J.Meat Sci., *2019*, 9(1) : 18 - 23

Enhancement of Quality Parameters of Chicken Meat Momos by Incorporation of Minced Fish Meat

Tanuja[1], Pathak, V[1]., Verma, A. K[2]., Rajkumar, V.[2], Goswami, M.[1] and Singh, V. P[1]

[1]*Department of Livestock Products Technology, College of Veterinary Sciences and Animal Husbandry, DUVASU, Mathura-281001*
and
[2]*Department of Goat Products Technology, Central Institute for Research on Goats, Mathura-281001*

ABSTRACT

The present study was carried out to enhance the nutrition and other quality parameters of chicken meat momos with the incorporation of minced fish meat. A total of five treatments consisting of 100% chicken meat as control (C), 25% of fish meat (F1), 50% of fish meat (F2), 75% of fish meat (F3) and 100% fish meat (F4) were prepared and evaluated for various physico-chemical properties, color and textural profile analysis as well as sensory attributes. There was no significant difference in mean pH value, cooking yield, weight gain and water activity but significant difference ($P<0.05$) was observed in mean moisture content, fat and ash content with increased level of fish. The mean L*, a* and b* values differed in non significant manner in which lightness and yellowness slightly increased with fish meat but redness decreased. The hardness, springiness, gumminess and chewiness values decreased but adhesiveness and cohesiveness values increased non significantly with fish meat incorporation. The mean flavor, texture, meat flavor intensity, mouth coating and overall acceptability values were highest for F3 (75%) as compared to other treatments. Meat Momos prepared with the incorporation of 75% fish meat were selected.

Keywords: *Chicken momos, minced fish meat, nutrition, quality parameters.*

Received: 10 January 2019 Accepted: 20 February 2019

INTRODUCTION

Consumers are much more health conscious than before and they need healthy, natural, quality, safe and convenient food with pleasant appearance, texture, odor and taste. Meat constitutes integral part of routine diet of human beings since time immemorial and promises to provide complete nutrition and health. Fish and poultry meat has majority of these requirements. Poultry meat is highly digestible and a very well recognized nutritious food due to abundant high quality protein, B- complex vitamins and important minerals especially iron but low in fat and calories than meat from other species, and for this, it has occupied a special place in the diet (Barbut, 2005). Fish meat has excellent sensory qualities and high nutritive value due to its high content of protein and lipid with superior biological value with high digestibility. High-protein content as well as essential amino acid profile and less stroma make fish meat easily digestible. It has high content of long chain ?-3 polyunsaturated fatty acids (PUFA) ie. all cis-5,8,11,14,17- eicosapentaenoic acid (EPA) and all cis-4,7,10,13,16,19- docosahexaenoic acid (DHA) (Akkus et al. 2004). Unsaturated fatty acids, minerals and vitamins are known to be rich in fish meat (Aitken et al.1982; Gulyavuz and Unlusayin, 1999). The unsaturated fatty acids (n-3 PUFA) are essential for normal growth and development and may prevent or moderate coronary artery disease, hypertension, diabetes, arthritis and autoimmune disorders as well as cancer. So the demand of marine food snacks has created a huge bonaza in world food market as nutritionally dense food. A number of studies have reported successful incorporation of fish flesh or fish powder into starch based material by extrusion process to produce nutritional extruded products that were accepted by consumers. The incorporation of fish mince in ethnic snacks like chicken momos can not only enhance the organoleptic properties even can also be helpful in development of high value animal nutrients and quality products. So the present study was conducted with an objective of determining the quality parameters of chicken meat momos prepared with incorporation of minced fish meat.

MATERIALS AND METHODS

The study was conducted in the Department of Livestock Products Technology, College of Veterinary Sciences and Animal Husbandry, DUVASU, Mathura. Dressed broiler poultry carcasses were procured from authorized meat shops, Mathura and were brought to the Department of Livestock Products Technology, College of Veterinary Sciences and Animal Husbandry, DUVASU, Mathura. Thereafter the hot carcasses were kept in refrigerator at 4±10C for 4-6 hours. The meat was kept frozen at -180 C in deep freezer till further use. The fresh Rohu (Labeo rohita) fish of the carp family (Cyprinidae) was purchased from local market of Mathura. Refined wheat flour, condiments, salt, spice mix and refined oil were purchased from local market. All the chemicals and media used in the study were of analytical grade and procured from Hi Media laboratories (P) Ltd, Mumbai.

*Corresponding author E-mail address: naveenlpt@rediffmail.com

Product Methodology

The chicken meat was thawed and cooked under moist heat by pressure cookeing at 1210C for 15 minutes. The fresh fish meat procured from local market was washed properly and put in hot water (1000C) for 20 minutes for easy removal of the scales, fins and spines. The boiled chicken meat, fish meat and condiments used for filling were manually chopped separately with hand vegetable chopper. All the ingredients were mixed as per the formulation to prepare the filling material for chicken Momos. The dough was prepared by proper kneading of refined wheat flour with refined oil, corn starch, salt and water in a bowl. 5 g dough was taken, rolled in round shape and filled with 15 g of filling material and the edges were closed properly. The meat Momos were shaped manually at ambient temperature followed by cooking in Momos steamer for 30 minutes which was oiled prior to the cooking to prevent the sticking of Momos to the steamer surface. Then meat Momos were packed in presterilized LDPE bags of 200 gauze and sealed with the help of a sealer. Total four formulations of the filling material were prepared by replacing part or whole of chicken meat by fish meat and assigned as: C- chicken momos without fish meat, F1- chicken Momos with 25% fish meat, F2- chicken Momos with 50% fish meat, F3- chicken Momos with 75% fish meat and F4- chicken Momos with 100% fish meat. The formulation was taken as shown in Table 1 and 2.

Table 1: Formulation used for the preparation of chicken fish meat momos

Ingredients	C	F1	F2	F3	F4
Chicken meat%	50	37.5	25	12.5	-
Fish meat%	-	12.5	25	37.5	50
Condiments%	38.5	38.5	38.5	38.5	38.5
Refined wheat flour (Maida)%	5	5	5	5	5
Spices%	2	2	2	2	2
Chili%	3	3	3	3	3
Salt%	1.5	1.5	1.5	1.5	1.5

Table 2: Formulation used for preparation of dough of chicken fish meat momos covering

Ingredients	Percent
Refined Wheat Flour (maida)	89.5
Corn Starch	6
Oil	4
Salt	0.5
Water	As per the requirement

Analytical procedure:

pH was determined by using digital pH meter (WTW, Germany, model pH 330i) by immersing the spear type combination electrode (Sentix®, Germany) directly into the slurry prepared by mixing the triturated momo sample with distilled water. The weight of meat Momos were recorded before and after cooking. Cooking yield was calculated and expressed in percentage. Weight increase was evaluated according to Ozkaya and Kahveci (1990). The cooked Momos were rested for 5 min, the weight was recorded and percent weight increase was calculated on the basis of difference between the weight of cooked and uncooked Momos. Water activity was determined using hand held potable digital water activity meter (Rotonix HYGRO Palm AW1 Set/40). Finely ground sample was filled up (80%) in a moisture free sample cup provided along with water activity meter. The sample cup was placed into the sample holder, and then sensor was placed on it for five min for a_w value. Proximate Composition (moisture, fat, protein and ash content) were determined as per AOAC (1995).

Energy content, color and textural properties were measured at Goat Products Technology department at Central Institute for Research on Goat (CIRG) Makhdoom, Mathura. Gross energy of samples was determined by using Digital Oxygen Bomb Calorimeter (Parr 6200 Calorimeter, Moline, USA). The color parameters of the meat Momos sample were measured using colorimeter of Color Tech PCM+ (Color Tec Associates Inc. Clinton NJ, USA). The color reading included lightness (L), redness (a) and yellowness (b). Textural properties of meat momos were evaluated using the texterometer (stable Micro system TA.XT-2i-25) in Central Institute for Research on Goat (CIRG) Makhdoom, Mathura. Texture profile analysis (TPA) (Bourne, 1978) was performed using homogeneous sample for each treatment which was compressed to 10mm of original height through miniature Ottowa and Kramer shear cell platen probe. Cross head speed of 2.00 mm per second, post test speed 10.00mm per sec. target mode distance 10.00 mm was used and hardness, adhesiveness, springiness, cohesiveness, gumminess and chewiness were determined.

The sensory quality of samples was evaluated using 8 point hedonic scale (Keeton, 1983) where 8 denoted extremely desirable and 1 denoted extremely poor.

Statistical analysis

Data were analyzed statistically on 'SPSS-19.0' software package as per standard methods (Snedecor and Cochran, 1994). Duplicate samples were drawn for each parameter and the experiment was replicated thrice (n=6) except sensory

evaluation where total number of observations for each parameter was 27 (n=27).

RESULTS AND DISCUSSION

Physico-chemical properties:

The mean pH, cooking yield, weight gain and water activity values for various treatments prepared by different levels of minced chicken meat are shown in Table 3. There was no significant difference observed in pH values among control and treatments. The mean pH values increased with increased level of fish flesh during preparation of meat Momos. The typical pH of live fish muscle is about 7.0 (Kayim and Can, 2010) whereas meat is acidic in nature having ultimate pH of 5.4-5.8. The mean cooking yield, weight gain and water activity increased non significantly with increased percentage of fish flesh during preparation of Momos. It might be due to the presence of more moisture content in fish meat. Weight gain and water activity values are highly correlated with cooking yield and increased with incorporation of water in the chicken momos while steaming. Water activity is the amount of water present in any food product that is available for microorganisms' growth (Jay, 1996), this is the main reason that animal origin food including aquatic foods are considered to be perishable in nature.

Proximate Estimation

The mean moisture, protein, fat, ash and energy values for various treatments prepared by different levels of minced chicken meat are shown in Table 4. The mean moisture content increased significantly ($P<0.05$) with the increased level of fish meat in chicken momos. The present study was supported by Huda et al. (2010) who reported the higher amount of moisture with fish flesh incorporation in fish balls. Mello et al. (2012) also observed higher moisture content as compared to control in fish burger sample. The protein content slightly decreased with fish flesh incorporation in chicken momos. This may be because of slightly lower protein content in fish meat as compared to that of chicken. Tokur et al. (2004) found similar protein content in Tilapia fish burger as observed in the present study. The mean fat and ash content increased significantly($P<0.05$) with increased level of fish flesh which might be due to higher fat percentage in fish meat as compared to chicken meat. This finding is in agreement with Yu (1991) who reported that the higher the fish meat ratio used, the higher was fat content of the fish crackers. Huda et al. (2010) also observed the same range of fat in fish crackers. King (2002) reported that the ash content was increased with increased percent of fish meat. The energy content decreased non significantly with incorporation of fish meat. Sehgal et al. (2008) also reported about 144 kcal/ 100g gross energy of fried fish minced pakora.

Color estimation

The mean Lightness, Redness and Yellowness values for various treatments prepared by different levels of minced chicken meat are shown in Table 5. The mean lightness and yellowness values for all treatments increased in a non significant manner with increased percent of fish flesh in chicken momos. The possible reason of this may be higher fat and less haem pigment in fish meat as compared to chicken meat. Similar findings were observed by Mardiah et al. (2010) who found the effects of tapioca starch on lightness value of fish flakes. Pietrasik (1999) observed the same in the scalded fish sausages with incorporation of modified corn starch. Redness or a -value of the product was decreased non significantly with increased level of fish flesh during the preparation of meat Momos which might be due to white meat of fish.

Texture profile analysis

The mean hardness, adhesiveness, cohesiveness, springiness, gumminess and chewiness values for various treatments are shown in Table 6. The hardness, springiness, gumminess and chewiness values decreased whereas adhesiveness and cohesiveness values increased non significantly with fish meat incorporation. This might be due to more fibrous nature of protein in chicken meat than fish meat and high moisture content of the later. The gumminess and chewiness values are highly correlated with each other and decreased in fish incorporated Momos which might be due to higher fat content in fish which made them tender and more palatable. The negative value of adhesiveness was also observed by Juemanee et al. (2009) in the preparation of frozen shrimp burger with the incorporation of different levels of modified tapioca starch, sodium alginate, and iota-carrageenan.

Sensory evaluation

The mean appearance and color, flavour, texture, saltiness, mouth coating, meat flavour intensity and overall acceptability scores are shown in Table 7. There was non significant difference observed for appearance and color, flavor, saltiness and mouth coating scores among all the treatments whereas meat flavor intensity and texture scores increased significantly ($P<0.05$) with minced fish incorporation. Sehgal et al. (2008) also reported non significant difference in appearance and

color value during the formation of fish patties from Labeo rohita. Tokur et al. (2004) and Mello et al. (2012) also observed non significant increase in flavor and mouth coating during the preparation of fish burger. Similar significant ($P<0.5$) increase in mean texture and meat flavor values with fish incorporation were observed by Levent (2010) during the preparation of fish fingers with carp family. The mean overall acceptability scores were recorded to be highest for F3 treatment containing 75% of fish flesh followed by F4 with 100% of fish meat. It may be attributed to higher sensory scores for all other sensory attributes due to high fishy flavor and good texture. Vega et al. (2013) also reported a higher value for overall acceptability of frankfurter prepared with surimi.

CONCLUSION

The chicken meat momos were developed with incorporation of different levels of minced fish meat and were studied for various quality parameters to evaluate the consumer acceptance. The incorporation of fish meat enhanced the textural and color properties of chicken momos. The nutritional content of chicken momos also enhanced in terms of beneficial unsaturated fatty acids and mineral content. Fish incorporated chicken meat momos were very well accepted by sensory panelists. Chicken meat momos with 75% minced fish meat obtained highest scores for sensory parameters including overall acceptability.

REFERENCES

Aitken A, Mackie, IM, Merritt, JH and Windsor, ML (1982). Fish Handling and Processing. 2nd ed. Bell & Bain Ltd., Glasgow, UK.

Akkus Ö, Varlik, C, Erkan, N and Mol, S (2004). Determination of some quality parameters of fishballs prepared from raw and boiled Fish. Turk. J. Vet. Anim. Sci 28: 79-85.

AOAC (1995). Official Method of Analysis. 16th Edn. Association of Official Analytical Chemists, Washington, DC.

Barbut S (2005). Poultry products processing. First Indian reprint. CRC press LLC. pp.1-15.

Bourne MC (1978). Texture profile analysis. Food Tech. 32: 62-66.

Gülyavuz H and Ünlüsayin, M (1999). Fish Processing Tech. ISBN: 975-96897-0-7, Ankara, Turkey 27-40.

Huda N, Shen, YH, Huey, YL and Dewi, RS (2010). Ingredients, proximate composition, colour and textural properties of commercial Malaysian fish balls. Pak. J. Nutrition 9(12): 1183-1186.

Jay JM (1996). In: Modern food Microbiology 4th edition C.B.S. Publishers and distributors New Delhi, pp.38-39.

Juemanee, P, Kijroongrojana, K, Usawakesmanee, W and Posri, W (2009). Juiciness improvement of frozen battered shrimp burger using modified tapioca starch, sodium alginate, and iota-carrageenan. Songklanakarin J. Sci. Technol 31(5): 491-500.

Kayim M and Can, E (2010). The pH and Total Fat Values of Fish meat in different iced storage period. Asian J. Animal and Veterinary Advances 5: 346-348.

Keeton J T (1983) Effect of fat and sodium chloride/phosphate levels on the chemical and sensory properties of pork patties. J Food Sci 48: 878-81.

King MA (2002). Development and sensory acceptability of crackers made from the Bigeye fish (Brachydeuterus auritus), Food and Nutrition Bulletin 23(3): 317-320.

Levent IZCI (2010). Utilization and quality of fish fingers from Prussian Carp (Carassius gibelio). Pak. Veterinary J 30(4): 207-210.

Mardiah A, Huda, N and Ahmad, R (2010). A study on the physicochemical properties, microstructure and sensory characteristics of fish flakes. J. Fisheries and Aquatic Sci 5: 469-482.

Mello SCRP, Freitas, SC, Clemente, S, Franco, RM, Nogueira, EB and Freitas, DDGC (2012). Development and bacteriological, chemical and sensory characterization of fish burgers made of Tilapia minced meat and surimi. Arq. Bras. Med. Vet. Zootec 64(5): 1389-1397.

Özkaya H, and Kahveci, B (1990). Tahil ve Ürünleri Analiz Yöntemleri. Gida Teknol. Derne_i Yayinlari No: 14, Ankara, pp. 146-148.

Pietrasik Z (1999). Effect of content of protein, fat and modified starch on binding textural characteristics and colour of comminuted scalded sausages. Meat Sci 51: 17-25.

Sehgal HS, Shahi, M, Sehgal, GK and Thind, SS (2008). Some Quality Aspects of Fish Patties Prepared from an Indian Major Carp, Labeo Rohita (ham). Int. J. Food Sci. and Nutri 59(3): 192-201.

Snedecor G W and Cochran, WG (1994). Statistical methods. 8th Edn. The Iowa State University Press Ames, Iowa, USA.

Tokur B, Polat, A, Beklevik, G and Özkutuk, S (2004). Changes in the quality of fishburger produced from tilapia (Oreochromis niloticus) during frozen storage (- 18? C). Eur. Food Res. Technol 218: 420 - 423.

Yu SY (1991). Acceptability of fish crackers (keropok) made from different types of flours. Asean Food J 6(3): 114-116.

Vega WRC, Fonseca, G, Feisther, VDC, Silva, TF and Prentice, C (2013). Evaluation of frankfurters obtained from croaker

(Micropogonias furnieri) surimi and mechanically deboned chicken meat surimi-like material. J Food 11(1): 27-36.

Table 3: Physico-chemical properties (Mean ± SE) of chicken momos prepared with fish incorporation

	C	F1	F2	F3	F4	Treatment mean
pH	5.76±0.18	5.80±0.14	5.87±0.13	5.93±0.08	5.98±0.10	5.87±0.05
Cooking yield %	107.08±0.08	107.09±0.17	107.10±0.20	107.35±0.03	107.38±0.04	107.20±0.05
Weight gain %	6.48±0.11	6.49±0.04	6.50±0.16	6.53±0.04	6.54±0.08	6.51±0.04
Water activity	0.985±0.004	0.986±0.003	0.987±0.002	0.987±0.004	0.989±0.002	0.98±0.001

Table 4: Proximate estimation (Mean±SE) of chicken momos prepared with fish incorporation

	C	F1	F2	F3	F4	Treatment mean
Moisture (%)	57.94D±0.17	59.53C±0.38	61.85B±0.31	62.70B±0.13	65.70A±0.43	61.54±0.51
Protein (%)	17.39±0.81	17.33±0.25	17.32±0.33	17.33±0.38	17.27±0.13	17.33±0.18
Fat (%)	2.57C±0.22	3.26B±0.04	3.37AB±0.05	3.48AB±0.10	3.75A±0.08	3.28±0.08
Ash (%)	0.96B±0.006	0.97AB±0.006	0.98A±0.004	0.98A±0.004	0.98A±0.004	0.97±0.002

Table 4: Proximate estimation (Mean±SE) of chicken momos prepared with fish incorporation

	C	F1	F2	F3	F4	Treatment mean
Moisture (%)	57.94D±0.17	59.53C±0.38	61.85B±0.31	62.70B±0.13	65.70A±0.43	61.54±0.51
Protein (%)	17.39±0.81	17.33±0.25	17.32±0.33	17.33±0.38	17.27±0.13	17.33±0.18
Fat (%)	2.57C±0.22	3.26B±0.04	3.37AB±0.05	3.48AB±0.10	3.75A±0.08	3.28±0.08
Ash (%)	0.96B±0.006	0.97AB±0.006	0.98A±0.004	0.98A±0.004	0.98A±0.004	0.97±0.002

Mean values bearing same superscript do not differ significantly (P>0.05).

Table 5: Color parameters (Mean±SE) of chicken momos prepared with fish incorporation

	C	F1	F2	F3	F4	Treatment mean
Lightness (L*)	47.88±0.34	47.90±0.03	47.92±1.08	48.02±0.36	48.05±0.34	47.96±0.23
Redness (a*)	2.61±0.07	2.47±0.14	2.43±0.19	2.35±0.06	2.33±0.08	2.44±0.05
Yellowness (b*)	12.57±0.04	12.57±0.12	12.58±0.05	12.58±0.24	12.58±0.06	12.58±0.05

Table 6. Texture profile values (Mean ± SE) of chicken momos prepared with fish incorporation

	C	F1	F2	F3	F4	Treatment mean
Hardness (N/cm2)	66.77±4.30	66.75±6.31	66.67±6.06	66.60±6.14	66.55±6.23	66.67±2.43
Adhesiveness (Ns)	-0.43±0.05	-0.43±0.05	-0.42±0.04	-0.42±0.05	-0.42±0.04	-0.42±0.02
Springiness (cm)	0.42±0.09	0.42±0.09	0.41±0.08	0.41±0.09	0.41±0.09	0.41±0.03
Cohesiveness (ratio)	0.065±0.00	0.065±0.00	0.065±0.00	0.065±0.00	0.067±0.00	0.065±0.00
Gumminess (N/cm2)	28.99±5.34	28.99±4.89	28.98±4.89	28.97±4.92	28.92±4.77	28.97±2.06
Chewiness (N/cm)	8.44±1.26	8.44±1.23	8.42.03	8.42±1.03	8.42±1.05	8.43±0.46

Table 7: Sensory evaluation (Mean ± SE) of chicken momos prepared with fish incorporation

	C	F1	F2	F3	F4	Total
Appearance & color	5.92±0.17	5.74±0.17	5.59±0.17	5.62±0.22	5.88±0.22	5.75±0.08
Flavor	5.96±0.16	5.62±0.19	5.96±0.16	6.00±0.16	5.96±0.16	5.90±0.07
Texture	5.07AB±0.17	4.96B±0.18	5.11AB±0.20	5.51AB±0.20	5.59A±0.19	5.25±0.08
Saltiness	5.96±0.19	5.96±0.16	5.96±0.16	5.92±0.19	5.88±0.18	5.94±0.07
Mouth coating	5.66±0.17	5.96±0.16	5.96±0.19	6.16±0.15	5.94±0.18	5.94±0.07
Meat flavor intensity	5.81C±0.17	5.96BC±0.16	6.29AB±0.17	6.48A±0.15	6.51A±0.14	6.21±0.07
Overall acceptability	5.85A±0.20	5.81A±0.17	5.96AB±0.16	6.35B±0.16	6.00B±0.17	5.99±0.07

Overall means bearing different superscripts between rows (A, B, C, D……) differ significantly (P<0.05) for each table

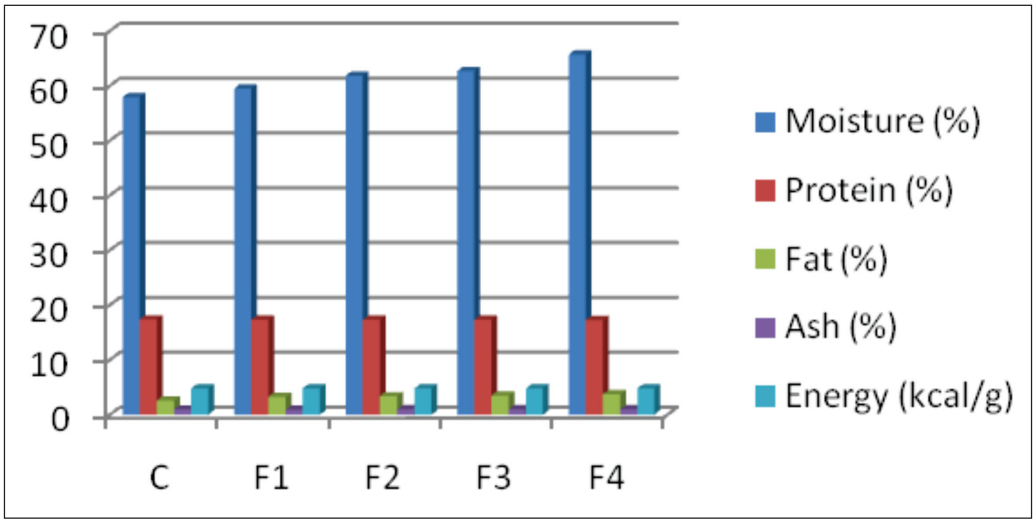

Fig. 1: Proximate estimation of chicken momos prepared with fish incorporation

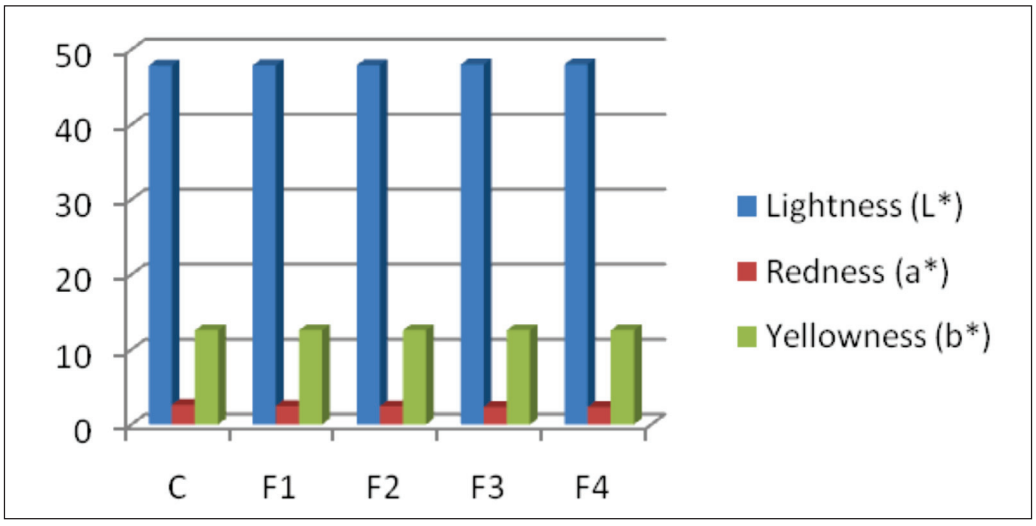

Fig. 2: Color parameters of chicken momos prepared with fish incorporation