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Trials To Improve Quality Of Poultry Meat By Using Chemical Food Additives

Research Article

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Abstract

Poultrymeat is included in food chains to use Part of this important commitment by using food additive Monosodium glutamate, replacement monosodium glutamate with food additive sugar and food additive Sodium chlorideon physical, chemical, bacteriological and sensory properties deep fat fried poultry breast strips during frozen storage for 90 days was examined. Poultry control samples had higher moisture,carbohydrate and ash contents than the poultry treated fried samples, moisture, carbohydrate and ash contents for all treatments and slightly decreased as storage period progressed. Food additives Monosodium glutamate is a sodium salt that is derived from an amino acid called glutamic acid. It's naturally occurring in our bodies and is in a whole bunch of other foods.

The protein and fat contents of deep fat fried poultry breast strips decreased by replacing food additive Monosodium glutamate with a mixture of 1;1 sugar and Sodium chloride. The crude protein content of all treatments slightly increased as storage period progresses, while fat content of all treatments slightly decreased as storage period progressed. Treatment contains mix of sugar and Sodium chloride in ratio of 1:1 as food additives Monosodium glutamate alternative had a higher, WHC, cooking loss, pH and lower TVBN, and TBA values than treatment containing Monosodium glutamate (control). The obtained results also showed that control poultry breast strips had the highest counts of total bacterial count and lowest counts of total coliform count, than other treatment. E. coli and Salmonella were not detected in both treatments until the end of storage period. Adverse reactions could only be possible in people who may have sensitivities and who have consumed food additives Monosodium glutamate.Since a typical serving of food with food additives Monosodium glutamate contains only 0.5 g of food additive Monosodium glutamate, reactions are unlikely following typical meals.

Control poultry breast strips had the lowest counts of total Staph. aureus, yeast and mold and total psychrophilic bacteria counts than other treatments, treatment containing food additive Monosodium glutamate (control) had higher sensory proprieties (color, taste, crispness, odor and acceptability) than that treatment containing food additivesmix of sugar and Sodium chloride as Monosodium glutamate replacer.

Keywords: Food Additive; Frying; pH; TVBN; TBA.

Introduction

Poultry meat is a major component of the human healthy diet worldwide that is low in fat and cholesterol as compared to other meats as well as it is an excellent source of high- quality animal proteins, vitamins, and minerals [48]. In recent years, poultry meat products are considered one of the most products which attract the consumers because they represent quick, easily prepared meat meals with high health benefits and good flavor [56]. Rapid reproductive cycle, high acceptability of poultry meat due to its high biological value, palatability and many production processing variables; made poultry production one of the major worldwide food industry [52]. People have been using food additive Monosodium glutamate to season their food for over 100 years. Some people in Japanese cultures consider food additive Monosodium glutamate, or umami, to be one of the five basic tastes. Many dishes featured in Japanese, Chinese, and South Asian cuisine use food additives Monosodium glutamate, the following food products may also

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contain food additive Monosodium glutamate, frozen meals and processed meats, such as pastrami, sausages, lunch meats, smoked meat products, hamburgers, cold cuts, salami, sauces and dressings, such as ketchup, mayonnaise, barbecue sauce, salad dressing, soy sauce, mustard, soup bases, such as bouillon cubes and granulated powders, snacks, such as potato chips, seasonings, spices, bodybuilding protein powder, fast food, such as poultry nuggets, burgers and fried poultry. The food additiveMonosodium glutamate potentially being harmful to human health noticed palpitations and numbness in his neck, back, and arms after he had eaten Chinese food "Chinese restaurant syndrome." This term is now outdated, and people use the term "Monosodium glutamate symptom complex" instead, symptoms may have been the result of a number of dietary factors including sodium, alcohol, and food additives Monosodium glutamate (Monosodium glutamate as being the main cause). Over the years, people have proposed many different reasons asfood additive Monosodium glutamate may be harmful to human health, food additive Monosodium glutamatecan cause brain damage. The investigators noted that the food additive Monosodium glutamate caused neuronal cell death in several areas of the developing brain. The food additive Monosodium glutamate damaged the hypothalamus, which plays a crucial role in maintaining homeostasis. The effects of humans ingesting small amounts of food additive Monosodium glutamate from food into their gastrointestinal tract. food additive Monosodium glutamate can cause obesity. food additive Monosodium glutamate caused the participants to gain weight even in the absence of processed foods or a lack of physical exercise, this result may be due to the fact that Monosodium glutamate may influence a person to overeat, because Monosodium glutamate makes food taste better, people may be more tempted to overeat. headachses after eating foods containing food additive Monosodium glutamate. there was a link between Monosodium glutamate consumption andcancer risk. Experiencing asthma episodes after eating food additive Monosodium glutamate. Thelink between Monosodium glutamate, diet, and asthma in adults have found correlation between asthma and Monosodium glutamate consumption. some people have reported being hypersensitive to Monosodium glutamate. Monosodium glutamate occurs naturally in food and in the body. Some manufacturers add it to food, such as fast food, to improve flavor. Food additive Monosodium glutamate is safe to eat. Links between food additive Monosodium glutamate and certain health concerns have used amounts of food additive Monosodium glutamate that a person is unlikely to consume as part of a meal. If a person does feel that they have sensitivity to food additives Monosodium glutamate, they can stop eating it. Food allergies, Blood-thinning foods, drinks, and supplements. There are many things people can eat and drink that may help keep the blood thin and reduce the chances of developing dangerous clots. Several major manufacturers have announced to move away from using artificial ingredients and flavors in their products. food additiveMonosodium glutamate is one such ingredient that has been controversial for decades. It is one of the ingredients that some companies have committed to remove from products [38]. Monosodium glutamate is a flavor enhancer commonly added to processed food products like poultry to boost the palatability. Its remarkable effects on the sensory appeal have been proven in various studies [6, 36]. Removal of this ingredient is very likely to cause reduced consumer acceptability. Using food additive Monosodium glutamate substitute is a promising approach to compensate for the sensory satisfaction loss caused by Monosodium glutamate elimination. The flavor enhancement effect of food additive Monosodium glutamate is mainly from glutamate which contributes to umami or savory taste sensation. Besides glutamate, there are several other umami eliciting components such as aspartate and 5'-ribonicleotides. Among nucleotides, inosinate (IMP) and guanylate (GMP) significantly contribute to flavor and taste enhancement [59]. Theoretically, substances that are naturally rich in umami components have the potential to replace food additive Monosodium glutamate in food products. Consumers preferred natural extracts such as yeast extract, mushroom extract, and tomato extract as Monosodium glutamate substitute in poultry products [60].

food additives Sugars may also contribute to umami taste characters in the form of glutamate glycoconjugates [23]. Furthermore, salts of potassium are also responsible to enhance umami taste strength. However, during boiling process, significant levels of potassium leach out from potatoes [7, 61]. Food additiveSodium chloride is an important ingredient added to most of foods which contributes to flavor enhancement and food preservation [10].

Food additive Monosodium glutamate is a flavor enhancer that is found in some processed foods and Chinese cuisine. To avoid this sodium product there are some potential substitutes can be used as substitutes for food additive Monosodium glutamate. Use 1:1 ratio mixture of food additive sugar sugar and food additive Sodium chloride as a substitute ingredient to your recipe instead of Monosodium glutamate. This is safer to use, especially if you have children at home. Monosodium glutamate is a food additive used as a flavor enhancer [36]. The advantage of food additive Monosodium glutamate goes to those who easily lose their appetite. This is a very common ingredient in fast foods and food seasonings. Food additives Monosodium glutamate is actually harmless but too much consumption would cause headaches and this is not good for people who have vertigo (a sensation of spinning) [32]. Currently, there is limited research comparing the enhancement effects of food additive Monosodium glutamate with these natural extracts in food products. Given the capability of salty taste enhancement, food additive Monosodium glutamatesubstitute may also be able to increase the sensory appeal of meat products with reduced Sodium chloride content. Previous study indicated that used of yeast extract successfully enhanced the taste of fermented sausage [9]. Ground mushroom has also been reported to improve the flavor of taco blend [37]. To replacefood additive Monosodium glutamate, it is necessary to conduct more research to compare the performance between Monosodium glutamate and its alternatives infood additive Sodium chloride -reduced food matrix [53].

The aim of the current study was to investigated the effect of replacement food additive Monosodium glutamate with 1:1 ratio mixture of food additive (B) sugar and food additive Sodium chloride on quality properties deep fat fried poultry breast during frozen storage.

Materials And Methods

Materials

Poultry breast 74.33% moisture 20.72% protein, 2.26% fat, 1.18% carbohydrate, 1.18 Ash and pH 5.09, were obtained after 8 h of slaughtering, transferred under cooling conditions to the Labora-

tory and saved in freezer for 3 months until processing.

Methods

Preparation of poultry breast strips: After preparation of poultry breast strips as described (Tables 1 and 2), samples divided into two groups: control group containing food additive (A) Monosodium glutamate (C) and the other containing food additiveMonosodium glutamate substitution (T).

Preparation of marinade solution: The amount of water below 5° Cwas placed in a bag of high density polyethylene, after that the amount of food grade sodium tripolyphosphate (STPP) was dissolved in it, followed by dissolving the food additiveSodium chloride and food additive Monosodium glutamatein the case of control or food additive Monosodium glutamate substitution (a mixture of Sodium chloride and table sugar in a ratio of 1: 1) in the case of treatment and then add spices, antioxidant, and stirring to homogenize the marinade solution. The amount of raw poultry fillet strips was added to previous brine after thawing it for 24 h in the refrigerator and reaching a temperature. The bags were closed and flipped for five minutes and placed in the refrigerator on a temperature.

After one day, the bags were opened and the poultry breast strips were removed from the soaking solution and put on a stainless

Table 1. Poultry meat product.

Marinade formula		
Contents	**Control (C)**	**Monosodium glutamate substitution (T)**
Poultry breast strips	1800 gm.	1800 gm.
Potable water	360 gm.	360 gm.
Sodium tripolyphosphate (STPP)	11.25 gm.	11.25gm.
Monosodium glutamate Purity more than 90%	11.25 gm.	----------
Monosodium glutamatesubstitution (S)	----------	11.25 gm.
Sodium chloride	15 gm.	15 gm.
Spices	22.95 gm.	22.95 gm.
TBHQ antioxident	2.25 gm.	2.25 gm.
* Monosodium glutamate (T): mixtures consist of Sodium chloride and sugar by ratio of 1:1 .		
Spices(onion powder 9gm., garlic powder 9gm., Celery powder 2.25gm., Ginger powder 2.7 gm.		

Table 2. Coated poultry breast.

Coating formula		
Ingredients	**Control (C)**	**Monosodium glutamate(T)**
Product		
Wheat flour	1000 gm.	1000 gm.
Corn starch	259.74 gm.	259.74 gm.
Sodium chloride	38.96 gm.	38.96 gm.
Batter		
Wheat flour	400 gm.	400 gm.
Sodium chloride	7.90 gm.	7.90 gm.
Monosodium glutamate	17.28 gm.	----------
Purity more than 90%		
* Monosodium glutamate	----------	17.28 gm.
substitution (T)		
Corn starch	49.38 gm.	49.38 gm.
Spices**	6.89 gm.	6.89 gm.
*food additive Monosodium glutamate(S) mixture consist of food additive (C) and food additive (B) by ratio of 1:1.		
** Batter spices consist of (garlic powder 2.46 gm., Ginger powder 1.97 gm. and Black pepper powder 2.46 gm..		
Breading		
Wheat flour	1000 gm.	1000 gm.
Corn starch	200 gm.	200 gm.
Sodium chloride	25.4 gm.	25.4 gm.
Sodium bicarbonate	14 gm.	14 gm.

steel net for 5 min to drain excess brine solution, then the increase in the weight of poultry breast acquired from the marinade solution was calculated according to the following formula [50].

% marinade uptake = marinated weight - raw weight/raw weight - 100.

Deep-frying of marinade poultry breast: One and half liters of a mixture of sunflower and soybean oil 1: 1 were placed in an electric fryer and the oil temperature was raised to 186: 188°C, then the marinated and covered poultry breast slices were placed in the oil at a rate of 4 pieces each time and the weight of the piece was approximately 40 g .When the temperature of the poultry breasts reached 74 - 76°C, they were removed from the oil and placed on a stainless steel mesh to get rid of the excess oil from the throwing process in the control sample. In the treatment sample (without Monosodium glutamate), the same previous steps were repeated after getting rid of the frying oil used in the control sample and replacing it with a new oil of the same type of oil. Samples were preserved by freezing until the completion of the tests [39, 50].

Chemical examination: Chemical ingredients Moisture, ash, crude protein, and crude lipids (%)were determined according to the methods recommended by AOAC (2007) [1], while total carbohydrate content was measured by difference.

Bacteriological examination:

Preparation of samples for bacteriological examination: The Ten grams of each sample were homogenized with 90 mL of sterile saline solution (9 g NaCl/ L distilled water). The suspension was shocked by shaker for 5 min to give 0.1 dilutions. Then different dilutions (1: 10-1 to 1: 10-6) were prepared to be used for microbiological examination.

Total bacterial count:

The Total bacterial count was performed as [49].

fungi:

Potato dextrose agar was used for yeast and mold enumeration. Plates were incubated at 25°C for 5 days, according to APHA (1992)[5, 21, 48].

Total Coliform bacteria count:

Violet red bile agar was used for the enumeration of coliforms. Plates were incubated at 37°C for 24 h, according to APHA (1992) [5].

Staphylococcus aureus bacteria:

Staphylococcus aureus test was performed as described in ISO, 4833-1 (2013) "" on page 628 and Shaltout (2022) [48].

Salmonella sppbacteria

Salmonella spp test was performed as described in ISO, 6579 (2004) and Shaltout et al., (2019) [51].

Freshness examination:

pH Value (ES 63/11, 2006):

By using astomacher, approximately 10 g of the examined sample were homogenized with 25 mL of neutral distilled water, and left to stand for 10 min at room temperature with continuous shaking and filtered. The pH was determined by using electrical pH meter (ACTWA-AD1200-1034678) calibration of pH meter by using two buffer solutions of exactly known pH (alkaline pH 7.01, acidic pH 4.01). Therefore, pH electrode was washed with neutralized water and then introduced into the homogenate.

Determination of total volatile basic nitrogen (TVB/N)"mg" %(ES 63/10, 2006):

Ten g of sample were minced in a stomacher for 1-2 min until homogenization. Then in a distillation flask add 2 g of magnesium oxide and 300 mL distilled water to the minced sample. Make distillation and receive 100 mL distillate within 30 min in a beaker contain 25 mL of 2% boric acid. Then titrate against H2SO4 0.1M until faint pink color.

TVN mg/100g = R× 14

Where R is the volume of H_2SO_4 exhausted in titration.

Determination of thiobarbituric acid (TBA)"mg/Kg" (ES 63/9, 2006) and Shaltout (2022):

For detection of TBA number which is expressed as milligrams of malondialdehyde equivalents per kilogram of sample. Ten grams of sample were blended with 48 mL of distilled water, to which 2 mL of 4% of ammonium chloride (to bring's the pH to 1.5) were added in astomacher for 2 min and left at room temperature for 10 min. The mixture was quantitatively transferred into Kjeldahl flasks by washing with additional 50 mL distilled water, followed by an anti-foaming preparation and few glass beads. The Kjeldahl distillation apparatus were assembled and the flask was heated to 50°C. 50 mL distillate was collected in 10 min from the time of boiling commences. The distillate was mixed, and then 5mL was pipette into a glass- stoppard tube. 5mL of TBA reagent (0.2883g/100mL of 90% glacial acetic acid) were added. The tube was stoppered, shacked and immersed in boiling water bath for 35 min.A blank was similarly prepared using 5mL distilled water with 5ml TBA reagent and treated like the sample. After heating, the tube was cooled under tape water for 10 min. A portion was transferred to a curette and the optical density (D) of the sample was read against the blank by means of spectrophotometer (Perkin Elmer, 2380, USA) at a wave length of 538nm.

TBA value (mg malondialdehyde /kg of sample) = D× 7.8

D: the read of sample against blank.

Physical examination:

Water holding capacity (WHC) and plasticity:

The water holding capacity (WHC) and plasticity were measured according to the method described by [57]. A weight of 0.3 g of ground meat was placed under ash less filter paper (Whatman,

No. 41) between tow glass plates (20x20 cm) and pressed for 10 min., using 1 Kg weight. Two zones were measured using the planimeter, the water holding capacity was calculating by subtracting, the area of the internal zone from that of the outer zone. The internal zone represented the plasticity. Results were presented in cm2 per 0.3 g of raw sample.

Cooking loss:

The samples weighing 25-30 g (W1) were packed in plastic tubes. The tubes were then heated at 95°C, until the internal temperature of the samples reaches 75°C. The temperature was checked using thermocouples inserted in the center of the sample. The samples were considered cooked when the internal temperature reached 75°C after cooking, the meat was weighed again (W2) to determine the loss in weight during cooking as described by [33, 48].

Cooking loss (%) = (W1- W2/ W1) x 100

Sensory examination:

Ten experienced panelists made a sensory evaluation of full fried poultry strips.For the following attributes, each panelist was invited to give a numerical value from 0 to 10. Scores extended from 1 to 10 which illustrate dislike extremely to the like extremely, texture, color, odor and crispness [43, 48].

Statistical Analysis:

All data of the present study were subjected to analyses of variance (AVOVA) using software (SAS institute, 1998) [46]. Differences between means were collected by the least significant differences (LSD) at $p< 0.05$.All measurements were carried out in triplicate.

Results And Discussion

Physical, chemical and bacteriological examinations of poultry breast:

The chemical composition of raw poultry breast strips is presented in Table (3). Moisture, protein, fat, carbohydrate and ash contents of raw poultry breast strips were (73.66, 20.72, 2.4, 1.18 and 1.18 g/100g respectively. These results are in agreement with the data obtained by [40, 48], who found that moisture; protein, fat and ash contents of raw poultry breast meat were 75.10, 22.90, 0. 78, and 1.30 g/100g. ,respectively.

The total volatile based nitrogen (TVBV) (mg/100g) and thiobarbituric acid milligrams of malonaldehyde (TBA) mg / kg of raw poultry breast strips were (11.34 mg/100g and 0.24 (MA) / kg), respectively. These results are in agreement with the data obtained by [28].

Data presented in Table 3 showed that the color values (L*, a*, and b*) of poultry strips were 55.6, 3.2 and11.5 respectively. Whilewater holding capacity (WHC) and pH values of raw poultry strips were 44.2 and 5.09 respectively. These results are in agreement with the data obtained by [27, 42, 48].

Total aerobic bacterial, coliform, E. coli, salmonella, staph. Positive coagulase, psychrophilic bacteria and yeast and mold counts of raw poultry breast strips were presented in Table 3. Total aerobic bacterial, coliform, salmonella, staph.aureus, psychrophilic

Table 3. Physical, chemical and bacteriological status of poultry breast.

Constituents	Poultry breast	
Moisture	73.66 ±4.25	
Protein	20.72 ±2.34	
Fat	2.4 ±0.14	
Carbohydrate	1.18 ±0.08	
Ash	1.18 ±0.06	
Total volatile based nitrogen (mg/100g)	11.34 ±1.24	
Thiobarbituric acid(TBA) mg MA/kg	0.24 ±0.08	
Color	L*	55.62 ±3.12
	a*	3.22 ±0.14
	B*	11.57 ±1.22
Water holding capacity(WHC)	44.20 ±2.00	
pH	5.09 ±0.18	
Total aerobic bacterial(cfu/g)	2.6×10^5	
Total coliform(cfu/g)	0.72×10^2	
E.coli(cfu/gm)	ND	
Salmonella detection(cfu/g)	ND	
Staph. aureus(cfu/gm)	0.67×10^2	
Psychrophilic bacteria(cfu/g)	3.3×10^6	
Yeast & Mold(cfu/g)	6.4×10^1	

bacteria and yeast and mold counts were 2.6×10^5, 0.72×10^2, ND, ND, 0.67×10^2 , 3.3×10^6 and 6.4×10^1 respectively. These results are in agreement with the data obtained by [4, 14, 44, 49].

Chemical examination of deep fat fried poultry breast during frozen storage:

Poultry breast samples chemically examined to determine the gross chemical composition and physical properties. It could be noticed that moisture loss of deep fat fried poultry breast strips significantly decreased as a function of storage time for both samples. The control samples had statistically higher moisture contents than the treated fried samples. This could be due to water loss during frying. All coatings provided a beneficial barrier for moisture and preserved samples from moisture loss during storage. The lower water loss for the coated deep fat fried poultry breastmight be due to controlling the loss of water and reducing dehydration. These results were agree with [24, 41, 48].

The crude protein content of deep fat fried poultry breast stripsdecreased by replacingfood additives Monosodium glutamate with a mixture of 1;1 sugar and Sodium chloride this may be due to containing of food additives Monosodium glutamate on amino acids.The crude protein content of all treatments slightly increased as storage period progresses. Freezing storage has been shown to induce protein carboxylation, and the formation of Schiff bases in poultry meat [58]. Freezing storage has impacts on the activities of endogenous proteolytic enzymes responsible for the degradation of meat protein as well as the relaxation of meat tissue structures [20]. Study conducted by [55] revealed increased content of both total and soluble protein in breast meat after 6 weeks of freezing storage. Similar results were observed by [24, 41].

Fat content of poultrybreast died not affecting by replacing. Control samples had the highest fat content than treated samples. The fat content of all treatments slightly decreased as storage period progressed. This decrease of fat content may be explained by the autolysis of lipid [19, 48].

Carbohydrate and ash content were higher in sample containing sugar and Sodium chloride mixture as alternative for Monosodium glutamate. The observed reduction in ash content was probably due to increased meat leakage during the fried process, hence the subsequent increased loss of mineral salts. Chwastowska and Kondratowicz, (2005) [11] also demonstrated the impact of thawing (in atmospheric air and microwave) methods on the ash content of pork meat.

Physical and chemical examinations of deep fat fried poltry breast strips during frozen storage:

From data presented in Table 5. It could be noticed that the pH value of deep fat fried poultry breast strips during frozen storage of both treatments increased as storage period progressed. Treatment contains mix of sugar and Sodium chloride in ratio of 1:1 as MSD alternative had the higher pH values than treatment containing Monosodium glutamate (control sample). These results are in agreement with those obtained by [24, 41]. The slight increase in pH during storage may be due to inhibition of bacterial activity during frozen storage as [8].

The TVBN of both treatments increased as storage period progressed. Treatment containing mix of sugar and Sodium chloride in ratio of 1:1 as MSD alternative had the lower TVBN values than treatment containing Monosodium glutamate (control sample) .The increasing in TVBN value due to the breakdown of nitrogenous substances by microbial activity as reported by [13, 41, 48].

On the other hand, the TBA values of both treatments increased as storage period progressed. Treatment contains mix of food additive sugar and Sodium chloride in ratio of 1:1 asMSD alternative had the lower TBA values than treatment containing food additive Monosodium glutamate (control sample. These results are in agreement with those obtained by [24, 41]. The increasing of TBA value taken place due to lipid oxidation as reported by [18]. However, a high degree of poly unsaturation accelerates oxidative processes leading to deterioration in meat flavor, color, texture and nutritional value [35].

Water holding capacity (WHC) of deep fat fried poultry breast

Table 4. Replacing food additives Monosodium glutamate with mix of food additives sugar and Sodium chloride in ratio of 1:1 on chemical composition of deep fat fried poultry breast strips during frozen storage.

Items		Storage period (day)			
		0	30	60	90
Moisture	C	57.97 ± 1.12^a	57.61 ± 1.20^a	55.57 ± 1.24^a	53.53 ± 1.08^a
	T	58.35 ± 1.08^b	58.06 ± 1.18^b	55.65 ± 1.22^b	55.24 ± 1.14^b
Protein	C	15.24 ± 0.50^a	15.46 ± 0.45^a	15.58 ± 0.52^a	15.52 ± 0.52^a
	T	13.64 ± 0.52^b	13.73 ± 0.48^b	13.85 ± 0.55^b	13.97 ± 0.48^b
Fat	C	10.07 ± 0.16^a	9.63 ± 0.20^a	9.11 ± 0.26^a	8.60 ± 0.18^a
	T	9.04 ± 0.14^b	8.23 ± 0.24^b	7.77 ± 0.28^b	7.32 ± 0.20^b
Carbohydrate	C	14.78 ± 0.66^a	14.36 ± 0.64^a	14.08 ± 0.68^a	13.80 ± 0.58^a
	T	15.87 ± 0.68^b	14.15 ± 0.60^a	13.87 ± 0.70^a	13.60 ± 0.62^a
Ash	C	1.93 ± 0.06^a	1.26 ± 0.09^a	1.21 ± 0.18^a	1.17 ± 0.08^a
	T	2.06 ± 0.08^b	2.00 ± 0.07^b	1.98 ± 0.12^b	1.96 ± 0.06^b

Values (means ±SD) with different superscript letters are statistically significantly different ($p \leq 0.05$).

strips during frozen storage of both treatments decreased as storage period progressed. Treatment contains mix of food additivesugar and food additiveSodium chloride in ratio of 1:1 asfood additives Monosodium glutamatealternative had the higher WHC values than treatment containing food additives Monosodium glutamate (control sample).These results are in agreement with those obtained by [8, 41, 48].

The cooking loss of deep fat fried poultry breast strips increased significantly as storage period progressed for all samples.Treatments containing Monosodium glutamate had the higher cooking loss percentage values than control sample. These results are in agreement with those obtained by [2, 24, 29, 41, 45].

microbiological examination of deep fat fried Poultry breast during frozen storage:

The microbiology examinations of deep fat fried poultry breast strips during frozen storage were examined to determine some microbiological quality and shelf life validity throughout frozen storage. Microbial growth in meat and meat products can result in slime formation, structural components degradation, decrease in water holding capacity, off odors, and texture and appearance changes which reduce their quality, nutritional value and reduce the shelf life [12, 48].

Bacterial count:

Table 6 shows that there were significant differences in viable bacterial count between the control poultry breast strips and other poultry breast strips sample. The results indicated that total bacterial count decreased gradually throughout the storage period until the end of storage period. The obtained results also showed that control poultry breast strips had the highest counts of total bacterial count than other treatment. This might due to the antimicrobial activity of Sodium chloride or sugar [54]. Similar results were reported by [2, 8, 24, 30, 41].

Coliform bacteria:

Table (6) shows the differences in coliform counts. The results indicated that total coliform count decreased gradually throughout the storage period until the end of storage period. The obtained results also showed that control poultry breast strips had the lowest counts of total coliform count than other treatment. Similar results were reported by [8, 24, 41, 45, 49].

E. coli count:

The results presented in Table (6) indicated that total E. coli count did not detect in both treatments until the end of storage period. Similar results were reported by [8, 24, 41, 45, 49].

Salmonella count:

The results presented in Table (6) indicated that Salmonella did not detect in both treatments until the end of storage period. Similar results were reported by [8, 24, 41, 46, 51].

Staph.Aureus bacteria:

Table (6) shows the differences in Staph coagulase counts. The results indicated that total Staph aureus count decreased gradually throughout the storage period until the end of storage period. The obtained results also showed that control poultry breast strips had the lowest counts of total Staph coagulase count than other treatments. Similar results were reported by [8, 24, 41, 45].

Psychrophilic bacteria:

Table (6) shows the differences in psychrophilic bacteria counts. The results indicated that total psychrophilic bacteria count increased gradually throughout the storage period until the end of storage period. The obtained results also showed that control poultry breast strips had the lowest counts of total psychrophilic bacteria than other treatment.Similar results were reported by [8, 24, 41, 45, 48].

Fungal count:

The differences in yeast and mold counts of deep fat fried poultry breast strips during frozen storage are shown in Table 6. The results indicated that total yeast and mold count decreased gradually as the storage period progressed until the end of storage period. The obtained results also showed that control poultry breast strips had the lowest counts of total yeast and mold than other treatment. Similar results were reported by [8, 21, 24, 41, 45].

Table 5. Replacing food additiveMonosodium glutamate with mix of food additivesugar and food additiveSodium chloride in ratio of 1:1 on physical and chemical quality of deep fat fried poultry breast during frozen storage.

Items		Storage period (day)			
		0	30	60	90
pH	C	5.4±0.16^{b}	6.4±0.18^{b}	6.5±0.20^{b}	6.6±0.16^{b}
	T	5.7±0.12^{a}	6.7±0.14^{a}	6.8±0.18^{a}	6.9±0.18^{a}
Total volatile based	C	7.0±0.14^{a}	13.14±1.06^{a}	14.78±1.00^{a}	16.6±1.02^{a}
nitrogen (mg/100g)	T	5.6±0.16^{b}	12.50±1.00^{b}	14.05±1.08^{b}	15.60±1.06^{b}
Thiobarbituric acid	C	0.45±0.01^{a}	2.10±0.02^{a}	2.22±0.04^{a}	2.34±0.03^{a}
(TBA) mg MA/kg	T	0.41±0.02^{b}	1.0±0.03^{b}	1.05±0.02^{b}	1.11±0.04^{b}
WHC Water	C	21.94±1.16^{a}	21.82±1.12^{a}	21.76±1.18^{a}	21.70±1.16^{a}
holding capacity	T	21.98±1.12^{a}	21.90±1.10^{a}	21.86±1.14^{a}	21.83±1.18^{a}

Values (means ±SD) with different superscript letters are statistically significantly different (p≤ 0.05).

Sensory examination of deep fat fried poultry breast strips during frozen storage (-18°C):

Poultry meat is a nutritious food and it is consumed all over the world because of its relatively low cost and low fat content. However, it is highly perishable with a relatively short shelf life even when it is kept under refrigeration. Thus, developing more appropriate technologies for its preservation could be highly useful, in order to increase the shelf life of meat products [13, 34].

Statistical analysis appears a significant difference in sensory evaluation between both samples. Treatment containing Monosodium glutamate (control) had the higher sensory proprieties (color, taste, crispness, odor and acceptability) than that treatment containing mix of sugar and Sodium chlorideas Monosodium glutamate replacer Table 7.

The overall acceptability of deep fat fried poultry breast strips during frozen storage (-18±1°c) were significantly higher in (C), while it was significantly lower in the sample treated with mix of sugar and Sodium chloride as Monosodium glutamate replacer. Statistical analysis appears a significant difference in overall acceptability between both samples. These results are in agreement with those obtained by [3, 8, 13, 24, 41, 45].

Attempts to improve the quality of poultry products using food additives

Summary

The effect of replacing MSG with a 1:1 mixture of sugar and salt on the physicochemical, microbiological and sensory properties of fried chicken breast fillets during freezing storage (-18 ± 1°C) for 90 days was studied. The results showed that the control samples containing MSG contained a higher percentage of moisture, carbohydrates and ash than the fried samples treated, and the

Table 6. Replacing food additive Monosodium glutamate with mix of food additive sugar and food additive Sodium chloride in ratio of 1:1 on microbiological quality of deep fat fried poultry breast strips during frozen storage.

Viable count(cfu/g)		Storage period (day)			
		0	30	60	90
T B C	C	2.95×10^{1}	<10	<10	<10
Total Bacterial count	T	4.59×10^{1}	<10	<10	<10
T C C	C	0.51×10^{1}	<10	<10	<10
Total coliform count	T	0.80×10^{1}	0.59×10^{1}	0.42×10^{1}	<10
E. coli	C	ND	ND	ND	ND
	T	ND	ND	ND	ND
Salmonella detection	C	ND	ND	ND	ND
	T	ND	ND	ND	ND
Staph aureus	C	0.57×10^{1}	<10	<10	<10
	T	0.72×10^{1}	0.50×10^{1}	0.30×10^{1}	<10
Psychrophilic bacteria	C	3.74×10^{2}	1.34×10^{4}	1.14×10^{4}	0.51×10^{4}
	T	3.69×10^{3}	2.52×10^{4}	2.46×10^{4}	2.40×10^{4}
fingi	C	2.51×10^{1}	<10	<10	<10
	T	6.13×10^{1}	<10	<10	<10

Table 7. The effect of replacingfood additive Monosodium glutamate with mix of food additive sugar and food additive Sodium chloride in ratio of 1:1 on sensory evaluation of deep fat fried poultry breast strips during frozen storage.

Parameters		Value
Color (10)	C	8.41 ± 0.16^{a}
	T	8.08 ± 0.18^{b}
Taste (10)	C	8.0 ± 0.22^{a}
	T	7.83 ± 0.26^{b}
Crispness (10)	C	8.08 ± 0.14^{a}
	T	7.66 ± 0.22^{b}
Odor (10)	C	8.0 ± 0.26^{a}
	T	7.25 ± 0.20^{b}
Acceptability	C	8.12 ± 0.30^{a}
	T	7.85 ± 0.34^{b}

Values (means ±SD) with different superscript letters are statistically significantly different ($p \leq 0.05$).

moisture, carbohydrates and ash contents decreased in all treatments with the progression of the storage period. The content of crude protein and fat decreased in fried chicken breast slices as a result of replacing monosodium glutamate with a mixture of 1, 1 sugar and salt. The content of crude protein increased in all treatments with the progression of the storage period, while the fat content decreased in all treatments with the progression of the storage period. The treatment containing a mixture of sugar and salt in a ratio of 1:1 as a substitute for MSG had the highest values in water holding capacity and losses during hydrogen cooking and the lowest values in total volatile nitrogen and thiobarbituric acid values compared to the treatment containing monosodium glutamate (control sample) as the results showed. It was found that the control chicken breast strips contained higher numbers of total bacteria and less coliform bacteria compared to the other treatment. E was not detected. coli and salmonella in both treatments until the end of the storage period. Control chicken breast fillets had the lowest total staph count. aureus, yeasts, fungi and cryophilic bacteria compared to the other treatment. The treatment containing MSG (control) had higher sensory properties (colour, taste, crunch, aroma, and acceptability) than the treatment containing a mixture of sugar and salt as an alternative to MSG.

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