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Corn/tapioca flour added to fish pasta product produced from defattened steam cooked Pangasius fish meat

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Abstract
This research was mainly proposed to remove or reduce the SFA and MUFA content and retention of PUFA content in the Pangasius fillets. Proximate composition of raw Pangasius meat shows moisture-73.24%, protein-15.26%, fat-9.60% and 1.58%. Proximate composition of steam cooked Pangasius meat shows moisture-70.22%, protein-25.23%, fat-2.46% and 1.95%. The steam cooked defatted fillets shows reduction in SFA and MUFA content. But the heat treatment affects the SFA and MUFA content but there is no much loss in the fatty acid content compared to steam cooked defatted fillets and are compatible with reduced in fatty acid composition, so it is utilized to add pasta product and proposed to analyze the proximate and sensory properties such as taste, flavor, odor, appearance and texture respectively.
The sensory assessment of wheat with fish pasta products samples was carried out by trained and untrained panels using hedonic scale between 1–9 rating scale. Its starts from dislike extremely to like extremely.

Keywords: Corn/tapioca, defattened steam, cooked Pangasius fish meat

Introduction
Nowadays, there is a tremendous constant challenge taking place in developing countries for the development of low cost, high energy, and nutrient-rich food (Foschia *et al*., 2015) [1]. As per the consumer demand and interest, many industries are developing new meat products or upgrading the existing product. While involving in those following activities, the industries should consider the following factors listed below. The products should be developed from a naturally occurring raw material. It should be consumed as a part of daily life and have good acceptability. They have to be subjected to minimum processing to avoid the loss of sensory properties and quality. The products should be efficiently available at a low cost. The products should be easy to prepare, store, and preserve.
Fish and fishery products are considered to be the healthiest food component of the human diet (Malcolmson, 2003; Krishnan *et al*., 2012; Foschia *et al*., 2015) [2, 1]. Therefore, the demand for fish products has increased rapidly in day-to-day life. Studies on the development of Pasta products from Pangasius fish are detailed below. The pasta is mainly prepared from wheat flour, which contains about 10–15 g/100 g of protein but there is a lack of essential amino acids, making it an incomplete protein. To compensate for the lack of protein in the pasta, fish protein can serve as an excellent source of proteins as they contain all the essential amino acids with excellent digestibility and it is efficiently available in low cost. Pangasius is a majorly cultured freshwater fish species in India; it is a rich source of proteins and other nutrients. Pangasius fillets contains considerable amount of rich fatty acids and proteins. This work is mainly focused on making the product by combining the pasta and Pangasius fish fillets to provide good acceptability and delicious food product. Nowadays, due to increased population and metamorphic lifestyle the food preferences diverted the consumers from drudging staple foods to ready to eat (RTE) and ready to cook (RTC) foods. Pasta is one of the Ready to Cook products that are widely accepted by a wide range of consumer because of its taste, low cost, and convenience. In developing countries, the consumption rate of pasta is increased day by day due to the metamorphic lifestyle making it one of the most consumed foods presently. In pasta production, India ranked 22nd with the production of 1.0 million tons out of 14.3 million tons of world production in 2015 (Sadeghi and Bhagya 2008) [3]. The pasta is mainly prepared from wheat flour, which contains about 10–15 g/100 g of protein but there is a lack of essential amino acids, making it an incomplete protein (Mahmoud *et al*., 2012) [4]. To compensate for the lack of protein in the pasta, fish protein can serve as an excellent source of proteins as they contain all the essential amino acids with excellent digestibility and it is effectivey available in low cost.

Material and Method
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. The ice of size 2-3 cm level were produced and kept into the box and fish were spread over ice layer then carried out for further steps. The required ingredients for pasta preparation were corn flour, water, egg, salts and defatted Pangasius fish powder.

Method
Cooking of pagasius fillets and pasta preparation
- Raw meat (Pangasius sp)
- Dressed meat
- Washed with water

- Steam cooking (98 °C for 15 minutes)
- Reduced content of SFA and MUFA
- The dough was prepared by automatic pasta maker
- Turn in the anticlockwise direction to produce pasta by
- Different size of die fitted with the pasta
- Dry the prepared pasta in a hot air cabinet dryer.
- Packed in a polythene bag
- pasta preparation and serve

Sampling procedure

Random samples were chosen and taken for analyzing proximate fatty acid composition. Samples were collected from steam cooked meat added with pasta products. Instantly prepared pasta was used to carry out a sensory evaluation by panelists.

Proximate composition analysis

The protein, fat, ash, water and carbohydrate content were analyzed by AOAC methods (2000). 1 gram wet sample need for analysis of protein content, 4.5-5 gram of samples are used to estimate the fat content, 2 gram of dry sample are used to estimate the ash and 10 gram of wet samples are used to analyse the moisture content. The protein content of raw fillet, cooked meat and pasta product was analyzed by the Kjeldahl method (1883). The digester temperature was followed at 300 to 400 °C and distillation process was run for 8 minutes. The fat content of raw fillet, cooked meat and pasta product was analysed by Folch methods (1957). The moisture content of raw meat, cooked meat and pasta products were analysed by AOAC methods (2000). The samples were kept in hot air oven for 12 hours at 100 °C. Ash content of raw meat, cooked meat and pasta products were analysed by AOAC methods (2000). The samples were kept in muffle furnace for 24 hours at 550 °C. The carbohydrate content of raw meat, cooked meat and pasta products were analysed by different methods. Chemicals used to estimate protein includes sulfuric acid, digestion mixture: copper sulfate-0.1g and potassium sulfate-2.5 g for each sample, sodium hydroxide, 40%, boric acid, 4%, mixed indicator: methyl red-0.16g and bromocresol green-80 mg in 100ml of 95% ethanol and standard sulfuric acid 0.1N.

Chemicals used for anayzing fat composition includes chloroform and methanol (2:1) and potassium chloride (KCL), 0.74%. and one more method of soxhlet used in 80 ml of petroleum ether. Chemical used to estimate crude fiber includes sulfuric acid 1.25% and sodium hydroxide 1.25% and petroleum ether 40-60 °C.

Fatty acid composition analysed by Gas chromatography

Fatty acids are very important components of lipid content. GC is most common method in analysing fatty acid composition. The fatty acid is a complex structure and it contains many components of fatty acid such as acylglycerols, cholesterol esters, waxes and glycosphingolipds. It is extracted by process 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 are 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, 4ml sodium hydroxide is added and refluxed for 5-10minutes until droplets of fat disappears. 5ml of methanol is added and then refluxed for another 1min. the content is cooled and then 15ml of saturated sodium chloride solution is added. Then, 5ml of hexane is added and shaken well and then remove the upper layer hexane layer. Repeat the extraction with hexane twice. it is combined with the hexane layer and evaporated 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 30minutes. tTen, inject 0.5ml of standard FAMEs mixture onto the GC. Then, it is started and the 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. Calculate area unit value expressed to percentage of the fatty acid of total lipids is done.

Sensory evaluation

Sensory evaluation of pasta product was carried out by trained and untrained panelists using 9 points hedonic scale according to (Yousef *et al*., 2003; prabhasankar *et al*., 2009a) [26].

Statistical analysis

The SPPS 19 (IBM, 2O10) statistical package was used for analysis of experimental results. The results were produced in the mean standard deviation.

Result and Discussion

Raw fish characteristics for pasta preparation

The morphological characteristics of *Pangasius* species are elongated and laterally compressed body, scale less body, shape of the head and abdomen is flat. Eye constitutes half of the anterior parts of the head. David 1963, reported about first maturity at 54 cm. The filleting industry produces significant amounts of head, bone, scrap meat, and skin by-products. By way of proper processing, it can be converted to various high-value products, and it is economically efficient. Pangasius feeds on bottom prefers insects, mollusks and fishes (Rahman AKA 2005, Talwar PK and Jhingran AG 1991) [9]. In my study the Pangasius fish was purchased from Chennai fish market. the fish was kept in an insulated box and brought to the fish processing lab of College of Fish Processing Engineering, Nagapattinam.

The physical and morphological characteristics was evaluated and studied. Length and of the fishes 40cm, 46cm, 41cm, 39cm, 43cm and 38cm and the weight of the fishes 850g, 670g, 630, 765, 905g and 980g respectively. After dressing, meat weight of the fillets is 2.750kg. The characteristics of the brought fresh fish includes bright eye, black pupil and no slime on the body surface and brick red color gills.

Pangasius fillets cooked under steam cooked method

Steaming method provides desirable for sensory property and loss of minimum content of nutrients and also plays a important role in destruction of microorganism. At the time of cooking of fish meat containing water, the physical and chemical properties will get changed. Digestibility of fish will get increased due to denaturation of proteins and PUFAs content get reduced in during heat treatment (Raj *et*

al., 2008; Asmah *et al*., 2014) [8, 16]. (Nurhan, 2007) observed that the cooking process affects the amino acid content. The various fish fatty acid profile can be affected by various cooking methods it was reported given by (Nurhan 2007; Weber *et al*., 2008; Larsen *et al*., 2010; Koubaa *et al*., 2012; Sengor *et al*., 2013; Asmah *et al*., 2014; Neff *et al*., 2014) [11, 12, 13, 14, 16, 14]. This type of heat treatment reduced the lipid content and retain vitamins C, and preserve the colour and texture of various food products (Idrus & Yang, 2012) [18] The cooking will reduce the amount of amino acids and PUFAs in the fish meat and also used in determination the super-heated steam cooking are influence into fish nutritional composition which has include in proximate composition, fatty acid and amino acid composition. During cooking, reaction take place on physical and chemical composition, it would either improve or impair to the nutritional value of cooked meat (Bognar 1998). This method can be compared with oven cooking. Ash content reduced in steaming than convection cooking methods and there is reduction of PUFAs/SFA ratio in steaming methods when compared with raw fillets (Puwastien *et al*., 1999; Gokoglu *et al*., 2004; Nurhan 2007; Weber *et al*., 2008) [19, 20, 11]. and (Siscovick 1995; Kris-Etherton re al., 2002) [22, 21, 23].

When the fish meat which was used in press cake subjected to superheated steam, the final products was found to have low amount of omega-3 fatty acids (Bórquez, *et al*., 2008). Superheated steamed dryer is suitable for the stability of omega-3 fatty acids in the fish meat particles and this fish meat contains low amount of omega-3 fatty acid during drying in superheated steam (Bórquez, 2003). During cooking of meat containing amount of thermos labile and PUFAs contents are reduced (Finot, 1997) [27] and change in amino acid content were also observed (Iwasaki & Harada 1985; Maruf *et al*., 1900; Garcia-Arias *et al*., 2003; Ismail & Ikram 2004). Effects of different cooking method on fatty acid profile of fish meat were observed by various researchers (Gall *et al*., 1983; Hearn *et al*., 1987; Sanchez-Muniz *et al*., 1992; Agren & Hannienn 1993; Toth-Markus &Sass-Kiss 1992; Regulska- Iiow & Iiow 2002; Gladyshev *et al*., 2005) [28, 29, 30]. The basic concepts of cooking process to remove the undesirable reaction in the meat (Lund 2003). In case of modern super-heated steam can be produced addition of sensible heat into water it should be increasing in saturation temperature at given pressure. This method believed to provided low- calories cooking by removing present of excess amount of fat and salts and their retained content of vitamins (Pronyk 2004; Head *et al*., 2010).

The present study was carried out by the fillets which were cooked by domesticated steam cooked under 98±2ºC for 15minutes. the main disadvantage of pangasius fish is that it has more saturated and mono-unsaturated fatty acid and it cause heart and brine diseases.

This fatty acid can be removed by the steam cooked method. It is dried in solar unit at the temperature under 30-60ºC for 8hrs and in the second day it is continued with drying in the solar drier chamber for 8-9hrs and then it is made into powder. Fish powder with different concentration is incorporated in pasta products due to lack of essential amino acid. The essential amino acid which is present in the Pangasius is added to pasta which is a protein source for human beings.

Table 1: Fatty acid composition of Pangasius meat

Compounds	Fatty acids	Raw meat	Steam cooked meat
C 4:0	Butyric acid	0.41	0.3
C 12:0	Lauric acid	0.1	
C 14:0	Myristic acid	7	5.76
C 14:1	Myristoleic acid	0.9	
C 15:0	Pentadecanoic acid	0.18	0.37
C 15:1	Cis-10 Pentadecanoic acid		
C 16:0	Palmitic acid	33.13	31.68
C 16:1	Palmitoleic acid	1.57	1.91
C 17:0	Heptadecanoic acid	0.15	0.4
C 17:1	Cis-10 Heptadecanoic acid		
C 18:0	Stearic acid	6.68	7.66
C 18:1t	Vaccenic acid	37.77	38.01
C 18:2t	Linolelaidic acid	4.84	6.12
C 18: 2 n6c	Linoleic acid	0.19	0.18
C 18:3n3	α-Linolenic acid	0.28	0.59
C 13:3 n6	ϒ-Linolenic acid	0.23	0.13
C 20:1	Cis-11 Eicosenoic acid	1.24	1.14
C 20:2	Eicosadienoic acid	0.2	0.55
C 20:4n6	Arachidonic acid	1.36	0.24
C 20:3	Dihomo-γ-linolenic acid		
C 21:0	Henicosanoic acid	2.26	0.51
C 22:0	Behenic acid	0.18	0.96
C 22:1n9	Erucic acid	0	
C 22:2	Docosadienoic acid	0	0.01
C 22:6n3	Docosahexanoic acid	0	0.26
C 23:0	Tricosanoic acid	0.05	0
C 24:0	Lignoceric acid	1.22	0.31
C 24:1	Nervonic acid	0	0.85
Unknown		3.7	2.06
Total		100	100
Samples	Raw meat	steam cooked meat	

Saturated fatty acids	51.36	47.95
Mono-unsaturated fatty acids	41.48	41.31
Poly-unsaturated fatty acids	7.1	8.78

Pasta prepared from steam cooked fillets

The different concentrates of tilapia fish powder were incorporated with pasta products due to the presence of essential nutritional composition in tilapia fish powder. Five sample are done Sample-I control pasta 0% of fish powder, sample-II 6% of fish powder were added (TFP-6%) which is called as tilapia fish pasta. Sample-III at 12% added (TFP-12%), sample-IV at 17% fish powder added (TFP-17%), and Sample-V at 23% fish flour were added (TFP-23%) by Merrill AL, Watt BK, (1973). The present study was carried out by the pasta incorporated with the different concentrations of Pangasius meat powder. It consists of 0% control pasta, 5% PFP, 10%, 15% and 20%pangasius fish pasta were added. Further there is a study of proximate composition and sensory attributes of pasta products.

Standardization of recipe for preparation of fish pasta from pangasius fillets and sensory evaluation

The required ingredients for pasta preparation are tapioca with corn flour, maida, water, egg, salts and defatted Pangasius fish powder. These ingredients were purchased from the local shop (miller super market, Thoothukudi). Anbudhasan *et al*., 2014 [35] was followed.

The sensory assessment of pasta products samples was carried out by trained and untrained panels and the hedonic scale were used. It has 1–9 rating scale starting from dislike extremely to like extremely (Yousef *et al*. 2003; Prabhasankar *et al*. 2009a) [36]. Further four sensory characteristics were included, color, aroma, flavor and aftertaste and have maximum score point of 10. Total or overall acceptability of sensory attributes at $10^{\times}$ 4 = 40. It could be accepted for both intensity, hedonic and overall acceptability (Lee *et al*.1991). The present study carried out by use of the four different concentration of fish powder incorporated with pasta ingredients for basic recipe for standardization. 0% for control pasta containing ingredients about 500g maida, 500g corn flour, 100g egg, 300ml water and 20g salt respectively. There are four different Pangasius fish powder concentrate were incorporated with pasta ingredients such as 5%, 10%, 15% and 20% of Pangasius fillets powder added to pasta to make in 5% for 1.370 kg, 10% for 1.420kg, 15% for 1.470kg and 20% for 1.520kg make the pasta products. The present study was carried out by two different method. In first type, pasta was cooked with vegetables and in second method, masala pasta without vegetables.In both type of pasta, sensory evaluation was done by 25 panelists which has to be used 9-point hedonic scales for sensory evaluation parameters of appearance, texture, color, flavour and taste. There are five samples and the added score average Sample-I 8.64%, Sample-II 8.76%, Sample-III 8.85%, Sample-IV 8.86% and Sample-V 8.96%. It varies with different concentration of fish powder added to pasta products and this score could be varied respectively. The 9-point scale were briefly explained by score sheet consisting of 9-like extremely, 8-like very much, 7-like moderately, 6-like slightly, 5-neither like nor dislike, 4-dislike slightly, 3-dislike moderately, 2-dislike very much and 1-dislike extremely respectively. ANOVA test is applied to the samples of sensory attributes of differentiation identified by panelist. There are two statistical test such as t- test and F-test are used. T-test are applied to the sample of sensory evaluation of pasta products. There are much variation between samples due to ingredients concentrates variation. F-test are applied to sensory evaluation of pasta products. There is much variation between samples.

Table 2: Sensory evaluation of pasta products

Evaluation parameter	Sample-I	Sample-II	Sample-III	Sample-IV	Sample-V
Appearance	8.68%	8.75%	8.88%	8.87%	8.95%
Texture	8.65%	8.74%	8.81%	8.89%	8.98%
Color	8.55 %	8.79%	8.89%	8.84%	8.92%
Flavour	8.68%	8.73%	8.84%	8.88%	8.99%
Taste	8.66%	8.79%	8.87%	8.82%	8.97%
Total	$8.64^{\pm 0.00}$%	$8.76^{\pm 0.00}$%	$8.85^{\pm 0.00}$%	$8.86^{\pm 0.00}$%	$8.96^{\pm 0.00}$%
Evaluation parameters		T-test			F-test
Sample-I-II		1.000			0.896
Sample-II-III		0.000			0.661
Sample-III-IV		0.921			0.828
Sample-IV-V		0.000			0.440

Cooking characteristics of pasta

Cooking quality of pasta products considered about the consumer attributes performance of the pasta. Cooking quality parameters includes cooking time, cooking loss, water absorption index, swelling index, texture (Gelencser *et al*., 2008; Sobota *et al*., 2015; Ficco *et al*., 2016) [38, 39].

The quality and cooking characteristics of pasta, that is based on the protein-starch network structure of the pasta product (El-Khayat *et al*., 2006). Pasta firmness, elasticity and cooking loss were based on protein content and starch composition of ingredients (Samaan *et al*., 2006).

The present study was carried out by the use of five different level of samples to prepare pasta. The inclusion of raw pasta 50 gram, 15gram vegetables, 4gram masala, 15-gram oil, 2gram salt accordingly. Ingredients were recorded based on the standardization recipe. Each five samples were recorded at same weight of 86gram. Then, after cooked, the loss of weight was recorded for Sample-II, III, IV are loss from 86-66= 20 g was lost, sample-V are loss from 86-

63=23g was lost and Sample-I are loss from 86-65=21g was lost respectively.

Proximate composition of pasta products

Pasta added with fish flour reduces the moisture content and carbohydrate and increases the lipid, protein and ash content of fish pasta. Addition of tilapia flour to fish results in low amount of carbohydrate and higher amount of protein, fat and lipid content and it was established by Monterio MLG, *et al*., 2014. This results stated that the content of ash, fat, protein content was increased and moisture and carbohydrate decreased due to addition of fish flour with pasta products hich is compared with control pasta (Hong SR, Yoo B, 2012, USDA-2016). The present study was carried out by the use of different concentration of fish flour added to pasta products and the nutritional composition of Pangasius fish pasta. There is an increase in the protein, fat and ash content and decrease in moisture and carbohydrate content due to addition of fish flour. The protein, fat and ash content were gradually increased from 0% level to 20% level of pasta products. This composition gradually increases the concentration of nutritional profile due to presence of high amount of essential amino acid and essential fatty acids in Pangasius fish fillets. Fish pasta proximate composition such as moisture, protein, fat, ash, carbohydrate and fiber content were studied. Different level of concentration fish powder was added to pasta products. Sample-I has an amount of moisture-5.68%, protein-11.88%, fat-1.92, ash-0.96% and carbohydrate-80.15%. Sample-II has moisture-5.32%, protein-14.76%, fat-1.75%, ash-1.45% and carbohydrate-76.32%. Sample-III has moisture-4.33%, protein-17.46%, fat-1.96%, ash-1.58% and carbohydrate-73.88%. Sample-IV has moisture-4.56%, protein-20.96%, fat-2.04%, ash-1.97% and carbohydeate-70.68%. Sample-V has moisture-4.05%, protein-23.88%, fat-2.28%, ash-1.87% and carbohydrate-67.66%. Fiber content of pasta which is in larger amount in the wheat pasta without addition of fish flour will gradually decreases hen Pangasius flour is added. It is based on inclusion of different concentration of fish flour. ANOVA test are applied to analysis of sample variation between the samples. Degrees of freedom 2. T-test was applied there is no significant difference between samples and F-test was applied and there was little significant variation between samples. F- test shows not that much variation between the samples.It shows 0.1%, it means only one percent changes from100 percentages of samples.

Table 3: Proximate composition of pasta products

Composition	Sample-I		Sample-II		Sample-III	Sample- IV	Sample-V	
Moisture	$5.68^{\pm 0.000}$%		$5.32^{\pm 0.001}$%		$4.33^{\pm 0.000}$%	$4.56^{\pm 0.000}$%	$4.05^{\pm 0.000}$%	
Protein	$11.88^{\pm 0.000}$%		$14.76^{\pm 0.000}$%		$17.46^{\pm 0.000}$%	$20.92^{\pm 0.000}$%	$23.88^{\pm 0.000}$%	
Fat	$1.92^{\pm 0.000}$%		$1.75^{\pm 0.000}$%		$1.96^{\pm 0.000}$%	$2.04^{\pm 0.000}$%	$2.28^{\pm 0.000}$%	
Ash	$0.96^{\pm 0.000}$%		$1.45^{\pm 0.000}$%		$1.58^{\pm 0.000}$%	$1.97^{\pm 0.000}$%	$1.87^{\pm 0.000}$%	
CHO	$80.15^{\pm 0.000}$%		$76.32^{\pm 0.000}$%		$73.88^{\pm 0.000}$%	$70.68^{\pm 0.000}$%	$67.69^{\pm 0.000}$%	
Microwave cooked samples	sample-I- t-test	sample-I- f-test	sample-II- t-test	sample-II- f-test	sample-III- t-test	sample-III- f-test	sample-IV-V- t-test	sample-IV-V- f-test
Moisture	0.000	0.1	0.000	0.0	0.000	0.1	0.000	0.0
Protein	0.000	0.2	0.000	0.0	0.000	0.5	0.000	0.3
Fat	0.000	0.6	0.000	0.0	0.000	0.0	0.000	0.0
Ash	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0
CHO	0.000	0.0	0.000	0.0	0.000	0.0	0.000	0.0

Conclusion

Wheat Pasta added with Pangasius meat was defatted by steam cooking method. It is used to reduce the saturated and mono-unsaturated fatty acid and retention of poly un-saturated fatty acid. This method shows high Lose of more than 5% saturated fatty acid and low amount mono-unsaturated fatty acid and increased poly un-saturated fatty acid. The raw meat contains saturated fats-51.36% and after heat treatment it is found to be 47.95%. Mono-unsaturated fats contain raw meat-41.48% after heat treatment this fat was reduced to 41.31%. Poly un-saturated fatty acids increases from 7.10% to 8.78%respectively. Due to lack of essential amino acid in the wheat pasta Steam cooked defatted meat are utilized to add pasta and it is compensated by adding Pangasius meat which has more essential amino acid present in them. Different concentrates of fish flour addition of pasta could be varied with nutritional and sensory parameters. Proximate composition of moisture and carbohydrate level gets decreased due to addition of fish flour concentrate. Protein, fat and ash content increased based on addition of fish flour concentrates it could be increased. Fiber content present in higher amount in wheat pasta without the addition of fish flour, after addition of fish flour fiber content there is a reduced state due to increase in fish flour concentrates. ANOVA statistical method was applied to analyse the sensory parameters with wide variation between samples due to fish flour and different concentrates was added. Sensory and proximate composition was lesser than in ragi pasta made from steam cooked meat.

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