

COMPARISON BETWEEN SUNFLOWER AND SESAME HALVA ASSORTMENTS FROM IAȘI COUNTY MARKET

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Abstract

Sunflower halva is a traditional product characteristic to Eastern European countries, while sesame halva is one of the most popular foods in countries of the Middle East and North Africa.

In the current paper sensory profile, fat, protein, total sugars, total reducing sugars, ash and moisture content of halva assortments from Iași County market were compared. Sunflower and sesame halva samples from different producers and countries (Bulgaria, Romania, Turkey and Ukraine) were purchased from different stores and markets localised in Iași County.

Research revealed a total fat content between 31.48 - 37.95%, proteins ranking between 11.4 - 11.95%, total sugars within 26.97-42.57% limits, ash between 1.57 – 1.80% and moisture content ranged between 0.68 – 2.75%. Statistical differences between the sesame and sunflower halva assortments of were highly significant both for the sensory analysis and chemical composition. Differences found between the halva assortments are due different technologies, recipes and raw materials used in the technological process.

Key words: halva, sunflower, sesame, sensory analysis, chemical composition

INTRODUCTION

Sunflower halva is a traditional product characteristic to Eastern European countries, while sesame halva is one of the most popular foods in countries of the Middle East and North Africa [7] being a homogeneous mixture consisting of sunflower or sesame seeds tahini, cacao powder or sugared fruit, caramel, water, soapwort root extract and flavours, being an important source of energy [2]. Characteristic to Eastern European countries is the replacement of sesame from the halva recipe with sunflower seeds due to the high availability of sunflower in this region [7], [8], [12].

Regarding nutritional value of halva, it has a high content of vitamin E and zinc. Halva proteins are of plant origin, lipids are represented by the oils contained of sunflower and sesame seeds subjected to processing, cholesterol-free as well as other natural vegetable fats [9]. Carbohydrates present in halva are represented by the sugar and glucose with rapid absorption and high glycemic index [10-12].

Concerning the quality of halva we found limited information in literature [3-6], [8], [12], so our comparative study will provide new information about the quality of sunflower and sesame halva assortments from the Iași county market.

MATERIAL AND METHOD

Sunflower and sesame halva samples from different producers and countries Bulgaria, Romania, Turkey and Ukraine, coded (HB, HR, HU, HSC, HSF and HSV) were purchased from different stores and markets localised in Iași County. All types of halva samples were gathered in original package and transferred to the analysis laboratory.

Sensory evaluation was performed by a team of twenty members, persons who are familiar with sunflower halva, but less with sesame halva. Sensory analysis was performed in a tasting room, complying with the technical requirements necessary to perform this operation. Respecting a modern working method [1] each of the board members received six coded samples as fractionated products, of rectangular shape, with the weight

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of about 20g/per sample corresponding for each type of halva. Sensory evaluation of the samples was performed using the analytical method of assessing the quality by scoring, using a 30-point system scale for sugar products [1]. Based on the results of sensory evaluation, total average score was calculated for each of the six types of samples. The obtained results were interpreted based on the scoring scale for quality evaluation [1]. Thus, for the sensory feature colour, maximum points that could be given was 6, for appearance and smell was 4, for taste was 8, for texture was 5, and for packing maximum points that could be given was 3.

The moisture content was determined by oven method in according with standard STAS 2213/4-68.

Determination of total fat was performed by Lindner method in according with standard STAS 2257-67, result being expressed on percentage of fat (%) using the formula:

$$\% \text{ Fat} = \frac{(V_1 - 1)m_1}{(V - 1.1 m_1) m} \cdot 100,$$

where:

m_1 - fat weight (g);

m - sample weight (g);

V - volume of petroleum ether used (ml);

V_1 - volume of petroleum ether and fat taken (ml);

1.1 = 1/d - volume correction, considering that the fat has a relative density of ~ 0.9.

Protein content was determined by Kjeldahl method which consists in determination of total nitrogen which, multiplied by the coefficient of transformation of nitrogen in protein, gives the amount of protein in the sample. The coefficient of transformation of nitrogen for vegetable materials is 5.7.

$$\text{Protein \%} = \frac{(V - V_1) \cdot 0.0014 \cdot 100}{g} \cdot 5.7,$$

where:

V - volume of n/10 sulphuric acid from the Erlenmeyer flask [ml];

V_1 - volume of n/10 sodium hydroxide used in titration of sulphuric acid excess [ml];

0.0014 - the amount of nitrogen in [g] corresponding to 1 ml of sulphuric acid sol. 0.1 n;

g - sample weight taken in for analysis [g];
5.7 - coefficient of nitrogen transformation.

Determination of total sugars content was performed in according with standard STAS 2213/12-70. Total sugars content is expressed in percentages, after following formula:

$$\% \text{ Total sugar} = \frac{c \cdot V \cdot V_i \cdot 100}{V_1 \cdot 100 \cdot 1000 \cdot m},$$

where:

c - sugar content (mg) corresponding to sodium thiosulphate volume used for titration;

V - volume of the homogenized sample (ml);

V_i - volume of the inverted sample (ml);

V_1 - sample volume used for titration (ml);

m - sample weight (g).

Ash was determined by calcinations at $550 \pm 20^\circ\text{C}$ in calcinations oven in according with standard STAS 2257-67.

The software used for statistical analysis was SPSS. We calculated the average, standard deviation, coefficient of variation and statistical significance of differences between samples, using Anova Single Factor.

RESULTS AND DISCUSSIONS

Sensory analyses

Sensory evaluation of the six assortments of halva relates to the assessment of colour, appearance, smell, taste, texture, as well as the packaging.

Regarding the mean score for the *colour* feature (table 1), tasters' assessed Romanian sunflower halva as being the closest to the colour that a perfect halva must have, obtaining the highest value of the three assortments respectively 5 points from the maximum of 6, and the lowest value was obtained by Ukrainian halva of 4.467 points, with a yellow-gray lighter colour. In the case of sesame halva tasters' assessed the pistachio sesame halva as being the closest to the colour that a perfect halva must have obtaining the highest value of the three assortments respectively 5.26 points from the maximum of 6, and the lowest value was obtained by vanilla halva with 5.06 points.

Table 1 Results of sensory analysis of the halva assortments

Sensory features	HR		HB		HU		HSC		HSF		HSV	
	$\bar{X} \pm s_x$	V %										
Colour	5.00±0.76	15.12	4.73±0.88	18.67	4.33±1.23	28.49	5.13±0.74	14.48	5.26±0.88	16.78	5.06±0.96	18.97
General appearance	3.26±0.46	14.01	3.26±0.70	21.54	3.33±0.72	21.71	3.46±0.46	18.46	3.6±0.74	20.47	3.2±0.56	17.52
Smell	3.26±0.70	21.54	3.60±0.51	14.09	3.73±0.59	15.90	3.26±0.59	18.17	3.20±0.94	29.41	3.13±0.35	11.23
Taste	6.46±1.25	19.27	5.33±1.23	23.15	7.13±1.06	14.86	5.66±1.18	20.74	6.33±1.59	25.08	5.73±1.39	24.19
Texture	3.13±0.64	20.42	3.60±1.18	32.87	3.86±0.99	25.61	4.26±0.70	16.49	4.06±0.96	23.63	4.06±0.96	23.63
Packaging	2.93±0.26	8.80	2.93±0.26	8.80	2.13±0.35	16.49	3.00±0.00	0.00	3.00±0.00	0.00	3.00±0.00	0.00
TOTAL	24.06±2.09	8.67	23.46±3.23	13.75	24.53±3.70	15.08	24.80±2.08	8.38	25.46±3.20	12.58	24.20±2.96	12.22

Analyzing the data from table 1, it can be observed that for *appearance* feature all six halva assortments achieved scores ranging between 3.20 and 3.60 points from the maximum of 4.

For *smell* feature Ukrainian assortment obtained the highest score of 3.733 points from the maximum of 4, having a pleasant smell, flavoured and well pronounced. The minimum value registered for this feature was obtained by the vanilla sesame assortment, respectively 3.13 having a pleasant odour slightly flavoured.

Concerning the *taste* feature, the highest score was obtained again by Ukrainian assortment, respectively 7.133 from a maximum of 8, with a sweet and pleasant taste, characteristic of roasted sunflower seeds. The lowest value was recorded this time for Bulgarian assortment, with a score of 5.333, having a sweet taste, pleasant but poorly pronounced.

Regarding the *texture* feature, all sesame assortments obtained scores of over 4 points; meanwhile only Ukrainian halva assortment

obtained a closed score of 3.867 points from the maximum of 5. The lowest score of 3.133 was registered at Romanian assortment, product having a specific texture but slightly crumbly.

Of the three types of halva assortments, the sesame halva with pistachio totalled the highest mean score, respectively 25.46 from the maximum of 30 points. This assortment, along with other two sesame halva and with the Romanian and Ukrainian assortments, received mark *Good*, while ranked last because some sensorial features didn't fulfil the tasters' desired conditions with the lowest score was the Bulgarian assortment, these one obtained a total mean score of 23.46 points and receives mark *Satisfactory*.

Overall assessment of sensory features enlighten that sesame halva types obtained higher general scores than sunflower assortments.

To highlight the potential differences between the three assortments of halva in terms of sensory analysis, we performed tests of statistical significance.

Table 2 Statistical significance for sensory features of the studied halva assortments

Specification	Feature	Assortments	Significance level	Statistical significance
0	1	2	3	4
Sunflower and sesame halva	Colour	HR vs. HU	0.05	N.S.
		HR vs. HB	0.05	N.S.
		HU vs. HB	0.05	N.S.
		HSC vs HSF	0.05	N.S.
		HSC vs HSV	0.05	N.S.
		HSF vs HSV	0.05	N.S.
	General appearance	HR vs. HU	0.05	N.S.
		HR vs. HB	0.05	N.S.
		HU vs. HB	0.05	N.S.
		HSC vs HSF	0.05	N.S.
		HSC vs HSV	0.05	N.S.
		HSF vs HSV	0.05	N.S.
	Smell	HR vs. HU	0.05	N.S.
		HR vs. HB	0.05	N.S.
		HU vs. HB	0.05	N.S.
		HSC vs HSF	0.05	N.S.
		HSC vs HSV	0.05	N.S.
		HSF vs HSV	0.05	N.S.
	Taste	HR vs. HU	0.05	N.S.
		HR vs. HB	0.01	*
HU vs. HB		0.001	***	
HSC vs HSF		0.001	***	
HSC vs HSV		0.01	*	
HSF vs HSV		0.001	***	

0	1	2	3	4
	Texture	HR vs. HU	0.05	N.S.
		HR vs. HB	0.05	N.S.
		HU vs. HB	0.05	N.S.
		HR vs. HU	0.05	N.S.
		HR vs. HB	0.05	N.S.
		HU vs. HB	0.05	N.S.
	Packaging	HR vs. HU	0.001	***
		HR vs. HB	0.05	N.S.
		HU vs. HB	0.001	***
		HSC vs HSF	0.05	N.S.
		HSC vs HSV	0.05	N.S.
	Total	HSF vs HSV	0.05	N.S.
		HR vs. HU	0.05	N.S.
		HR vs. HB	0.05	N.S.
		HU vs. HB	0.05	N.S.
HSC vs HSF		0.05	N.S.	
		HSC vs HSV	0.05	N.S.
		HSF vs HSV	0.05	N.S.

N.S - insignificant * - significant *** - highly significant

Analysing the data from table 2 it was found that there are significant differences between the assortments of halva from Romania and Bulgaria and between cacao and vanilla sesame halva in terms of *taste* feature. Highly significant differences were found between the Ukrainian and Bulgarian assortments for *taste* and *packaging* features. Also, highly significant differences were recorded for vanilla and pistachio, cacao and pistachio sesame halva in terms of taste feature, Romanian and Ukrainian assortments for *packaging* feature, while the rest of the differences were insignificant

Halva assortments present a balanced chemical composition, being representative for these types of products. In table 3 are presented the results of chemical composition of the six assortments taken in study.

Humidity in the case of all analysed assortments ranged between $0.68 \pm 0.006\%$ and $2.75 \pm 0.61\%$, values which complies with the products standards for sesame halva but lower for sunflower halva [3-6], [8], [11-12].

In terms of dry matter content, the highest percentage was recorded in the case of Romanian halva assortments, respectively 99.32%, while the lowest value of 97.25% was registered at vanilla flavoured halva.

Romanian halva assortment had the highest fat content, respectively 37.95%, while the lowest content was determined in the case of cacao assortment of 31.48% [3-5], [8], [12].

Determination of protein content is not a current procedure in the manufacturing process of traditional halva [2], so our research will provide new information for speciality literature.

Maximum protein content was of 11.95%, value determined in the case of the Ukrainian assortment, and minimum protein content of 11.40% was registered in the case of Bulgarian assortment, data being similar to one reported in the speciality literature [3-5], [8], [11], [12].

For total sugar the highest percent was obtained for the Romanian halva of 48.39 %, while the lowest value was recorded in the case of sesame halva with pistachio of 39.92%.

For the six studied assortments of sunflower halva, the highest percentage of directly reducing sugar was of 34.43% recorded at Romanian assortment while the minimum value of 21.69% was determined for the pistachio assortment, all values being within the limits reported in literature for sunflower halva ranking between 20.40% and 34.40%[3-5], [8], [11-12].

Table 3 Chemical composition of the halva assortments

Specification	n	Assortments	$\bar{X} \pm s_{\bar{x}}$	V%
Humidity (%)	10	HR	0.68±0.006	2.89
		HU	0.75±0.009	3.98
		HB	1.09±0.01	2.87
		HSC	2.12±0.05	2.31
		HSF	2.64±0.38	2.06
		HSV	2.75±0.61	2.60
Dry matter (%)	10	HR	99.32±0.01	0.02
		HU	99.25±0.01	0.03
		HB	98.89±0.02	0.07
		HSC	97.58±0.82	0.98
		HSF	97.36±0.28	0.87
		HSV	97.25±0.96	0.31
Fat (%)	10	HR	37.95±0.03	0.21
		HU	32.40±0.009	0.09
		HB	33.44±0.03	0.09
		HSC	31.48±1.84	0.49
		HSF	33.01±1.64	0.56
		HSV	32.86±1.46	1.01
Protein (%)	10	HR	11.87±0.006	0.13
		HU	11.95±0.07	0.15
		HB	11.40±0.008	0.19
		HSC	11.69±0.72	1.67
		HSF	11.71±0.59	1.48
		HSV	11.74±1.06	0.88
Total sugars (%)	10	HR	48.39±0.99	1.65
		HU	45.68±0.35	2.51
		HB	44.58±1.58	1.12
		HSC	41.30±0.67	2.32
		HSF	39.92±1.77	2.55
		HSV	42.57±0.23	0.89
Directly reducing sugars (%)	10	HR	34.43±0.004	0.04
		HU	29.78±0.003	0.03
		HB	26.97±0.004	0.05
		HSC	23.56±0.97	0.97
		HSF	21.69±1.14	0.56
		HSV	24.02±1.25	0.22
Ash (%)	10	HR	1.57±0.003	0.72
		HU	1.80±0.003	0.54
		HB	1.68±0.002	0.44
		HSC	1.80±0.004	0.67
		HSF	1.66±0.003	0.71
		HSV	1.59±0.004	0.34

Maximum ash content was of 1.80% determined for Ukrainian and cacao flavoured halva assortments, and minimum content was of 1.57% in the case of Romanian halva assortment.

To highlight the potential differences between the three assortments of halva in terms of chemical composition, we performed tests of statistical significance.

Analyzing the obtained data, were found highly significant differences between all the

halva assortments for each studied chemical parameter.

CONCLUSIONS

Following the study of the six halva assortments we found that all fulfil the qualities required by standard regulations.

Following the sensory analysis were found significant differences between the assortments of halva from Romania and Bulgaria and between cacao and vanilla

sesame halva in terms of *taste* feature and highly significant differences were found between the Ukrainian and Bulgarian assortments for *taste* and *packaging* features and for vanilla and pistachio, cacao and pistachio sesame halva in terms of *taste* feature, Romanian and Ukrainian assortments for *packaging* feature, while the rest of the differences were insignificant.

Total fat, directly reducing sugars and protein contents were similar with those reported in the literature, while humidity content in case of all sunflower halva, registered lower values than the ones reported in the literature.

Analyzing the data obtained after determination of chemical composition, were found highly significant differences between all the types of halva assortments for each studied chemical parameter.

Differences found between the six assortments of s halva may be due different technologies, recipes and the quality of raw materials used in the manufacture in the country of origin.

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