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Nutritient level in edible marine fish *Hemiramphus gorakhpurensis* and its depletion during storage

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Abstract
In Asia, fish is the only source of protein for about one million people. Security of food supply has not only to do with energy content but also with the nutritive value if the available protein, in particular animal protein. Biochemical studies on fish tissue are of specific intrest, since such tissues constitute a rich nutrients like protein and calorific value (Joshi *et al*., 1979). Fish and fish products are highly perishable, and spoilage is principally the result of microbial and oxidative mechanisms, microbial activity causes a breakdown of fish protein with resulting release of undesirable fishy odour, oxidative rancidity of unsaturated fatty acid in oily fish also resulted (Day., 2001). Salting of fish in brine concentration of 20% (W/v) before smoking resulted in the smoked product having salt content of at least 10 percent (wwb). This concentration was found to reduce fragmentation during smoking (Gitonga., 1998). The study emphasizes the details about the different storage process in edible marine fish and nutrient depletion during different hours of storage at room temperature, ordinary freezer, 4 ^{0}C deep freezer, and salt dried fish of *Hemiramphus gorakhpurensis* (Marine edible fish).

Keywords: Marine fish, control freshness, nutritive status of fish during storage

Introduction
Freshwater fish flesh provide an excellent source of protein for human diet. Nutritional studies have proved that fish proteins rank in the same class as chicken protein and superior to milk, beef protein and egg albumin. It comprises all the 10 essential amino acids in desirable strength for human consumption. Besides protein, fish flesh also offer mineral, iodine, vitamins and fats (Amesen, 1969) [2]. Fish is consumed either as a preparation from freely caught fish or from those that have been preserved in some form. The most important principle of preservation can be done, both for short and long duration by employing different methods Fish spoils very rapidly after death. In raw fish, spoilage takes place mainly due to enzymatic action and oxidation. During fish spoilage the fish passes through three different stages namely pre rigor and post rigor, fish spoilage based on the temperature (Ahmed, 1987) [1]. The nutritional value, the look, the flavour and even the biochemical composition do not remain normal and undergo changes during preservation, processing and storage (Bramstedt, 1962) [3]. When fish is improperly preserved microbial decomposition affects the amino acid content of fish and in some cases lower the value of fish protein (Varela, 1958) [13]. The recent method of preservation is refrigeration as it prevents putrefaction and decay. Generally fishes from India and other countries should extended storage period because the flesh do not contain microbial substance and other explanation may be the complete absence of the type of bacteria which are active even at low temperature (Linquori *et al*., 1963) [10]. Refrigerated storage prevents amine formation (Vaciana *et al*., 1996) [12]. Salting is a very old and common method of preserving fish in India and also throughout the world. slt dehydrate the killed fishes by osmosis and enters their body tissues to increase concentration to the saturation point. The study emphasizes the details about the different storage process in edible marine fish and nutrient depletion during different hours of storage at room temperature, ordinary freezer, 4 ^{0}C deep freezer, 20 ^{0}C deep freezer and salt dried fish of *Hemiramphus gorakhpurensis* (Marine edible).

Materials and Methods

Marine fish *Hemiramphus gorakhpurensis* are available in fresh condition in fish market, Coimbatore after 4 hours of catch. They were brought to the laboratory for the estimation of biochemical composition. In the laboratory they were washed and the surface moisture is removed using blotting paper. The biochemical composition such as water content, protein, carbohydrate, fat, ash content and calorific value were estimated in *Hemiramphus gorakhpurensis* during different hours of storage as shown in the Table. 1

Table 1: The biochemical composition such as water content, protein, carbohydrate, fat, ash content and calorific value were estimated in *Hemiramphus gorakhpurensis* during different hours of storage

During of storage Nature of storage	6 hours	24 hours	48 hours	72 hours	1 week	2 weeks	3 weeks
Room Temperature	✓	✓	✓				
Freezer	✓	✓	✓				
Deep freezer (-4 ^{0}C)	✓	✓	✓	✓			
Salt dried					✓	✓	✓

Water content was calculated in muscle immediately after catch and also after storage. The dissected tissue of *H. gorakhpurensis* were placed in separate vials (weighed to 100mg) and dried in hot air oven for 24 hours at 80 ^{0}C until attaining constant weight. The weight difference between wet and dried tissue elucidate the water content present in the particular tissues and its percentage is calculated.

Protein was estimated by adopting the method of Lowry *et al*. (1957) [11] in the muscle tissue of *H. gorakhpurensis* immediately after catch and also in different storage condition. Sample was prepared was prepared by taking 100 mg of muscle of *H. gorakhpurensis* and homogenised with 1 ml of 0.9% of Nacl solution,1ml of 5% Trichloroacetic acid was added and centrifuged at 800rpm,this precipitate was dissolved in 1ml of 0.1N NaoH.0.1ml of this aliquot was taken and made up to a final volume of 0.1 ml. Finally the amount of protein present in the aliquot sample were calculated and the amount of protein is expresses in percentage.

Carbohydrate is estimated by the method adopted by Hedge and Hofreiter (1962) [8]. 100 mg of muscle of *H. gorakhpurensis* was homogenised in 1 ml of 0.9% of Nacl solution,1ml of 5% TCA was added to 1 ml of tissue exract. The homogenate was centrifuged at 800rpm for 20 minutes. To 1 ml of the supernatant 5 ml of anthrone reagent was added. The series of test tube were kept in boiling water bath for 10-15 min, and then cooled in dark, after 40 min, the OD value was read at 620nm.

Fat was resoluted by gravimetric method using chloroform-methanol mixture (3:1) (Folch *et al*., 1957) [6] in muscle of *H. gorakhpurensis* in fresh fish and also after storage.100 mg of muscle were weighed and ground well with 5 ml of chloroform methanol mixture. The homogenate was centrifuged taken in a small weighed beaker and the beaker was placed inside a large beaker and filled with water along the sides and kept overnight in hot air oven without any disturbance, In between the methanol with dissolved protein layer and chloroform with dissolved protein layer and chloroform with dissolve fat, white precipitate was formed methanol is removed without disturbing the chloroform layer and chloroform was evaporated in the oven at about 60 ^{0}C. The beaker was weighed and the difference between final and initial weight of the beaker will give the lipid content of the tissue and lipid was expressed in percentage.

Ash content was calculated by taking 10mg dry sample kept in hot porcelain crucible and heated at 100 ^{0}C water was completely evaporated and material with crucible is kept in bunsen burner it was charred and transferred to muffle furnace kept in room temperature at 700 ^{0}C until ash was obtained. The crucible is transferred to desiccators containing sulphuric acid, cooled and weighed as soon as the room temperature was obtained. The ash content was calculated

$$\text{Percentage of ash} = \frac{W_3 - W_1 \times 100}{W_2 - W_1}$$

where W1=Weight of empty crucible
W2=weight of crucible with sample
W3 =Weight of crucible with ash

The calorific value was calculated in tissue of *H. gorakhpurensis* (K cal X gm dry weight) was determined by using calorific equivalent of 5.65% for protein,9.45% for lipid and 4.1% for carbohydrate(Brody,1945)

Result and Discussion

The present investigation gives clear detail about the "Nutritional level in edible marine fish, *H. gorakhpurensis* and its depletion during storage is shown in

Table 1: Biochemical composition in the muscle tissue of *H. gorakhpurensis*

Biochemical compositions (Control fish)	*Hemiramphus* gorakhpurensis (%)
Water content	62.50
Protein %	28.40
Carbohydrates %	8.90
Fat %	9.80
Ash content %	0.932
Calorific value	2.80

Table 2: Biochemical composition in the muscle tissue of *H. gorakhpurensis* during different hour of storage at room temperature

Biochemical Compositions (%)	Control	Different hour of storage			
		6 hrs	12 hrs	24 hrs	48 hrs
Water content (%)	62.50	61.75	60.00	58.60	57.80
Protein (%)	28.40	26.20	24.30	22.73	20.00
Carbohydrates (%)	8.90	8.60	8.20	7.90	7.60
Fat (%)	9.80	9.60	9.40	9.10	8.80
Ash content (%)	0.932	0.847	0.729	0.638	0.547
Calorific value	2.74	2.56	2.43	2.30	2.10

Table 3: Biochemical composition in the muscle tissue of *H. gorakhpurensis* during different hour of storage at Ordinary freezer

Biochemical Compositions (%)	Control	Different hour of storage			
		6 hrs	12 hrs	24 hrs	48 hrs
Water content (%)	62.50	59.00	58.25	57.0	55.00
Protein (%)	28.40	25.20	24.20	23.50	21.60
Carbohydrates (%)	8.90	7.20	6.90	6.50	6.10
Fat (%)	9.80	9.40	9.10	8.90	8.60
Ash content (%)	0.932	0.846	0.633	0.431	0.324
Calorific value	2.74	2.40	2.31	2.22	2.07

Table 4: Biochemical composition in the muscle tissue of *H. gorakhpurensis* during different hour of storage at -4 ^{0}C deep freezer

Biochemical Compositions (%)	Control	Different hour of storage				
		6 hrs	12 hrs	24 hrs	48 hrs	72 hrs
Water content (%)	62.50	60.00	58.00	55.60	53.80	50.00
Protein (%)	28.40	24.30	22.40	21.20	19.40	18.00
Carbohydrates (%)	8.90	8.60	8.50	8.30	8.20	8.00
Fat (%)	9.80	9.30	9.00	8.80	8.60	8.40
Ash content (%)	0.932	0.632	0.592	0.421	0.325	0.269
Calorific value	2.74	2.45	2.32	2.23	2.11	2.00

Table 5: Biochemical composition in the muscle tissue of salt dried *H. gorakhpurensis* during different times of storage condition

Biochemical Compositions (%)	Control	Different hour of storage		
		1 week	2 week	3 week
Water content (%)	62.50	0.400	0.383	0.200
Protein (%)	28.40	17.20	16.30	15.60
Carbohydrates (%)	8.90	7.00	6.80	6.30
Fat (%)	9.80	7.90	6.80	6.10
Ash content (%)	0.932	0.175	0.139	0.025
Calorific value	2.74	1.85	1.74	1.64

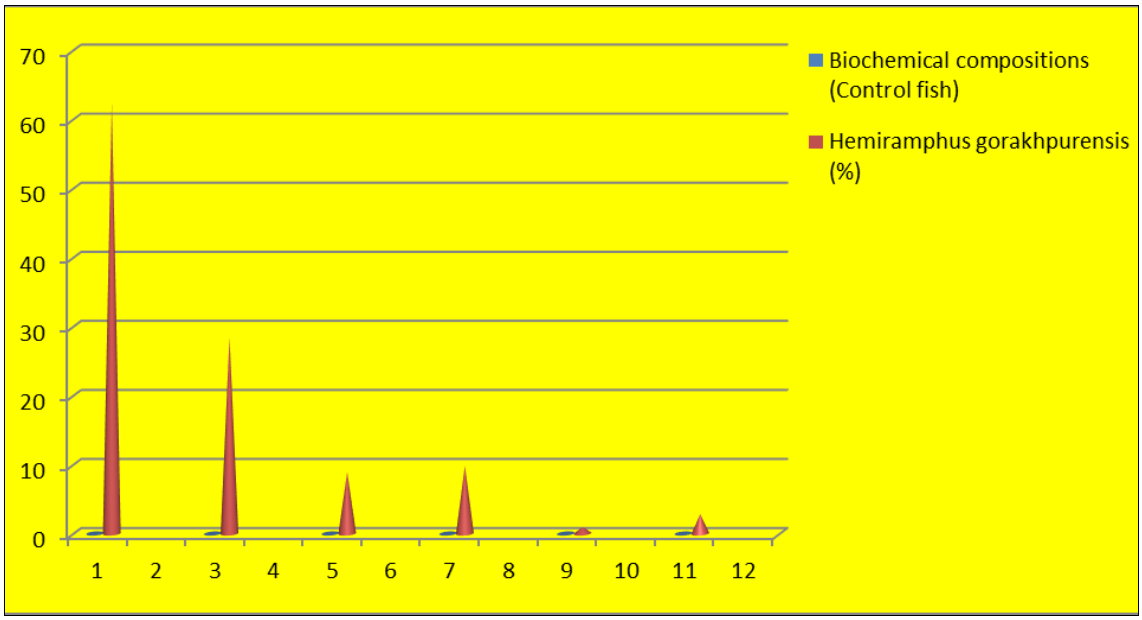

Fig 1: Biochemical composition in the muscle tissue of *H. gorakhpurensis*

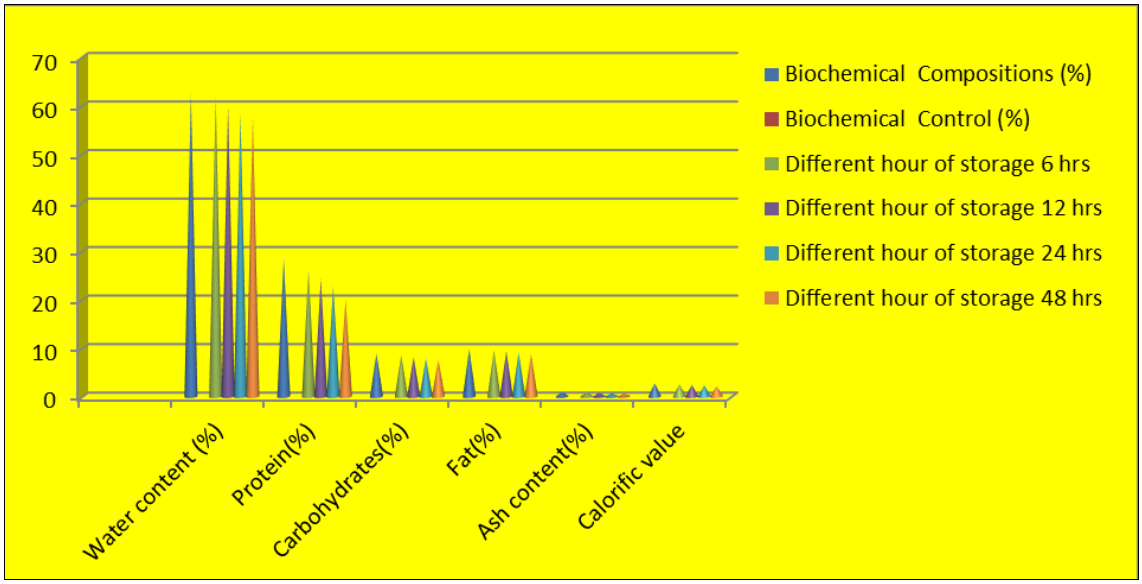

Fig 2: Biochemical composition in the muscle tissue of *H. gorakhpurensis* during different hour of storage at room temperature

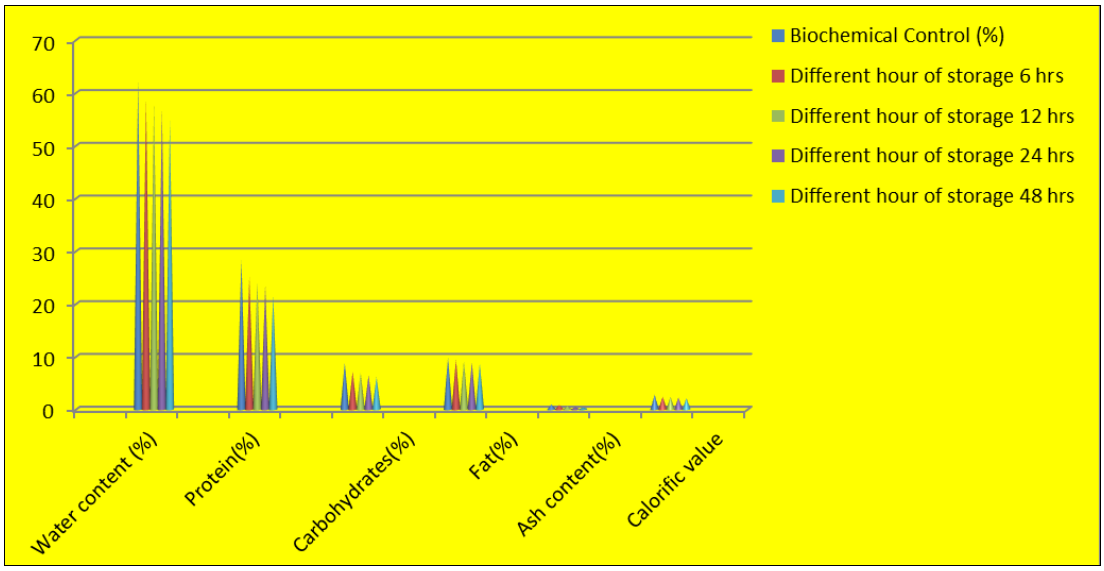

Fig 3: Biochemical composition in the muscle tissue of *H. gorakhpurensis* during different hour of storage at Ordinary freezer

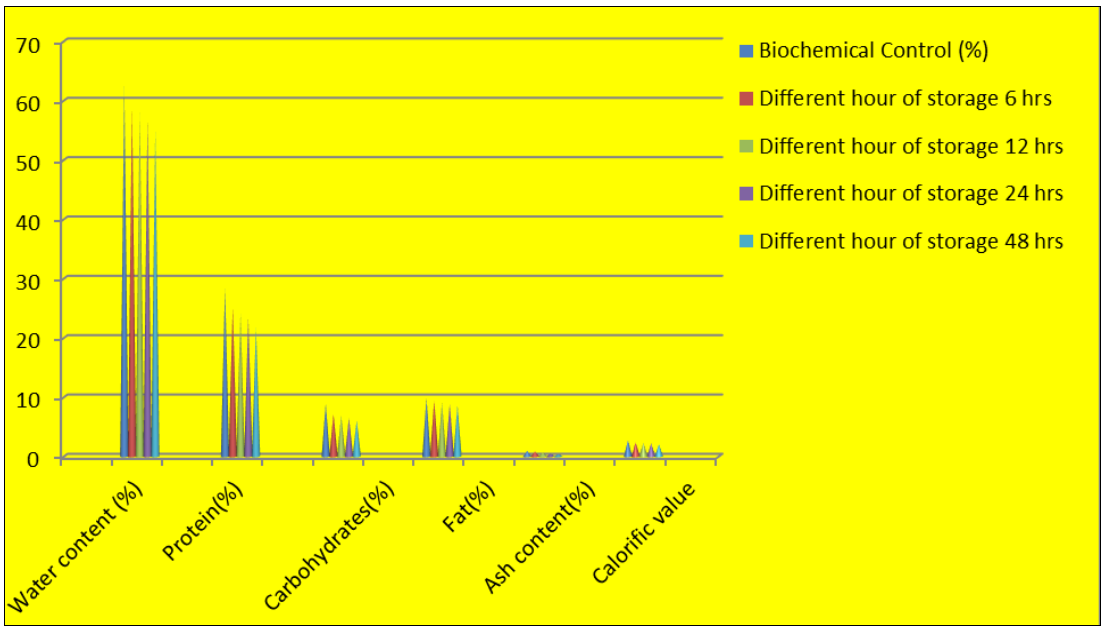

Fig 4: Biochemical composition in the muscle tissue of *H. gorakhpurensis* during different hour of storage at -4 ^{0}C deep freezer

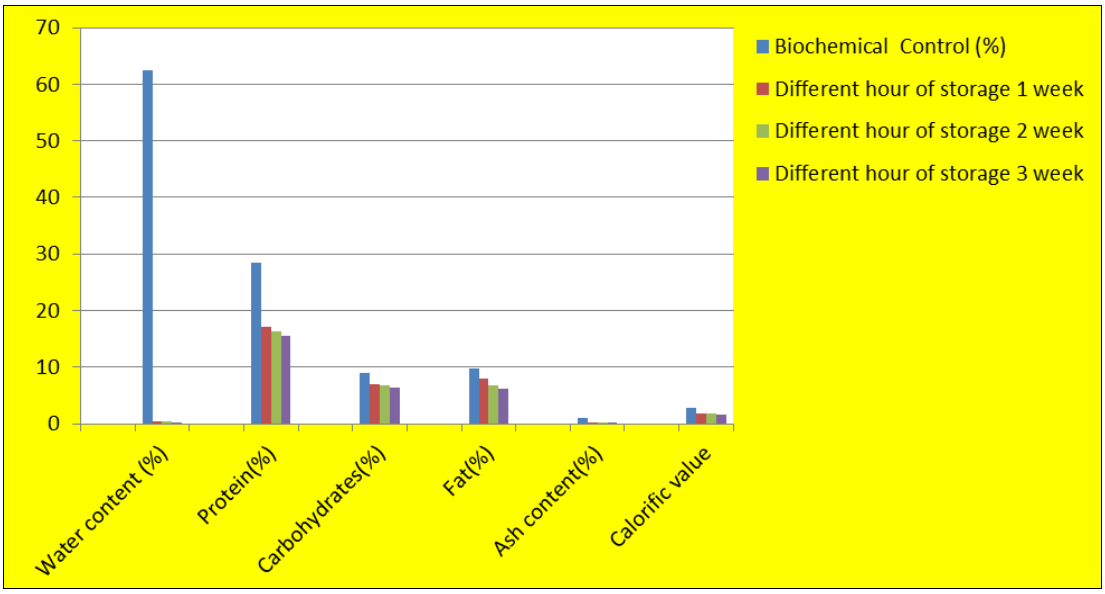

Fig 5: Biochemical composition in the muscle tissue of salt dried *H. gorakhpurensis* during different times of storage condition

Discussion

The marine fish selected for the study showed maximum level of water content in the muscle tissue of control fish and start to decline after 6 hours, 12 hours of storage at room temperature and minimum water content was observed after 24 hours and 48 hours of storage at room temperature. But reduction of water content in was very less in the fishes stored in freezer, -4 ^{0}C deep freezer and salt dried. Bret *et al*. (1961) reported that the body composition was greatly affected by ratio, size and temperature. The protein content in the muscle tissue of *H. gorakhpurensis* showed maximum level in the control followed by fish stored -4 ^{0}C deep freezer. Same was analysed in case of carbohydrate, fat etc.

Marine fish selected for the present study showed highest level of water content, protein, carbohydrate, fat and ash content in the muscle tissue of control fish, gradual decline was notice during different levels of storage. Therefore the calorific value also declined during storage, gradual decline in the calorific content was noticed after 24 and 48 hours of storage at room temperature. Body energy reserves was very less in the fish stored in ordinary freezer, -4 ^{0}C deep freezer and salt dried fish.

The study emphasizes the detail about the different storage process in edible marine fish *H. gorakhpurensis* and its depletion during different hours of storage. From this investigation fish consumers are suggested to cook the fish before 72 hours of storage in deep freezer or before 24 hours of storage in ordinary freezer or before 12 hours of storage at room temperature, to avoid the food borne diseases due to storage and also to minimize the nutrient loss.

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