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SEASONAL VARIATIONS IN THE PROXIMATE COMPOSITION OF ASIAN STINGING CATFISH *HETEROPNEUSTES FOSSILIS* (*BLOCH*, 1794) AND BANDED SNAKEHEAD (*CHANNA STRIATA*) (BLOCH, 1793) COLLECTED FROM PADDY FIELD OF KERALA

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ABSTRACT
Two freshwater fish namely, Asian Stinging catfish and Banded snakehead (*Channa striata*) (Bloch, 1793) were collected from the paddy field of Kerala and subjected to proximate composition analysis. Significant level of variation were observed in the proximate composition of two different fish species. The present study also revealed that the changes in the biochemical composition of fish muscle varies in accordance with the seasons. Protein and lipid also shows an inverse relation with moisture content in the fresh fish flesh.

KEY WORDS: proximate composition, seasonal variation, freshwater fish

INTRODUCTION

Fisheries is one of the foremost sector in the world economy. Nutritional quality of a food item is one of the most significant factor in consumer satisfaction. Animal proteins are considered as the complete source of protein because they contain all the ten essential amino acids. Because of this, it was suggested that at least one- third of the total requirement of the protein in the daily diet must come from animal source (Ferdose et al., 2011). Consumption of fish item provides better nutrients to a large number of people all over the world. It is estimated that the freshwater fish contributes above 6% of the annual animal protein supplies for human (FAO, 2007).

Fresh fish flesh consist of protein, moisture and lipid as a macro nutrients and carbohydrate, vitamins and minerals as the micro nutrients. Proximate composition in fish flesh generally comprises the estimation of protein, fat, moisture and ash. Owing to its special nutritive status, awareness about fish as a healthy food is gaining importance. From this point of view, precise information about biochemical composition of fish seems to be indispensable for its better processing and preservation and hence final acceptance by the consumer. Biochemical composition of the fish muscle varies usually from species to species and even between one individual to other. This is due to some external and internal factors like age, size, sex, season, eating habitat, migratory swimming, starvation condition, geographical location, environmental condition, growth habitat and flesh position etc. (Pawar and Sonawane, 2013).

Asian stinging catfish (*Heteropneustes fossilis*) and Banded snakehead (*Channa striata*) are the two fresh water fish commonly found in Kerala. These species have great acceptance in terms of daily food and the physiological properties differ among each other. These two fish are mainly vend to common people for consumption without adopting any advanced levels of processing technologies. Additionally, the data regarding the changes in the proximate composition of the species at various seasonal conditions are also lacking.

MATERIALS AND METHODS

Fish samples were procured from a local fish market, Tiruvalla, Kerala, India. They were caught by the cast net from the nearby paddy fields by fishermen and transported to the market and later transferred to the laboratory in a water container to immerse the live fish. Fish was slaughtered (stunned by a blow to the head), and muscle between the gills and the dorsal fins were used for analyses in triplicates. Determination of moisture content of the raw fish was conducted by the method of AOAC (1995). Crude protein of the fish was determined by Micro- Kjeldhal method (Pearson, 1999).

Total lipid content of the moisture free sample was determined by extracting the fat by Soxhlet method (AOAC, 1995). The ash content was measured by the incineration of the sample according to AOAC (1995). Data were collected from the experiment was tabulated and the final result was prepared by using both M.S Excel and SPSS 17 for windows.

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RESULTS

Proximate composition and seasonal variation in the average value of moisture, crude protein, crude fat and ash content of Asian Stinging catfish and Banded Snakehead for twelve months (June 2010 to May 2011) were analyzed (Table 1&2). The protein and lipid content in catfish flesh and banded snakehead shows slight fluctuation. High value for protein content in catfish was noticed in the month of March (18.3228%) and the lowest in the month of July (12.8730). Considering the lipid content, minimum and maximum value were observed in the month of June (1.8703%) and April (3.1153%) respectively. Moisture content in muscle tissue shows an inverse relation with that of lipid (r = -0.7310012) and protein values(r = -0.8837) and the lowest value was noted in the month of April (75.0067%) and highest value in the month of June (82.0144%). A positive relation was observed between protein and lipid content (0.5694). The highest value for total ash content were observed in December (2.9062%) and a second peak was observed in the month of May (2.1018%).

Fresh flesh of Banded snakehead shows high value for protein, 19.4537% and lipid, 6.30333% in the month of April. A very strong negative correlation between lipid and water content was observed (r = -0.83598) within the muscle tissue. Also muscle protein showed an inverse relation with water content in it(r =-0.94617), while it had a good positive relation with that of lipid content (r =0.8687). The lowest value for moisture content was noted in the month of May (*72.82107%)* while highest was in the month of July (78.1893%). Ash content shows no significant correlation with other constituents within the muscle tissue analyzed. The highest and lowest value for ash content noticed in the month of February (1.892%) and June (1.2971*%)* respectively. Analysis of variance showed that there was a significant variation between fish species (*ANOVA p<0.005*) and between months within the species (p<0.001).

Table 1: Proximate composition of Asian Stinging catfish muscle at different months

Asian Stinging catfish				
	Protein (%)	**Lipid (%)**	Moisture (%)	**Ash (%)**
June	14.3000 ±0.5164	1.8703 ±0.2555	82.0144 ±1.0022	1.3534 ±0.3746
July	12.8730 ±0.2257	2.2706 ±0.2587	81.6710 ±1.2810	1.1807 ±0.2192
August	13.0145 ±0.3919	2.2162 ±0.0451	80.5570 ±0.6384	1.6280 ±0.1878
September	14.4827 ±0.2571	2.0748 ±0.5479	79.3624 ±0.7460	1.8953 ±0.0403
October	15.2187 ±0.3328	2.1342 ±0.1496	78.7848 ±0.5122	1.2040 ±0.2283
November	17.4634 ±0.4060	2.8601 ±0.1233	77.0643 ±0. 9536	1.8861 ±0.2764
December	16.2767 ±0.3286	2.8027 ±0.1051	77.6478 ±0.9654	2.9062 ±0.1039
January	15.9692 ±0.2856	2.7568 ±0.0245	79.4675 ±1.4540	1.2222 ±0.0817
February	16.0517 ±0.4299	2.0063 ±0.1992	79.0442 ±0. 9832	1.3174 ±0.1567
March	18.3228 ±0.1068	2.8568 ±0.1343	77.0144 ±0. 9475	1.2736 ±0.7386
April	18.2273 ±0.5304	3.1153 ±0.1208	75.0067 ±0.5987	1.1664 ±0.2754
May	17.9741 ±0.2587	2.8940 ±0.1630	75.0652 ±0.9758	2.1018 ±0.0697
Average	15.9951	2.41742	78.7249	1.5879

Table 3: Proximate composition of Banded Snakehead muscle tissue at different months

	Banded Snakehead			
	Protein	Lipid	Moisture	Ash
June	16.4386 ±0.5014	*3.4042* ±0.5546	76.8425 ±0.5764	1.2971 ±0.0364
July	*15.9374* ±0.2257	3.4981 ±0.2569	78.1893 ±0.8095	1.4602 ±0.1223
August	16.0915 ±0.3919	3.4935 ±0.4511	77.7434 ±0.6384	1.4009 ±0.1769
September	18.5742 ±0. 2707	4.7857 ±0.4791	73.4313 ±0.8598	1.3724 ±0.0103
October	18.4042 ±0.3285	5.0777 ±0.4957	73.7694 ±0.5215	1.3341 ±0.0223
November	17.7437 ±0.4607	4.7988 ±0.3349	*72.8361* ±0.9536	1.8407 ±0.0274
December	16.7905 ±0.1859	3.6958 ±0.5129	75.9881 ±0.6541	1.8349 ±0.1039
January	17.2667 ±0.2856	4.9110 ±0.2485	73.0708 ±0.5403	1.8428 ±0.0817
February	18.932 ±0.2991	5.4941 ±0.1992	73.1949 ±0.9832	1.8920 ±0.1567
March	18.9202 ±0.1068	5.4343 ±0.4323	*72.8448* ±0.9475	1.4994 ±0.0386
April	19. 4537 ±0.3353	5.0336 ±0.2081	73.0491 ±0.5987	*1.3893* ±0.0274
May	19. 0294 ±0.2866	4.9494 ±0.6295	*72.8211* ±0.9756	1.7687 ±0.6948
Average	17.9852	4.6455	74.4067	1.5400

DISCUSSION

Influence of seasonal variation on proximate composition of fish and fishery products is more importance than considering the nutritional changes that occurred. The present study has shown that peak in the muscle lipid and protein content were observed in February to April. This could be due to optimum availability of food and active feeding, facilitates a good circumstance for building energy reserve in the form of protein and lipid. During May –July, a reduction in muscle protein and lipid were observed and this season was noticed as spawning period. It might be due to utilization of stored energy source to fulfill the high energy demands, during the ovulation and spawning period. Jyotsna *et al* .(1995) reported that change in endocrine system during spawning season have an influence on protein content in fish muscle and is due to the controlling action of endocrine system in supplying nutrients to gonads from all parts of body and thereafter a noticeable rise in protein content was observed a recovery of normal life. Langer *et al.* (2013) stated that decline in fat content might be due to low feeding intensity and low availability of food items in *Paratelphusa masoniana*. John and Hameed (1995), Jonsson and Jonsson (2005) and Langer *et al*. (2008) discussed about declining of muscles lipid content during the period of development and maturation of gonads. Fluctuation in lipid content in fish fluctuate greatly and is associated to migratory swimming, sexual changes in connection with spawning, depletion of gonad and food consumption (Oduor-Odote *et al*., 2008; Ravichandran et al., 2012; Rodrigues *et al*., 2013). High lipid and protein content in both pre-breeding and breeding season also noticed in three major carps and is due to probable augmented vitellogenesis in ovary and spermatogenesis in testes that required large amount of lipoproteins Shaikh and Prakash (2011). Kalay *et al*. (2008) reported that protein contents decreased with age and fat contents increased accordingly, while no effect on other elements like Cu, Zn and Fe. They also reported a negative relationship between protein and lipid levels with age/size. While Zafar, and Ashraf (2011) reported that the lipid kept on decreasing with age/size while protein increased accordingly. The mean water content in the flesh of both fish species reaches its highest level during June to August, shows an inverse relationship with fat and protein content. This inverse relation might be due to unavailability of food, low food intake, low atmospheric temperature, and high energy

demands to homeostasis the body temperature etc. Similar inverse relations were earlier propounded by many authors (Nargis, 2006; Langer *et al*., 2008; Samyal *et al*., 2011; Vida and Bogdanovic, 2012; Langer *et al*., 2013). Ash content showed no significant correlation with other constituents in the tissue, proving there is no direct relationship between the ash and feeding or spawning activities. This result was in good agreement with Jafri (1968) in *Cirrhina mrigala*.

CONCLUSION

Insight into the biochemical composition discloses that the seasonal variation has a great impact on fish muscle proximate composition and is associated with different environmental factors and species specific physiological characters. These results also provides a good information on changes in proximate composition in terms of nutritional aspects in order to take necessary precautions for a healthy food habitat of the common people in Kerala consuming the same as rich nutrition source.

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