucose concentration significantly decreased in fish fed on diets containing the *allium Sativum*.

Similarly Gupta et al., (2009) studied that the garlic decreases plasma glucose and increases serum insulin in diabetic rat. They also studied that the effect of garlic extract on nickel or chromium induced alteration of plasma glucose and hepatic glycogen levels and anti oxidant status in rats.. Metwally (2009) showed that the effect of garlic on weight gain and growth performance of *O. niloticus* significantly increased in all groups fed on garlic with lower mortality rate and increases the antioxidant activity in fish. Total protein in blood serum significantly increased in the groups fed on garlic, while blood glucose, triglycerides and cholesterol levels were significantly decreased in the same treated groups.

Amin Farahi et.al., (2010) studied effect of garlic on growth factors, some haematological parameters and body compositions in rainbow trout (*Oncorhynchus mykiss*) which showed that weight gain and growth performance of *O. mykiss* significantly increased in all groups fed on garlic. Megbowon et al., (2013) observed that effects of garlic on the growth performance and nutrient utilization of fingerlings of an ecotype cichlid commonly called “wesafu” in Nigeria. Results showed significant increase in weight and growth performance of the ecotype cichlid in all groups fed on garlic.

Agatha A. et.al., (2012) studied the effect of different concentrations of garlic supplement in fish diet on growth and haematological parameters of *Clarias*

gariepinus fingerlings. They observed that increase in total length of garlic treated fish and white blood cell (WBC), red blood cell(RBC), packed cell volume (PCV), haemoglobin(HB) were observed to be significantly higher than the initial counts in the treatment groups as compared to the controls. AL-Salahy and Mahmoud (2003) studied that the effect of garlic administration on the carnivorous fish *Chrysichthys auratus* showed a hypoglycaemia, hypolipidaemia, hypocholesterolaemia, hypotriglyceridaemia and a drop in serum trifluoroacetic acid (TFAA) in response to repeated doses of garlic. Thus the objective of this experiment trails is to assess the influence of supplementary feeding of the garlic on total glycogen level of muscle tissue.

II. METHODS AND MATERIAL

The fishes selected for the experimental study was *Channa striatus*. Fishes were collected from the local fish market of Amravati. The average length of the fish was 16-18 cm and the weight was 17-45gm respectively. They were kept in glass aquarium, having tap water and added 1% KMnO4 solution for disinfection. The fishes were acclimated for 8-10 days in the laboratory condition by APHA (1998) method. During acclimatization they were feed with prawns as a natural food. After two weeks the fishes were separated into two groups. First group was considered as control and second group was considered as experimental. The first group of fishes considered as controlled were daily feed twice by prawns and the second group considered as experimental were feed with garlic pellets. The second group were given garlic pellets as dose two times a day after 7, 14, 21 days. Garlic was brought from the market and then it was converted to paste with the help of mixer and dried to form powder. This powder form of garlic was converted to small pellets and soybeans oil was used. These garlic pellets was given as dose for the fishes and it is 12 gm given as 1/3 of the total fish weight.

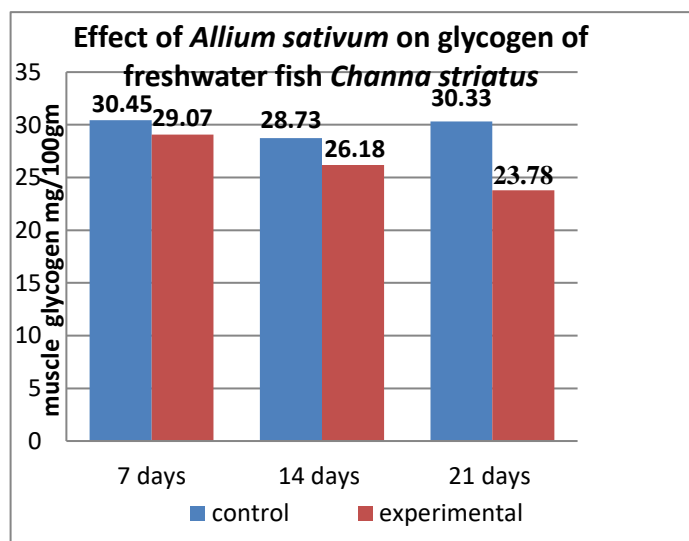
On the desire day the fishes were sacrificed and then dissected to collect the muscle tissue to study the effect of garlic on glycogen in the muscle tissue. Glycogen was estimated by Nelson-Somogy's (1944) or DNS method. Glucose was taken as standard solution.

III. RESULTS AND DISCUSSION

In the present study the impact of garlic on glycogen level in muscle tissue of fresh water fish *Channa striatus* was found to be in experimental treated fishes as 29.07 ± 0.833 , 26.18 ± 0.904 , 23.78 ± 1.784 , and control fishes 30.45 ± 1.18 , 28.73 ± 0.591 and 30.33 ± 0.498 , it is observed that glycogen level in the muscle tissue of fish was significantly decreased in the groups fed on garlic as compared to the control.

Table no 1:- Effect of garlic on glycogen in muscle of fresh water fish *Channa striatus*.

Days	Concentration of glycogen mg/100gm	
	Control	Experimental
7	30.45 ± 1.18	29.07 ± 0.833
14	28.73 ± 0.591	26.18 ± 0.904
21	30.33 ± 0.498	23.78 ± 1.784



IV. DISCUSSION AND CONCLUSION

Garlic is one of the most commonly used plants, both for medicinal and culinary purposes as providing flavor and taste to the final product. It is believed to be originated from central Asia over 6,000 years ago and has been extended towards west, south and east. The current experiment aimed to study the effects of garlic (*Allium sativum*) on the concentration of glycogen in the muscle tissue of the fresh water fish *Channa striatus*.

Glycogen level in muscles tissue reduced significantly in fish feed on diets containing garlic (*Allium sativum*). This condition was attributed to improving of the antioxidant system in cell of pancreas to produce insulin. These results agree with those of Kumar and Reddy (1999), who found that feeding mice with garlic induced significant decrease of serum glucose levels. Lower levels of plasma glucose in fish have also been reported in the assessment of biochemical effects of *Allium sativum* by Sheela and Augusti (1992). The present study demonstrated that administration of garlic induced glycogen concentration to reduce significantly in muscles of *Channa striatus* feed on diets containing garlic (*Allium sativum*). These results agree with those of Thomson and Ali (2003) and Shalaby et al., (2006). The effect of garlic on growth factors, some hematological parameters and body compositions in rainbow trout (*Oncorhynchus mykiss*) was studied by Amin Farahi et al., (2010) and their result showed that the weight gain and growth performance of *Oncorhynchus mykiss* significantly increased in all groups feed on garlic. There was a significant decrease of glycogen level in the fish feed on diets containing garlic as compared to the control group, this favors our study and the result observed, according to which the concentration of glycogen decreases after the fish feeds on garlic (*Allium sativum*).

In the present study it was observed that the garlic decreases glycogen level in the muscle tissue of *Channa striatus*. All the above benefits of garlic are very helpful in aquaculture. At the end, from the obtained results it could be recommended that garlic may be used to decrease glycogen level. Also garlic can be used as antibiotic for the treatment or prevention of disease and for enhancing fish tolerance to environmental stressors (Sivam, 2001), so addition of garlic to the diets of fish would be beneficial for the health of fishes.

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