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The development of organic sliceable black table olive products in sausage-like form from physicochemical, microbiological and organoleptic characteristics

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Abstract

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Olive paste is recognized not only for its excellent taste and quality, but also for its health promoting effects. However, there is a limited range of olive products in the market. The aim of the present study was the production of a new organic olive product in sausage-like form which has sliceable properties by using organic olive paste and additives. The physicochemical, microbiological, sensorial and textural characteristics of the final product were also determined. The suggested olive product with 19.7% oil content and 3% organic locust bean gum which showed the most desirable texture characteristics allowing the solidified olive paste to turn into sliceable sausage form, is considered advisable for industrial production. Thus, the organic production of an innovative added value olive product in sausage-like form could meet the evolving expectations of consumers, boost food industry's research and development, and increase the profitability of the producer, with concomitant harmonization with the current environmental and nutritional trends.

Keywords: organic food; organoleptic properties; physical parameters; chemical parameters; olive paste

Introduction

Nutrition and safety are two important aspects that prompt the consumers to prefer organic over conventional foods (Batra et al., 2014). Moreover, concerns regarding quality of food are on the rise. A surge in diseases like cancers and atopic disorders has motivated health professionals, consumers and policymakers to look for safer and healthier alternatives. Organically grown foods are being promoted as a promising alternative by their manufacturers and certain lobbies concerned with human health and environment (Magnusson et al., 2003). Organic production and consumption provide a delineated food system that can be explored for its potential contribution to sustainability (Strassner et al., 2015). Indeed, literature suggests that a trend towards the so called 'organic-plus' positioning can be perceived, with many consumers expecting an extensive orientation towards sustainability (Schleenbecker & Hamm, 2013).

The traditional Mediterranean diet, as a sustainable diet has as a major constituent the consumption of olives or olive oil. Indeed olive and olive oil are located in the middle of the Mediterranean food pyramid and it is considered the principal source of dietary fat because of its high nutritional quality (Vasto et al., 2014).

However, there is a limited range of olive products in the market. Organic olives are used for the production of olive oil, table olives and olive paste (Kailis & Harris, 2007). Olive pastes have their origin in ancient times and olive products are traditional foods in many Mediterranean countries (Renna et al., 2015). Table olives are very popular in the food market and are consumed as stuffed or marinated. Tapenades and olive pastes are also popular, but to a lesser extent (Kailis & Harris, 2004). Olive pastes are more popular with consumers, particularly in Italy and France, and are used to spread on dry biscuits or bread as appetizers or as condiments for pasta, fish or meat dishes (Kailis & Harris, 2007; Aka-Kayguluoglu et al., 2014). Olive paste produced by destoned processed green or black olives crushed to a paste with or without the addition of other foodstuffs and additives. The organoleptic characteristics of olive pastes mostly depend on the quality of the processed olives used (Kailis and Harris, 2007). Aside from the chemical composition of olive oil, olive paste is recognized not only for its excellent taste and quality, but also for its health promoting effects. In addition, olive paste can include a lot of heterogenic components of animal and of vegetable origins (Aka-Kayguluoglu et al., 2014)**.** Typically, olive products have been mainly consumed by those living around the Mediterranean and in Middle Eastern countries. Olives are now also popular in Asian and South Pacific countries, something which has led to innovation and development of new products to meet demands of different palates (Kailis and Harris, 2007). On the other hand, the food industry, as a dynamic system, needs to reinvent itself at a constant rate to meet the continuously changing consumers' demands. For the effective marketing of a new foodstuff, it is important industry to evaluate the new product, taking into consideration many aspects relevant to its quality. Thus, it is crucial to consider food safety as well as its nutritional, sensory and commercial quality, among other aspects (Aka-Kayguluoglu et al., 2014). Up to date studies have focused on the new table olive processing techniques. However, there is no study about the production of olive products in different tissue hardness and product forms (Alvarenga et al., 2012). Thus, the need for the development of new, innovative, olive products, which on the one hand meet the evolving consumer expectations and on the other help the producer cope with the current economic challenges, is justified. In this context, the aim of the present study was the production of a new organic olive product in sausage-like form which has sliceable properties by using organic olive paste and organic additives. The physicochemical, microbiological, sensorial and textural characteristics of the final product were also determined.

Methods

Organic olive paste, organic lecithin, organic locust bean gum, lactic acid and collagen sausage casings (45 mm diameter) were used for the production of sliceable olive paste in sausage-like form.

The following steps describe the production method of the olive product:

1. Excess oil was removed from olive paste by heating up to 40°C and collecting from upper top (the aim for the remaining oil content was set to reach 15% and 20% respectively).
2. Olive paste was mixed with additives (0.8% organic lecithin and organic locust bean gum at three different concentrations 0.1%, 0.2% and 0.3% respectively. Thus, six different formulations of organic olive pastes were produced.
3. The pH value of the paste mix was reduced to 4.2 using lactic acid.
4. The paste mix was filled into the sausage casings.
5. The sausage-like olive paste mixes were pasteurized at 100°C for 7 minutes.
6. The sausage-like olive paste mixes were hanged, cooled and stored at 4°C.

Analytical procedures

The measurements of moisture and oil content were obtained following the standard procedure of the Association of Official Analytical Chemists International (Horwitz, 1990, 2000). The content of free fatty acids in the oil of olive products was determined by the titration method according to AOAC (Helrich, 1990)**.** pH was measured with a pH meter (Consort P514, Belgium). The Hunter Lab D25-PC2 model colorimeter (Hunter Lab, Reston, USA) was used to analyze the color of olive products. Water activity was determined with the water activity tester device (Novasina AG, Switzerland) according to AOAC (Horwitz, 1980). The salt content of olive products was determined according to Mohr's method (Cemeroglu, 2007). Texture Analyzer - TAS-PRO was used for the conduction of texture measurements according to the method of Herrero et al. (2007). For the conduction of texture analysis, olive product samples with 45 mm diameter were sliced at 20±0.5 mm thickness and peeled from the sausage casings. The texture characteristics which were evaluated were: hardness, elasticity, gumminess, chewiness and cutting ability.

A sensory panel evaluated the sensory characteristics of olive products. Evaluations were performed after 5 days of storage at 4°C. The panel was comprised of fifteen trained panelists who evaluated the appearance, color, tissue hardness, taste, smell, aroma, slicing ability (with knife) and general eating quality of samples. A nine-point scoring scale was employed, in which 8 was set for excellent quality, 0 was set for very poor quality and 4 was set as the acceptance limit (Panagou et al., 2002; Venturini et al., 2011).

Total mesophilic aerobic bacteria, yeast and mold colony forming units (CFU) were determined by standard spread plate methodology. Twenty-five-gram samples of homogenized olive pastes were mixed with 225 ml sterile Butterfield's phosphate buffer in a sterile bag and then were agitated for 1 minute in a paddle blender (Masticator, Spain). Duplicate packages of homogenized olive pastes were tested for each dosage. Samples were then placed in an ice chest until all samples were ready for the dilution step. One ml of the supernatant was then serially diluted in 9 ml Butterfield's phosphate buffer. Selected dilutions (0.1 ml) were plated in duplicate on plate count agar (PCA) (Difco, USA) or potato dextrose agar (PDA) (Difco, USA) containing 25 µg/ml chloramphenicol (Sigma, USA). On day 1, each dilution was plated. After determining the CFU for each sample at this time point, 3 dilutions were plated for each time point thereafter. PCA plates were incubated at 30°C for 48 h, and PDA plates were plated at 30°C for 72 h. Plates with CFUs between 25 and 300 were utilized to calculate the CFU/g. The reported CFU reflect the average of 4 to 6 plates (Prakash et al., 2000).

Statistical analysis

In the present study a randomized experimental design was used. The experiment was repeated three times. The presence of significant differences among the samples was determined by Tukey-Kramer test ($p \leq 0.05$). Statistical analysis was performed using JMP®, program v. 3.5 (SAS Institute, Cary, NC, USA).

Results

The initial characteristics (moisture content, pH, free fatty acid content, water activity and color values) of the organic olive paste which was used as raw material are presented in Table 1.

In particular, as it is shown, following the removal of the excess oil from olive paste, the remaining oil content in olive paste was determined to be 14,6% and 19,7% instead of the targeted levels, which were set at 15% and 20% respectively.

In Table 2 moisture content, pH, free fatty acid content, water activity and color values of the final altered olive products are presented.

Total mesophilic aerobic bacteria, yeast and mold count of olive product are presented in Table 3. There was a significant reduction in total mesophilic aerobic bacteria and yeast counts as the corresponding loads of olive paste were reduced from $3x10^5$and $5,2x10^4$ to $9,0x10^2$-$1,3x10^3$ and $1,2x10^3$-$5,3x10^3$ of olive products respectively.

Table 1. Initial characteristics of organic olive paste

Moisture (%)	62.09	Sensory evaluation	
pH	4.47	Appearance	6.4
Free fatty acids amount (% oleic acid)	1.56	Color	7.0
Fat (%)	25.2	Tissue hardness	2.2
Water activity	0.92	Taste	5.5
The number of total mesophilic aerobic bacteria (cfu/g)	$3x10^5$	Smell	6.1
Yeast count (cfu/g)	$5.2x10^4$	Aroma	6.2
Mold count (cfu/g)	<10	General eating quality	6.2
Color values L / a / b	12.26/-0.41/-1.33		

Table 2. Moisture content, pH, free fatty acid content, water activity and color values of olive products

Samples		Moisture content (%)	pH	Free fatty acid content (% oleic acid)	Water activity	Color values		
Oil content (%)	Gum content (%)					L	a	b
14.6	1	68.37±2.62a	4.19±0.18	1.57±0.05	0.93±0.03a	12.26±0.25	-0.41±0.01	-1.37±0.12
	2	67.14±2.33b	4.21±0.11	1.66±0.04	0.91±0.03c	11.83±0.32	-0.43±0.02	-1.25±0.11
	3	66.67±2.74b	4.20±0.13	1.62±0.04	0.92±0.03b	11.60±0.41	-0.38±0.01	-1.35±0.17
19.7	1	64.40±3.16d	4.19±0.12	1.80±0.05	0.90±0.03c	12.27±0.35	-0.41±0.01	-1.33±0.12
	2	64.87±2.74cd	4.20±0.13	1.78±0.04	0.89±0.02d	12.35±0.24	-0.42±0.02	-1.32±0.11
	3	65.64±3.16c	4.19±0.14	1.74±0.03	0.88±0.02d	11.84±0.22	-0.42±0.02	-1.36±0.12

Numbers with different letters in the same column differ statistically at the 5% level of significance ($p < 0.05$)

Table 3. Total mesophilic aerobic bacteria, yeast and mold count of olive products

Samples		Total mesophilic aerobic bacteria (cfu/g)	Yeast count (cfu/g)	Mold count (cfu/g)
Oil content (%)	Gum content (%)			
14.6	1	$1,0x10^{3}$	$1,2x10^{3}$	<10
	2	$1,1x10^{3}$	$1,6x10^{3}$	<10
	3	$9,0x10^{2}$	$2,4x10^{3}$	<10
19.7	1	$1,0x10^{3}$	$5,3x10^{3}$	<10
	2	$1,3x10^{3}$	$3x10^{3}$	<10
	3	$9,0x10^{2}$	$2,1x10^{3}$	<10

Table 4. Textural characteristics of olive products

Samples		Hardness (g)	Elasticity (cm)	Gumminess (g)	Chewiness (g)	Cutting ability (g)
Oil content (%)	Gum content (%)					
14.6	1	147.50±8.94d	0.21±0.01	328.16±7.25d	402.16±8.49b	20.13±1.15d
	2	176.44±9.75c	0.26±0.02	353.27±8.40bc	403.85±7.92b	26.59±0.94c
	3	213.65±12.36b	0.29±0.01	387.55±7.94a	411.54±10.63a	30.04±1.04b
19.7	1	130.19±11.52e	0.19±0.01	292.68±8.63d	372.16±9.74c	27.48±1.02c
	2	172.02±10.16c	0.26±0.01	336.44±11.26c	373.85±8.36c	30.17±1.12b
	3	262.83±14.96a	0.29±0.02	371.59±13.47ab	391.54±9.45bc	35.29±0.96a

Numbers with different letters in the same column differ statistically at the 5% level of significance ($p < 0.05$)

Table 5. Sensory evaluation results of olive products

Samples		Appear-ance	Color	Tissue hardness	Taste	Smell	Aroma	Slicing ability	General eating quality	Total score
Oil content (%)	Gum content (%)									
14.6	1	6.8±0.2a	6.8±0.2	6.1±0.1	5.4±0.1	5.5±0.1c	5.3±0.1	6.2±0.2d	6.9±0.2	49.0
	2	7.1±0.2a	6.9±0.1	6.1±0.1	5.7±0.1	6.0±0.1ab	6.0±0.1	6.6±0.2c	7.0±0.2	51.4
	3	6.3±0.1b	7.4±0.1	7.0±0.2	6.2±0.2	6.3±0.1a	6.5±0.2	6.9±0.2b	7.3±0.1	53.9
19.7	1	6.5±0.1b	6.9±0.1	5.3±0.1	6.0±0.1	6.0±0.1ab	6.1±0.2	6.5±0.1c	6.7±0.1	50.0
	2	5.9±0.1c	6.9±0.1	5.5±0.1	6.3±0.2	6.0±0.1ab	6.3±0.1	6.9±0.2b	7.1±0.1	50.9
	3	7.2±0.2a	7.3±0.2	6.3±0.1	6.7±0.3	5.9±0.2b	6.4±0.2	7.2±0.2a	7.4±0.1	54.4

Numbers with different letters in the same column differ statistically at the 5% level of significance ($p < 0.05$)

Texture is an important attribute of food, largely determining its organoleptic quality (Peleg, 1987). The textural characteristics of olive products are presented in Table 4.

There were no statistically significant differences in regard to color, structure, taste, aroma and general eating quality scores between the evaluated olive formulations. Mixing with locust bean gum and lecithin allowed the solidified olive paste to turn into sliceable sausage-like form. The results of sensory evaluation of olive products and olive paste are presented in Table 5.

Discussion

The initial high pH value of the black olive pastes, in combination with their increased moisture content (Table 1), could limit even further the shelf life of olive products and increase their microbiological risk (Alvarenga et al., 2012), pH value was reduced to 4.19-4.21 from 4.47 by the addition of lactic acid.

Furthermore, considering that the color parameters of a food is the first contact point of the consumer (Moyano et al., 2010), it is worth mentioning that oil content and locust bean gum levels did not cause any statistically significant differences on color values (L, a and b) of the final olive products. Color values of the olive products were in agreement with that found by Escudero-Gilete et al. (2009) and Alvarenga et al. (2012) in similar studies.

Moreover, free fatty acid content (Table 2) was detected to be between 1.57 and 1.74% oleic acid. There were not statistically significant differences regarding the free fatty acid content between olive products and olive paste.

As it is shown in Table 2, water activity of olive products was ranged between 0.88 and 0.93. It is evident that the higher the oil content of olive products, the lower the water activity. Salting stops growth of most microbes by reducing the water activity of the olive flesh. Lowering the water activity of table olives by adding salt or drying, the osmotic pressure in the cells of microorganisms is increased, impairing their ability to grow (Kailis and Harris, 2007). In this study, removing oil from olive paste decreased the water content of the final olive product proportionally. Thus, the application of hurdle technology is necessary in order to ensure food safety. The preservation of high added value foods is achieved by the application of combined methods in order the foods to remain stable and safe. For this reason, it is important to have multi-hurdles approach for developing safe and wholesome food products (Leistner, 1992; Soliva-Fortuny et al., 2002). In this research, a combination of triple hurdles were used: pH reduction to 4.2, heat treatment (7 minutes at 100°C) and cold storage (4°C), in order to ensure food safety of the developed new olive product.

Indeed, literature suggests that olive paste is one of the secondary processing products from processed table olive flesh (Kailis and Harris, 2007). pH reduction by organic acid in combination with the proper combination of time and temperature for thermal application are prerequisites for safe olive paste production (Kailis and Harris, 2007; Pingeon et al., 2011). In the present study, higher pasteurization conditions (7 minutes at 100°C) were used for the thermal processing of olive products compared to the moderate pasteurization conditions used for olive paste production (Altinbas Ozdemir, 2013).

There was a significant reduction in total mesophilic aerobic bacteria and yeast counts thanks to the applied heat treatment processing step. Thus, in this research study, the reduction of pH value to 4.2, in conjunction with the thermal processing, applied to ensure food safety from microbiological point especially for *C. botulinum* and its spores. Destruction of *C. botulinum* spores were reported as the target of thermal processes for low acidity (4.5 pH and above) foodstuffs (Margosch et al., 2006). Same observations were also reported after two outbreaks of botulism associated with consumption of green olive paste in France (Pingeon et al., 2011).

Texture integrates a set of mechanical, geometric and surface properties detectable by mechanical, tactile, visual and auditory receptors (Szczesniak, 2002). This attribute also has a great influence on the processing, storage, maintenance and acceptance by consumers (Aguilera & Stanley, 1999). According to the results of the present study, the corresponding measurements of the tissue, i.e. hardness, elasticity, gumminess, chewiness and cutting ability of olive product were ranged between 147.50-262.83 g, 0.21-0.29 cm, 292.68-387.55 g, 402.16-372.16 g and 20.13-35.29 g respectively.

Low oil content samples were showed better gumminess and chewiness characteristics than high oil content samples at all levels of locust bean gum content. In contrast, the higher the locust bean content, the higher the measurements of textural characteristics.

The olive product with 19.7% oil content and 0.3% gum content achieved the highest total score, slicing ability and appearance. In particular, the higher the locust bean gum content in olive product, the higher is its slicing ability. It is worth mentioning that all scores of sensory evaluations exceeded the threshold of acceptance. In general, as it seems olive products showed higher sensory scores not only in terms of tissue hardness, but also in terms of appearance, taste and general eating quality scores compared to olive paste. According to these sensory evaluation results, olive products had higher consumer acceptance compared to the initial olive paste.

Conclusions

In this research, an innovative olive product with sausage-like shape and texture was developed, based on low-cost organic olive paste and organic additives, triggering the potential interest of food industry. Indeed, physicochemical, microbiological, sensorial and textural characteristics of the newly developed olive product could increase consumption, being more attractive to the consumer and more profitable to the producer, by adding value to already existing organic olive products.

This new innovative olive product is remarkably different from the commercial olive paste production, since for its production high salt concentration and preservatives are avoided, attracting, thus, the attention of health conscious consumers. According to the results of sensory evaluation, the suggested olive product had higher sensory acceptance than olive paste. The suggested olive product with 19.7% oil content and 3% organic locust bean gum, which showed the most desirable texture characteristics allowing the solidified olive paste to turn into sliceable sausage-like form, is considered advisable for industrial production. Thus, the organic production of an innovative added value olive product in sausage-like form could meet the demands of consumers, boost food industry's research and development, and increase the profitability of the producer with concomitant harmonization with the current environmental and nutritional trends.

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References

Aguilera, J. M., & Stanley, D. W. (1999). *Microstructural principles of food processing and engineering*. Springer Science & Business Media.

Aka-Kayguluoglu, A., Akpinar-Bayizit, A., & Sahin-Cebeci, O. I. (2014). Evaluation of physicochemical and sensory properties of green olive pastes. *Indian Journal of Traditional Knowledge*, *13*(4), 654-658.

Altınbaş Özdemir, B. (2013). *Zeytin ezmesi üretiminde HACCP sisteminin kurulması/Establishment of the HACCP system for production of olive paste*. MSc. Thesis, Namık Kemal University (Turkish).

Alvarenga, N. B., Lidon, F. J. C., Silva, A., Martins, G., Cruz, T., & Palma, V. (2012). Production and characterization of green and black olive paste using cream of animal and vegetable origins. *Emirates Journal of Food and Agriculture*, *24*(1), 12-16.

Batra, P., Sharma, N., & Gupta, P. (2014). Organic foods for children: Health or hype? *Indian pediatrics*, *51*(5), 349-353.

Cemeroglu, B. (2007). Food analysis. *Food Technology Society Publication*, (34), 168-171.

Escudero-Gilete, M. L., Meléndez-Martínez, A. J., Heredia, F. J., & Vicario, I. M. (2009). Optimization of olive-fruit paste production using a methodological proposal based on a sensory and objective color analysis. *Grasas y Aceites*, *60*(4), 396-404.

Helrich, K. (1990). Official Method 940.28 Fatty Acids (Free) in Crude and Refined Oils Titration Method. In *Official methods of analysis of the Association of Official Analytical Chemists*. 15th ed., Arlington, VA.

Herrero, A.M, J.A. Ordóñez, R. de Avila, B.L. Herranz and M.I. Cambero 2007. Breaking strength of dry fermented sausages and their correlation with texture profile analysis (TPA) and physicochemical characteristics. *Meat Science*, **77:** 331–338.

Horwitz, W. (1980). Water Activity: 32.004-32.009. In *Official Methods of Analysis of the AOAC*. 13th ed., Washington: AOAC International.

Horwitz, W. (1990). Official methods of analysis of AOAC international. Washington, DC: AOAC International.

Horwitz, W. (2000). Official method 942.15 Acidity (Titrable) of fruit products read with AOAC official method 920. In *Official methods of analysis of AOAC International*. 17th ed., Gaithersburg, Md.: AOAC International.

Kailis, S. G., & Harris, D. (2004). *Establish Protocols and Guidelines for Table Olive Processing in Australia: A Report for the Rural Industries Research and Development Corporation*. RIRDC, Pub. No: 04/136.

Kailis, S., & Harris, D. J. (2007). *Producing table olives*. Landlinks press, Australia.

Leistner, L. (1992). Food preservation by combined methods. *Food Research International*, *25*(2), 151-158.

Magnusson, M. K., Arvola, A., Hursti, U. K. K., Åberg, L., & Sjödén, P. O. (2003). Choice of organic foods is related to perceived consequences for human health and to environmentally friendly behaviour. *Appetite*, *40*(2), 109-117.

Margosch, D., Ehrmann, M. A., Buckow, R., Heinz, V., Vogel, R. F., & Gänzle, M. G. (2006). High-pressure-mediated survival of Clostridium botulinum and Bacillus amyloliquefaciens endospores at high temperature. *Appl. Environ. Microbiol.*, *72*(5), 3476-3481.

Moyano, M. J., Heredia, F. J., & Meléndez-Martínez, A. J. (2010). The color of olive oils: the pigments and their likely health benefits and visual and instrumental methods of analysis. *Comprehensive Reviews in Food Science and Food Safety*, *9*(3), 278-291.

Panagou, E. Z., Tassou, C. C., & Katsaboxakis, K. Z. (2002). Microbiological, physicochemical and organoleptic changes in dry-salted olives of Thassos variety stored under different modified atmospheres at 4 and 20° C. *International Journal of Food Science and Technology*, *37*(6), 635-641.

Peleg, G. M. (1987). Physical measures of texture. *Food Texture*. New York.

Pingeon, J. M., Vanbockstael, C., Popoff, M. R., King, L. A., Deschamps, B., Pradel, G., Dupont, H., Spanjaard, A., Houdard, A., Mazuet, C.& Belaizi, B. (2011). Two outbreaks of botulism associated with consumption of green olive paste, France, September 2011. *Eurosurveillance*, *16*(49), 20035.

Prakash, A., Guner, A. R., Caporaso, F., & Foley, D. M. (2000). Effects of low-dose gamma irradiation on the shelf life and quality characteristics of cut romaine lettuce packaged under modified atmosphere. *Journal of Food Science*, *65*(3), 549-553.

Renna, M., Rinaldi, V. A., & Gonnella, M. (2015). The Mediterranean Diet between traditional foods and human health: The culinary example of Puglia (Southern Italy). *International Journal of Gastronomy and Food Science*, *2*(2), 63-71.

Schleenbecker, R., & Hamm, U. (2013). Consumers' perception of organic product characteristics. A review. *Appetite*, *71*, 420-429.

Soliva-Fortuny, R. C., Elez-Martínez, P., Sebastián-Calderó, M., & Martín-Belloso, O. (2002). Kinetics of polyphenol oxidase activity inhibition and browning of avocado puree preserved by combined methods. *Journal of Food Engineering*, *55*(2), 131-137.

Strassner, C., Cavoski, I., Di Cagno, R., Kahl, J., Kesse-Guyot, E., Lairon, D., Lampkin, N., Løes, A.K., Matt, D., Niggli, U., Paoletti, F., Pehme, S., Rembiałkowska, E., Schader, C., & Stolze, M. (2015). How the organic food system supports sustainable diets and translates these into practice. *Frontiers in Nutrition*, *2*, Article 19.

Szczesniak, A. S. (2002). Texture is a sensory property. *Food Quality and Preference*, *13*(4), 215-225.

Vasto, S., Barera, A., Rizzo, C., Di Carlo, M., Caruso, C., & Panotopoulos, G. (2014). Mediterranean diet and longevity: an example of nutraceuticals?. *Current Vascular Pharmacology*, *12*(5), 735-738.

Venturini, A. C., Cavenaghi, Â. D., Castillo, C. J. C., & Quiñones, E. M. (2011). Sensory and microbiological evaluation of uncured fresh chicken sausage with reduced fat content. *Food Science and Technology*, *31*(3), 629-634.

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