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Quality of Traditional Egyptian Luncheon(Emulsion Type Sausage)

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Abstract: Investigation of 800 traditional Egyptian beef luncheon samples (emulsion type sausage) produced by eight different meat processing plants (100 samples each) were collected from different production lots.Sensory, physiochemicaland bacteriological analyses for all investigating samples of Egyptian luncheon.The finding of sensory panel analysis of Traditional Egyptian luncheon showed that all investigated samples had generally low mean values regardless the processing plants. Moreover, all investigated samples which had generally low sensory panel scores with slightly significant difference ($p<0.05$) between products by the different processing plants. There were significant differences ($p<0.05$) in sensory panel scores in samples produced by different processing plants.The mean value of proximate chemical composition showed that the moisture and protein were 63.386±0.83 and 12.46±0.21 respectively.There were significant differences between mean values of the different processing plants. Data of Egyptian luncheon sausage produced by different processing plants showed slight significant difference between mean values of pH, TBA and TVBN with the highest mean value were recorded in samples of VIII processing plant (7.172, 1.998 and 13.4 respectively). Bacteriological analysis showed a significant differences between mean values of the different processing plants except for anaerobicbacteria and Lipolytic count.
Key words: Egyptianluncheon, Emulsion Type Sausage, Quality of luncheon.

Introduction

Emulsions are among the widely consumed foods all over the world. Meat emulsions gain its importance based on their wide consumption as value added food items, ranged from highly valued liver sausages up to low cost sausages and bologna. Meat emulsion is a complex systems in which fat is emulsified into a viscous fluid composed of solubilized myofibrillar proteins specially myosin. Emulsion type meat products possess a diversity of physicochemical and sensory quality attributes due to the variety of ingredients and processing conditions[1]. Traditional Egyptian luncheon is one of the most common emulsion type product in Egypt gaining its popularity because it represents quick easily preparedmeat meals and solve the problem of the shortage in fresh meat of high price [2].

Good emulsion-type sausages is processed using high quality skeletal musclesalone, which ultimately increases the cost of the final product. Therefore, some offal meat e.g. heart can be incorporated in order to reduce the cost [3,4]. Moreover,mechanically recovered meat constitutes a suitable raw material for the formulation of many meat products including emulsion type sausages [5,6]due to its good nutritional and functional properties.

Most of meat processors in Egypt illegally replace beef meat partially or totally with MRPM in meat products to reduce products cost[7]**,** which ultimately deteriorates the sensory quality of the finished products beside its high microbial load[8]which resulted in products with short shelf life [9,10]**.**Therefore, the study concerned with investigation of different quality attributes of one of the most popular Egyptian meat products produced by different processing plants.

Material and methods

A total of 800 traditional Egyptian beef luncheon samples (emulsion type sausage) produced byeight different meat processing plants (100 samples each) were collected from different production lots. Each sample was represented by three packages from the same production date. Samples were immediately transferred to the laboratory of Food Hygiene Department, Faculty of Veterinary Medicine, Cairo University, then kept at 4°C till investigation.

Sensory examination

Sensory analysis was performed following the guidelines of [11]. Fifty semi-experienced panelists (from both sexes in the age range of 30 to 45 years) were chosen from the staff members and post-graduate students of the Department of Food Hygiene and Control at Faculty of Veterinary Medicine, Cairo University, Egypt. Panelists were selected on the basis of their previous experience in evaluation of Egyptian luncheon. Before sensory analyses all panelists received a preparatory session related to descriptive sensory attributes including color, flavor, juiciness, binding, texture, emulsion and overall acceptability of Egyptian luncheon. Sensory examination was carried out under controlled conditions in special room with controlled temperature, free from noise and odor with adequate lightening. Tap water was provided between samples to cleanse the palate. Each panelist evaluated three replicates of all samples (sliced and non-sliced samples were available) in a randomized order and asked to assigns a numerical value between 1 and 9 for the investigated attributes, where 9 denote extremely acceptable and 1 denotes extremely unacceptable. Non-sliced pastirma was sliced before serving.

Proximate chemical analysis

Moisture, protein, fat and ash contents (g % sample) of Egyptian luncheon from the each processing plants s were determined for each replicate according to the method of [12]. For determination of moisture contents, 3 g of sample were dried at 100ºC until constant weight was obtained. Protein content was determined according to the kjeldahl method. Fat was determined by 6-cycle extraction with petroleum ether in a Soxhlet apparatus, and ash was determined by ignition at 500 C for 5 hours.

Measurement of pH value

Five grams from the sample was homogenized with 20 ml distilled water for 10-15 seconds, and the pH of the slurry was measured using digital pH meter (LovibondSenso Direct) with a probe type electrode (Senso Direct Type 330) where 3 reading of each sample were obtained and the average was calculated. The meter was calibrated every two samples using two buffers 7.0 and 4.0.

Determination of Thiobarbituric Reactive Substances (TBARS)

Five grams from the homogenized luncheon sample was homogenized with 15 ml distilled water using a lab blender stomacher (Lab blender 400) for 10 seconds at the highest speed. After that one ml from the homogenate was mixed with 50 Ml butylated hydroxyanisole (7.2%) and 1 ml each of 15mM 2-thiobarbituric acid and 15% trichloroacetic acid. The mixture was vortexed, incubated in a boiling water bath for 15 minutes to develop color, then cooled under running water for 10 minutes, vortexed again, and centrifuged for 15 minutes at 2500 rpm. The absorbance of the resulting supernatant was measured at 531 nm using Unico 1200 (USA) series spectrophotometer against a blank (1ml of deionized water and 2ml of 2-thiobarbituric acid trichloroacetic acid solution). The reading was multiplied by 7.8 to obtain the value of TBARS expressed as milligrams of malonaldehyde per kilogram of sample [13].

Determination of Total Volatile Base Nitrogen (TVBN)

Tens grams luncheon sample was macerated with 100ml tap water and washed into distilling flask with 200ml tap water, then 3 grams magnesium oxide was added. A macro-Kjeldahl distillation apparatus connected to the distillation flask (containing 25 ml of 2% boric acid and few drops of methyl-red indicator) was operated with the receiving tube dipped below the liquid till collection of 200ml. TVBN (mg/100 gm sample) calculated as the titration multiply by (14) [14].

Bacteriological examination

A 10 g from each luncheon sample were homogenized with 90 mL of sterile 1/4 strength Ringer's solution (Oxoid BR 52) for 2 minutes in a stomacher bag under aseptic conditions using stomacher (Lab blender 400, Sweard lab. Model No. AB 6021). Ten-fold decimal dilutions were prepared using the same diluent **[15]**. A 0.1 ml portion from each dilution was spread in duplicates onto Plate Count Agar (Merck) and incubated at 35ºC for 48 hours for enumeration of Total aerobic mesophilic bacteria **[16]**and at 7ºC for week for enumeration of psychotropic bacteria**[17]**. Mesophilic anaerobic bacterial count was performed using Reinforced Clostridial Medium "RCM" (oxoid, CM 149). Inoculated plates over lodged with an additional layer of about 10 ml of melted RCM (50-55ºC) then incubated anaerobically using anaerobic jar and kit at 35ºc for 72 hours while **[18]**. Skim milk agar plates (Defico, 232100) incubated at 30ºC for 48 hours were used for enumeration of proteolytic bacteria. After incubation, plates were flooded with 1% Hcl for 1 minute, then excess was poured and colonies that were surrounded by zones were counted **[19]**. For lipolytic bacteria, tributyrin agar plates (Oxoid PM 4) incubated at 30ºC for 3 days was used. Lipolytic bacteria on tributyrin agar were detected by transparent zones surrounded the colonies on an opaque background of the media **[20]**. All bacterial counts were expressed as colony-forming units per gram (CFU g^{-1}) of sample used for

Statistical analysis

The values given in each treatment are the mean values from three replicate. Mean ± standard errors (SE) were calculated. Data were subjected to analysis of variance (ANOVA). Comparison of means was carried out by Duncan's multiple-range test and significance was considered at $p<0.05$. Analysis was performed using a SPSS package (SPSS 19.0 for Windows, SPSS Inc, Chicago, IL, USA).

Result and Discussion

Table (1): Sensory panel scores of Egyptian luncheon sausage produced by processing plants(mean ± SE).

	Color	Flavor	Juiciness	Binding	Texture	Emulsion	Overall acceptability
I	1.8^{a}±0.39	1.7^{a}±0.23	1.33^{a}±0.091	1.1^{a}±0.10	1.37^{a}±0.19	1.23^{a}±0.14	1.47^{a}±0.15
II	2.4^{a}±0.19	2.1^{ab}±0.10	1.47^{a}±0.034	$1.2^{a,b}$±0.20	$1.83^{a,b}$±0.11	1.3^{a}±0.20	1.57^{a}±0.14
III	$4.168^{b,c}$±0.29	3.70^{c}±0.33	$3.2^{b,c}$±0.31	4.17^{c}±0.15	3.39^{c}±0.32	$3.73^{b,c}$±0.16	3.85^{c}±0.19
IV	3.702^{b}±0.52	$3.4^{b,c}$±0.68	$2.8^{b,c}$±0.64	2.8^{bc}±0.67	3.07^{c}±0.61	$3^{b,c}$±0.67	2.37^{b}±0.29
V	5.1^{c}±0.54	4.52^{c}±0.64	4.5^{d}±0.38	4.33^{c}±0.78	4.67^{d}±0.42	4.1^{c}±0.69	5.17^{d}±0.077
VI	$3.866^{b,c}$±0.34	$3.034^{a,b,c}$±0.33	$2.234^{a,b}$±0.37	$2.73^{b,c}$±0.41	$2.97^{b,c}$±0.27	2.5^{ab}±0.40	2.56^{b}±0.15
VII	$4.234^{b,c}$±0.35	4.034^{c}±0.43	$3.2^{b,c}$±0.51	4.2^{c}±0.48	$3.9^{c,d}$±0.37	$3.83^{b,c}$±0.45	3.91^{c}±0.39
VIII	$4.868^{b,c}$±0.58	4.3^{c}±0.75	$3.77^{c,d}$±0.54	4.3^{c}±0.83	$4.0^{c,d}$±0.61	$3.97^{b,c}$±0.64	4.91^{d}±0.09

***a-d: Means with different superscripts differ significantly at p<0.05.**

Data of sensory panel analysis of Traditional Egyptian luncheon showed that all investigated samples had generally low mean values regardless the processing plants. Moreover, there were significant differences ($p<0.05$) between different processing plants in all investigated sensory attributes. Sensory panel analysis clearly indicated that investigated samples had slightly accepted (>4.5) to unaccepted (<4.50) color scores with variations in the degree and intensity of color. Binding was a common problem in all investigated samples which had generally low sensory panel scores with slightly significant difference ($p<0.05$) between products by the different processing plants (Table 1).

Texture of all investigated samples had generally unacceptably low sensory panel scores. Moreover, there were significant differences ($p<0.05$) in sensory panel scores in samples produced by different processing plants. [21]showed that incorporation of mechanically deboned chicken meat with a significant percentage in processed meat results in poor texture. The eating quality characteristics (flavor, juiciness and overall acceptability) of investigated products scored moderate scores of 4.52, 4.50 and 5.17, respectively with significant differences ($p<0.05$) between different processing plants.

Table (2): Proximate chemical composition (%) of Egyptian luncheon sausage produced by processing plants (mean ± SE).

	Moisture	protein	Fat	Ash
I	47.747^{a} ±1.28	5.81^{a}±0.23	7.78^{a}±1.69	3.541^{a}±0.335
II	47.68^{a}±2.45	5.6^{a}±0.44	7.29^{a}±2.04	3.607^{a}±0.201
III	63.386^{c}±0.839	12.46^{e}±0.21	7.75^{a}±1.38	3.136^{a}±0.044
IV	57.91^{b}±2.041	11.27^{d}±0.51	7.54^{a}±1.29	5.677^{a}±1.319
V	52.16^{a}±1.16	8.24^{b}±0.14	7.84^{a}±0.75	3.381^{a}±0.152
VI	52.34^{a}±2.86	9.52^{c}±0.17	10.69^{a}±0.87	6.545^{a}±3.838
VII	$58.45^{b,c}$±1.25	6^{a}±0.0	8.57^{a}±1.48	2.943^{a}±0.078
VIII	57.72^{b}±0.43	6^{a}±0.0	6.84^{a}±0.63	2.940^{a}±0.059

***a-e: Means with different superscripts differ significantly at p<0.05.**

The mean value of proximate chemical composition showed that the moisture and protein were 63.386±0.83 and 12.46±0.21, respectively. There were significant differences between mean values of the different processing plants (table 2) that may be due to the variation in type and level of extenders and fillers used [22]. High ash contents were noticed in all investigated samples. Ash content exceeded the permissible limit stated by the Egyptian Standard Specification [23]which indicated addition of high carbohydrate [7]and orhigh amount of mechanically recovered poultry meat which could be correlated with high bone content [24].

Table (3): pH, TBA and TVBN in Egyptian luncheon sausage produced by processing plants(mean ± SE).

	PH	TBA	TVBN
I	5.84^{a}±0.36	$0.699^{a,b}$±0.30	$8.408^{a,b,c}$±0.87
II	$6.28^{a,b}$±0.037	1.915^{b}±0.59	$7.112^{a,b}$±1.38
III	$6.44^{b,c}$±0.05	0.386^{a}±0.07	$9.8^{b,c}$±1.39
IV	6.48^{bc}±0.048	$0.56^{a,b}$±0.04	$8.12^{a,b,c}$±0.93
V	6.362^{b}±0.237	$0.532^{a,b}$±0.12	5.7^{a}±0.71
VI	$6.14^{a,b}$±0.068	0.294^{a}±0.058	$7.7^{a,b}$±0.91
VII	$6.88^{c,d}$±0.073	$0.906^{a,b}$±0.48	$11.04^{c,d}$±0.95
VIII	7.172^{d}±0.105	1.998^{b}±1.03	13.4^{d}±0.6

***a-d: Means with different superscripts differ significantly at p<0.05.**

Data of Egyptian luncheon sausage produced by different processing plants showed slight significant difference between mean values of pH, TBA and TVBN with the highest mean value were recorded in samples of VIII processing plant (7.172, 1.998and 13.4respectively). The results agree with that of [25]who found that the pH values of the luncheon meat ranged from 5.0 to 7.5.High value of TBA may be due to incorporation of mechanically deboned meat which contributes to a high phospholipid content, because the phospholipid fraction of the lipid has been shown to contribute approximately 90% of the TBA-reactive substances in chicken fat [26].Also the presence of bone marrow that contributes high levels of copper, iron and magnesium. These metals act as catalysts in the oxidation of lipids[27]. The values of TVBN were in the permissible level reported by **Egyptian Organization Standardization** [23]which limited the content of TVN value in meat products to not more than 20 mg/ 100g [28].

Table (4): Bacterial counts (log_{10} CFU/g) of Egyptian luncheon sausage produced by processing plants (mean ± SE).

	APC	Anaerobic bacterial count	Psychrotroph	Proteolytic	Lipolytic
I	$1.84^{a,b}$±0.51	$<2.00^{a}$ ±0.0	$2.67^{a,b}$±0.22	2.86^{b}±0.19	1.52^{a} ±0.64
II	$3.29^{a,b,c}$±0.93	$<2.00^{a}$±0.0	$2.50^{a,b}$±0.83	3.7^{b}±0.52	2.98^{a} ±0.41
III	$2.69^{a,b,c}$±0.70	$<2.00^{a}$ ±0.0	3.33^{b}±0.36	$1.99^{a,b}$±0.51	2.46^{a} ±0.62
IV	1.37^{a}±0.57	$<2.00^{a}$ ±0.0	$2.26^{a,b}$±0.58	3.32^{b}±0.33	1.51^{a} ±0.64
V	$1.86^{a,b}$±0.47	1.55^{a} ±0.65	$1.86^{a,b}$±0.76	$1.55^{a,b}$±0.65	1.43^{a} ±0.89
VI	1.66^{a}±0.42	0.56^{a} ±0.55	$2.49^{a,b}$±0.24	0.4^{a}±0.4	1.35^{a} ±0.57
VII	4.33^{c}±0.68	$<2.00^{a}$±0.0	0.77^{a}±0.77	3.22^{b}±1.17	1.26^{a}±0.77
VIII	$3.78^{b,c}$±0.57	1.12^{a} ±1.1	3.19^{b}±0.88	$2.17^{a,b}$±1.33	2.66^{a}±0.42

***a-c: Means with different superscripts differ significantly at p<0.05.**

Data of bacteriological analysis showed a significant differences between mean values of the different processing plants except for anaerobic bacteria and Lipolytic count (Table 4).The generally low bacterial counts may be due to heat treatment or preservative added. This finding agree with [29] found that the incipient spoilage of meat and meat products (off odour, slime starts and off flavors occurs when the aerobic mesophilic counton meat reaches 7 log cfu/g.[30,31,32,33,34,35]

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