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Evaluation of grass carp (Ctenopharyngodon idellus) surimi in beef burger formulation in Egypt

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SUMMARY

Four beef burger formulations were produced with 5, 10, 15 & 20% surimi addition, also control pure beef burger group was prepared, to explore the effect of adding surimi to beef burger and evaluate its shelf life during frozen storage. Proximate composition and fatty acid profile were determined for processed burger at zero time. Physico- chemical characteristics (pH, cooking loss, Shear force, TVB-N, TBA-value), aerobic plate count, coliforms count, S.aureus count, as well as sensory attributes were examined at monthly interval during three months of frozen storage (−18 °C). The sensorial quality was determined by means of a panel test, which assessed appearance, flavor, tenderness, juiciness and overall acceptability during the storage period. It was concluded that surimi from grass cap can be introduced into beef burger formulation with acceptable nutritional, sensory and storage characteristics. Where all surimi added burger samples were highly acceptable. Moisture content was significantly increased, while fat content was decreased in 20% surimi added burger. Shear force value was decreased with increase surimi content in the examined burger, and cooking loss showed no significance difference among all examined groups. Aerobic plate count and Coliforms count were significantly reduced by frozen storage. While, S.aureus couldn't be detected at the end of storage time. Fat stability represented by TBA-value was significantly stable in burger containing surimi than that of beef only, but no

significant difference is noticed in TVB-N among all groups during storage time.

INTRODUCTION

Although Surimi production and processing are vast growing and widely distributed industries in many parts of the world (FAO, 2004), surimi products are scantly marketed in Egypt. Surimi is washed and squeeze minced fish, without any pronounced taste and flavor. It possesses high jellifying capability due to its high myofibrillar proteins content, which makes surimi an ideal functional ingredient for fabrication new food products (Lanier, 2000) and allows it to assume almost any desired texture (Park & Morrissey, 2000).

Grass carp is produced by a relatively high quantity in Egypt because of its wide production from both aquaculture source and natural resources as it used in nationwide programme for biological weed control in the irrigation and drainage systems (FAO, 2005). However, it is low in price and has limited scope for consumption in the fresh form. Processing of Grass Carp into surimi and Surimi-based product is an effective way to utilize freshwater fish with low commercial value (Wu and Mao 2008). Many investigators proved that surimi can be produced from grass carp with good jellifying properties and nutritive value (luo et al. 2001, Xichang et al. 2005, Luo et al. 2006, Mao & Wu 2007 and Pan et al 2010).

Beef burger is one of the most popular meat products, mainly among Young aged group people. However, many health hazards are conjugated with its consumption due to its high fat content (Fernandez-Gines et al., 2005; Howarth et al., 2005, Oh et al., 2005 and Smith-Warner and Stampfer, 2007). The increase public awareness of health problem with high fat products, the demand for low fat meat products and alternative healthier meat products, subjected food processing research for producing meat system with altered compositional profile (Giese, 1996, Xiong,et al. 1999, and Kubberod, et al. 2002).

Therefore the objectives of this study are to produce healthier beef burger through addition of grass carp surimi in different level (5-20%). Assess acceptability, organoleptic properties and health benefits of the produced beef burger in comparison with the full-fat commercial burger, during three months of frozen storage.

MATERIALS AND METHODS

Surimi production

Grass carp surimi was processed traditionally according to method recommended by Hossain et al. (2004).

Fresh grass carp (Ctenopharyngodon idellus) were skinned and deboned by hand and washed to remove any remaining slime, scales or blood adhering to the flesh. Cleaned fish flesh was minced through 4 mm plate electric mincer (Fama Fabbrica Atter zzature Machine Alimentrac, Rimini-Italy). Fish mince was washed with iced water at a mince/water ratio of 1:3 (w/w) for 15 minutes with gently stirred for 5 min., dewatering was achieved by wrapping surimi in cheese cloth and squeezing by hand. Washing and dewatering processes were repeated three times. In the final wash (third wash) 0.1% (w/w) salt was added to the iced water. Cryoprotectants, 4% (w/w) sucrose, 4% (w/w) sorbitol and 0.25% (w/w) polyphosphate, were mixed thoroughly with surimi and packed into polyethylene bags of 500 g each, finally Frozen at -20°C and was kept frozen at -18°C.

Beef burger production

Frozen beef flanks (two months of production date) and fresh beef fat were purchased from local market and kept frozen till processing. Immediately before processing, frozen meat was thawed on refrigerator shelf, flanked and minced at 8mm plate, while fat was minced a 2tmm plate. Frozen surimi was tempered at room temperature for 2 hours, and then minced separately at 8mm plate. Beef burger was formulated according of ESS (1688/2005) with 65% lean beef and 20% beef fat, 1.8% sodium chloride, 0.003 sodium tripolyphosphate, iced water and spices. Minced beef, fat, seasoning and water were added in a paddle mixer and blended at low speed for 5 minutes and the resulted meat mix was divided into 5 parts. The first portion was used as control, while the prepared surimi was mixed with the other four portions manually to substitute 5, 10, 15, and 20% of the meat mass. After mixing, the meat mass was formed into discs of 60 gm by using manual patty former. Where five groups were produced as follow: - 1) 100% beef formulation (control) 2) 95% beef formulation & 5% surimi 3) 90% beef formulation & 10% surimi, 4) 85% beef & 15% surimi, 5) 80% beef formulation & 20% surimi. Processed burger was frozen at -20°C in and stored in a deep freezer at -18°C for 3 months.

Investigation

All groups were examined for proximate analysis (moisture, protein, fat, and ash %) and fatty acid profile at zero time. Whereas, physico- chemical characteristics (pH, cooking loss, Shear force, TVB-N mg%, TBA-value mg mal/kg), bacterial load (aerobic plate count, coliforms count and

S.aureus count), and sensory attributes were examined at monthly interval, for 3 months.

Proximate composition: Moisture content was determined as weight loss of two grams sample after drying at 102°C. Total protein (crude protein) content of sample was determined using the Kjeldahl method. While crude lipid content was determined by the Soxhlet method and ash content was determined by mineralisation at 550°C following the standard AOAC (1990) methods.

Fatty Acid Profile: lipid was extracted following the Bligh and Dyer (1959) method and was saponified with 20% of potassium hydroxide in methanol, and the unsaponifiables was extracted with diethyl ether (peroxide free). Fatty acid standard and samples were converted to methyl ester following the Vogel, (1975) method, where fatty acid methyl esters of samples' lipid were separated and quantified by GC (GVC Pye Unican series304 gas chromatography). Peaks were identified by comparison with retention times of known standards.

Determination of pH, Cooking loss and Shear force: pH was measured using a digital pH meter (ORION/KNI pHE EU TECH England) as described by AOAC (1990). Five grams of sample was blended with 45 ml of distilled water and pH of formed slurry was recorded.

Burger samples were grilled to 70°C an internal temperature to determine the cooking loss as the difference between the fresh and cooked sample weight divided by the fresh weight. Then samples were chilled at refrigerator temperature overnight and used for shear force (5kg/cm^2) determination after equilibration at room temperature by using Accu force II with force gage 0-5kg (M1 3339-USA).

Determination of TVB-N mg%: Distillation method was performed using microdistilation unit as described by FAO (1986).

TBA – value mg mal/Kg: The extent of lipid oxidation was assessed by measuring thiobarbituric acid value (TBA-value) using the method of Benjakul and Bauer (2001). Sample of 0.5 g was dispersed in 2.5 ml of a solution containing 0.0375% thiobarbituric acid, 15% trichloroacetic acid and 0.25N HCl. The mixture was heated in boiling water for10 min, followed by cooling. The mixture was centrifuged and absorbance of supernatant was measured at 532 nm. TBARS were calculated and expressed as mg malondialdehyde/kg samples.

Bacteriological analysis: aerobic plate count (APC), coliforms(MPN) and S.aureus count were preformed according to the techniques recommended by APHA (1992). Ten grams sample were homogenized with 90 ml of sterile 1/4 strength Ringers' solution aseptically using stomacher (Steward Stomacher 400 Lab Blender, London, UK). Ten-fold decimal dilutions were prepared and inoculated onto Standard plate count agar, lauryl sulphate tryptose broth and Baird Parker agar for APC, coliforms (MPN) and S.aureus count respectively. Plates were incubated at 32°C for 24-48 hours to determine APC and coliforms (MPN) count and at 37°C for 24-48 hours to determine S.aureus count. Results were expressed as log colony forming unit (CFU) per gram of sample.

Sensory Analysis: Coded samples were grilled to 70°C and served warm to a panel team consisting of 12 experienced judges of Food Hygiene department, Faculty of Vet. Med. Cairo Univ. A six-point scale was used (Murphy et al 2004) to assess appearance, flavor, juiciness, tenderness, and overall acceptability (1–6; very poor, poor, fair, good, very good and excellent).

Statistical analysis: Results were reported as mean values of each determination. Analysis of variance (ANOVA) was performed by procedures SPSS 17.0 for Windows, SPSS Inc, Chicago, IL, USA. Differences among the mean values of the various treatments were determined by the least significant difference (LSD) test, and the significance was defined at $P < 0.05$.

RESULTS & DISCUSSION

Proximate composition & Fatty acid profile: Moisture, protein, lipid and ash content of produced burger are given in table (1). Moisture content was higher in all examined groups than control one with significant increase ($P<0.05$) in 20% added surimi group (66,61%). The high moisture content could be correlated with higher moisture percentage in the added surimi (Turan and Sőnmez, 2010). Regarding protein content in produced burger, non -significant increase in protein percentage with increased added surimi was observed in all examine groups. while a significant reduction ($P<0.05$) in lipid content was noticed in 20% surimi added beef burger than control group, with insignificant fat reduction in other groups were observed. Partial replacement of fat content in burger formulation by surimi in addition to low fat content of the added surimi -due to successive washing during its processing- could be an acceptable reason for the fat content reduction in 20%surimi added beef burger. Also no significance difference could be detected among groups in their ash content.

Fatty acid profiles of experimentally produced burger are presented in fig. (1). Saturated fatty acids (SFA) accounted for 52.91-59.39%, monounsaturated fatty acid (MUFA) ranged from 35.33-39.62% and PUFA ranged from 2.36 -7.89% of total fatty acids in all examined samples. Control group showed the highest content (59.39%) of SFA and lowest (2.36%) polyunsaturated fatty acid (PUFA). Surimi incorporation of beef burger by 15 & 20% significant reduce SFA and increase PUSA. On the other hand 5 & 10 % surimi added burger proved no significant difference in their fatty acid profile than control group.

pH, Cooking loss & shear force: pH, cooking loss & shear force values of control and surimi added burger groups during three months of frozen storage are shown in table (2). pH values showed no significant(P□ 0.05) difference among all examined samples. Similar results were recorded by Tokur et al. (2006) who found that there were no significant changes in pH value of mirror carp fish burgers during 5 month frozen storage. In these regards Ruiz-Capillas & Moral, (2001) stated that pH value is not a suitable index on its own to determine quality of fish, however, it can be useful as a guideline for quality control of fish when used with other quality parameters.

Incorporation of surimi in beef burger as fat and meat replacer significantly (P□ 0.05) affects its texture. Obtained results revealed that an inversely relationship between added surimi and shear force values in examined samples. Where increase. surimi level in beef burger formulation from 0-20% reduce shear force values from 0.33 kg/cm^2 in control group to 0.2 kg/cm^2 in 20% surimi added burger. These values were recorded at zero time and continued for the first and second month of frozen storage. Data provided by Murphy et al. (2004) were in harmony with the recorded result. However, it was observed that shear force values were increased with storage time, where at the third month of frozen storage 15 and 20% surimi added burger showed the highest shear force values 0.636 and 0.67 5kg/ cm^2 respectively. This could be due to myofibrillar protein denaturation during frozen storage and explain the product toughness at the end of storage period. This leads to the lower tenderness score for surimi containing burger in sensory examination at the end of frozen storage.

Concerning cooking loss, it was observed that continues increase of cooking loss with extend storage time. This could be explained by adverse effect of freezing on protein structure the water holding capacity of the product (Benjakul et al.2005). However, no significance difference (P<0.05) could be established among different treatments throughout storage time. The obtained results were in harmony with that recorded by Murphy et al. (2004).

TVB-N & TBA-value: Changes of TVB-n mg% and TBA-value mg mal /Kg of different produced burger groups during three months of frozen storage are presented in table (3). Total volatile basic-nitrogen is proposed as an indicator of fresh meat quality because its increase corresponding to bacterial spoilage, their permissible limit in burger as meat product should not be exceed 20mg% (ESS-1688/2005). It was observed that TVB-N values insignificantly (P<0.05) increased with storage time extension. At zero time TBV-N values ranged from 12.43 - 12.55 mg% while at the end of storage period, TVB-N were ranged from 14.98 – 15.31 mg% in all groups and no significance difference could be established among different examined beef burger groups. Furthermore, all examined samples were still within the acceptable level.

TBA-value is widely used as an indicator for lipid oxidation in meat and fish products. In this study all examined samples showed marked increase in TBA-value with extend of storage time, however, it doesn't exceed the permissible limit stated in EES (1688/2005). It's worthily mentioning that burger containing 15 & 20% surimi showed significant (P<0.05) reduction in TBA-value during the whole storage time than control and other surimi added burger groups. This could be explain by addition of relatively large amount of surimi that has low fat percentage (3.1%), and removal of most oxidative enzymes during washing process of fish mince (Turan and Sõnmez, 2010).

Bacteriological analysis: In order to estimate the initial quality of produced burger before and during frozen storage aerobic plate count (APC), Coliforms count and Staphylococcus aureus (S. aureus) count were performed. Bacterial load was significant reduced in all examined groups during frozen storage to reach more than one log at the end of storage period. Where APC was reduced from 5.0-5.2 log^{10}cfu/g at zero time to 3.6 -3.3 log^{10}cfu/g at the end of frozen storage time. In this regard, the International Commission on Microbiological specifications for Food (ICMSF 2005) recommends that the flesh APC should not exceed 10^6/g wet weight. This recommendation was met by the present results. Also, coliforms count was significantly reduced by two log through three months of frozen storage period, Control group (100% beef burger) showed the highest coliforms count. S.aureus could be detected during zero time only in surimi mixed beef burger in low count (2.-2. log^{10}/g), this may be correlated with manual mixing during burger production. These reductions could be referring to high sensitivity of counted bacteria to freezing effect. It was clear that addition of surimi to beef burger formulation doesn't significantly affect APC, or coliforms count or S.aureus count among the five examined groups throughout storage period.

Sensory analysis: The sensory qualities of processed burger were evaluated in terms of appearance, flavour, tenderness, juiciness and overall acceptability (Fig. 2). The acceptability of fish products during frozen storage depends on the changes in their sensory attributes. Sensory scores, in all examined groups declined throughout the three months of frozen storage. However, all groups remained quite acceptable at the end of storage period. Control group showed the highest score for flavor and overall acceptability which could be attributed to the more familiarity of the product by the panelists. No significance differences could be observed among 5, 10, 15, & 20% added surimi burger in their flavor and overall acceptability till 2nd month of storage. At the end of storage time 20% surimi added burger proved lowest scores due to presence of light fishy odour, which may be referring to the manual and traditional production of surimi. No significance differences were noticed among samples for burger marbling appearance. Significant increase of juiciness and tenderness scores was recorded in 15 and 20% surimi added burger samples through first and second month of frozen storage followed by significant reduction at the third month. These increases could be a result of gel forming ability and high moisture content of added the added Surimi. While the reduction in the last month could be due to denturative effect of freezing on myofibrillar protein of the added surimi. Furthermore, addition of 5 and 10% Surimi to burger formulation revealed no significant difference ($P<0.05$) in their juiciness and tenderness scores than the control group.

Conclusion: This study outlines the scope for the development of healthier ready-to-cook surimi-beef mix burger with high nutritional value and good storage stability. Where addition of 15 and 20% grass carp Surimi can reduce fat content and TBA-value, proved high panelists acceptability, and good quality during three months of frozen storage.

References:

AOAC (1990). Official Methods of Analysis. The Association official analytical chemists, 13th Ed. Virginia, USAAPFC.

APHA (1992). Compendium of Methods for the Microbial Examination of food. 3rd Ed., American public health association, Washington, Dc., USA.

Benjakul S., Visessanguan W., Thongkaew C. and Tanaka M . (2005). Effect of frozen storage on chemical and gel-forming properties of fish commonly used for surimi production in Thailand. Food Hydrocolloids 19 (2005):197–207.

Benjakul, S. and Bauer, F. (2001). Biochemical and physicochemical changes in catfish (Silurus glanis Linne) muscle as influenced by different freeze–thaw cylces. Food Chemistry, 72: 207–217.

Bligh, E. G. and Dyer, W. J. (1959). A rapid method of total lipid extraction and purification. Can. J. Bioch. and Physiol. 37 (8): 911.

ESS 1688 (/2005). "Egyptian standard specification". Egyptian standard specification for frozen burger, Egyptian organization for standardization and quality control.

FAO (1986). Food and Agriculture organization. Manuals of food quality control. 8. Food analysis. Rome. Italy.

FAO (2005). Food and Agriculture Organization. Regional review on aquaculture development 2. Near east and North Africa – FAO fisheries circular no. 1017/2.

FAO. (2004). Food and Agriculture Organization. The State of World Fisheries & Aquaculture, p. 153, FAO Fisheries Dept., Rome, Italy.

Fernandez-Gines, J.M., Fernandez-Lopez, J., Sayas-Barbera, E. and Perez-Alvarez, J.A. (2005). Meat products as functional foods. A review. Food Science, 70: 37–43.

Giese, J. H. (1996). Fats, oils and fat replacers. Food Technology, 50(4), 78–83.

Hossain, M.L., kamal M.M., Shikha F. H. and Shahidul Hoque, M. D. (2004). Effect of Washing and Salt Concentration on the Gel Forming Ability of Two Tropical Fish Species. Int. J. Agri. Biol., (6): 5762-766.

Howarth, N., Huang, T., Roberts, J.A. and McCrory, M. (2005). Dietary fiber and fat are associated with excess weight in young and middle-aged US adults. Journal of the American Dietetic Association, 105: 1365-1372.

ICMSF (2005). The International Commission on Microbiological specifications for Food. Fish and fish products, In Microorganisms in foods 6: Microbial ecology of food commodities, ed. ICMSF, 174–249. New York: Kluwer Academic/Plenum Publishers.

Kubberod, E., Ueland, O., Rodbotten, M., Westad, F., and Risvik, E. (2002). Gender specific preferences and attitudes towards meat.Food Quality and Preference, 13(5), 285–294.

Lanier, T. C. (2000). Surimi gelation chemistry. In J. W. Park (Ed.), Surimi and Surimi Seafood (pp. 237–265). New York: Marcel Dekker.

Luo, Y., Shen, H. and Pan, D. (2006), Gel-forming ability of surimi from grass carp (Ctenopharyngodon idellus): influence of heat treatment and soy protein isolate. Journal of the Science of Food and Agriculture, 86: 687–693.

Luo, Y.K., Kuwahara, R., Kaneniwa M. Murata, Y. and Yokoyama, M. (2001). Comparison of gel properties of surimi from Alaska pollock and three freshwater fish species: effects of thermal processing and protein concentration. J Food Sci 66(4):548–54.

Mao L.C. and Wu T. (2007). Gelling properties and lipid oxidation of kamaboko gels from grass carp (Ctenopharyngodon idellus) influenced by chitosan. J Food Eng 82(2):128–34.

Murphy ,S. C., Gilroyb, D., Kerrya, Buckleya, J.F. , and Kerrya J.P.(2004). Evaluation of surimi, fat and water content in a low/no added pork sausage formulation using response surface methodology. Meat Science 66 (2004) 689–701.

Oh, K., Hu, F.B., Manson, J.E, Stampfer, M.J. and Willet, W.C. (2005). Dietary fat intake and risk of coronary heart disease in women. 20 years of follow-up of the nurses' health study. American Journal of Epidemiology, 161: 672-679.

Pan, J., Shen, H. and Luo, Y. (2010). Cryoprotective effects of trehalose on grass carp (Ctenopharyngodonlidellus) surimi during frozen storage. Journal of Food Processing and Preservation, 34: 715–727.

Park, J.W., and Morrissey, M. T. (2000). Manufacturing of Surimi from light muscle fish. In J. W. Park (Ed.), Surimi and surimi seafood (pp. 23–58). New York: Marcel Dekker.

Ruiz-Capillas, C. and Moral, A. (2001). Correlation between biochemical and sensory quality indices in hake stored in ice. Food Research International, 34: 441-447.

Smith-Warner, S. and Stampfer, M.J. (2007). Fat intake and breast cancer revisited. Journal of the National Cancer Institute, 99:418-419.

Tokur, B., Ozkutuk, S., Atici, E., Ozyurt, G. and Ozyurt, C.E. (2006). Chemical and sensory quality changes of fish fingers made from mirror carp (Cyprinus carpio L., 1758), during frozen (storage -18°C). Food Chemistry, 99: 335–341.

Turan, H. and sőnmez, G. (2010). Changes in proximate composition of thornback ray (raja clavata , l . 1758) surimi during washing and frozen storage. Journal of Food Processing and Preservation. 34 (2010): 24–34.

Vogel, A. J. (1975). A text book of practical organic chemistry. 3rd ed. P. 969. English language book society and Longman. Croup Ltd. London.

Wu, T.and Mao, L. (2008). Influences of hot air drying and microwave drying on nutritional and odorous properties of grass carp (Ctenopharyngodon idellus) fillets. Food Chemistry 110 (2008): 647–653.

Xichang,W., Fukuda, Y., Shunsheng, C., Yokoyama, M., Yudong,C., Chunhong,Y., et al. (2005). Development of intermediate foodstuff derived from freshwater fish in china. Journal of Ocean University. of china, 4:229-233.

Xiong, Y. L., Noel, D. C. and Moody, W. G. (1999). Textural and sensory properties of low-fat beef sausages with added water and polysaccharides as affected by pH and salt. Journal of Food Science, 64 (3): 550–554.

Table (1): Mean values of Proximate Composition of different burger groups at zero time.

Examined samples	Moisture%	Protein%	Fat%	Ash%
Control	61.24^{a}	11.9^{a}	20.31^{a}	1.05^{a}
5% added surimi	61.89^{a}	12.16^{a}	19.74^{a}	1.07^{a}
10% added surimi	62.35^{a}	12.44^{a}	18.19^{a}	1.0^{a}
15% added surimi	63.05^{a}	13.09^{a}	17.4^{a}	1.09^{a}
20% added Surimi	66.61^{b}	13.35^{a}	16.83^{b}	1.07^{a}

Means with different letters within the same column differ significantly at P□ 0.05.

Table (2): Mean values of pH, Shear force and Cooking loss of different burger groups.

sample	Zero time			1st Month			2nd Month			3rd Month		
	pH	Cook Loss	Shear F	pH	Cook Loss	Shear F	pH	Cook Loss	Shear F	pH	Cook Loss	Shear F
Control	6.0^{a}	20.0^{a}	0.33^{a}	6.02^{a}	21.8^{a}	0.327^{a}	5.98^{a}	23.6^{a}	0.40^{a}	6.1^{a}	26.3^{a}	0.57^{a}
5%	6.01^{a}	20.7^{a}	0.319^{a}	6.02^{a}	22.0^{a}	0.324^{a}	5.99^{a}	25.2^{a}	0.39^{a}	6.11^{a}	27.3^{a}	0.51^{a}
10%	6.01^{a}	21.3^{a}	0.24^{b}	6.04^{a}	21.9^{a}	0.211^{b}	5.95^{a}	24.8^{a}	0.35^{b}	6.13^{a}	27.0^{a}	0.52^{a}
15%	6.04^{a}	19.5^{a}	0.217^{b}	6.07^{a}	20.4^{a}	0.198^{b}	6.06^{a}	23.6^{a}	0.34^{b}	6.1^{a}	26.2^{a}	0.69^{a}
20%	6.1^{a}	19.4^{a}	0.20^{b}	6.1^{a}	20.6^{a}	0.184^{b}	6.15^{a}	23.1^{a}	0.35^{b}	6.29^{a}	26.4^{a}	0.67^{a}

Means with different letters within the same column differ significantly at P□ 0.05.

Table (3): Mean values of TVB-N mg% & TBA-value mg mal/kg during frozen storage

Examined samples	Zero- time		1st Month		2nd Month		3rd Month	
	TVB-N	TBA-value	TVB-N	TBA-value	TVB-N	TBA-value	TVB-N	TBA-value
Control	12.43^{a}	0.191^{a}	13.13^{a}	0.215^{a}	14.65^{a}	0.325^{a}	15.25^{a}	0.44^{a}
5%	12.25^{a}	0. 190^{a}	13.13^{a}	0. 209^{a}	14.7^{a}	0.310^{a}	15.31^{a}	0.43^{a}
10%	12.47^{a}	0.183^{a}	13.47^{a}	0.195^{a}	14.95^{a}	0.288^{a}	15.22^{a}	0.38^{a}
15%	12.24^{a}	0.107^{b}	13.48^{a}	0.117^{b}	14.66^{a}	0.269^{b}	14.98^{a}	0.31^{b}
20%	12.55^{a}	0.115^{b}	13.55^{a}	0.137^{b}	14.73^{a}	0.267^{b}	15.12^{a}	0.29^{b}

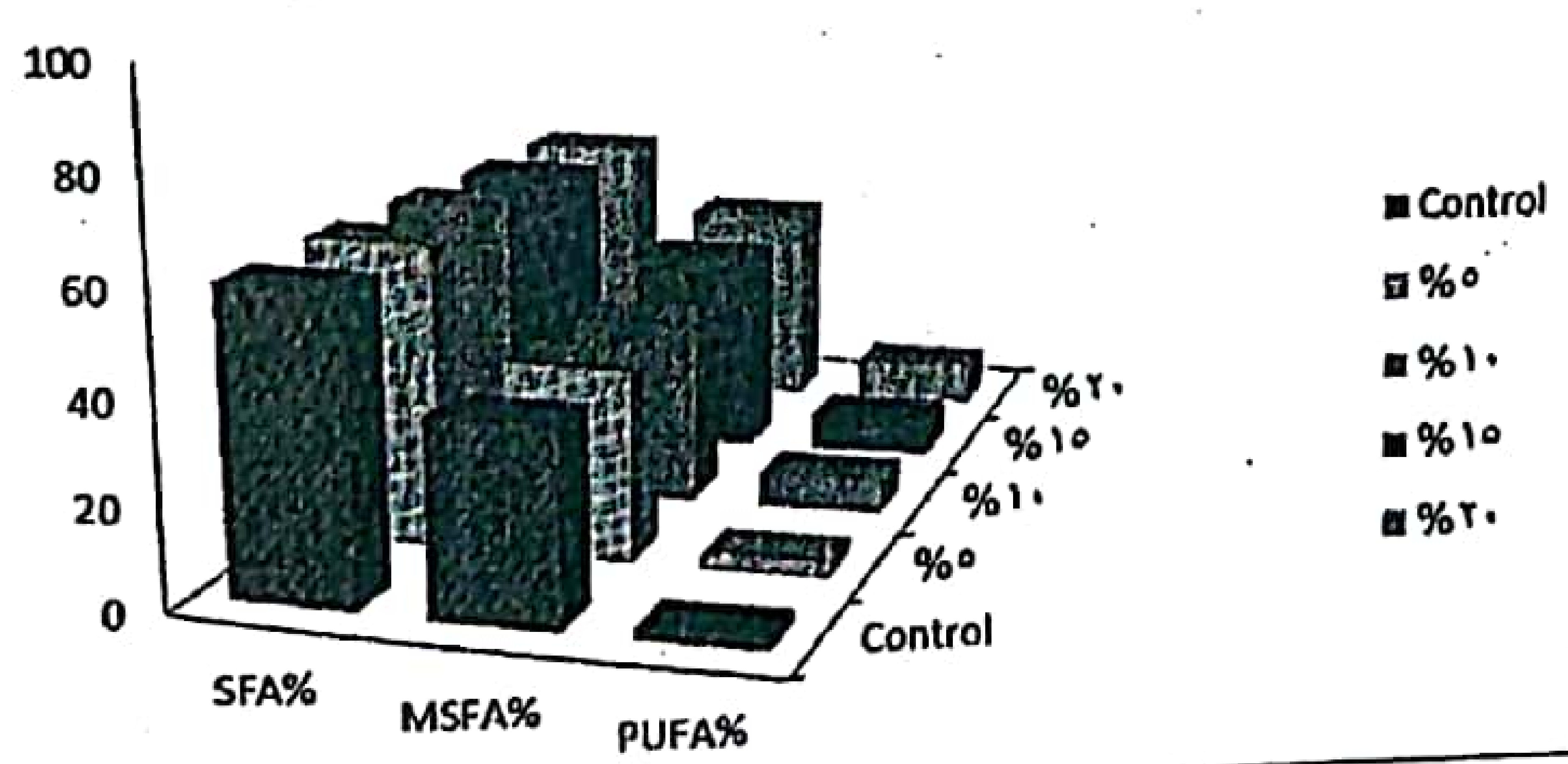
Means with different letters within the same column differ significantly at P□ 0.05.

Table (4): Mean values of Bacterial count in burger groups.

Examined samples	Zero time			1st Month			2nd Month			3rd Month		
	APC	Coli forms	S aureus	APC	Coli forms	S aureus	APC	Coli forms	S aureus	APC	Coli Forms	S aureus
Control	5.2[a]	4.6[a]	NI	4.7[a]	4.0[a]	NI	4.8[a]	3.0[a]	NI	3.6[a]	2.3[a]	NI
5%	5.2[a]	4.3[a]	2.7[a]	4.9[a]	3.8[a]	2.3[a]	4.5[a]	2.9[a]	NI	3.3[a]	2.0[a]	NI
10%	5.3[a]	4.5[a]	2.8[a]	5.1[a]	4.0[a]	2.5[a]	4.8[a]	3.2[a]	NI	3.5[a]	2.2[a]	NI
15%	5.3[a]	4.4[a]	2.9[a]	5.1[a]	4.0[a]	2.6[a]	4.0[a]	3.0[a]	NI	3.4[a]	2.1[a]	NI
20%	5.0[a]	4.5[a]	3.0[a]	4.9[a]	4.0[a]	2.6[a]	4.6[a]	3.3[a]	NI	3.4[a]	2.1[a]	NI

NI: not isolated - Means with different letters within the same column differ significantly at $P \leq 0.05$.

Fig.1: Fatty acid profile of surimi added beef burger



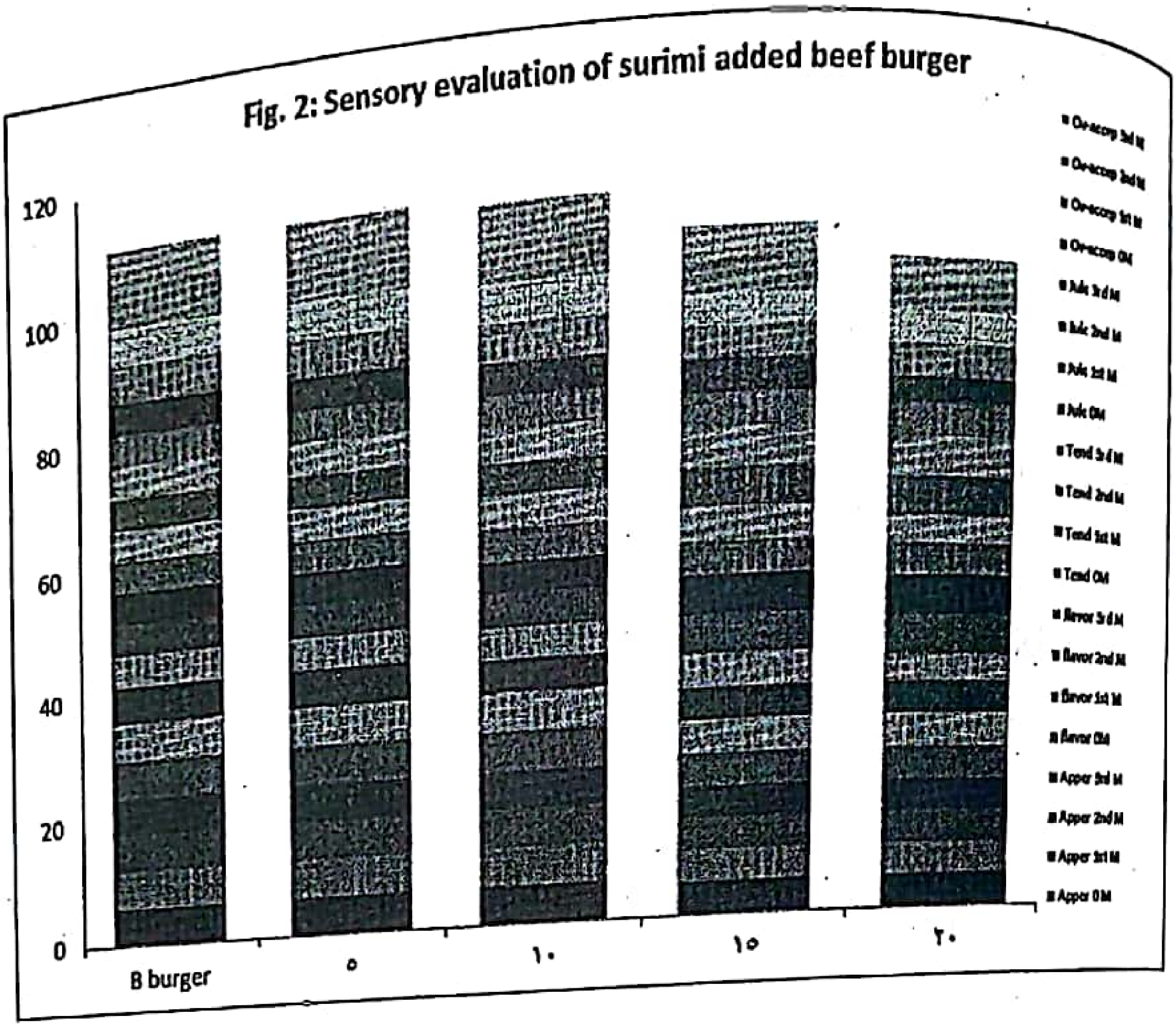


Fig. 2: Sensory evaluation of surimi added beef burger

تقييم إضافة سوريمى مبروك الحشائش في خلطة البيرجر البقرى

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الملخص العربى

يعتبر السوريمى منتج غير معروف لدى المستهلك المصرى بالرغم من فوائده الغذائية والصحية العديدة. على النقيض من ذلك فان استهلاك مصنعات اللحوم التى تحتوى علي نسب عالية من الدهون الحيوانية المشبعة مثل البيرجر البقرى منتشرة بصورة كبيرة خاصة بين الشباب. لذلك تم تصميم هذه التجربة لاستكشاف امكانية إضافة سوريمى مبروك الحشائش في إنتاج البيرجر البقرى من خلال انتاج خمسة مجموعات من البيرجر حسب المواصفات القياسية المصرية لتصنيع البيرجر وإحلال السوريمى محل ٠، ٥، ١٠، ١٥، ٢٠% من اللحم والدهن فى خلطة البيرجر. وأعتبرت المجموعة الأولى هى المجموعة الضابطة وحفظت كل المجموعات بالتجميد (-١٨°م) لمدة ثلاثة اشهر. وفحصت هذه المجاميع للقيمة الغذائية (نسبة الرطوبة، البروتين، الدهن والرماد الكلى)، محتواها من الاحماض الدهنية وذلك بعد التصنيع مباشرة. بالإضافة الى تحليل الخواص الفيزوكيماوية (درجة تركيز ايون الهيدروجين، معدل الفقد اثناء الطبخ، قوة القطع، المواد النيتروجينية الطيارة، حامض الثايوباربيتيوريك)، الفحص البكتري (العدد الكلى للبكتريا الهوائية، العدد الكلى الميكروبات القولونية ، ميكروب العنقود الذهبى) و الفحص الحسى للمظهر العام، النكهة، الطراوة، العصيرية والقبول العام للمنتج. وأجرى الفحص بشكل دورى مرة كل شهر. وقد اظهرت الدراسة ان إضافة السوريمى بنسبة٥ و١٠% لم يحدث فروق معنوية عن المجموعة الضابطة. بينما كانت إضافة السوريمى نسبة ١٥، ٢٠% ذات تأثير معنوى ملحوظ بمقارنتها بالمجموعة الضابطة حيث انخفضت نسبة الدهون فى البيرجر وانخفاض قيمة قوة القطع مما يعنى زيادة طراوة المنتج. وانخفضت قيمة حامض الثايوباربيتيوريك للعينات مع درجة قبول عالية من قبل المتذوقين خلال فترة الحفظ. ولكن لوحظ ارتفاع معنوى في قيمة قوة القطع في الشهر الثالث وقلة الطراوة فى المنتج وذلك يعزى الي حدوث تغيرات فى بروتينات الالياف العضلية للسوريمى كنتيجة لطل فترة التخزين بالتجميد.