



Fatty acid composition of grilled cooked pangasius meat studied by gas chromatography

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Abstract

Pangasius catfish culture is widely practiced in India. It has low cost of production, fast growth rate and disease resistance, more freshness, Good market potential in interior areas, especially in restaurants and hotels but it has more fat and hence has an unusual odour, when consumed in processed form affects the marketability and further value addition Also the nutritional value of catfish lipids is low because of a small amount of n-3 family PUFA and high amount of MUFA and SFA. The SFA and trans C18:1 MUFA can increase risk of chronic cardiovascular diseases that affects the heart, blood vessels, and brain. Effective processing method can get rid of the fat content in Pangasius catfish fillet and provide a good protein food for consumers. The present project is therefore proposed to develop a suitable preprocessing method for removal of fat from catfish fillets. Heat treatment such as grilled method were used to reduce in the SFA and MUFA content of fish fillets. The present research is proposed to standardized the different time and temperature of cooking process of defatted fillets. this research proposed on study of saturated and mono-unsaturated fatty acid from different portion of heat treatment meats.

Keywords: pangasius meat, gas chromatography, MUFA and SFA

Introduction

Pangasius genus includes the catfish varieties that are commonly found in the south-east Asian region. It belongs to the family Pangasiidae. The most common variety of cultured fish is Pangasianodon hypophthalmus. This fish species is also called, Sutchi catfish, striped catfish, or Tra fish. Among all the freshwater species, Pangasius catfish is the world's fastest-growing species in aquaculture. Pangasius is now traded worldwide as skinless and boneless fillets popularly along with portions, steaks, fillets, and also as value-added products Jeyakumari *et al.*, 2016; Thi *et al.*, 2013). The fish attains a bodyweight of 1.2 to 1.3 kg rapidly within six months but usually harvested after eight months of culture. Pangasius fillets are a good substitute for white-fleshed fishes in the market due to their increasing acceptability and popularity; Pangasius is usually served in the European market as skinned and boneless frozen fillets (Noseda *et al.*, 2012), currently, these fillets exported to over 100 countries worldwide. Fillets were characterized by high moisture levels of 80% and low crude protein of 15.8% and lipid of 3.0% contents. Total lipids were characterized by low cholesterol levels of 40 mg/100 g, high percentages of saturated fatty acids (47.5%) of total fatty acid. Low percentages of polyunsaturated fatty acids (20%) are present in total fatty acids mainly represented by linoleic acid (60% of total polyunsaturated fatty acids).

There is different portion of meat fats was removed by the heat treatment were used to removal or reduced the fat content from Pangasius fillets by the grilled method were used. It is held by different time and same temperature to remove fat content from the fillets. Best time and temperature is best for analysis and standardized time and temperature for removal of SFA and MUFA and retain PUFA content.

Materials and methods

Materials

Pangasius hypophthalmus were collected from Madurai AM fish farm and fish markets. The collected fishes were kept in insulated iceboxes. Insulated icebox prevents dehydration, and temperature fluctuation thus delays the spoilage of fish. Further, it is easy to handle. Flake ice produced by flake ice machine was used during fish transportation and processing purpose. Size of the ice for 2-3 cm level were produced to kept into the box and fish were spread on ice layer then carried out further steps.

Method

Preparation of dressed meat

The raw pangasius sp was collected from the market and washed with water. If any foreign material adhered to the outer surface, it was removed. Weight of the cleaned fish sp. was noted down. Removal of fins, head, evisceration was carried out and further washed in clean water. The weight of dressed meat was noted down.

Cooking of pagasius fillets and pasta preparation

- Raw meat (pangasius sp)
- Dressed meat
- Washed with water Grilled oven cooking (120°C for 15 minutes)
- Reduced content of SFA and MUFA

Sampling procedure

Randomly samples were chosen and study of different time and temperature was used to remove fat from the fillets. The time and temperature which gave better removal of fat is suitable for standardization of time and temperature. Samples were collected from grilled cooked meat and their analysis of fatty acid composition. mainly focus on study of saturated and mono-unsaturated fatty acid from defatted fish meats.

Standardization time and temperature for defatting of Pangasius fillets

There are different methods of heat treatment used to remove or defatted of *Pangasius* fillets. The selected 50 gram of meat was done a heat treatment for three times by the same method. The grilled method were followed.

The grilled method was done by domesticated grill oven instrument with the temperature of 120°C for 5 and 10 minutes. This both experiment resulted in incomplete loss of fat. I've conducted same experimented again with the temperature of 120°C for 15 minutes and the meat was completely free of fat content. So, this finalized the standard temperature and time for the defatting of pangasius fillets. The grilled and steam method standardized temperature and time is 120°C for 15 minutes. it is suitable for further study purpose.

Grilled oven cooking

Grilled oven cooking was carried out in a prestige grilled oven. In this cooking method, the fillets were kept in the oven to reach the core temperature of 120°C for 15 minutes.

Fatty acid composition analysed by Gas chromatography

Fatty acid is very important components of lipids content. GC is most common method it is used for analysis of fatty acid composition. The fatty acid is a complex structure it is contain more components of fatty acid such as acylglycerols, cholesterol esters, waxes and glycosphingolipids.

It is extracted by use of saponification hydrolysis it is done by alkaline medium AOAC, 1990. The FAMES are extracted by use of the methanol and boron trifluoride. Extraction and methylation it is done by folch method are used to obtained the lipid components from the ten gram of fish samples. Esterification was done, take 250g lipid fraction it is dissolved in to toluene in the round bottom flask. Then, added 4ml sodium hydroxide and reflux for 5-10 minutes until droplets of fat disappears. added 5ml of methanol and reflux for another 1min. cool the content and add 15ml of saturated sodium chloride solution. then, add 5ml of hexane, shake well and then remove the upper layer hexane layer. Repeat the extraction with hexane twice. it is combine hexane layer and evaporate to dryness in a rotary flask evaporator set at 55-60°C. The methyl esters in 1ml of HPLC grade hexane for injection in GC. The column at 210°C for 30 minutes. Then, inject 0.5ml of standard FAMES mixture onto the GC. Then, it is start to separation of FAMES takes 45min. Next, inject 0.5ml of sample FAMES. Identify the individual fatty acid in the sample by comparing the retention time of the individual fatty acid in the standard mixture. Calculated area unit value expressed to percentage of the fatty acid of total lipids.

Statistical analysis

The SPSS 19 (IBM, 2010) statistical package was used for

analysis of experimental results. The results were produced in the mean standard deviation.

Result and Discussion

Fatty acid composition of defatted Pangasius meat

Fatty acid composition of raw Pangasius meat

Raw Pangasius meat contains head portion of saturated fatty acid-53.04%, mono-unsaturated fatty acid-40.7% and poly-unsaturated fatty acid-7.06%. Body portion of saturated fatty acid-51.77%, mono-unsaturated fatty acid-40.44% and poly-unsaturated fatty acid-7.06%. Ventral portion of saturated fatty acid-50.37%, mono-unsaturated fatty acid-40.47% and poly-unsaturated fatty acid-7.07%. Tail portion of saturated fatty acid-46.79%, mono-unsaturated fatty acid-39.83% and poly-unsaturated fatty acid-6.94%. Microwave heat treatment was used to reduce saturated and mono-unsaturated fatty acids and retention of poly-unsaturated fats after defatted meats.

Grilled method

In Grill, heat was produced and discharged through a tube which was used to cook the food. Grill microwave oven is suitable for reheating, cooking and grilling the various food items. The oven was maintained with preheat oven temperature up to 275F. Based on cooking process.

it will take time to cooking the food is depending upon the cooking process, it may have need for 20 -30 minutes. The fish products can be prepared by various cooking methods such as boiled, grilled, fried and baked and their particularly study about grilled oven methods (Lee 1991). Study about preparation by grill oven method. Proximate composition of grilled fish products was studied by (Bochi *et al.*, 2008). In case low fat fish moisture and fat content does not affected by grilling methods and their also does not affected the chemical composition of final products (Dreeling *et al.*, 2000). The minerals content can be affected during cooking time it was reported by (Kucukgulmez *et al.*, 2006).

The present research proposed to defatting of Pangasius fillets were used by under grill oven at maintain the temperature 120°C for 15 minutes. After heat treatment the SFA and MUFA content was reduced and mineral composition was increased. The proximate composition was increase the protein and ash while decrease the moisture and fat content. Raw Pangasius meat contains head portion of saturated fatty acid-53.04%, mono-unsaturated fatty acid-40.7% and poly-unsaturated fatty acid-7.06%. Body portion of saturated fatty acid-51.77%, mono-unsaturated fatty acid-40.44% and poly-unsaturated fatty acid-7.06%. Ventral portion of saturated fatty acid-50.37%, mono-unsaturated fatty acid-40.47% and poly-unsaturated fatty acid-7.07%. Tail portion of saturated fatty acid-46.79%, mono-unsaturated fatty acid-39.83% and poly-unsaturated fatty acid-6.94%. Grilled heat treatment was used to reduce saturated and mono-unsaturated fatty acids and retention of poly-unsaturated fats after defatted meats.

Table 1: Fatty acid composition of Pangasius fillets

Compounds	Fatty acids	Head portion	Body portion	Ventral portion	Tail portion
C 4:0	Butyric acid	0.13	0.12	0.10	0.11
C 12:0	Lauric acid	0.14	0.11	0.13	0.15
C 14:0	Myristic acid	4.42	4.45	4.41	4.47
C 14:1	Myristoleic acid	0.06	0.04	0.07	0.05
C 15:0	Pentadecanoic acid	0.40	0.42	0.44	0.43

C 15:1	Cis-10 Pentadecanoic acid	0.24	0.21	0.23	0.26
C 16:0	Palmitic acid	29.45	29.56	29.34	29.83
C 16:1	Palmitoleic acid	1.61	1.63	1.60	1.65
C 17:0	Heptadecanoic acid	0.43	0.41	0.44	0.42
C 17:1	Cis-10 Heptadecanoic acid	0.14	0.16	0.13	0.15
C 18:0	Stearic acid	8.18	8.27	8.53	8.25
C 18:1t	Vaccenic acid	35.13	35.27	35.54	35.35
C 18:2t	Linolelaidic acid	5.17	5.24	5.43	5.27
C 18: 2 n6c	Linoleic acid	0.14	0.13	0.15	0.12
C 18:3n3	α -Linolenic acid	0.85	0.82	0.80	0.83
C 13:3 n6	γ -Linolenic acid	0.15	0.14	0.13	0.16
C 20:1	Cis-11 Eicosenoic acid	0.62	0.60	0.64	0.63
C 20:2	Eicosadienoic acid	0.54	0.52	0.50	0.54
C 20:4n6	Arachidonic acid	0.41	0.44	0.46	0.43
C 20:3	Dihomo- γ -linolenic acid	0.19	0.17	0.18	0.15
C 21:0	Henicosanoic acid	0.55	0.53	0.52	0.51
C 22:0	Behenic acid	1.31	1.35	1.33	1.32
C 22:1n9	Erucic acid	0.54	0.51	0.55	0.53
C 22:2	Docosadienoic acid	0.03	0.04	0.02	0.01
C 22:6n3	Docosahexanoic acid	0.24	0.26	0.28	0.23
C 23:0	Tricosanoic acid	0.1	0.3	0.5	0.2
C 24:0	Lignoceric acid	0.42	0.41	0.40	0.44
C 24:1	Nervonic acid	0.86	0.84	0.87	0.83
	Unknown	7.55	7.05	6.28	6.68
	Total	100	100	100	100

Table 2

Samples	Grilled head portion	Grilled body portion	Grilled ventral portion	Grilled tail portion
Saturated fatty acids	45.53	45.93	46.14	46.13
Mono-unsaturated fatty acids	39.20	39.26	39.63	39.45
Poly-unsaturated fatty acids	7.72	7.76	7.95	7.74

Conclusion

Different portion of meat was conducted the heat treatment such as grilled method used to remove saturated and mono-unsaturated fatty acid from the Pangasius fillets. PUFA was retain the cooked fillets. Grilled fillets standardization time and temperature is 120°C for 15 minutes. average calculated fat content of 4 g from 50g of meat. This method was held by domesticated prestige grill oven. Meat characteristics of well completed drop out fat content from cooked fillets at standard time 15 minutes and temperature 120°C. 5 g of fat was collected from 50g meat. Grilled cooked head, body, ventral and tail portion samples has given percentage of up to 53.04%, 51.77%, 50.37% and 46.79% after heat treatment there is a loss 7.51%, 5.84%, 4.23% and 0.66% of the saturated fatty acid. The MUFA content of the raw head, body, ventral and tail fillets constitutes the amount of up to 40.7%, 40.44%, 40.47 and 39.83% after heat treatment of the microwave cooked samples has given compatible result of the amount of the 38.51%, 38.74%, 38.69% and 38.08%. After heat treatment there could be change in content and lost composition of the fatty acid which represents the amount of up to 1.5%, 1.18%, 0.84% and 0.38%. PUFA content is increased after heat treatment such as the steam method and it established good result from 7.06 to 7.95% representing the samples. The heat treated samples showed the change in the composition and it constituted the increased in the concentration of the PUFA of the fillets and is found to be in the range of up to 0.88%.

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