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Studies on the Biochemical and Sensory Changes in the Value added Product (Fish Noodles) Stored under Ambient Storage Conditions

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Abstract—*An attempt was undertaken to study the comparative biochemical and sensory changes in the fish noodles (30% fish mince) and veg. noodles (control, 100% refined wheat flour) kept under ambient temperature conditions over a period of 60 days. The comparative biochemical analysis revealed a higher protein (21.12%), lipid (3.82%), ash (1.54%) and moisture (8.81%) content in fish noodles in comparison to veg noodles (8.11% protein, 0.76% lipid, 0.91% ash and 5.60% moisture). The Thiobarbituric acid (TBA) and Free fatty acid (FFA) values were higher in fish noodles as compared to the control veg. noodles which is due to the lipid oxidation and hydrolysis occurring in the mince added in fish noodles. However, TBA and FFA values in fish noodles were within the permissible limits till the end of storage period of 60 days. Further, the sensory analysis reported higher scores with respect to appearance, flavour, juiciness and texture in fish noodles (5.80) in comparison to the veg noodles (4.82) at the end of storage period. Hence, keeping in view the enhanced nutritional and sensorial qualities of fish noodles, they are highly recommended as ready to cook and serve alternative of healthy food for human consumption in comparison to veg. noodles.*

Keywords*: Fish noodles, fish mince, Wallago attu, lipid oxidation and sensory scores.*

Introduction

A major problem affecting the health of children in India is the Protein energy malnutrition (PEM). As per World Health Organization, PEM refers to an imbalance between supply of protein and energy and the body's demand for them to ensure optimal growth and function. The awful consequences of PEM include reduced immunity to infections, lower physical and cognitive growth, leading to permanent impairment particularly in pre-school children. Going with the numerical records , PEM constitutes about 48% of stunting cases, 19.8% of wasting cases and 42.5% of underweight cases among the under five children of India, which is actually highest in world (Bhutia, 2014). As such there occurs a need to supplement the diet of children with some additional protein source which besides adding nutrition is also savoury and economical. Also, children's food choices are guided by their preferences and as such they are highly fond of snacks like noodles, pasta etc. But these snacks which are made from wheat, water and salt are generally rich in carbohydrates but poor in proteins. and hence are inadequate in meeting nutritional need of humans. Therefore, incorporation of some additional protein in cereal snacks can solve the problem. Fish is considered to be a cheap source of valuable proteins, omega-3 fatty acids, vitamins like vitamin A, vitamin B2, vitamin B6, micronutrients and minerals viz. iron, calcium, iodine, potassium which are necessary for our optimal growth. Hence, preparation of fish incorporated noodles can be a better option in controlling the protein malnutrition in present children. Therefore, an attempt was undertaken to incorporate fish mince of *Wallago attu* in the flour to prepare value added fish incorporated noodles and then comparing its nutritional status with the veg noodles i.e control, without mince.

Materials and method:

For preparation of fish noodles, fish mince 30% was incorporated with wheat flour (70%). The mixture containing the ingredients was mixed manually along with 2% salt and moisture was adjusted by the addition of water. The mixed dough was transferred into a tray and kept at air conditioned room maintained at 24 °C for 30 minutes. Veg noodles i.e. control was also prepared using only wheat flour and with no added fish mince.

The prepared dough was extruded through the stainless steel extruder into round shape. Then these extruded noodles were kept in a hot air oven (Scientech Ltd.) at 65 ± 2°C for required time (7-8 hours) for drying of noodle. It was then transferred into an

electrical drier maintained at 60°C and dried for 6 hours. Products obtained i.e. fish noodles and control noodles were then subjected to sensory analysis upto 90 days.

Analyses: The proximate composition (ash and moisture) of the fish samples were evaluated using the standard AOAC procedure (AOAC, 1995). The protein content was determined using the Lowry et al., (1951). Fat content was determined using Folch *et al.*(1957). Thiobarbituric acid value of fish muscle during storage was determined using the method of Witte *et al.* (1970). Free Fatty Acid (FFA) was determined by method of US Army laboratories (Natick) described by Koniecko (1979). Extract Release Volume (ERV) was determined as per the method of Strange *et al.* (1977). The pH of fish muscles was determined by the method of Keller *et al.* (1974). The microbiological profile was determined according to APHA method (1984). Sensory analysis was conducted by a taste panel consisting of five to seven semi experienced judges using 8 point descriptive scale (Keeton, 1983) where 8 denoted extremely desirable and 1 denoted extremely poor. Data were expressed as mean ± SD and were analyzed by one-way ANOVA test using SPSS. Values <0.05 were considered as significant and p values <0.001were considered as highly significant.

Results and Discussion:

Proximate compositional changes

Total Protein content (T_PC) in Veg noodles and fish noodles: The protein content of control (veg. noodles) was found to be lower i.e 8.11±0.03% in comparison to the protein content of fish noodles 21.12±0.05%. Higher protein content of fish noodles is attributed to the addition of fish mince. Support for these results can be drawn from the studies of Yu (1990) on surimi based dried noodles, Maluf (2010) in Pacu meat containing pasta, Neves *et al.*(2004) in fish noodles and Goes *et al.* (2016) in pasta made from Tilapia protein concentrate. They attributed it to the to the fact that fish mince has a high biologic protein with a balanced amino acid profile and a good proportion of methionine and cysteine, which are the main limiting amino acids in vegetal protein sources.

Table 1: Proximate composition of Veg noodles (Control) v/s Fish noodles stored at ambient temperature (28° C).

Proximate composition	Veg noodles	Fish noodles
Protein (%)	8.11±0.03	21.12±0.05
Lipid (%)	0.76±0.01	3.82±0.01
Ash (%)	0.91±0.05	1.54±0.02
Moisture (%)	5.60±0.02	8.81±0.01

Total Lipid content (T_LC) in Veg noodles and fish noodles: The lipid content of control samples was 0.76±0.01%while it revealed a higher value of 3.82±0.01% in fish incorporated noodles. The increased fat content of fish noodles is due to higher contents of fat in *Wallago attu* in comparison to the flour used. Similar results have been proposed by Kamalkanth (2015) in noodles made from Japanese threadfin bream (*Nemipterus japonicus*), Verma *et al.* (2014) noodles containing chicken meat, Goes *et al.* (2016) in pasta with Tilapia fish mince and Verma *et al.* (2012) in chicken meat noodles.

Total Ash content (T_AC) in Veg noodles and fish noodles: There was an increase in the ash content from 0.91±0.05% for veg noodles to 1.54±0.02% in fish mince incorporated fish noodles. The increase may be due to the minerals and bony matter present in mince. Similar increase in ash content was observed by Chin *et al.* (2012) in surimi based yellow noodles, Goes *et al.* (2016) in fish pasta, Verma *et al*. (2012) in chicken based noodles. They associated such increase in ash to the aggregation of minerals during fabrication of noodle.

Total Moisture content (T_MC) in Veg noodles and fish noodles:

In the present results, the moisture content varied from 5.60±0.02% in Veg noodles to 8.81±0.01% in fish mince incorporated noodles. Increase in the moisture content of value added fish noodle was also reported by Kamalkanth (2015) in extruded fish based noodles, Dileep *et al.* (2010) ribbon fish noodles, Chin *et al*. (2012) in surimi based noodles and Verma *et al*. (2012) in chicken noodles. They associated such moisture increase in fish noodles to the high moisture contents in meat as compared to the flour used. Further, they added that the high water holding capacity of meat might have increased the levels of water absorption.

Chemical changes

Thiobarbituric acid (TBA) in Veg noodles (control) and fish noodles:

Perusals of Table- reveal that on 0 day, the TBA values are 0.104 mg mal/kg in veg noodles and 0.128 mg mal/kg in fish noodles. Further, these values increased to 0.113 and 0.244 mg mal/kg on 10th day, 0.124 and 0.348 mg mal/kg on 30th day, 0.212 and 0.563 mg mal/kg on 60th day and 0.221 and 0.667 mg mal/kg on 90th day of storage in veg noodles and fish noodles

respectively. In both the veg noodles and fish noodles, the values for TBA are well below the limit of acceptability i.e 8 mg mal/kg upto the end of storage period of 90 days. However, the higher TBA values of fish noodles in comparison to the veg noodles (control) may be due to the presence of mince which undergoes oxidation forming secondary oxidation products.

Table 2: Chemical changes in Veg noodles (control) v/s Fish noodles stored at ambient temperature (28° C).

DAYS	TBA (mg malonaldehyde/kg)		FFA(%)		pH	
	Veg noodles	Fish noodles	Veg noodles	Fish noodles	Veg noodles	Fish noodles
0 day	0.104^{a} ±0.01	0.128^{a} ±0.01	0.11^{a}±0.01	0.26^{a} ±0.01	6.7^{a} ±0.02	6.4^{a} ±0.02
10^{th} day	0.113^{a} ±0.08	0.244^{b} ±0.08	0.20^{ab}±0.05	0.40^{ab}±0.05	6.7^{a} ±0.01	6.5^{ab} ±0.01
30^{th} day	0.124^{ab} ±0.04	0.348^{c} ±0.04	0.56^{c}±0.05	0.84^{c} ±0.05	6.8^{ab} ±0.05	6.5^{ab} ±0.05
60^{th} day	0.212^{b}±0.3	0.563^{d} ±0.3	0.78^{cd}±0.44	1.05^{cd} ±0.44	6.8^{ab} ±0.01	6.5^{ab} ±0.01
90^{th} day	0.221^{b}±0.03	0.667^{de}±0.05	0.88^{d}±0.03	1.14^{cd}±0.03	6.9^{ab} ±0.04	6.75^{c} ±0.04

Free fatty acid (FFA) in veg noodles (control) and fish noodles:
Initially, on 0 day, the value of FFA in veg noodles (control) is 0.11% against 0.26% in fish noodles. These values further increased to 0.20% and 0.40% on 10^{th} day, 0.56% and 0.84% on 10^{th} day, 0.56% and 0.84% on 30^{th} day 0.78% and 1.05% on 60^{th} day and finally reaching upto 0.88% and 1.14% on 90^{th} day of storage in veg noodles and fish noodles respectively. The presence of FFA in veg noodles and fish noodles indicate the ongoing hydrolysis which may occur due to the entry of water during cooking (Table- 2).

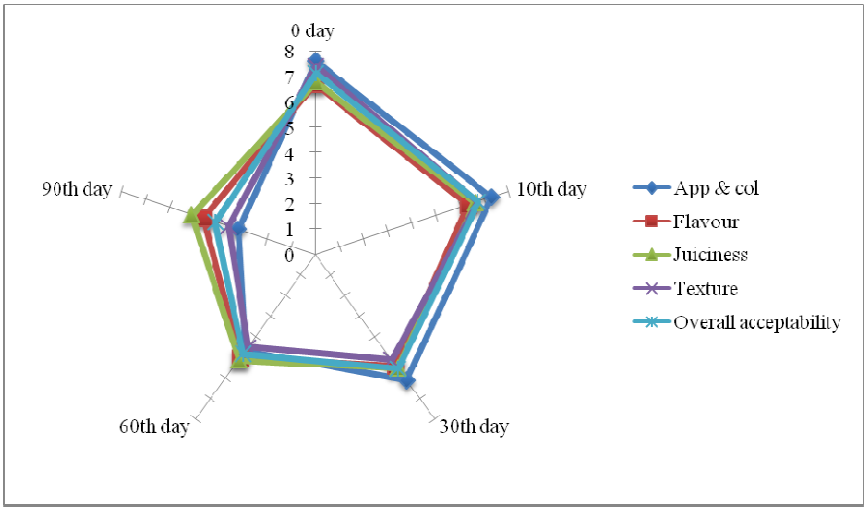
pH in veg noodles (control) and fish noodles: The pH value on 0 day was found to be 6.7 in Veg noodles (control) and 6.4 in fish noodles. The value further increased to 6.9 and 6.75 in Veg noodles and fish noodle respectively on 90^{th} day of storage. The decline in pH of fish noodles is attributed to the acidic nature of meat as suggested by Verma *et al.* (2012) in chicken noodles, Chin *et al.* (2012) in surimi based noodles and Kamalkanth (2015) in fish noodles.

MICROBIAL CHANGES

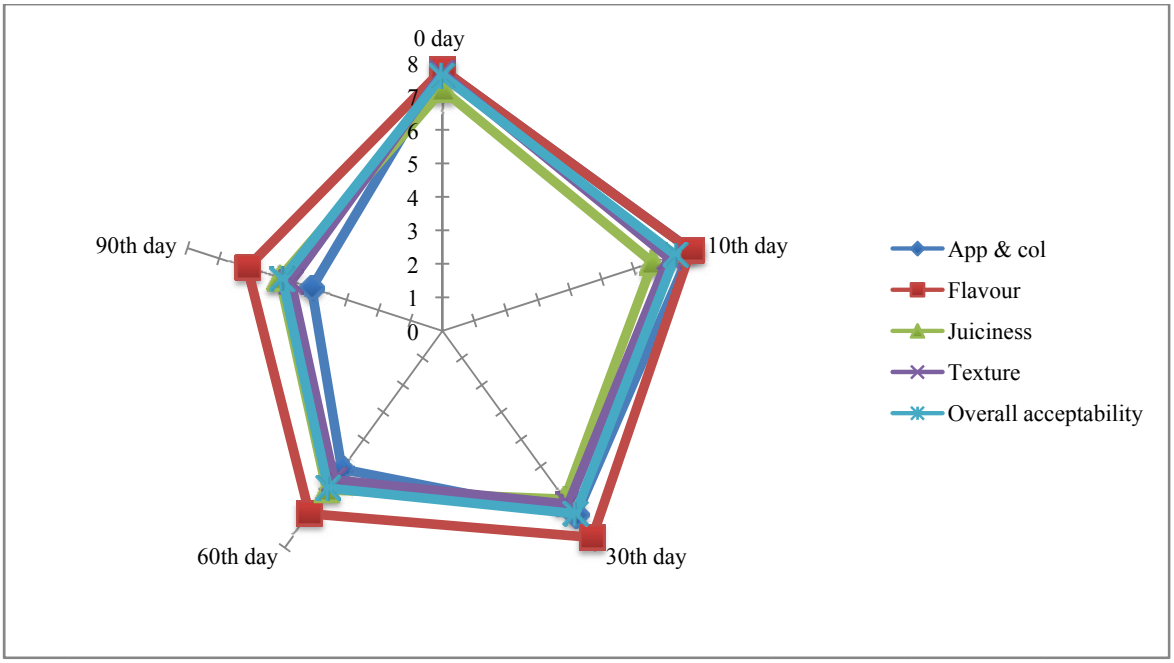
Generally, the activity of microorganisms is the major shelf life limiting factor. Microbial count analysis reported no growth of microorganisms both in veg noodles and fish noodles indicating that the products were sterile throughout the storage period.

Sensorial changes

Sensory qualities of noodles were evaluated in terms of appearance and colour, flavour, juiciness, texture, odour and overall acceptability. Sensory sessions were conducted upto 90 days (Fig.-1). It was found that during the whole storage period, appearance & colour and texture were mostly affected. This could be due to Maillard Browning reaction taking place during storage. Juiciness and flavour were good till the end of storage period. The overall acceptability of veg noodles and fish noodles based on various sensory parameters suggested that veg noodles were slightly acceptable with a score of 4.12 while fish noodles had a higher score of 5.02 with moderate acceptability at the end of storage (90 days). The higher acceptability of fish noodles might be due to the addition of fish mince which improves texture, flavour as well as nutritional content (Murray *et al.*,1980; Clayton and Das, 1982; Kim, 1996; Kubomura, 1998 and Hou, 2001)



a) Veg noodles



b) Fish noodles

Fig 1: Sensory scores of Veg noodles (control) and Fish noodles stored at ambient temperature (28^{o} C).

Conclusion

The present study clearly foredeals the role of fish noodles in alleviating the problems of malnutrition and undernutrition among the greater section of our population. Fish being a good source of proteins and highly unsaturated fatty acids, when added into the wheat noodles makes them highly nutritious, increases flavour and imparts a better texture. Also the cost effectiveness of fish noodles makes it a perfect alternative against expensive protein supplements.

References

[1] AOAC. Official Methods of Analysis. 16th Edn., Association of Official Analytical Chemists, Washington DC, USA;1995.
[2] APHA. Compendium of method of microbiological examination of foods. 2nd Edn., American Public Health Association, Washington DC; 1984.
[3] Bhutia DT. Protein energy malnutrition in India: The plight of our under five children. Journal of Family Medicine and Primary care. 2014; 3:63-67.
[4] Chin,CK, Huda, N and Yang TA. Incorporation of surimi powder in wet yellow noodles and its effects on the physicochemical and sensory properties. Int Food Res J , 2012; 19: 701-707.
[5] Clayton JT and Miscourides D N. Extruder texturized foods from underutilized fish tissue. Journal of Aquatic food Product Technology, 1992; 3(4): 65–89.
[6] FAO, Market penetration of developing country seafood products in European retail chains. Globefish Research Programme 90: 56, 2008.
[7] Folch J, Less M and Sloane GWS. A simple method for the isolation and purification of total lipids from animal tissues. J. Biol. Chem. 1957; 226: 497–509.
[8] Goes E S R, Sduza MLR, Michka JMG, Kimura KS, Lara JAF, Delbem ACB and Gasparind E. Fresh pasta enrichment with protein concentrate of tilapia: nutritional and sensory characteristics. Food Sci. Technol, 2016; 36(1): 76-82.
[9] Hou G. Oriental noodles. In: Advances in Food and Nutritional Research. (ed. Steve L.Taylor) Academis press. 2001; 43: 141–93.
[10] International Commission on Microbiological Specifications for Foods, Sampling plans for fish and shellfish, In: Microorganisms in Foods. Sampling for Microbiological Analysis: Principles and Scientific Applications, University of Toronto Press, Toronto, Canada, 1986; 2(2):181-196.
[11] Keeton, JT. Effect of fat and NaCl/phosphate levels on the chemical and sensory properties of pork patties. J.Food Sci. 1983; 48:878-881.
[12] Keller JE, Kelly GC and Acton JC. Effect of meat particle size and casing diameter on summer sausage properties during drying. Journal of Milk Food Technology. 1974; 37:101-106.

[13] Kim S, Lee K, Park J, Lee H and Hwang I. Effect of natural antioxidants on stored freeze-dried food product formulated using horse mackerel (Trachurus trachurus). J Sci Technol. 2006; 41: 90-95.
[14] Koniecko EK. In: Handbook for meat chemists. Avery Publishing group Inc., Wayne, NewJersey, USA,1979.
[15] Kubomura K. Instant noodles in Japan. Cereal Foods World, 1998; 43: 194–197.
[16] Lowry OH, Rosenbrough NJ, Farr AL and Randall RJ. Protein measurement with the folin phenol reagent. J. Biol. Chem. 1951; 193: 265-275.
[17] Maluf MLF, Weirich CE, Dallagnol JM, Simoes MR, Feiden A and Boscolo WR. Elaboracao de massa fresca de macarrao enriquecida com pescado defumado. Revista do Instituto Adolfo Lutz.2010; 69: 84-90.
[18] Murray BP, Stanley DW and Gill TA. Improved utilization of fish protein–co-extrusion of mechanically deboned salted minced fish. Canadian Institute of Food Science and Technology Journal. 1980; 13(3):125–130.
[19] Strange ED , Benedict RC, Smith JL and Swift, CE. Evaluation of rapid tests for monitoring alterations in meat quality during storage. J Food Prot. 1977;10: 843-847.
[20] Verma AK, Pathak V and Singh VP. Quality Characteristics of Value Added Chicken Meat Noodles . J Nutr Food Sci. 2014; 4(1): 1-5.
[21] Verma, A.K., Pathak, V. and Singh, V.P. (2012). Incorporation of chicken meat in rice flour based noodles and its effects on physicochemical and sensory qualities. Int J Curr Res, 4: 461-466.
[22] Witte VC, Krause GF and Bailey MB. A new extraction method for determining thiobarbituric acid analysis. J. Food Sci. 1970; 35:582.
[23] Yu SY. Fish noodles.1990, Pp. 224-230. Papers presented at seventh session of the indo-pacific fishery commission working party on fish technology and marketing. Bangkok, Thailand, 19-22 April 1988. FAO Fisheries Report No. 401 Supplement.