SENSORIAL ASSESSMENT OF FROZEN BROILER MEAT IN RELATION WITH TIME

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Abstract

Meat quality evaluation as aliment is addressed exclusively to consumer and it's finally perception is a relation between chemical composition and sensorial perception.

Freezing main effect upon meat quality is represented by cells' destruction due to ice crystals increase. Freezing provoke changes in pigments, aroma or important nutritive components, even if those could be lost during excessive storage by freezing.

Study aimed to evaluate sensorial parameters' variation of pectoral musculature from three experimental batches with different freezing periods: three months (L1), six months (L2) and nine months (L3) at a storage temperature of -18°C in thermal centre.

Colour mean uniformity for analysed samples was between 7.26±0.457 (L3) and 9.46±0.299 points (L1). For colour aspect, hedonic analysis results show certain uniformity between batches, while colour uniformity show a declassing of breast aspect from L3 batch, expressed by a mean difference higher with 2 points between batches L3 and L1, respectively L3 and L2.

Analysed muscular samples show that batch L1 obtained the most favourable mean scores, meat being described by an intermediary granulosity, fibrousnesses, succulence and greediness and a minimal adhesiveness. Second place was occupied by texture of muscular samples belonging to batch L2, followed by the ones from batch L3.

Keywords: Sensory, Parameters, Freezing

INTRODUCTION

Meat quality evaluation as aliment is addressed exclusively to consumer and it's finally perception being a relation between chemical composition and sensorial perception.

Freezing main effect upon meat quality is represented by cells' destruction due to ice crystals increase. Freezing provoke changes in pigments, aroma or important nutritive components, even if those could be lost during excessive storage by freezing.

MATERIAL AND METHODS

Study aimed to evaluate sensorial parameters' variation of pectoral musculature from three experimental batches with different freezing periods: three months (L1), six months (L2) and nine months (L3) at a storage temperature of -18°C in thermal centre.

Portioning of meat samples and their further thermal processing into a oven pre-heated at 120°C for 20 minutes aimed to reach a cooking temperature of 75°C in the centre of each sample, monitoring being realized by a K type thermocouple at removal from oven, samples being identified, codified and served hot to tasters in ceramic bowls utilised during thermal treatment.

To balance the samples' presentation order was used the model specified by *McFieet al., 1989.* At establishing the score for analysed characteristics, tasters utilised a cube (2 x 2 cm thick slices) from analysed sample for descriptive parameters of colour and aroma and another cube for taste and texture, analysis of sensorial perceptions being made in controlled light conditions on an 10 point scale regarding their intensity of expression.

RESULTS AND DISCUSSIONS

Table 1 shows the sensory descriptive properties for chicken meat breast color after

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3, 6 and 9 months of freezer storage. The eating quality of meat that had been frozen properly and stored adequately should not deteriorate significantly. After sensorial analysis took place and data were collected, we obtained the following variations for chicken breast meat color: the higher score for color overall aspect was assessed at L2 (chicken meat breast 6 months freeze stored). The results obtained at L1 and L3 were similar, although storage time was extreme, no differences ($P > 0.05$) being found.

Table 1 Sensory colour evaluation of chicken breast meat after 3, 6 and 9 months of freezer storage

	Specification		$\bar{X} \pm s_{\bar{x}}$	V%	Min. – Max.	Interpretation of differences **T-Test** (2-tailed)	
COLOUR	Color overall aspect	L1	**1.47**±0.236	57.239	0.41 – 3.72	**L1-L2**	t = -2.211; p = 0.044*
		L2	**2.69**±0.417	60.012	0.39 – 5.82	**L1-L3**	t =0.683; p = 0.506ns.
		L3	**1.31**±0.302	91.731	0.22 – 4.69	**L2-L3**	t = 3.287; p = 0.005**
	Colour uniformity	L1	**9.37**±0.291	11.356	5.42 – 10.04	**L1-L2**	t = 0.397; p = 0.697 ns.
		L2	**8.83**±0.213	9.264	6.72 – 10.11	**L1-L3**	t = 3.709; p = 0.002**
		L3	**7.35**±0.461	23.383	3.39 – 9.58	**L2-L3**	t = 3.602; p = 0.003**

T- test (2-tailed)– for each analysed character, compared between the experimental groups
ns. unsignificant differences (p >0.05); * significant differences (p <0.05);** distinct significant differences (p<0.01).

Also, inconclusive differences that were not statistically significant ($P > 0.05$) were recorded by the sensory assessment of color uniformity between meat samples that were stored a period of 3 and 6 months under freeze temperatures. Statistically speaking, time of storage had a bigger influence on color uniformity ($P < 0.01$), the average values having an inverse proportion relationship with the time of storage, its uniformity deteriorating with time.

Table 2 Sensory aroma evaluation of chicken breast meat after 3, 6 and 9 months of freezer storage

	Specification		$\bar{X} \pm s_{\bar{x}}$	V%	Min. – Max.	Interpretation of differences **T-Test** (2-tailed)	
AROMA	Aroma intensity	L1	**5.87**±0.430	26.793	3.22 – 8.69	**L1-L2**	t = -3.428; p = 0.004**
		L2	**7.48**±0.364	18.677	5.12 – 9.59	**L1-L3**	t = 1.472; p = 0.163ns.
		L3	**4.98**±0.456	33.317	2.30 – 7.50	**L2-L3**	t = 4.335; p = 0.001**
	Fried aroma	L1	**1.48**±0.227	60.731	0.31 – 3.27	**L1-L2**	t = -2.083; p = 0.056ns.
		L2	**2.68**±0.411	58.531	0.30 – 6.19	**L1-L3**	t = -1.468; p = 0.164ns.
		L3	**2.20**±0.329	58.937	0.21 – 4.33	**L2-L3**	t = 1.424; p = 0.176ns.
	Peanuts / hazelnuts aroma	L1	**0.91**±0.269	128.381	0.00 – 4.31	**L1-L2**	t = -1.858; p = 0.084ns.
		L2	**1.32**±0.357	112.631	0.01 – 4.79	**L1-L3**	t = 1.152; p = 0.269ns.
		L3	**0.48**±0.231	153.340	0.00 – 3.48	**L2-L3**	t = 3.302; p = 0.005**
	Rancid aroma	L1	**0.12**±0.034	111.312	0.00 – 0.43	**L1-L2**	t = 1.821; p = 0.090ns.
		L2	**0.07**±0.031	187.759	0.00 – 0.32	**L1-L3**	t = 3.233; p = 0.006**
		L3	**0.04**±0.019	226.271	0.00 – 0.30	**L2-L3**	t = 1.193; p = 0.253ns.
	Metallic / blood aroma	L1	**1.95**±0.434	80.669	0.40 – 5.80	**L1-L2**	t = -2.028; p = 0.062ns.
		L2	**3.46**±0.584	68.240	0.60 – 7.50	**L1-L3**	t = -0.983; p = 0.342ns.
		L3	**2.81**±0.557	73.736	0.00 – 6.86	**L2-L3**	t = 0.671; p = 0.513ns.

T- test (2-tailed)– for each analysed character, compared between the experimental groups
ns. unsignificant differences (p>0.05); * significant differences (p<0.05);** distinct significant differences (p<0.01).

Aroma profile (Table 2) was assessed trough 5 parameters, two of them with negative connotations (rancid aroma and metallic / blood aroma). As numeric values on the 10 points scale, aroma intensity had the higher average score (4.98 – 7.48), followed by metallic / blood aroma (1.95 – 3.46). The results showed no differences (P > 0.05) between experimental batches for the metallic / blood and fried aroma, while the results with distinct significant differences (P < 0.01) are showed specific in Table 2. Overall, the best results for pectoral muscle were obtained for L2 batch samples; characterize trough intense aroma and a light sensing of fried flavor completed by peanuts / hazelnuts aroma. In the same time, at 6 months of storage, the noticeable negative characteristics were metallic / blood flavor and rancid aroma.

For taste parameters (Table 3), the results converged to the same positive characterization for L2 muscle samples, although for sweet, salty and acid tastes results showed no differences (P > 0.05) between the experimental groups. Umami taste had the significant differences (P < 0.05) between L2 and L3 meat samples, 6 months being the period assessed favourable for its emphasis. At the same time, L2 meat samples were equilibrated by sweet and acid tastes.

Table 3 Sensory taste evaluation of chicken breast meat after 3, 6 and 9 months of freezer storage

Specification			$\bar{X} \pm s_{\bar{x}}$	V%	Min. – Max.	Interpretation of differences T-Test (2-tailed)	
TASTE	Sweet taste	L1	**4.84**±0.398	30.831	2.44 – 7.12	**L1-L2**	t = -0.726; p = 0.480$^{ns.}$
		L2	**5.26**±0.458	36.490	3.11 – 8.59	**L1-L3**	t = -1.064; p = 0.305$^{ns.}$
		L3	**5.51**±0.373	32.375	2.59 – 8.31	**L2-L3**	t = -0.324; p = 0.751$^{ns.}$
	Umami taste	L1	**2.11**±0.422	82.414	0.01 – 7.23	**L1-L2**	t = -1.686; p = 0.114$^{ns.}$
		L2	**2.86**±0.462	74.544	0.00 – 9.19	**L1-L3**	t = 0.632; p = 0.538$^{ns.}$
		L3	**1.82**±0.271	61.638	0.00 – 4.33	**L2-L3**	t = 2.218; p = 0.044*
	Salty taste	L1	**0.51**±0.111	80.341	0.00 – 1.32	**L1-L2**	t = 0.980; p = 0.344$^{ns.}$
		L2	**0.39**±0.041	51.182	0.09 – 0.69	**L1-L3**	t = 0.414; p = 0.685$^{ns.}$
		L3	**0.38**±0.173	151.131	0.02 – 2.19	**L2-L3**	t = -0.097; p = 0.924$^{ns.}$
	Acid taste	L1	**0.59**±0.228	125.389	0.10 – 3.60	**L1-L2**	t = -0.159; p = 0.876$^{ns.}$
		L2	**0.73**±0.159	88.774	0.00 – 2.00	**L1-L3**	t = -1.117; p = 0.283$^{ns.}$
		L3	**1.07**±0.129	48.751	0.11 – 2.09	**L2-L3**	t = -1.653; p = 0.121$^{ns.}$
	Bitter taste	L1	**0.04**±0.016	169.611	0.00 – 0.20	**L1-L2**	t = 1.505; p = 0.154$^{ns.}$
		L2	**0.01**±0.008	254.849	0.00 – 0.10	**L1-L3**	t = -2.199; p = 0.045*
		L3	**0.09**±0.013	71.457	0.00 – 0.21	**L2-L3**	t = -4.149; p = 0.001**

T- test (2-tailed)– for each analysed character, compared between the experimental groups
$^{ns.}$unsignificant differences (p > 0.05); * significant differences (p < 0.05);** distinct significant differences (p < 0.01).

Overall, the results show that at an increased time of freezing, the bitter and acid tastes were high, with statistical significant differences (P < 0.05; P < 0.01) for the results between 6 and 9 months of cold storage.

For texture assessment were not found differences (P > 0.05) between the tasted samples of those 3 experimental groups for succulence and fibrousness. The meat samples frozen for three months were characterized by the highest granularity (between those 3 batches), very juicy but fibrous in the same time, with a moderate adhesion and with an almost unnoticed unctuousness.

Table 4 Sensory texture evaluation of chicken breast meat after 3, 6 and 9 months of freezer storage

	Specification		$\bar{X} \pm s_{\bar{x}}$	V%	Min. – Max.	Interpretation of differences T-Test (2-tailed)	
TEXTURE	Granulosity	L1	**5.72**±0.459	31.008	2.31 – 8.59	L1-L2	t = 1.904; p = 0.078$^{ns.}$
		L2	**4.59**±0.534	44.175	1.42 – 8.27	L1-L3	t = 3.156; p = 0.007**
		L3	**3.45**±0.421	44.572	0.81 – 6.29	L2-L3	t = 1.942; p = 0.073$^{ns.}$
	Adhesiveness	L1	**1.51**±0.295	81.069	0.21 – 4.24	L1-L2	t = 1.926; p = 0.075$^{ns.}$
		L2	**0.85**±0.263	135.351	0.00 – 3.10	L1-L3	t = -0.719; p = 0.484$^{ns.}$
		L3	**1.83**±0.334	72.472	0.42 – 4.86	L2-L3	t = -2.245; p = 0.041*
	Succulence	L1	**2.35**±0.371	56.728	0.20 – 5.10	L1-L2	t = 1.882; p = 0.081$^{ns.}$
		L2	**1.74**±0.321	70.942	0.40 – 4.00	L1-L3	t = 1.743; p = 0.103$^{ns.}$
		L3	**1.49**±0.294	91.247	0.10 – 5.20	L2-L3	t =0.452; p = 0.658$^{ns.}$
	Fibrousnesses	L1	**6.14**±0.374	25.943	3.40 – 8.90	L1-L2	t = 1.249; p = 0.232$^{ns.}$
		L2	**5.47**±0.565	38.456	2.20 – 8.70	L1-L3	t = 2.244; p = 0.041*
		L3	**4.71**±0.515	42.071	2.22 – 8.10	L2-L3	t = 1.054; p = 0.310$^{ns.}$
	Unctuousness	L1	**0.10**±0.039	174.919	0.00 – 0.60	L1-L2	t = -0.482; p = 0.638$^{ns.}$
		L2	**0.11**±0.063	205.465	0.00 – 1.00	L1-L3	t = -1.278; p = 0.222$^{ns.}$
		L3	**0.17**±0.054	122.953	0.00 – 0.90	L2-L3	t = -0.768; p =0.455$^{ns.}$

T- test (2-tailed)– for each analysed character, compared between the experimental groups
$^{ns.}$unsignificant differences ($p > 0.05$); * significant differences ($p < 0.05$);** distinct significant differences ($p < 0.01$).

The results for L2 meat samples were equilibrate for all texture descriptive parameters. By lengthening the time of freezing, the meat samples of L3 batch were characterised by higher adhesiveness and unctuousness compared with other two batches, the differences ($P < 0.05$; $P < 0.01$) being showed in Table 4.

CONCLUSIONS

Tracking the entire imagine of analysed sensorial characters we could appreciate the qualitative superiority of pectoral musculature from carcasses of chickens from experimental batch L2 due to favourable score regarding colour and its uniformity, corroborated with aroma intensity, fried and peanut one, completed by a sweet and savoury taste, umami, almost imperceptible of salty, acid and bitter and intermediary textural parameters. The second place was occupied by meat samples of chicken carcasses from batch L1, followed by the ones belonging to batch L3.

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