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Professional paper

SENSORY CHARACTERISTICS OF COLD PRESSED SUNFLOWER OIL WITH THE ADDITION OF AROMATIC HERBS

Katerina Temelkovska[1*], Gorica Pavlovska[1], Valentina Pavlova[1], Viktorija Stamatovska[1]

[1]Faculty of Technology and Technical Sciences – Veles, Dimitar Vlahov, 1400, Veles, University St. Kliment Ohridski-Bitola, Republic of North Macedonia

**Corresponding author: katerina.temelkovska@uklo.edu.mk*

Abstract

Cold pressed sunflower oil is an unrefined oil with great biological value and good sensory properties. Due to its chemical composition, this oil easily oxidizes, creating harmful products for human health. Various artificial and natural stabilizers are added to prevent oxidation. Essential oils or aromatic herbs are used as natural stabilizers, which also change the sensory properties of the oils.

The oil analysed in this paper is cold pressed sunflower oil to which fresh aromatic herbs have been added, such as rosemary, garlic, parsley and mint. One aromatic herb is added to each bottle of oil, and one bottle of oil is without additives (control). The oils are stored for 6 weeks in the dark, and then the sensory characteristics of these oils are assessed through validated questionnaires and sensory tests. The following characteristics of the oils were determined through a series of hedonistic and visual tests: aroma, colour, clarity, taste, crunchiness, and chewiness.

The aromatic herbs that are added do not affect the crispness and chewiness, but they do affect the smell, taste, colour, and clarity. The oil without additive and the oil with the addition of rosemary have the most acceptable smell and taste and the highest grades for colour and clarity. Apart from these two oils (without additive and with the addition of rosemary), there is also the oil with the addition of garlic.

Key words: *cold pressed sunflower oil, rosemary, garlic, parsley, mint*

INTRODUCTION

Cold-pressed sunflower oil is highly valued for its pleasant sensory properties and high biological value. Unrefined sunflower oil has a light-yellow colour and the typical smell of sunflower seeds. It is rich in unsaturated fatty acids, vitamin E, provitamins, lecithin, phytosterols, minerals, and other ingredients. extremely useful for human health. (Dimić, 2005; Dimić et al., 2015; Konuskan et al., 2019; Bendini et al., 2011). Since oils oxidize easily, it is important to prevent their oxidation. The oxidative stability of oils is increased by antioxidant fractions from Lamiacae herbs (Babovic et al., 2010; Mousavi et al., 2012; Niamat et al., 2016). Many herbs such as rosemary, mint, parsley, garlic, sage, thyme, etc. contain antioxidants that stabilize lipids and lipid-containing foods (Eftinzjijoska & Pavlovska, 2019; Yanishlieva et al., 2006; Bravi et al., 2016; Mousavi et al., 2012; Niamat et al., 2016; Temelkovska & Pavlovska, 2021).

Regarding the natural antioxidants, rosemary is widely accepted as one of the spices with the greatest antioxidant effect. (Yanishlieva et al., 2006; Olmedo & Grosso 2019; Aguilar et al., 2008). The antioxidant activity of rosemary extract is related to the presence of several phenolic diterpenes such as carnosic acid, carnosol, rosmanol, epirosmanol, isorosmanol, rosmarinic acid, and other steroids and triterpenes (Genena et al., 2008; Nieto et al., 2018). The use of rosemary as a natural antioxidant is highly accepted by consumers

due to its beneficial sensory properties (Olmedo & Grosso, 2019; Ghafoor et al., 2020; Ali et al., 2021).

The most important active components of parsley are flavonoids, phenols, coumarins, vitamin C, and the high content of beta-carotene, which is an important liposoluble antioxidant (Trifunschi & Ardelean, 2012). The characteristic aroma and taste of parsley come from the volatile components (Sitarek et al., 2015; Ulrich et al., 2011). Mint has a high content of namonoterpene ketones, aldehydes, natural phenols, and flavonoids that have a high antioxidant effect. The specific smell of menthol is due to α-cyteral, menthofuran, isomenthone, menthol, carvone, and linalool. (Zhang et al., 2022).

Garlic contains two types of antioxidant compounds, flavonoids and sulfur-containing compounds: allyl-cysteine, dialyl sulfide, and allyl trisulfide. Derivatives of amino acids that contain sulfur allin (S-allyl-L-cystein sulfoxide) can be converted into allicin (diallyldisulfide-S-oxide), a compound responsible for the smell of garlic, under the action of the enzyme allinase. (Pardo et al., 2007).

Rosemary, parsley, garlic, and mint improve human health due to their high antioxidant, antimicrobial, anti-inflammatory, and anti-cancer potential and reduce the risk of chronic diseases such as diabetes, cardiovascular diseases, neurological disorders, etc. Food that is enriched with spices and herbs has functional, nutritional, and health benefits. (Labban et al., 2014; Rahbardar & Hosseinzadeh, 2020; Lesnik et al., 2021; Agyare et al., 2017; Nayak et al., 2020; Ansary et al., 2020).

Spices and herbs are widely used as food additives, increasing oxidative and microbiological stability and thus extending the shelf life of food (Przygodzka et al., 2016; Al Soudy et al., 2020; Rababah et al., 2012; El-Sayed & Youssef, 2019). Spices and herbs affect the sensory properties of the food to which they are added, improving the taste and smell, thereby making them acceptable for consumption (Habib et al., 2017; Tawfek & Ali, 2022; Amer & Rizk, 2022; Hamad et al., 2017; Issaoui et al., 2016).

One of the most important parameters of edible oils is the sensory evaluation, because with the addition of spices to improve the stability of the oils, there is a change in the sensory characteristics. (Olmedo & Grosso, 2019; Akçar & Gümüşkesen, 2011).

MATERIAL AND METHODS

Cold-pressed "Fila" sunflower oils with a volume of 750 mL (Agrofila DOOEL Shtip, Republic of North Macedonia) were used for analysis. Oil without addition (control) and oils with additions of aromatic herbs and spices were used. 20 g of fresh rosemary (*Rosmarinus officinalis* L.), garlic (*Allium sativum* L.), parsley (*Petroselinum crispum* Mill.), or mint (*Mentha piperita* L.) originating from N. Macedonia were added to the oils. The herbs in the oils were added at a concentration of 2.8%. The oil without the addition was opened immediately before the analysis, while the oils with the addition of aromatic herbs and spices were stored in the dark for a period of six weeks.

Sensory analyses were performed at the Department of Nutrition, Faculty of Technology and Technical Sciences Veles. In the research, validated questionnaires were used to assess the sensory characteristics of oils by a selected group of 20 panellists (students), all of whom had previous experience and training in the sensory analysis of different food products. All respondents were familiar with the activities that would follow. Before the beginning of each sensory test, the requirements in the questionnaire, the method of rinsing the oral cavity after each tasting, and the method of cleaning the nasal cavity after each analysis are clarified. Each sensory analysis was followed by a short break in order to rest the senses.

The following sensory tests were used for the sensory evaluation: hedonic smell test, preference and ranking test, colour and clarity test, hedonic colour and clarity test, taste test, the hedonic taste test, crispiness test, the hedonic crispness test, chewiness test, and the hedonic chewiness test (Carabante & Prinyawawatkul, 2018; Yang & Lee, 2019). To perform the hedonic smell test, colour and clarity test, and hedonic colour and clarity test, one sample of all cold-pressed sunflower oils (the oil without additives and the oils with additives) was used for these tests. In order not to mix the smells, the samples

were placed in transparent cups covered with a piece of paper, and between smelling the samples, it was necessary to smell the upper part of the palm. Each panellist received 5 samples for analysis, blindly labelled with a three-digit code. The cups with the oil samples were placed on a white sheet of paper to observe the colour shade and clarity of the oil (Figure 1).

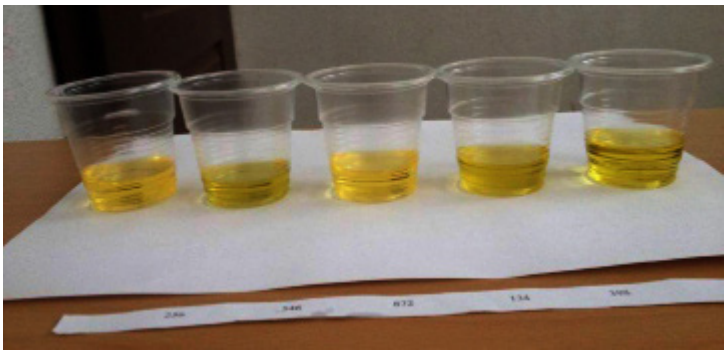

Figure 1. Oil's samples for sensory analysis.

To perform the crispiness test, the hedonic crispness test, the chewiness test, and the hedonic chewiness test, a few drops of the oils were placed on a piece of cucumber as a neutral sample. Samples of cucumber and a two-pack with oil drops were blindly marked with a three-digit code. The taste test and the hedonic taste test were determined by placing a few drops of oil on a piece of biscuit as a neutral sample. The panellists tried the samples in order from left to right and determined the required parameters according to the questionnaire requirements. Between each trial, the panellists cleaned the oral cavity with water and a piece of biscuit.

For the hedonic tests, a 9-point hedonic scale (1 = disliked extremely, 2 = disliked very much, 3 = disliked moderately, 4 = disliked slightly, 5 = neither liked nor disliked, 6 = liked slightly, 7 = liked moderately, 8 = liked very much, and 9 = liked extremely) is used to determine the acceptability of the oils (Wichchukit & O'Mohony, 2014).

Statistical analysis was performed with descriptive statistics using Microsoft Office Excel data analysis (Levine et al., 2008).

RESULTS AND DISCUSSION

The results obtained for sensory characteristics of the oils from the hedonistic tests are shown in Table 1 and Figure 2.

Table 1. Mean sensory scores and standard deviation from the hedonistic tests.

Sample	OWA	OWR	OWG	OWP	OWM
	$\overline{x}$ ± SD				
Smell	6.90 ± 1.18	6.75 ± 1.83	3.30 ± 2.54	2.50 ± 1.57	3.15 ± 1.90
Taste	5.95 ± 1.64	5.90 ± 1.99	3.40 ± 2.74	3.85 ± 1.73	4.40 ± 2.01
Colour	7.45 ± 1.10	6.05 ± 1.93	6.65 ± 1.57	4.40 ± 1.79	5.25 ± 1.97
Clarity	7.67 ± 0.86	6.95 ± 1.50	6.80 ± 1.36	2.95 ± 1.70	3.50 ± 2.06
Crunchiness	7.75 ± 0.91	7.60 ± 0.99	6.85 ± 0.99	7.35 ± 0.75	7.10 ± 1.02
Chewability	7.85 ± 0.75	7.65 ± 0.67	6.85 ± 0.75	6.90 ± 0.85	6.75 ± 0.91
Overall acceptance	7.22 ± 0.81	6.83 ± 0.83	6.11 ± 1.52	5.09 ± 1.94	5.40 ± 1.53

*n = 20; $\overline{x}$ ± SD mean value ± standard deviation; OWA-oil without additive; OWR-oil with rosemary; OWG - oil with garlic; OWP -oil with parsley; OWM-oil with mint.

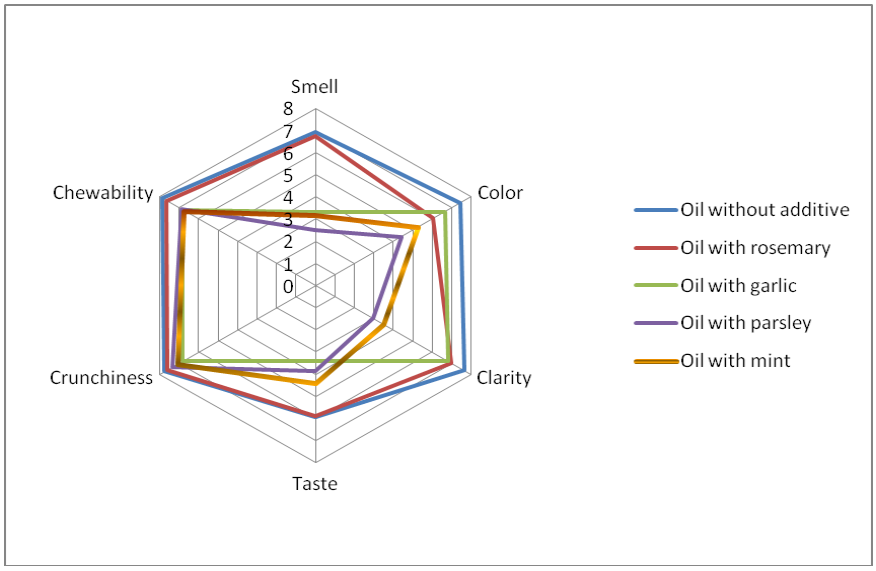

Figure 2. Sensory profile of the oils from the results obtained from hedonistic tests.

The biggest differences between the oils are in the ratings for smell, clarity, and taste (Table 1, Figure 2). The panellists gave high marks for smell to the oil without the addition (6.9 points) and to the oil with the addition of rosemary (6.75 points), while the oils with garlic, parsley, and mint have very low marks (3.30, 2.50, and 3.15 points, respectively). In terms of colour and clarity, the most acceptable are oils without additives (7.45 and 7.65 points, respectively), garlic oil (6.65 and 6.8 points, respectively), and rosemary oil (6.05 and 6.95 points, respectively), while parsley and mint oils are less acceptable (4.4, 2.95, 5.25, and 3.5 points, respectively). The oil without addition and the oil with addition of rosemary have an acceptable taste (5.95 and 5.9 points, respectively), the oil with mint is less acceptable (4.4 points), at least the oils with addition of parsley (3.85 points) and garlic (3.4 points). Crunchiness and chewiness are acceptable for all oils by the panellists. The oils with the highest scores for overall acceptability are the oil without addition and the oil with rosemary (7.22 and 6.83 points, respectively). The oil with the addition of parsley has the lowest score for the hedonic tests (5.09 points).

A visual test is performed to determine the colour of the oils (Figure 3)

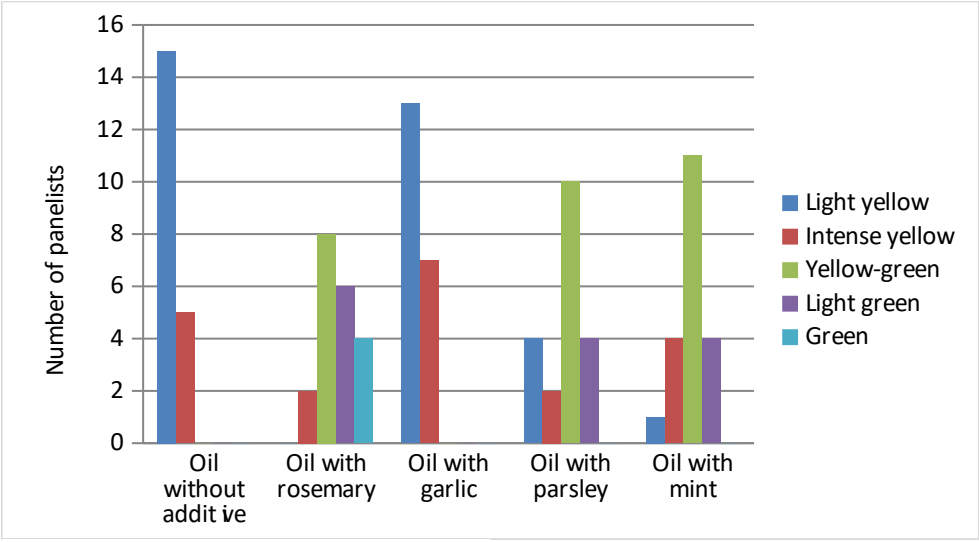

Figure 3. Sensory analysis for color of oils without and with additives.

According to the panellists, the oil without the additive has a light yellow to intense yellow colour (15 and 5 points, respectively), the oil with the addition of rosemary has a yellow-green to light green colour (8 and 6 points, respectively), the oil with the addition of garlic has a light yellow to intense yellow colour (13 and 7 points, respectively), and the oils with the addition of parsley and mint have a mainly yellow-green colour (10 and 11 points, respectively) (Figure 3).The green pigments in the oil are chlorophyll compounds from herbs that have been added to the oil, chlorophyll also has a high antioxidant effect and reduces the oxidation process in cold pressed oils (Solymosi & Mysliwa-Kurdziel, 2017).

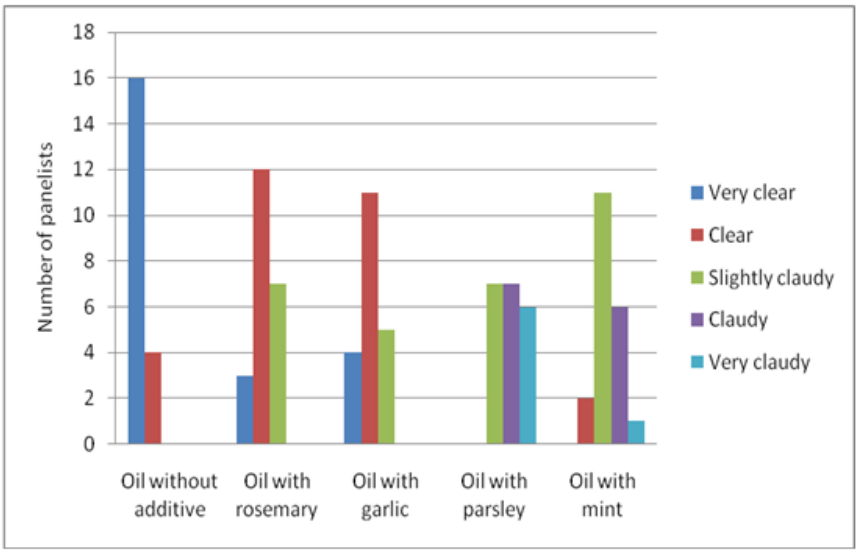

Figure 4. Sensory analysis for clarity of oils without and with additives.

The visual sensory test for the clarity of the oils shows that the clearest is the oil without additives, which is very clear (16.00 points), followed by the oils with the addition of rosemary and garlic (12.00 and 11.00 points, respectively), which are clear. The oil with mint is slightly cloudy, and the oil with parsley is cloudy (Figure 4).

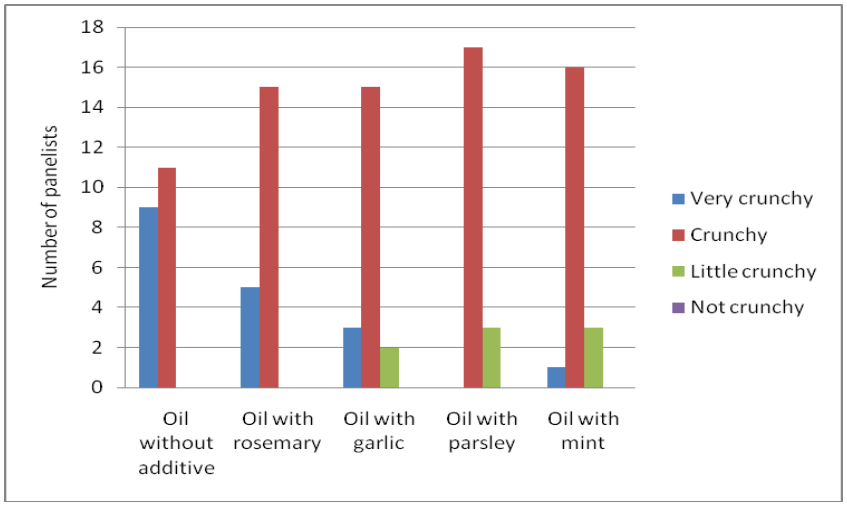

Figure 5. Sensory analysis for crispiness of oils without and with additives.

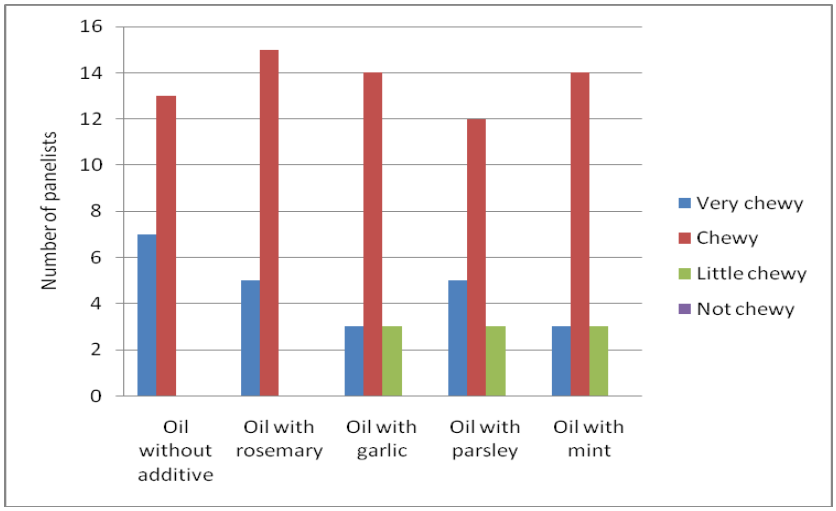

Figure 6. Sensory analysis for chewiness of oils without and with additives.

According to the sensory tests for the crunchiness and chewiness of the cucumbers with oil, there were no big variations between the obtained results, so all the cucumbers with oil have good crunchiness and chewiness (Figures 5 and 6). This means that the additives in the oils do not affect the crunchiness and chewiness of the food.

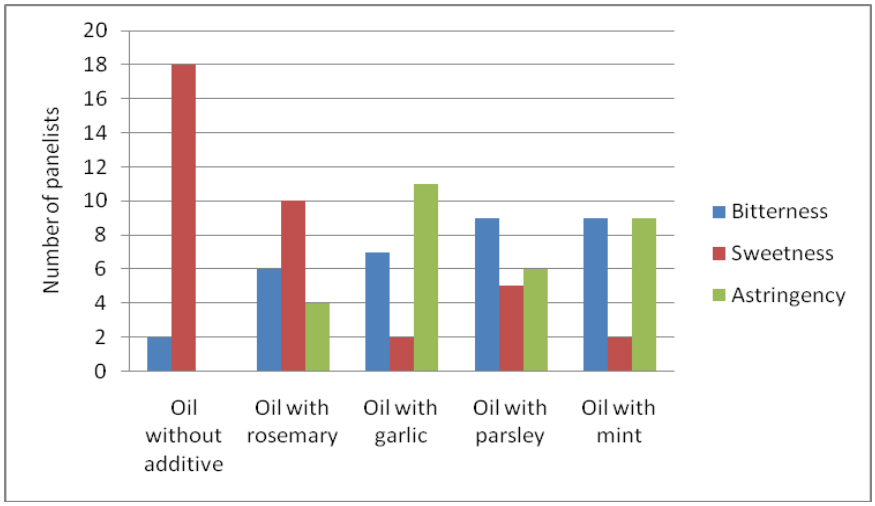

Figure 7. Sensory analysis for taste of oils without and with additives.

The taste of the oil was determined on a sample of a few drops of the analysed oil on a baking sheet as a neutral sample, and the results of these analyses are given in figure 7. The oil without addition and the oil with addition of rosemary have the highest sweetness (18.00 and 10.00 points, respectively). Oils with the addition of rosemary and garlic have a slightly bitter taste (6.00 and 7.00 points, respectively), and oils with the addition of parsley and mint have a more intense bitter taste (9.00 points, both). Oils with the addition of garlic and mint have the highest degree of astringency (11.00 and 9.00 points, respectively). According to the oil taste preference test, the oil without the additive, the oil with the addition of rosemary, and the oil with the addition of garlic have a taste with greater acceptability than the oils with the addition of mint or parsley. The panellists mentioned that after consuming the samples of oils with the addition of parsley and oil with the addition of mint, they felt an unpleasant odour retronasally. Changes in the taste of oils with additives are due to the components from the herbs that have passed into the oil, and most often these are the phenolic components that have strong antioxidant activity.

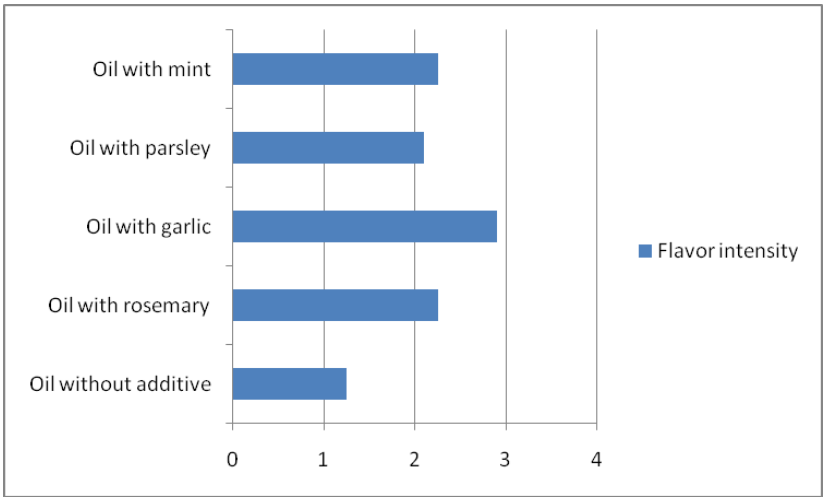

Figure 8. Sensory analysis for flavour intensity of oils without and with additives.

The flavour intensity test was made for the oils on a scale from 1 to 5, where 5 represents the most intense flavour and 1 represents the least intense flavour. Figure 8 shows that the taste of the oil with the addition of garlic is the most intense (2.90 points), while the taste of the oil without the addition is the least intense (1.25 points).

The majority of the respondents answered that the oil without addition and the oil with addition of rosemary have the highest acceptability, while the oils with addition of garlic, parsley, and mint have an unacceptable smell. The panellists answered that the oil with the addition of garlic has the most intense smell, the oils with the addition of mint and parsley have an intense and unpleasant smell, the oil with the addition of rosemary also has an intense but pleasant smell and the oil without the addition has the least intensity smell.

CONCLUDING REMARKS

From the sensory analysis, it can be seen that the oils without addition and the oils with the addition of rosemary are more acceptable than the oils with the addition of garlic, parsley, and mint, in terms of their smell and taste. Oils with the addition of garlic have an intense smell of garlic, oils with the addition of parsley and mint have an unpleasant smell and taste. Additives in oils do not affect the crunchiness and chewiness of food, and they are the same as oils without additives. The oils with the addition of parsley and mint are cloudier than the others. Oils with the addition of rosemary are the most acceptable for consumption because they have the most acceptable sensory properties.

REFERENCES

Aguilar, F., Autrup, H., Barlow, S., Castle, L., Crebelli, R., Dekant, W., ... & Toldrá, F. (2008). Use of rosemary extracts as a food additive-Scientific opinion of the panel on food additives, flavourings, processing aids and materials in contact with food. *EFSA J*, *721*, 1-29.

Akçar, H.H. & Gümüşkesen, A.S. (2011). Sensory evaluation of flavored extra virgin olive oil. *GIDA 36*(5), 249-253.

Al Soudy, M., E-Batawy, O.I., Abdel Fattah, A.A., Gohari, S.T., El-Dsouky, W.I. (2020). Production of function yoghurt drink fortified with different types of herbal extracts and its biological attributes in hepatitis rats. *Journal of Agricultural Sciences*, *28*(1), 217-228.

Ali, I.H., Dey, M., Alzubaidi, A.K., Alneamah, S.J.A., Altemimi, A.B., Pratap-Singh, A. (2021). Effect of Rosemary (*Rosmarinus officinalis* L.) Supplementation on Probiotic Yoghurt: Physicochemical Properties, Microbial Content, and Sensory Attributes. *Foods, 10*(10), 2393.

Amer, S.A. & Rizk, A.E. (2022). Production and

evaluation of novel functional extruded corn snacks fortified with ginger, bay leaves and turmeric powder. *Food Production, Processing and Nutrition*, *4*:4 1-17.

Ansary, J., Forbes-Hernandez, T.Y., Gil, E., Cianciosi, D., Zhang, J., Elexpuru-Zabaleta, M., Simal-Gandara, J., Giampieri, F., Battino, M. (2020). Potential health benefits of garlic based on human intervention studies: A brief Overview. *Antioxidants (Basel)*, 9(7), 619.

Babovic, N., Zizovic, I., Saicic, S., Ivanovic, J., Petrovic, S. (2010). Oxidative stabilization of sunflower oil by antioxidant fractions from selected Lamiaceae herbs. *Chemical Industry & Chemical Engineering Quaeterly*, *16*(4) 287-293

Bendini, A., Barbieri, S., Valli, E., Buchecker, K., Canavari, M., Toschi, T.G. (2011). Quality evaluation of cold pressed sunflower oils by sensory and chemical analysis. *European Journal of Lipid Science and Technology*, *113*(11), 1375–1384.

Bravi, E., Perretti, G., Falconi, C., Marconi, O., Fanrozzi, P. (2016). Antioxidant effects of supercritical fluid garlic extracts in sunflower oil. *Journal of the Science of Food and Agriculture*, *97*(1), 102-107.

Agyare, C., Appiah, T., Boakye, Y.D., Apenteng, J.A. (2017). Petroselinum crispum: a Review. *Medicinal Spices and Vegetables from Africa*, 527-547.

Carabante K. & Prinyawawatkul W., (2018). Data analyses of a multiple-samplet sensory ranking test and its duplicated test: A review, *Journal of Sensory Studies*, *33*(4), e12435.

Dimić, E. (2005) Cold pressed oils, Faculty of Technology, Novi Sad.

Dimic, E., Premovic, T., Takaci, A., Vujasinovic, V., Radocaj, O., Dimic, S., (2015). Uticaj kvaliteta semena na oksidativnu stabilnost hladno presovanog ulja suncokreta. *Hemijska industrija*, *69*(2), 175-184.

Eftinzjijoska H., Pavlovska G. (2019). Stability of oil from oil seed rape with garlic under various conditions. *Journal of Agriculture and Plant sciences,* JAPS*, 17*(1), 51-56.

El-Sayed, S.M. & Youssef, A.M (2019). Potential application of herbs and spices and their effects in functional dairy products, *Heliyon*, *5*(6).

Genena, K. A., Hense, H., Smania, A., Souza, S. M. (2008) Rosemary (Rosemarinus officinalis) – a study od the composition, antioxidant and antimicrobial activities od extracts obtained with supercritical cabon dioxide. *Food Science and Technology 28 (2), 463-469.*

Ghafoor, K., Yüksel, B., AL Juhaimi, F., Özcan M. M., Uslu, N., Babiker E.E., Ahmed, I.M.A., Azmi, I.U. (2020). Effect of frying on physicochemical and sensory properties of potato chips fried in palm oil supplemented with thyme and rosemary extracts. *Journal of Oleo Science*, 69(10) 1219-1230.

Habib, E.E., Shamsia, S.M., Awad, S.A., Ziena, H.M. (2017). Physicochemical and sensory properties of labneh fortified with Salvia officinalis. *Alexandria Science Exchange Journal*, *38*, 761-769.

Hamad, M.N.F., Taha, E.M., Mohamed, W.M. (2017). Effect of fortification palm oil with some spices on physic-chemical composition, microbiological analysis, sensory evaluation and economic study of Tallaga-like cheese. *Indian J Dairy Sci*, *70*(1), 23-31.

Issaoui, M., Flamini, G., Souid, S., Bendini, A., Barbieri, S., Gharbi, I., Tosehi, T.G., Cioni, P.L., Hammami, M. (2016) How the addition of spices and herbs tovirgin olive oil to produce flavored oils affects consumer acceptance. *Natural Product Communications*, *11*(6), 775-780.

Konuskan, D.B., Arslan, M., Oksuz, A. (2019). Physicochemical properties of cold pressed sunflower, peanut, rapeseed, mustard and oliveoils grown in the Eastern Mediterranean region. *Saudi Journal of Biological Sciences*, *26*(2), 340–344.

Labban, L., El-Sayed, U.M., Ibrahim, Y.M. (2014). The effects of rosemary (Rosmarinus officinalis) leaves powder od glucose level, lipid profile and lipid perodoxation, *International Journal of Clinical Medicine*, *5*(6), 297-304.

Lesnik, S., Furlan, V., Bren, U. (2021). Rosemary (Rosmarinus officinalis L.): extraction techmiques, analytical methods and health-promoting biological effects. *Phytochemistry Reviews*, *20*(4), 1-56.

Levine, D. M. (2020). Statistics for managers using Microsoft Excel.

Mousavi, R.S., Ghavami, M., Gharachorloo, M., Nateghi, L., Mahasti, P. (2012). Examination of the Effect of Mint and Basil Extracts on Sunflower Oil Stability. *Advances in Environmental Biology*, *6*(7) 1891-1896.

Nayak, P., Kumar, T., Gupta, A.K., Joshi, N.U. (2020). Peppermint a medicinal herb and treasure of health: A review. *Journal of Pharmacognosy and Phytochemistry*, *9*(3), 1519-1528.

Niamat, I., Tariq, A.R., Imran, M., Kanwal, F., Mitu, L. (2016). Stabilization of sunflower oil with extracts from fenugreek, mint and liquorice. *Bulgarian Chemical Communications*, *48*(4), 753-757.

Nieto, G., Ros, G., Castillo, J. (2018). Antioxidant and Antimicrobial Properties of Rosemary (Rosemarinus officinalis, L.): A Review. *Medicines MDPI*, *5*(3), 98.

Olmedo, R.H. & Grosso, N.R. (2019). Oxidative Stability, Affective and Descriptive Sensory properties of roasted peanut flavored with oregano, laurel and rosemary essential oils as natural preservatives of food lipids. *European Journal of Lipid Science and Technology*, *121*(5), 1800428.

Pardo, J.E., Escribano, J., Gomez, R., Alvarruiz, A. (2007). Physical-chemical and sensory quality evaluation of garlic cultvars. *Journal of Food Quality*, *30*(5), 609-622.

Przygodzka, M., Zieliński, H., Ciesarová, Z., Kukurová, K., Lamparski, G. (2016). Effect of selected spices on chemical and sensory markers in fortified rye-buckwheat cakes. *Food Science and Nutrition*, *4*(4), 651-660.

Rababah, T.M., Feng, H., Yang, W., Yücel,S. (2012). Fortification of potato chips with natural plant extracts to enhace their sensory properties and storage stability. *Journal of the American Oil Chemists' Society*, *89*(8), 1419-1425.

Rahbardar, M.G. & Hosseinzadeh, H. (2020). Therapeutic effect of rosemary (Rosmarinus officinalis L.) and its active constituents on nervous system disorders. *Iran J. Basic Med Sci.*, *23*(9), 1100-1112.

Sitarek, M., Radzanowska, J., Wtulich, J., Dobrzynskf, J., Gajewski, M. (2015). Sensory characteristics of two parsley (Petroselenium sativum ssp. cripum L.) cultivars depending on storage conditions. Annals of Warsaw University of Life Sciences SGGW, *Horticulture and Landscape Architecture*, *36*, 33-45.

Solymosi K. & Mysllwa-Kurdziel B. (2017). Chlorophylls and their derivates used in food industry and medicine. *Mini - Reviews in Medicinal Chemistry*, *17*(13), 1194 - 1222.

Tawfek, M.A.E.M & Ali, A.R.M. (2022). Effectiveness of cardamom (Elettaria Cardamomum) or bay leaf (Laurus Nobilis L.) powder in improving the quality of labneh. *Acta Sci. Pol. Technol. Aliment*, *21*(1), 39-52.

Temelkovska, K. & Pavlovska, G. (2021) Reducing the oxidation of cold pressed sunflower oil by adding rosemary or parsley. *International Journal of Food Science and Nutrition*, *6*(5), 65-69.

Trifunschi, S. & Ardelean, D. (2012). Quantification of Phenolic and Flavonoids from Petroselinum Crispum Extracts. *Journal Medical* Aradean, *15*(1-4), 83-86.

Ulrich, D., Bruchmüller, T., Krüger, H., Marthe, F. (2011). Sensory characteristics and volatile profiles of parsley (Petroselinum crispum [Mill.] Nym.) in correlation to resistance properties against septoria blight (Septoria petroselini). *J. Agric. Food Chem., 59*, 19, 10651-10656.

Wichchukit S. & O'Mahony M. (2014). The 9-point hedonic scale and hedonic ranking in food science: some reappraisals and alternatives. *Journal of the science of food and agriculture*, *95*(11) 2167-2178.

Yang J. & Lee J. (2019). Application of sensory descriptive analysis and costumer studies to investigate traditional and authentic foods: A review. *Foods*, *8*(2), 54.

Yanishlieva, V. N., Marinova, E., Pokorny, J. (2006). Natural Antioxidants from Herbs and Spices. *European Journal of Lipid Science and Technology*, *108*(9), 776-793.

Zhang, J., Li, M., Zhang, H., Pang, X. (2022). Comparative investigation of aroma profiles of five different mint (Mentha) species using a combined sensory, spectroscopic and chemometric study. *Food Chemistry*, *371*(1), 131104.

СЕНЗОРНИ КАРАКТЕРИСТИКИ НА ЛАДНО ЦЕДЕНО СОНЧОГЛЕДОВО МАСЛО СО ДОДАТОК НА АРОМАТИЧНИ БИЛКИ

Катерина Темелковска[1], Горица Павловска[1], Валентина Павлова[1], Викторија Стаматовска[1]

[1]Технолошко-технички факултет – Велес, ул. „Димитар Влахов“ бб, 1400 Велес, Универзитет „Св. Климент Охридски“ – Битола, Република Северна Македонија

**Контакт автор:* katerina.temelkovska@uklo.edu.mk

Резиме

Ладно цеденото сончогледово масло е нерафинирано масло со голема биолошка вредност и добри сензорни карактеристики. Поради својот хемиски состав ова масло лесно оксидира, при што се создаваат штетни продукти за здравјето на човекот. За спречување на оксидацијата се додаваат разни вештачки и природни стабилизатори. Како природни стабилизатори се користат етерични масла или ароматични билки кои ги променуваат и сензорните карактеристики на маслата.

Маслото кое е анализирано во овој труд е ладно цедено сончогледово во кое се додадени свежи ароматични билки: рузмарин, лук, магдонос и нане. Во секое шише масло се додава по една ароматична билка, а едно шише масло е без додаток (контрола). Маслата се чуваат 6 недели на темно, а потоа се врши процена на сензорните карактеристики на овие масла преку валидирани прашалници и сензорни тестови. Преку низа од хедонистички и визуелни тестови беа определени следниве карактеристики на маслата: мирис, боја, бистрина, вкус, крцкавост и џвакливост.

Ароматичните билки кои се додаваат не влијаат на крцкавоста и џвакливоста, но имаат влијание на мирисот, вкусот, бојата и бистрината. Маслото без додаток и маслото со додаток на рузмарин имаат најприфатлив мирис и вкус, а највисоки оценки за боја и бистрина освен овие две масла (без додаток и со додаток на рузмарин) има и маслото со додаток на лук.

Клучни зборови: *ладно цедено сончогледово масло, рузмарин, лук, магдонос, нане.*