Research Regarding Dynamics of Chemical Content from Pasteurized Egg Melange Stored in Polyethylene Type Packings

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In the current paper, we aimed to analyze the way in which packing (different polyethylene types) influence the quality of pasteurized melange during storage, packing being realized in units of 1 kg (Tetra Pak) (batch Lexp-1) and units of 5 kg (Bag in box) (batch Lexp-2). Products were stored during a period of 28 days at a temperature of +4°C, qualitative determinations being realized in first day (day 0), at 7 days, at 14 days, 21 days and in day 28 of storage. Were effectuated a sensorial examination and chemical analysis were was established the content in dry matter (%), water (%), proteins (%), content in essential amino acids (isoleucine, methionine, tryptophan, phenylalanine) and non-essential amino acids (alanine, histidine, glycine, serine) (mg/100g) as well as the content in lipids (%) establishing their profile by identification of some saturated fatty acids (16:0 mg/100g and 18:0 mg/100g) and unsaturated fatty acids (16:1 mg/100g and 18:1 mg/100g). After sensorial examinations, the first modifications were observed at the checking effectuated in day 21 for batch Lexp-2, the obtained score being of 18 points, and at checking effectuated in day 28 was given a score of 18 points for melange belonging to batch Lexp-1 and only 14 points for melange from batch Lexp-2. Differences were recorded also in case of chemical composition of products, so for protein content at batch Lexp-1 in first checking day was obtained a mean of 12.730±0.24% and at batch Lexp-2 12.614±0.22%. Differences between those two batches were insignificant ($p<0.05$). In case of fat content, at the end of storage period was obtained a mean of 11.256±0.06% for batch Lexp-1 and 11.244±0.11% for batch Lexp-2, differences being insignificant ($p < 0.05$). Regarding the profile of amino acids and fatty acids, the mean values obtained during whole storage period oscillated from one stage to another, but the differences between those two batches were insignificant ($p < 0.05$). Pasteurized egg melange suffers certain sensorial modifications during storage, especially on consistency and colouring, modifications which are accentuated mainly by storage conditions. Type of polyethylene utilized for this product hadn't influenced the nutritive qualities of product

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Advances in food processing and food packaging play a primary role in keeping the U.S. food supply among the safest in the world. Simply stated, packaging maintains the benefits of food processing after the process is complete, enabling foods to travel safely for long distances from their point of origin and still be wholesome at the time of consumption. However, packaging technology must balance food protection with other issues, including energy and material costs, heightened social and environmental consciousness, and strict regulations on pollutants and disposal of municipal solid waste [1].

The principal roles of food packaging are to protect food products from outside influences and damage, to contain the food, and to provide consumers with ingredient and nutritional information [2].

Eggs have been classified as nature's original functional food [3-7]. Eggs are one of the most complete foods for human consumption because they are rich in vitamins, minerals, fatty acids, and proteins that provide several essential amino acids of excellent biological value [8-12].

In case of eggs sold in shell, even if were tested several preservation methods, the best results were obtained by refrigeration, method utilized, nowadays, in majority of world's avian units [13, 14].

Even if proved its efficiency in time, storage of eggs in refrigeration conditions could generate severe problems, mostly when aren't respected storage conditions (especially thermal level), delivery conditions (refrigerated eggs must be gradually warmed) or quality conditions of eggs subjected to refrigeration (dirty eggs, with broken shell, stale etc.) [15-18].

In the food industry, egg products (dried pasteurized egg, pasteurized egg) are used preferentially rather than fresh eggs (shell eggs), because in addition to retaining flavor, color, nutritional value, and functional properties, they offer advantages such as better uniformity, less storage space, and ease of portion measurement [19, 20].

Also by pasteurization process is destroyed a great part of microbial charge, *Salmonella enterica sevor Enteritis* being the pathogen bacteria which could generate severe infections among consumers, egg being the most common product which could caused this contamination [21-23].

The term *Egg Products* refers to processed or convenience forms of eggs obtained by breaking and processing shell eggs. Egg products include whole eggs, egg whites, and egg yolks in frozen, refrigerated liquid, and dried forms available in a number of different product formulations, as well as specialty egg products.

In recent years, food industry prefers broken and pasteurized eggs for use as liquid whole egg, liquid white and liquid yolk [24, 25].

Package design and construction plays a significant role in determining the shelf life of a food product. The right selection of packaging materials and technologies maintains product quality and freshness during distribution and storage [26, 27].

Egg pasteurized products are sold in plastic bottles (PET), in Tetra Pak boxes or in packing units type Bag in box, all of those being on the market in different quantities.

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Plastics are made by condensation polymerization (poly-condensation) or addition polymerization (poly-addition) of monomer units. In poly-condensation, the polymer chain grows by condensation reactions between molecules and is accompanied by formation of low molecular weight by-products such as water and methanol [28, 29].

There are two major categories of plastics: thermosets and thermoplastics [30]. Thermosets are polymers that solidify or set irreversibly when heated and cannot be remolded. Because they are strong and durable, they tend to be used primarily in automobiles and construction applications such as adhesives and coatings, not in food packaging applications. On the other hand, thermoplastics are polymers that soften upon exposure to heat and return to their original condition at room temperature. Because thermoplastics can easily be shaped and molded into various products such as bottles, jugs, and plastic films, they are ideal for food packaging [31, 32].

Polyolefin is a collective term for polyethylene and polypropylene, the two most widely used plastics in food packaging, and other less popular olefin polymers. Both polyethylene and polypropylene possess a successful combination of properties, including flexibility, strength, lightness, stability, moisture and chemical resistance, and easy processing, and are well suited for recycling and reuse. The simplest and most inexpensive plastic made by addition polymerization of ethylene is polyethylene. There are two basic categories of polyethylene: high density and low density. High-density polyethylene is stiff, strong, tough, resistant to chemicals and moisture, permeable to gas, easy to process, and easy to form. Low-density polyethylene is flexible, strong, tough, easy to seal, and resistant to moisture. Because low-density polyethylene is relatively transparent, it is predominately used in film applications and in applications where heat sealing is necessary [33].

So, in the current paper we aimed to analyze the influence of polyethylene type, utilized in packing, on the pasteurized and packed egg melange during storage.

Experimental part

Material and method

Biological material was represented by pasteurized egg melange (without additives and preservatives) packed in units of 1 kg (Tetra Pak) (batch Lexp-1) and units of 5 kg (Bag in box) (batch Lexp-2). Products were achieved directly from the producer in the processing day (5 pieces Tetra Pak and 5 pieces Bag in box) and stored during 28 days at a temperature of +4°C. Qualitative determinations were realized in the first day (day 0), at 7 days, at 14 days, 21 days and in day 28 of storage. We mention the fact that at each qualitative check stages were unwrapped new packs.

Were tracked the sensorial characteristics of product (500mL/batch/check), and were analyzed the evolution of aspect, consistency, smell and taste. Sensorial characteristics were determined based on scale points system, characterized by the fact that for each feature are established 6 quality levels, mark 0 being given to a product with severe modifications or even altered. At each check stage were gathered samples from those two products and were given to team formed by five members. Appreciation of samples' sensorial features was realized by comparing with the existent standard quality conditions [34].

Quality chemical indicators (500mL/lot/check), were determined on dried product, melange being dehydrated at 60°C in a forced airflow incubator, Memmert IFE 500 model, for 48 hours. On dried product were made analysis to determine content in dry matter (%), water (%), proteins (%) (total nitrogen) establishing also the content in essential amino acids (isoleucine, methionine, tryptophan, phenylalanine) and non-essential amino acids (alanine, histidine, glycine, serine) (mg/100g) as well as content of lipids (%) establishing also their profile by identification of some saturated fatty acids (16:0 mg/100g and 18:0 mg/100g) and non-saturated fatty acids (16:1 mg/100g and 18:1 mg/100g).

Water content (W%) was established as difference in according with the formula: Water (%) = 100% – DM(%) [35, 36].

Content in dry matter (DM%) was established through AOAC no. 952.30 method [37] which is based on pre-dried eggs by dehydration in a Memmert UFE 700 forced air oven at 100°C.

Crude protein (CP%) resulted from total nitrogen content assessment via the Kjeldahl method, applied on a Velp Scientifica DK 6 digestion and UDK 7 distillation system, according to AOAC no. 925.31 method [38].

Quantitative determination of amino acids was effectuated using the method described in literature [39] and using high performance amino acid analyzer for the separation of amino acids, while tryptophan was colourimetrically determinate according to the method described also in literature [40].

Total lipids as crude fat (CF) content was determined by AOAC method no 925.32 [41], using a Velp Scientifica Soxhlet SER 148 extractor.

Fatty acids was established through AOAC no. 971.11 [42] method with GC Carlo Erba 5300 mega series Gas-chromatograph and a sample chromatogram with resulting fatty acid.

Collected data were subjected to statistical computation, using the ANOVA one-way algorithm included in MsExcel, to calculate the descriptive statistics (mean, standard error) and find out whether there were significant differences and upgraded with PostHoc Daniel's XL Toolbox version 4.01 (http://xltoolbox.sf.net), to identify the differences [43].

Results and discussions

In table 1 are presented the results of sensorial examination realized on pasteurized melange and wrapped in different polyethylene types. Analysis effectuated on fresh products (day 0) and after that at 7 days and 14 storage days didn't show modifications of the tracked parameters, each batch being appreciated with the maximum score (20 points), being as a homogenous paste, with agglomerations and foreigner bodies; smell and taste being characteristically pleasant.

The first modification were observed in day 21 of checking and in day 28 was obtained a score of 18 points for product belonging to batch Lexp-1 and only 14 points for product from batch Lexp-2.

To determine crude chemical composition was necessary to establish content in water (%) in dry matter (%) (table 1).

Regarding water content (%) the mean values calculated by us enlightened a slow decreasing from one check stage to another for each studied batch, differences between batches being insignificant during whole period. So, at batch Lexp-1 in day 0 of checking was obtained a mean value of 75.312±0.02% with a minimum of 75.25% while the maximum value was 75.39%. The studied character presented a very good homogeneity, value of variation coefficient being of only 0.069%. For batch Lexp-

Table 1
SENSORIAL CHARACTERISTICS OF PASTEURIZED MELANGE

Period (days)	Analyzed assortment	Experimental batch	Sensorial characteristics and obtained score				
			Aspect	Consistency	Smell and taste	Color	Total number of points
0	Melange	Lexp-1	5	5	5	5	20
		Lexp-2	5	5	5	5	20
7	Melange	Lexp-1	5	5	5	5	20
		Lexp-2	5	5	5	5	20
14	Melange	Lexp-1	5	5	5	5	20
		Lexp-2	5	5	5	5	20
21	Melange	Lexp-1	5	5	5	5	20
		Lexp-2	4	5	4	5	18
28	Melange	Lexp-1	4	4	5	5	18
		Lexp-2	3	3	4	4	14

Table 2
EVOLUTION OF WATER CONTENT (%) FROM PASTEURIZED MELANGE AND PACKED IN DIFFERENT POLYETHYLENE TYPES

Period (days)	Batch	Statistic estimators			
		$X \pm s_{\bar{X}}$	V%	Minimum	Maximum
0	Lexp-1	75.312±0.02^a	0.069	75.25	75.39
	Lexp-2	75.330±0.03^a	0.100	75.23	75.41
7	Lexp-1	75.294±0.05^a	0.149	75.11	75.39
	Lexp-2	75.298±0.03^a	0.100	75.19	75.37
14	Lexp-1	75.230±0.04^a	0.119	75.09	75.31
	Lexp-2	75.260±0.03^a	0.103	75.15	75.34
21	Lexp-1	75.180±0.02^a	0.084	75.11	75.26
	Lexp-2	75.204±0.03^a	0.098	75.09	75.28
28	Lexp-1	75.134±0.04^a	0.127	75	75.25
	Lexp-2	75.130±0.03^a	0.123	74.98	75.20

ANOVA within rows, between groups for different superscripts, one by one comparison: aa: not significant; ab significant, * (P<0.05); distinguished significant = ac, ** (P<0.01); highly significant = ad *** (P<0.001)

2 minimum was placed at a level of 75.23% and in this case maximum value was 75.41%, mean being of 75.330±0.03%. Also in this case was enlightened a very good homogeneity, variation coefficient value being 0.100%.

Situation was similar at the following effectuated checking's, so at the end of experiment (day 28 of storage), water content from analyzed product recorded mean values of 75.134±0.04% for batch Lexp-1 and 75.130±0.03% for batch Lexp-2. At batch level it is a good homogeneity of studied character, aspect confirmed by the very low values of variation coefficient of 0.127% respectively 0.123%.

Similar with water content from product the dry matter content was quite constant during experiment, reason to explain the lack of differences with statistical significance between batches, at each effectuated check.

So, for samples belonging to batch Lexp-1, rate of DM varied between 24.688±0.02 recorded before storage (fresh product) and 24.866±0.04% at the end of storage period (day 28). For this batch, the studied character presented a very good homogeneity, values of variation coefficient being of only 0.211–0.454% (table 3).

Chemical composition of pasteurized melange isn't influenced only by storage period, so the main components could suffer modifications only if pasteurization wasn't done properly or if products weren't stored at right temperature [44 - 47].

Regarding protein content for batch Lexp-1 in first check day (day 0) values oscillated between 11.80% and 13.11% calculated mean being 12.730±0.24%. For variation coefficient, we obtained a value of 4.198%, fact which indicates a very homogenous character inside batch. For batch Lexp-2 mean was 12.614±0.22% and variation

Table 3
EVOLUTION OF DRY MATTER CONTENT (%) FROM PASTEURIZED MELANGE AND PACKED IN DIFFERENT POLYETHYLENE TYPES

Period (days)	Batch	Statistic estimators			
		$X \pm s_{\bar{X}}$	V%	Minimum	Maximum
0	Lexp-1	24.688±0.02^a	0.211	24.61	24.75
	Lexp-2	24.670±0.03^a	0.305	24.59	24.77
7	Lexp-1	24.706±0.05^a	0.454	24.61	24.89
	Lexp-2	24.702±0.03^a	0.306	24.63	24.81
14	Lexp-1	24.770±0.04^a	0.362	24.69	24.91
	Lexp-2	24.740±0.03^a	0.314	24.66	24.85
21	Lexp-1	24.821±0.03^a	0.256	24.74	24.89
	Lexp-2	24.796±0.03^a	0.297	24.72	24.91
28	Lexp-1	24.866±0.04^a	0.384	24.75	25.00
	Lexp-2	24.870±0.04^a	0.372	24.80	25.02

ANOVA within rows, between groups for different superscripts, one by one comparison: aa: not significant; ab significant, * (P<0.05); distinguished significant = ac, ** (P<0.01); highly significant = ad *** (P<0.001).

coefficient value was 3.931%, which also indicates a very good homogeneity inside batch. After analysis, at this first check, weren't enlightened differences with statistical significance (table 4).

In day 28 of storage the obtained means were of 12.740±0.16% for batch Lexp-1 and of 12.688±0.09% for batch Lexp-2, differences being also insignificant (table 4).

Regarding the profile of amino acids the highest values for essential amino acids were founded for phenylalanine where for Lexp-1 in first check day (day 0) we obtain a mean value of 650.4±0.51 mg/100g and in day 28 of checking the mean value was 650.6±0.93 mg/100g. In case of batch Lexp-2 the obtained mean values were lower, but the observed differences didn't present statistical significance; so, in first storage day (day 0) mean obtained by us was of 650.0±0.63 mg/100g, in day 7 of 649.8±0.80 mg/100g, for the analysis effectuated in day 14 of storage was obtained a mean of 650.2±0.66 mg/100g, for day 21 of storage the mean was 650.4±0.51 mg/100g and the value of 650.0±0.95 mg/100g was recorded in the last storage day, respectively day 28 (table 5).

Non-essential amino acids analyzed on egg melange were represented by alanine, histidine, glycine and serine. The obtained values after calculus of statistical estimators enlightened the highest values for content in serine, where means for batch Lexp-1 in first storage day were 900.35±0.25 mg/100g and 893.88±2.43 mg/100g for batch Lexp-2 (differences between those two batches being insignificant), values which in day 28 of checking reached the means of 900.44±0.2 mg/100g for batch Lexp-1 and 891.30±1.0 mg/100g for batch Lexp-2.

Lipids are founded only in yolk being represented by triglycerides 66% from total lipids, phospholipids 28% from total lipids and cholesterol 5% [48].

Regarding fat content for batch Lexp-1 in first check day (day 0) values oscillated between 10.89% and 11.47% calculated mean being 11.294±0.10%. In case of batch Lexp-2 maximum reached till 11.244±0.11 %, value obtained in day 28 and 11.206±0.12 % value obtained in day 7 (table 6).

In the case of batches studied by us, regarding the content in saturated fatty acids, such as content in palmitic acid (16:0) and stearic acid (18:0), were recorded similar values from one check stage to another, the observed

Table 4
EVOLUTION OF PROTEIN CONTENT (%) FROM PASTEURIZED MELANGE AND PACKED IN DIFFERENT POLYETHYLENE TYPES

Period (days)	Batch Lexp-1				Batch Lexp-2			
	$\bar{X} \pm s_{\bar{X}}$	V%	Min.	Max.	$\bar{X} \pm s_{\bar{X}}$	V%	Min.	Max.
0	12.730±0.24^a	4.198	11.80	13.11	12.614±0.22^a	3.931	11.88	13.25
7	12.772±0.22^a	3.767	11.95	13.16	12.676±0.14^a	2.549	12.41	13.19
14	12.726±0.18^a	3.207	12.02	13.02	12.626±0.13^a	2.370	12.22	12.99
21	12.710±0.18^a	3.084	12.05	13.01	12.694±0.09^a	1.508	12.5	13.01
28	12.740±0.16^a	2.767	12.30	13.10	12.688±0.09^a	1.505	12.50	12.99

ANOVA within rows, between groups for different superscripts, one by one comparison:
aa: not significant; ab significant, * (P<0.05); distinguished significant = ac,
** (P<0.01); highly significant = ad *** (P<0.001).

Table 5
EVOLUTION OF AMINO ACIDS CONTENT (mg/100g) FROM PASTEURIZED MELANGE AND PACKED IN DIFFERENT POLYETHYLENE TYPES

Batch	Indicator	Period (days)				
		0	7	14	21	28
Essential amino acids, from which:						
Lexp-1	Isoleucine	592.6±2.25^a	591.8±3.84^a	592±3.75^a	592.4±2.86^a	592.6±1.63^a
Lexp-2		591.8±1.93^a	591.4±3.82^a	591.6±3.61^a	591.6±3.34^a	591.8±1.46^a
Lexp-1	Methionine	426.6±1.89^a	425.8±2.22^a	425.6±1.29^a	426.2±1.07^a	426.2±0.97^a
Lexp-2		426.0±2.10^a	425.6±2.11^a	424.8±1.59^a	424.6±1.75^a	425.0±1.14^a
Lexp-1	Tryptophan	201.4±0.51^a	201.2±0.86^a	201.0±1.05^a	201.2±0.58^a	201.6±0.68^a
Lexp-2		201.0±0.32^a	200.8±0.80^a	200.6±0.68^a	201.0±0.45^a	201.4±0.51^a
Lexp-1	Phenylalanine	650.4±0.51^a	650.2±0.66^a	650.4±0.51^a	650.8±0.37^a	650.6±0.93^a
Lexp-2		650.0±0.63^a	649.8±0.80^a	650.2±0.66^a	650.4±0.51^a	650.0±0.95^a
Non-essential amino acids, from which:						
Lexp-1	Alanine	720.19±0.25a	720.08±0,24^a	720.13±0,31^a	719.82±0,22^a	720.25±0,1^a
Lexp-2		720.16±0.06a	720.01±0,20^a	720.10±0,31^a	719.92±0,16^a	720.15±0,0^a
Lexp-1	Histidine	342.05±0.03a	342.04±0.04^a	342.14±0.37^a	341.97±0.31^a	342.44±0.2^a
Lexp-2		341.05±0.43a	341.10±0.38^a	340.99±0.56^a	341.42±0.18^a	341.19±0.0^a
Lexp-1	Glycine	410.54±0.18a	410.83±0.13^a	411.05±0.08^a	410.42±0.18^a	411.05±0.1^a
Lexp-2		409.03±0.33a	408.81±0.24^a	409.01±0.07^a	408.80±0.29^a	409.00±0.0^a
Lexp-1	Serine	900.35±0.25a	900.22±0.25^a	900.14±0.33^a	899.92±0.67^a	900.44±0.2^a
Lexp-2		893.88±2.43a	892.56±3.89^a	893.74±1.02^a	892.46±0.28^a	891.30±1.0^a

ANOVA within rows, between groups for different superscripts, one by one comparison: aa: not significant; ab significant, * (P<0.05); distinguished significant = ac, ** (P<0.01); highly significant = ad *** (P<0.001).

Table 6

EVOLUTION OF FAT CONTENT (%) FROM PASTEURIZED MELANGE AND PACKED IN DIFFERENT POLYETHYLENE TYPES

Period (days)	Batch Lexp-1				Batch Lexp-2			
	$X \pm s_{\bar{X}}$	V%	Min.	Max.	$X \pm s_{\bar{X}}$	V%	Min.	Max.
0	11.294±0.10[a]	2.071	10.89	11.47	11.228±0.12	2.406	10.89	11.44
7	1.244±0.09[a]	1.825	10.90	11.40	11.206±0.12	2.391	10.87	11.42
14	11.238±0.08[a]	1.619	10.98	11.41	11.214±0.12	2.360	10.90	11.42
21	11.308±0.08[a]	1.609	11.11	11.59	11.248±0.12	2.358	10.94	11.53
28	11.256±0.06[a]	1.095	11.05	11.35	11.244±0.11	2.196	10.95	11.50

ANOVA within rows, between groups for different superscripts, one by one comparison: aa: not significant; ab significant, * (P<0.05); distinguished significant = ac, ** (P<0.01); highly significant = ad *** (P<0.001).

Table 7

EVOLUTION OF LIPID COMPONENTS (g/100g) FROM PASTEURIZED MELANGE AND PACKED IN DIFFERENT POLYETHYLENE TYPES

Batch	Indicator	Period (days)				
		0	7	14	21	28
Saturated fatty acids, from which:						
Lexp-1	16:0 palmitic acid	2.172±0.01[a]	2.183±0.02[a]	2.190±0.02[a]	2.189±0.01[a]	2.184±0.01[a]
Lexp-2		2.168±0.01[a]	2.194±0.02[a]	2.177±0.01[a]	2.184±0.01[a]	2.180±0.01[a]
Lexp-1	18:0 stearic acid	0.730±0.02[a]	0.705±0.01[a]	0.700±0.01[a]	0.707±0.01[a]	0.705±0.01[a]
Lexp-2		0.727±0.02[a]	0.704±0.01[a]	0.695±0.01[a]	0.706±0.01[a]	0.696±0.01[a]
Unsaturated fatty acids, from which:						
Lexp-1	16:1 palmitoleic acid	0.283±0.01[a]	0.281±0.01[a]	0.274±0.01[a]	0.288±0.01[a]	0.278±0.01[a]
Lexp-2		0.289±0.01[a]	0.292±0.01[a]	0.288±0.01[a]	0.290±0.01[a]	0.297±0.01[a]
Lexp-1	18:1 oleic acid	3.102±0.16[a]	3.093±0.20[a]	3.209±0.12[a]	3.208±0.07[a]	3.248±0.09[a]
Lexp-2		3.274±0.01[a]	3.283±0.05[a]	3.289±0.05[a]	3.191±0.05[a]	3.215±0.03[a]

ANOVA within rows, between groups for different superscripts, one by one comparison: aa: not significant; ab significant, * (P<0.05); distinguished significant = ac, ** (P<0.01); highly significant = ad *** (P<0.001).

differences between those two batches being insignificant. So, for batch Lexp-1 the highest content in 16:0 was recorded at the checking made in day 14, mean being of 2.190±0.02 g/100g and the lowest level was recorded at checking realized in first day with a value of 2.172±0.01 g/100g (table 7).

Regarding content in palmitic acid (16:0) for pasteurized melange and packed in polyethylene bags belonging to batch Lexp-2, calculated mean values were 2.168±0.01 g/100g for first effectuated check (day 0), 2.194±0.02 g/100g at checking effectuated in day 7 of storage, 2.177±0.01 g/100g at 14 days, 2.184±0.01 at 21 days of storage and 2.180±0.01 at last effectuated check (day 28).

For content of stearic acid (18:0) values oscillated between 0.700±0.01 mg/100g recorded at check effectuated in day 14 and 0.730±0.02 mg/100g value calculated for fresh product (day 0), for pasteurized melange belonging to batch Lexp-1 (table 7).

For palmitoleic acid (16:1) at batch Lexp-1 values oscillated between 0.274±0.01 mg/100g value obtained in day 14 and 0.288±0.01 mg/100g mean obtained in day 21. In case of batch Lexp-2 maximum reached till 0.297±0.01 mg/100, value obtained in day 28 and 0.288±0.01 mg/100g value obtained in day 14 (table 7).

In the case of unsaturated fatty acids, the highest values were recorded for oleic acid (18:1) as follows 3.102±0.16 mg/100g for batch Lexp-1 and 3.274±0.01 mg/100g for batch Lexp-2 in first day of experiments (day 0). Dynamic analysis of oleic acid revealed the fact that those one kept constant during storage, recorded differences from one check stage to another being insignificant.

In the case of palmitoleic acid (16:1) the obtained values were much lower, so for batch Lexp-1, in first day of determinations (day 0) mean was of 0.283±0.01 mg/100g reaching at the end of storage period, day 28, at a mean of 0.278±0.01 mg/100g. For batch Lexp-2 we obtained a mean of 0.289±0.01 mg/100g in first day, 0.292±0.01 mg/100g in day 7, 0.288±0.01 mg/100g in day 14 of storage, 0.290±0.01 mg/100g in day 21 and 0.297±0.01 mg/100g at last effectuated checking. Must be mentioned the fact that also in this case weren't observed differences with statistical significance.

Conclusions

After sensorial examination were identified modifications, more accentuated at batch Lexp-2, when after 21 days of storage was recorded a score of 18 points, score for batch Lexp-1 being 20 points. At the last effectuated check, day 28, were enlightened modifications at both products, those ones being more severe for batch Lexp-2 were the score was 14 points and 18 points for batch Lexp-1.

Regarding water content were observed low losses at both batches, but differences didn't present statistical differences (p<0.05). So, at the end of storage period (day 28), the obtained mean value for batch Lexp-1 was 75.134±0.04% and for batch Lexp-2 was 75.130±0.03%.

In case of dry matter content the obtained mean values at the end of storage period were 24.866±0.04% for batch Lexp-1 and 24.870±0.04 % for batch Lexp-2. Studied character presented a very good homogeneity for both batches, differences between them being insignificant (p<0.05).

Regarding the protein content of melange belonging to batch Lexp-1, the obtained mean value at first check (day 0) was 12.730±0.24% reaching at the end of storage period at 12.740±0.16%. For batch Lexp-2 mean calculated in first storage day was 12.614±0.22%, mean value calculated in day 28 was 12.688±0.09%. As in the case of other determinations weren't observed differences with statistical significance ($p<0.05$) between those two batches during storage period.

Regarding amino acids profile the means obtained by us were 592.6±2.25 mg/100g for isoleucine content at batch Lexp-1 in day 0 of checking and 591.8±1.93 mg/100g at batch Lexp-2 in the same period. In the case of phenylalanine, the recorded mean values at the end of storage period were 650.6±0.93 mg/100g for batch Lexp-1 and 650.0±0.95 mg/100g for batch Lexp-2. From the non-essential amino acids, the highest content was observed for serine, mean of batch Lexp-1 being 900.35±0.25 mg/100g at first check effectuated and at batch Lexp-2 mean reached till 893.88±2.43 mg/100g.

Even if mean values oscillated from one check stage to another both in case of essential amino acids and also for non-essential amino acids, the recorded differences between batches were insignificant ($p<0.05$).

In case of saturated acids content, the most significant values were obtained for palmitic acid (16:0) where mean at beginning of storage period (day 0) was 2.172±0.01 g/100g for batch Lexp-1 and 2.168±0.01 g/100g for batch Lexp-2.

For unsaturated fatty acids, highest values were recorded for oleic acid (18:1) where means at the end of storage period were 3.248±0.09 g/100g for batch Lexp-1 and 3.215±0.03 g/100g for batch Lexp-2. Also in this case weren't observed differences with statistical significance during checking stages ($p<0.05$).

Lack of differences between batches, regarding chemical composition of product, show the fact that polyethylene type utilized for packing of pasteurized melange didn't influenced the product quality during storage.

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