

Effect of temperature on protein content in freshwater fish, *Channa punctatus* from Godavari river, Nanded

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SUMMARY

Fish have long been considered as excellent indicator of water quality. Each type of fish has its own fatal temperature, the temperature at which it will suffer heat death. Rapid temperature changes produce thermal shock or stress. In the present study, the snake headed fish, *Channa punctatus* was exposed to different temperature treatments *i.e.* 20, 25, 28, 30 and 32° C. The changes in protein content in fishes were observed on 24, 48, 78 and 96 hrs of continuous exposure. At higher temperature of exposure, *Channa punctatus* showed decreased in protein content in the muscle.

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Key Words :

Thermal effect,
Channa punctatus,
Protein content

Environmental stress causes a variety of detectable and recognizable physiological changes in fishes. The physiological changes including the changes at cellular level in several fish species under different experimental and natural conditions were reported (Place, *et al.* 2005; Atkins *et al.*, 2008; Franklins *et al.*, 2007; Ream *et al.*, 2003; Verma *et al.*, 1992).

Protein is one of the most important biochemical constituents and chemical complex which acts as energy yield of the fish with their constituent amino acid and are building blocks of the cell. Knowing the importance of fish as a nutrient, it is essential to know its nutritive value and variation. The fresh water fishes in India provide a food to mankind. The nutritive and medicinal value of fish has been recognized from immemorial time. Fishmeal is still a preferred protein source for fish diets corresponding to its high protein quality (NRC, 1993). Freshwater fish flesh provides an excellent source of protein for human diet. The protein is of high digestibility, biological and growth promoting value for human consumption. They are important biomolecules involved in a wide spectrum of cellular function. They interplay between enzymatic and non-enzymatic proteins to govern the metabolic harmony (Lehinger, 1984). Number of scientists

have done work on the effect of temperature on the biochemical content in freshwater fishes (Basha, 1984, Basha *et al.*, 2005). Fish can be subjected to great and sometimes rapid changes in ambient temperature which directly affect the protein content in freshwater fishes. With this background, an attempt has been made in this study on the tissue protein content in freshwater fish, *Channa punctatus* subjected to temperature stress.

EXPERIMENTAL METHODOLOGY

Channa punctatus, snakeheaded freshwater fish of family Channidae, order Perciformes locally called Dhoke (Jayaram, *et al.*, 1982). was chosen as an experimental animal. The fish of an average length of 21.81 ± 1.98 cm and a mean weight body weight of 40.73 ± 2.03g were collected from the Godavari river, Nanded (Maharashtra). These fishes were transported in oxygenated polyethylene bags to the laboratory. The fish were regularly fed with chopped earthworms and small pieces of goat muscles. The food found unused by fish was cleared periodically from the culture tank. The tank was cleaned periodically to avoid infection of fish and sprayed with 1 per cent potassium permagnate to eliminate any bacterial or fungal infection.

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The fishes were acclimatized in laboratory conditions for 4-5 days.

The experiments were carried out with the help of small glass tanks of 15 litres (2' L X 1.5' B X 1.5' H) capacity in which the tank was covered to avoid aerial respiration and jumping away of fish from the tanks. To provide proper supply of oxygen, an aerator was used. The fishes were grouped into 10 numbers in each tank. The 1st two batches were exposed to lower temperatures *i.e.* at 20° C and 25° C. The 3rd batch was maintained at room temperature at 28° C which served as control set during the experiment. The 4th and 5th batches were subjected to higher temperatures *i.e.* at 30° C and 32° C. The fishes were kept in temperature bath by adjusting it to different temperatures.

The protein content in muscle of freshwater fish, *Channa punctatus* was estimated by the method. The calibration curve used, relating the optical density of mg of protein, was prepared with highly processed bovine serum albumin as the standard. The fishes were exposed to different time periods *i.e.* from 24 hrs to 96 hrs and the protein content in muscle of *Channa punctatus* was estimated.

EXPERIMENTAL FINDINGS AND DISCUSSION

During the course of experiment, observations were made to know how the animal reacts to the thermal stress. Temperature is one of the most fundamental environmental stressors, altering almost all biological processes through its action on basic chemical reactions supporting physiological processes. The results of protein content in muscle are given in the (Table 1) for *Channa punctatus*. There were a remarkable changes or variations in the total protein content in freshwater fish, *Channa punctatus* when exposed to different temperatures. The amount of protein content decreased in stress condition. The protein content at 20°C from 24 hrs to 96 hrs was found to be 18.00 to 17.24, at 25°C, 18.47 to 17.06, at 28°C 18.16 to 17.21, at 30°C 17.36 to 15.66, at 32°C, 16.26 to 14.23. The optimal protein requirements may vary with fish species, size, water temperature and quality, variation in diet formulation as well as culture system (Ai *et al.*, 2004). The protein content was significantly affected by the seasonal temperature in the freshwater fishes (Geri *et al.*, 1995; Chandra Shekhar *et al.*, 2008).

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Table 1: Alterations in protein content of fresh water fish, *Channa punctatus* on exposure to different temperatures

Sr. No.	Temperature maintained in water bath (°C)	Period of exposure (hrs)	Amount of %protein mg/g. wet. wt of tissue
1.	20 °C	24 hrs	18.00 ± 0.13
		48 hrs	18.10 ± 0.10
		72 hrs	18.40 ± 0.11
		96 hrs	17.24 ± 0.08
2.	25 °C	24 hrs	18.47 ± 0.08
		48 hrs	18.21 ± 0.12
		72 hrs	17.14 ± 0.07
		96 hrs	17.06 ± 0.11
3.	28 °C (Control)	24 hrs	18.16 ± 0.14
		48 hrs	18.19 ± 0.16
		72 hrs	17.50 ± 0.13
		96 hrs	17.21 ± 0.08
4.	30 °C	24 hrs	17.36 ± 0.08
		48 hrs	16.50 ± 0.09
		72 hrs	16.03 ± 0.12
		96 hrs	15.66 ± 0.07
5.	32 °C	24 hrs	16.26 ± 0.12
		48 hrs	15.33 ± 0.14
		72 hrs	14.50 ± 0.16
		96 hrs	14.23 ± 0.11

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