invtur2024 conference

Proceedings of the INVTUR Conference 2024
8-10 May 2024, University of Aveiro, Portugal

Pages
849 – 866

Experiência de harmonização no olivoturismo: Aplicação prática de uma carta digital de azeites virgem extra

Pairing experiences in olive oil tourism: Practical application of an olive oil digital menu

BEBIANA MONTEIRO[1], MARIANA OLIVEIRA, MARTA QUINTAS[1], JOSÉ ANTÓNIO SILVA[1] & MARCOS SOUSA[1]

[1]Escola Superior de Hotelaria e Turismo do Instituto Politécnico do Porto

Contacting author: bmonteiro@esht.ipp.pt

Resumo | O olival e o azeite, enquanto património, desempenham um papel essencial na estrutura económica, social e cultural da civilização mediterrânica. Quando integrados no setor do turismo, tornam-se uma força motriz para o desenvolvimento rural de forma sustentável. Como resposta à procura de experiências autênticas, co-criativas, memoráveis e sustentáveis relacionadas com a gastronomia, o objetivo deste estudo é criar um menu de harmonizações de sobremesas com Azeites Virgem Extra do Norte de Portugal (Trás-os-Montes e Douro), promovidos num menu digital de azeites, com o propósito de potenciar a inovação na experiência gastronómica ao integrar azeites no conceito de harmonização (uma área pouco explorada em estudos anteriores). Os resultados deste estudo podem ser aplicados pelos produtores de azeite, mas também em hotéis, restaurantes, lojas especializadas, museus de azeite e centros interpretativos, na promoção dos produtos endógenos, na formação de equipas e partes interessadas, na comunicação em provas comentadas e/ou comercialização, na criação de harmonizações e a sua integração na oferta de experiências. Além disso, procura-se inovar no serviço de azeite (sommelier de azeite), promovendo uma experiência gastronómica única e invulgar, direcionada a consumidores que procuram seguir tendências e vivenciar experiências exclusivas no olivoturismo.

Palavras-chave | olivoturismo, azeite virgem extra, harmonização, tendências gastronómicas, valor nutricional

Abstract | Olive groves and olive oil, as olive oil heritage, play an essential role in the economic, social and cultural structure of the Mediterranean civilization. When integrated with the tourism sector, they can be a driving force for the development of rural regions, particularly as Olive Oil Tourism is an interdiscursive sector involving olive groves, olive oil, gastronomy, heritage and regional cultures. As a response to the demand for authentic, cocreative, memorable and sustainable tourism experiences related to gastronomy, the objective of this study is develop pairings of desserts with Extra Virgin Olive Oils from Northern Portugal (Trás-

os-Montes and Douro), to be promoted digital olive oil menu, with the purpose of fostering innovation in gastronomic experiences by integrating olive oils into the concept of pairing (an area underexplored in previous studies). Additionally, the practical application of this study is elevating the standard of olive oil service and promoting the endogenous products in Olive Oil Tourism, but also in Hotels & Restaurants, Specialty Stores and Olive Oil Museums and Interpretive Centers, creating pairings to raise the awareness of olive oil tourists for new applications of olive oil and its integration in the offer of experiences; and innovation in olive oil service (olive oil sommelier) promoting a unusual gastronomic experience, focused on consumers looking to follow trends and exclusive experiences in olive oil tourism.

Keywords | olive oil tourism, extra virgin olive oil, pairing, gastronomy trends, nutrition claims

1. Introdution

As result of the evolution of tourism, new types of tourism and stakeholders emerge, integrating olive farming and olive oil production into the industry (Alonso, 2010). Olive oil tourism as a subcategory gastronomic tourism has recently caught the attention of researchers in the field of tourism marketing and management (Hernández-Mogollón, Di-Clemente, Folgado-Fernández, & Campón-Cerro, 2019 and Alonso & Krajsic, 2013), revealing a huge potential for experience-level cross-selling (Alonso, 2010).

This concept was defined as "a form of tourism which includes experiences such as: visiting to olive oil production sites and staying at local accommodation, attending culinary courses on olive oil-based, buying olive oil, trekking on olive oil routes" (Manisa, Yerliyurt & Gül, 2013, p. 12, 16). Moreover, authors such as Pulido-Fernández, Casado-Montilla, & Carrillo-Hidalgo (2018, p. 1624) also refer to olive oil tourism as a "special interest tourism [that] derives from three types of general interest tourism (rural, nature and cultural) with connections to other specific types of tourism". Nunes (2014) believes that this kind of synergy boosts business competitiveness, territory development and experience authenticity.

The territory under study are the Northern of Portugal regions of Trás-os-Montes and Douro. Trás-os-Montes is the second largest production area of olive oil in Portugal, known for its native olive groves and terroir, which allow the production of excellent Extra Virgin Olive Oils (EVOO) of Protected Designation of Origin (PDO) " Trás-os-Montes". In the last decades, the Douro region, mostly recognized for its wine, has also been recovering ancient olive groves in the same spaces where wine-tourism represents the main income source and is more relevant, thus creating an opportunity for developing new experiences involving olive oil in that context.

In line with general trends, new trends in gastronomy emerge. Society is more aware and concerned about the general state of health, to which several factors contribute (Byrne, 2021). In this sense, gastronomy follows trends, creating gastronomic menus where, in addition to

products containing low amounts of salt, lactose or gluten-free or low carb are available, there is concern with food reuse and sustainability applied to gastronomic products.

Three objectives were defined in this study: (1) boosting innovation in the pairing of EVVO; (2) practical application of an Olive Oil Digital Menu (Monteiro et. al., forthcoming); (3) creation of dessert trends (finger food and low salt contents, PDO products, lactose free, gluten free, low carb and reusing wasted products). The outcome of this study could be applied not only by olive oil producers, but also in Hotels & Restaurants, Specialty Stores and Olive Oil Museums and Interpretive Centers, as it can help promote endogenous products, train teams and stakeholders and better communicate the product in tastings and/or sales. By creating pairings, it raises the awareness of olive oil tourists for new applications of olive oil and its integration in tourist experiences (cooking workshops, picnics in the olive grove and/or tasting menus); also bringing innovation into olive oil service (olive oil sommelier), by promoting a unique and unusual gastronomic experience, focused on consumers looking to follow trends and exclusive experiences in olive oil tourism.

2. Theoretical framework

Olive oil tourism is defined as a form of tourism based on activities linked to olive groves and olive oil, combining culture, nature, heritage and gastronomy. This form of tourism stands out as an alternative to traditional tourism. The concept of olive oil tourism is very recent, and several authors have contributed to its evolution (Table 1), highlighting several perspectives such as demand, supply, tourism and cultural, wine tourism, gastronomy, industrial and rural development.

Table 1 | Authors contribution to the concept evolution of olive oil tourism.

Demand	López-Guzmán et., 2016 Hernádez-Mogollón et al**.,** 2019 Murgado-Armenteros et al., 2021 Tregua et al., 2018
Supply	Campón-Cerro et al., 2017 Fleskens et al., 2009 Hernádez-Mogollón et al., 2019
Tourism and Cultural	Murgado-Armenteros et al., 2021 Pullido-Fernandez et al., 2019
Wine Tourism	Hwang & Quadri-Felitti, 2021 Vásquez de la Torre & Pérez, 2014
Gastronomy	Abril-Sellarés & Tello, 2019 Moral-Cuadra et al., 2020
Industrial	Millán et al., 2014
Rural	Abril-Sellarés & Tello, 2019

Tregua et al., 2018

Source: Adapted from Soares (2022)

The most relevant authors are Spanish and the studies are applied to Spanish territory (Soares, 2022). Since Spain is the main world producer of olive oil (1,790 thousand tons, one third of world production) (GPP, 2020), and olive tourism is a new dimension of tourism, it is natural that it motivates researchers towards this topic and in this territory.

The International Olive Oil Council (IOC, 2005), defined olive oil as the product obtained from the fruit of the olive tree (Olea europaea L.) extracted solely by physical processes. In addition to its unique sensory properties, it adds value to the final product and contributes to conferring new nutritional qualities and antioxidant properties, due to its lipid profile rich in essential fatty acids and bioactive compounds (Beraldo, Garcia, & Marfori, 2020), playing an important role in a balanced Mediterranean diet, and besides has an extraordinary gastronomic potential. Like most countries, Portugal considers olive oil tasting and its sensory profile as a central point of the experience linked to olive oil tourism (Bezerra & Correia, 2019), and, in this sense, its primary objective is the sensorial characterization of EVOO from Trás-os-Montes and Douro region, promoting the concept of olive oil tourism.

2.1. EVOO Sensory Profile

Sensory evaluation has been widely applied in EVOO especially as a method for the organoleptic assessment of EVOO applying to use a Designation of Origin (D.O.), carried out by a trained panel (IOC, 2005). However, few studies have been done concerning sensory profiling of EVOO for product design, marketing, hospitality and catering, pairing and olive tourism. Despite its long history and the several physical-chemical and cultivars studies carried out in last years, there is no scientific quantitative sensory attributes for EVOO from the Trás-os-Montes and Douro regions. Therefore, this flavor lexicon could be used to describe these EVOO for menu applications, and used by the staff allowing the articulation of flavor perceptions to consumers and for creative EVVO pairing menu. In the classification of olive oil, sensory analysis is a mandatory parameter, which was established by the Commercial Standard Applicable to Virgin Olive Oil, from the IOC, since 1987, and subsequently implemented by the European Union, which, through an organoleptic examination with a panel of tasters, checks the presence of positive or negative attributes (Conceição, 2020).

2.2. Gastronomy trends applied in dessert creation

One of the emerging concepts in this type of tourism is the creation of gastronomic experiences that can be combined with the current gastronomic trends launched by New Nutrition Business (2020), namely the themes of finger food or snackification, as well as the promotion of low salt

content, the growth of the market for lactose-free products and their benefits (Dekker, 2019) and the gluten free products as a current and necessary trend (Pietro, 2016).

Finger food or "snackification"

In January 2020 a study promoted by the Portugal Foods Association and the New Nutrition Business (2020) identified the ten central trends of the sector, based and grounded in the most diverse areas of health. Finger food or snackification, as identified by New Nutrition Business (2020), is one of the great new trends in focus. This trend is characterized not only by its versatility as a food product, but also by its flexibility as a product for reusing raw food materials, thus based on sustainability. Therefore, in this trend there is a concentration of practicality and versatility in food combined with the speed of preparation of gastronomic confections, reuse of wasted products at the beginning, culminating in small portions, recalling the non-consumption in exaggeration of the most diverse nutritional references.

Low salt content

In May 2013, the World Health Organization (WHO) met with all Member States, which recognized, agreed and signed the goal of reducing salt intake by 30% by 2025 (WHO, 2020). Excessive salt consumption has serious consequences, including the possible increased risk of the onset and / or progression of various diseases, such as cancer, high blood pressure and cardiovascular diseases. In this sense and taking as a principle that the excessive consumption of salt is a vehicle for the incidence of serious diseases, its reduction, across the board, from the most basic products to traditional cuisine and even to the laboratories of the great chefs, has become one of the most recent and successful contemporary trends in our gastronomy. Thus, the reduction of salt in the most diverse preparations has proven to be one of the most efficient and, in some cases, economical ways of reducing the increasing burden of non-communicable diseases, mainly by reducing the incidence of cardiovascular diseases and strokes. WHO (2020) recommends that salt intake not exceed 5 grams per day, but the physiological need for salt is less than 1 gram per day. However, and frighteningly, it appears that in most populations there is a daily consumption between 9 and 12 grams (Webster et al., 2014). Not only but also for these reasons, the WHO, together with the most diverse responsible entities in all member countries, has been shown to be fundamental in instigating with manufacturers of processed products, responsible for restaurants and even in the daily life of the population, the essential and fundamental gradual reduction of salt.

Lactose free products

Lactose intolerance is common and can affect people of all age groups, although it occurs more frequently frequency in advanced ages. Lactose intolerance is caused by deficiency in lactase (β-galactosidase), an enzyme that digests milk sugar. It is estimated that more than 70% of the adult population in the world has problems digesting lactose, a result of reduced or lack of β-

galactosidase activity in the intestine (Araujo, 2017). Due to the intolerance covering such a large proportion of the population, it is of greater importance that the food industry, which relies heavily on dairy products for other gastronomic productions, uses lactose-free products, so that the conditions for responding to the market are met.

Gluten free products

Celiac disease is characterized by being an autoimmune disease, caused by ingestion of gluten, which results in symptoms of malabsorption in the small intestine. Nowadays, there is no type of identified treatment for this disease, so the only way to have a normal life is to follow a completely gluten-free diet. Therefore, due to the growing number of gluten intolerant people, it is essential that food industry seeks to respond to this disease (WHO, 2020). Although it represents a challenge, due to the elasticity characteristics that gluten provides to gastronomic preparations, it is important to create menus where gluten-free offers are present and respond to the needs.

2.3. Pairing

The food pairing theory was introduced in 2002 by the Michelin-starred chef Heston Blumenthal, in collaboration with flavor expert François Benzi. Their hypothesis was straightforward: the more aromatic compounds two foods have in common, the better they taste together. This concept was grounded in the understanding that flavor is primarily influenced by volatile aromatic compounds rather than mouthfeel and basic tastes (salty, sweet, bitter, sour, or umami) (Klepper, 2011). Accordingly, a successful combination is determined by the shared volatile compounds.

The terms "match" (Harrington & Hammond, 2005; Harrington et al., 2010), "ideal pair" (King & Cliff, 2005), "harmony" (Cerratani et al., 2007) and "balance" (Eschevins et al, 2018; Paulsen et al., 2014) are commonly employed to characterize a successful combination. These terms highlight that the flavor intensity of the components in the pairing should be balanced to prevent one from overpowering the overall perception. In certain instances, achieving this balance involves leveraging complementary characteristics (Donadini et al., 2008).

Research on the importance of food pairing emphasizes the need to study food in context, particularly in meals and in combination with other foods (Lahne, 2018). Consumer perception of food-beverage pairings is influenced by the unity in variety and balance, with dominance of one component reducing liking and harmony (Paulsen et al., 2014). Sensory science plays a key role in evaluating food pairing, including the arrangement of ingredients, food-beverage combinations, and meal preparation (Galmarini, 2020). These studies collectively underscore the significance of food pairing in creating a satisfying and enjoyable dining experience.

The increasing interest in sensory analysis of olive oil, mandated by European Union (EU) law 2568/91 (EEC Reg.) and subsequent revisions (EC Reg. 796/02), highlights the necessity of defining an analytical method to accurately describe the sensory attributes for harmoniously pairing virgin olive oil with specific foods (Cerretani et al., 2007). A few studies have explored the concept of harmony in olive oil, particularly in relation to food pairings. Cerretani et al. (2007) proposed a method for evaluating the harmony of virgin olive oil and food pairings, which was further explored by Cichelli et al. (2020) in the context of extra virgin olive oils and vegetables. Both studies emphasized the importance of sensory analysis and flavor congruency in achieving harmonious pairings. Meneley (2004) explored the broader cultural and health implications of olive oil consumption, discussing its role in the Slow Food movement, underscore the importance of considering both sensory and cultural factors in the pairing of food and olive oil.

3. Methodology

The study applies qualitative methodology based on the guidelines of the International Olive Council (IOC) (2020, 2005). Three objectives were defined: (1) boosting innovation in the pairing of EVVO; (2) practical application of an Olive Oil Digital Menu (Monteiro et. al., forthcoming); (3) creation of dessert trends (finger food and low salt contents, PDO products, lactose free, gluten free, low carb and reusing wasted products).

The Northern Portugal Olive Oil Digital Menu (OODM) has 7 EVOO (Table 2) and was developed based on the contribution of the eleven sensory attributes defined by the trained panel.

Table 2 | EVOO promoted in Northern Portugal Olive Oil Digital Menu

Brand	**Region**	**Cultivars**	**Lot [L.]**	**PDO[1]**	**Organic Certification**
Casa de Santo Amaro Premium	Trás-os-Montes	Cobrançosa Verdeal Transmontana	L.CSAPR20-1	YES	No
Casa de Santo Amaro Prestige	Trás-os-Montes	Cobrançosa Madural Verdeal Transmontana	L.CSAPT20-1	YES	No
Quinta do Crasto Premium	Douro	Cobrançosa Madural Negrinha de Freixo	L.AQCP-019	NO	NO
Quinta dos Olmais	Trás-os-Montes	Cobrançosa Verdeal Transmontana Madural	L.OLM102	NO	YES
Quinta da Romaneira	Douro	Cordovil Galega	[L.002]	NO	NO

		Verdeal Transmontana Madural			
Quinta do Romeu	Trás-os-Montes	Cobrançosa Verdeal Transmontana Madural	L.20046664AOT	YES	YES
Quinta de Ventozelo	Douro	Verdeal Transmontana (predominantly)	L.VTZ19	No	No

[1] PDO | "Azeite de Trás-os-Montes "Protected Designation of Origin"

Source: Own elaboration

3.1. Sensory profile of EVOO

In this study, seven EVOO available in the Northern Portugal Olive Oil Digital Menu were analyzed. All EVOO were evaluated in duplicate, from 10:00 to 12:00 a.m. References and EVOO glasses covered with a watch-glass were immediately brought to the tasting booths.

Attributes intensities were scored on a five-point scale ("1", attribute is not perceived at all, to "5", the attribute is clearly perceived, and the intensity is higher to the reference), adapted from IOC (2007), Monteiro et al. (2012) and Vilela et al. (2015).

The panelists were instructed to give scores to the attributes in the order they perceived, and they were also instructed to rinse with water between EVOO and with green apple.

3.2. Gastronomy trends applied in dessert creation

Chocolate Truffles 99% Imperial, Red Peper Ice Cream, Serra da Lousã Honey PDO Ice Cream and Azores Pineapple PDO Carpaccio comprised the four desserts developed for the pairing menu and presented to the trained panel in portions of 20 grams/person (finger-food), with perfectly controlled nutritional levels.

Chocolate Truffles 99% Imperial

The intense dark 99% cocoa from Imperial was slowly melted in a water bath. Apart the chickpeas were drained and only aquafaba was used. This was emulsified in a mixer with a hook until it obtained a totally stable structure. Aquafaba was wrapped in chocolate in third portions. It ended, linking with EVVO.

Red Pepper Ice Cream

The pepper was baked in the oven at 200ºC, for 30min. The skin was removed, crushed and passed in Chinese. An infusion of cream was created with the rice jelly, raised to 100ºC. The yolks were seasoned with the previous mixture. The gelatin sheets were previously hydrated, drained and wrapped in the cream, practically devoid of water. Pepper pulp was involved. Bonded with EVVO. The preparation was done by machine for 45 minutes, until obtaining a creamy, icy and stable texture.

Serra da Lousã Honey PDO Ice Cream

An infusion was created with the cream, milk and honey, at 100ºC. The yolks were carefully seasoned, and the heat was returned until the preparation became more consistent. Bonded with EVVO. The preparation was done by machine for 45 minutes, until obtaining a creamy, icy and stable texture.

Azores Pineapple Carpaccio

Top and tail the Azores pineapple, then slice off the skin. Quarter lengthways, remove the core, then finely slice lengthways. Then drizzle with EVVO.

3.2.1. Nutritional declaration and nutritional claims

The nutritional declaration of the desserts that make up the pairing menu was based on the PortFIR methodology of the Table of Food Composition (TCA) suggested by Doutor Ricardo Jorge National Health Institute and following the quantities defined by the technical recommendations of desserts and service guidelines.

Thus, the analysis of the average value per 100 grams of the following parameters was followed: energy value (in calories and kilojoules), total fat, saturated fatty acids, carbohydrates, sugars, proteins and salt, extrapolating these values for the serving with the defined portion of 20 grams, with the addition of 5 grams extra virgin olive oil.

Regarding nutrition claims, the analysis was carried out according to the annex to Regulation (EC) No. 1924/2006, the annex to Regulation (EU) No. 116/2010 and the annex to Regulation (EU) No. 1047/2012, where these same procedures are referenced, which in this study will be analyzed the following:

(i) Low energy value: less than or equal to 40 kilocalories or 170 kilojoules, per 100g of solid content;
(ii) Low fat content: less than or equal to 3 grams per 100g of solid content;
(iii) Low sugar content: less than or equal to 5 grams per 100g of solid content;
(iv) Low salt content: less than or equal to 0,12 grams per 100g of solid content;

3.3. Pairing

The trained panel were asked to rate the liking of the individual desserts and the parings with EVOO related to harmony. A 5-point Likert scale was used to allow the panelists to measure the liking desserts (“strongly dislike” and “highly like”) and the level of match of each EVOO and desserts combination (“disharmonic” to “perfectly harmonic”).

4. Results

Being a type of oil extracted from the olive tree (Olea Europea L.) by sheer physical processes, the use of olive oil in gastronomy may add value to the final product. In addition to its unique palatable properties, it confers new nutritional qualities, due to its lipid rich profile with essential fat acids and bioactive components (Beraldo et al., 2020).

One of the emerging concepts in this type of tourism is the creation of gastronomic experiences which can be combined with the current gastronomic trends launched by New Nutrition Business (2020), particularly concerning finger food or snackification as well as the promotion of low salt content. The 7 EVOO from an Olive Oil Digital Menu were used to pairing 4 desserts.

4.1. EVOO Sensory Profile

The EVOOs from the Douro region (BD01 to BD03) are characterized by being less bitter and ripe fruity notes (Figure 1). Conversely, the EVOOs from Trás-os-Montes (BTM01 to BTM04) suggest characteristics of grass and green fruits, featuring intense hints of bitterness and pungency with a remarkable persistence (Figure 1), aligning with attributes previously described by Sousa (2015). The association with attributes such as pungency, bitterness, and persistence mirrors findings in studies by Jimenez (1995) and Lopez et al. (2008).

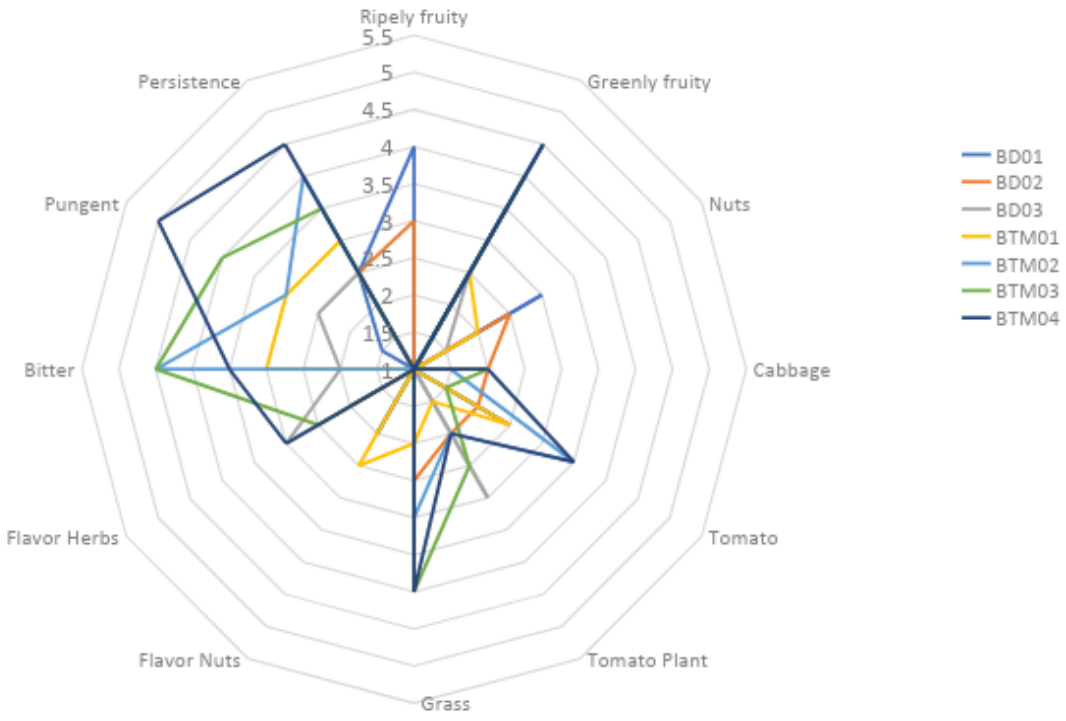

Figure 1 | Characterization of the sensory profile of seven EVOO by the median of the intensities of the attributes

Source: Monteiro et al., forthcoming

4.2. Gastronomy trends applied in dessert creation

Four dessert recipes were developed drawing on trends and nutritional levels perfectly controlled and codified:

(i) Dessert AAZ corresponds to the dessert in the "finger food" format of the "Chocolate Truffles 99% Imperial", in the amount of 20 grams, with the addition of 5 grams of EVOO that is finished during the performance of the indirect English service;

(ii) Dessert BAZ corresponds to the dessert in "finger food" format of "Red Pepper Ice Cream", in the quantity of 20 grams, with the addition of 5 grams of EVOO that is finished during the performance of the indirect English service;

(iii) Dessert CAZ corresponds to the "finger food" dessert of the "Serra da Lous. Honey PDO Ice Cream", in the amount of 20 grams, with the addition of 5 grams of EVOO that is finished during the performance of the indirect English service;

(iv) Dessert DAZ corresponds to the "finger food" dessert of the "Azores Pineapple PDO Carpaccio", in the amount of 20 grams, with the addition of 5 grams of EVOO that is finished during the service to the indirect English.

4.2.1. Nutritional declaration and nutritional claims

Through the TCA, the nutritional declaration per 100 grams was developed (Table 3), where we can verify that none respects the claim of low energy value, however the closest would be the DAZ dessert with the value of 48 kcal and 201 kJ. Regarding the claim of low-fat content, the dessert that respects that claim is DAZ, however, it should be noted that this analysis was carried out without the addition of olive oil performed during the table service. On the other hand, despite being the dessert with the highest energy value, AAZ dessert respects the nutritional claim of low sugar content. Regarding the low salt content, the desserts that fall under the respective nutrition declaration are AAZ (0,09g / 100g), BAZ (0,05 / 100g), CAZ (0,06 / 100g) and DAZ (0,00g /100g).

Table 3 | Nutritional declaration (average value per 100g) of each dessert, according to the technical data sheets

Nutritional Declaration (100g)								
Dessert	Energy (kcal)	Energy (kJ)	Total of fat (g)	Saturated fat (g)	Total of carbohydrates (g)	Sugar (g)	Protein (g)	Salt (g)
AAZ	457,31	1914,67	44,05	17,99	4,59	1,44	7,02	0,09
BAZ	297,37	1245,03	24,91	8,85	13,37	10,10	2,75	0,05
CAZ	336,46	1408,69	24,10	8,52	27,83	27,73	2,33	0,06
DAZ	48,00	200,97	0,20	0,00	9,50	9,50	0,50	00,0

Source: Own elaboration

Of the four dessert proposals presented (AAZ, BAZ, CAZ, DAZ) to the panel of tasters to implement food pairing, it appears that all of them respect the values considered as maximum, as far as the amount of salt is concerned.

In the nutritional declaration, per 100g, the desserts AAZ and BAZ, present values higher than the others (CAZ and DAZ), even so and yet, below the maximum value, 0,12g / 100g, according to the annex to Regulation (EC) No. 1924 / 2006, in the annex to Regulation (EU) No. 116/2010 and in the annex to Regulation (EU) No. 1047/2012.

In the presentation of results regarding finger food (Table 4), nutritional declaration per 25g, it appears that all the desserts presented (AAZ, BAZ, CAZ, DAZ) have 0.0g salt.

As far as the new gastronomic trends discussed here are concerned, one can then confirm the success of the problem initially posed for which in this study gastronomic proposals were sought that would shape the binomial low in salt versus "finger food".

Table 4 | Nutritional declaration of food pairing (average value per serving of 25g), consisting of capitation of 20g of dessert and 5g of olive oil added during the service.

Nutritional Declaration of Food Pairing (25g)

Dessert	Energy (kcal)	Energy (kJ)	Total of fat (g)	Saturated fat (g)	Total of carbohydrates (g)	Sugar (g)	Protein (g)	Salt (g)
AAZ	136,46	571,33	13,81	4,60	0,92	0,29	1,44	0,02
BAZ	104,47	437,39	9,98	2,77	2,67	2,02	0,56	0,01
CAZ	112,29	470,14	9,82	2,70	5,57	5,55	0,48	0,01
DAZ	45,21	189,29	5,00	1,00	0,04	0,04	0,00	0,00
Total	398,44	1668,19	38,61	11,07	9,20	7,90	2,48	0,04

Source: own elaboration

4.3. Pairing

The trained panel taste the four desserts with the 7 EVVO from the Olive Oil Digital Menu (Figure 2). In terms of pairing, in general, the preference is fixed on the desserts when finished with olive oil (indirect English service), thus valuing this method. The results suggest that AAZ dessert pairing with EVOO BD01 and BTM01 with nuts flavor in common, while BAZ dessert pairing with BTM02 and BTM04 with similar attributes (greenly fruity, grass, bitter, pungent and persistence). The perfect pairing to CAZ dessert is BD02 and BD04, both from Douro region and characterized by tomato plant aroma and herbs flavor. BTM02 and BTM04 are a perfect pairing with DAZ desserts and BTM03 is a good pairing distinguished by BTM02 and BTM04 from cabbage and tomato plant aroma.

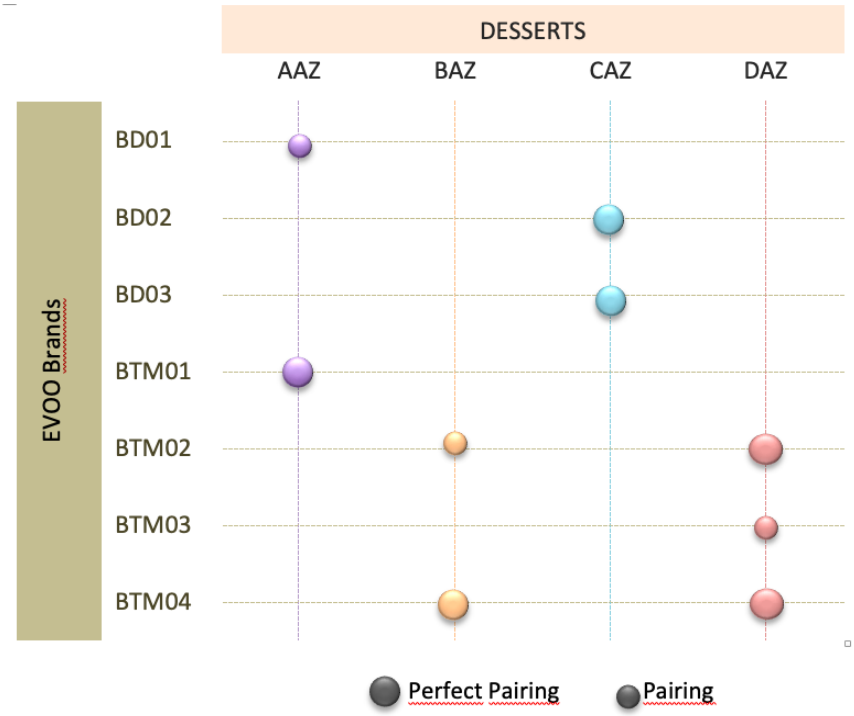

Figure 2 | EVOO pairing menu

Source: Own elaboration

Although no studies were found on pairing AVE with desserts, some of the results obtained are similar with the study by Cichelli et al., (2020): intense notes of green fruit, grass and herbaceous flavour combine with more bitter products, such as "Chocolate Truffles 99% Imperial".

5. Conclusion

Despite the growing interest in the sensorial and healthy properties of olive oils, there are few studies that have been developed with the aim of characterizing the sensory profile for the purpose of harmonization and connection to olive oil tourism.

The Trás-os-Montes region has been one of the most important Portuguese producing regions of EVOO, of internationally recognized quality, and particularly important in economic, social and cultural terms, and the Douro region is starting to promote de olive oil tourism, a cross selling with wine. The olive farming heritage of this region encourages the development of new tourist experiences, with an effect on enhancing the value of the product, the landscape and a sustainable territory.

The selected desserts are easy to make, with reduced preparation time, with ingredients that allow to follow current food trends and can be prepared in olive oil tourism units, enhancing the offer of memorable and co-creation experiences: culinary workshops with a focus on application unconventional use of olive oil, picnics in the olive grove with the finishing of desserts with

different olive oil profiles, better communication of the sensory profile of olive oils and their applications.

From the seven EVOO brands studied, three are very similar in terms of attributes and are also very distinct from each other, two other brands (BD02 and BD03) are characterized by a tomato plant aroma and herbal flavour, while the other two have different organoleptic characteristics, except for the descriptor "nuts flavour" that characterizes both brands and are also very distinct from each other.

On the other hand, in terms of the nutritional goals of the nutritional claims, we conclude that the strongest point is the low salt content, but in our menu, we can offer other positive points, such as one dessert with low sugar content, and another with low fat content. Despite this, it can be concluded that the "finger food" option, with smaller dessert portions, offers an experience with a lower energy value, allowing customers to enjoy a variety of food pairings. In terms of EVOO service, the addition of 5 grams of EVOO finished during the performance of the indirect English service, allows to have a different contact with the EVOO, the staff can use the flavour lexicon to explain the perfect pairing. It is also concluded that the preference of the panel of tasters is fixed on the desserts when finished with olive oil, thus valuing this method. Good pairing recommendations may be crucial for the success of healthy desserts and EVOO, both in the olive oil tourism and hospitality sector.

The limitation of this study, which may suggest future investigations, is the small sample size, which limits the generalization of the results, few studies in this area for a better discussion of results and dependence on panel availability. It is recommended to expand the range of references of EVVO brands and to other national and international POD regions; and develop pairings with endogenous products from each POD region.

The outcome of this study could be applied not only by olive oil producers, but also in Hotels & Restaurants, Specialty Stores and Olive Oil Museums and Interpretive Centers innovation, promoting the endogenous products, the olive oil service (olive oil sommelier) and a unusual gastronomic experience, focused on consumers looking to follow trends and exclusive experiences in olive oil tourism.

Acknowledgments | The authors would like to thank the Foundation for Science and Technology (FCT) for the scholarship granted under the Summer with Science program "ESHT Summer School Quantitative Methods Applied to Hotels and Restaurants "through national FCT / MCTES funds; and the producer "Quinta dos Olmais" for sharing know-how about olive oils.

References

Ahn, Y.-Y., et al., Flavor network and the principles of food pairing. Scientific Reports, 2011. 1: p. 196.

Alonso, A.D. & Krajsic, V. (2013). Food heritage down under: olive growers as Mediterranean food ambassadors. Journal of Heritage Tourism, 8 (2-3), pp. 158-171. doi: http://dx.doi.org/10.1080/1743873X.2013.767807

Alonso, A.D. (2010). Olives, hospitality and tourism: an Eastern Australian perspective. British Food Journal, 112 (1), pp. 55-68.

Beraldo, J., Garcia, L. V., & Marfori, T. G. (2020). Impact of the mediterranean diet and low carb diet on the metabolic syndrome: a systematic review. Science and health online. 5(3). ISSN 2448-3036.

Bezerra, R., & Correia, A. I. (2019). The Potential of Olive Oil For Creative Tourism Experiences in The Northern Region of Portugal. Revista Portuguesa de Estudos Regionais, 51, 55–72.

Campón-Cerro, A., Di-Clemente, E., Hernández-Mogollón, J., Salvo, P. & Calzati, V. (2014). Olive oil tourism in southern Europe: Proposals for tourism development of olive grove rural areas. Journal of Tourism & Development, 21/22, pp. 63-73. https://doi.org/10.20867/thm.25.1.5

Cerretani, L., Biasini, G., Bonoli-Carbognin, M., & Bendini, A. (2007). Harmony of virgin olive oil and food pairing : A methodological proposal. Journal of Sensory Studies, 22, 403-416.

Cichelli, A., Cerretani, L., Di Lecce, G., & Piochi, M. (2020). Exploring harmony in extra virgin olive oils and vegetables pairings. Grasas y Aceites.

Conceição, B. (2020). Chemical and sensory characterization of mountain oils [Master´s thesis, Instituto Politécnico de Castelo Branco]. Scientific Repository of Instituto Politécnico de Castelo Branco https://repositorio.ipcb.pt/handle/10400.11/6963.

D'Auria, A., Marano-Marcolini, C., Čehić, A., & Tregua, M. (2020). Oleotourism: A Comparison of Three Mediterranean Countries. Sustainability, 12(21), 8995. https://doi.org/10.3390/su12218995

Donadini, G., et al., Evaluation of Ideal Everyday Italian Food and Beer Pairings with Regular Consumers and Food and Beverage Experts. Journal of the Institute of Brewing, 2008. 114(4): p. 329-342.

Eschevins, A., et al., The role of aromatic similarity in food and beverage pairing. Food Quality and Preference, 2018. 65: p. 18-27.

Fleskens, L., Duarte, F., & Eicher, I. (2009). A conceptual framework for the assessment of multiple functions of agro-ecosystems: A case study of Trás-os-Montes olive groves. Journal of Rural Studies, 25(1), 141–155. https://doi.org/10.1016/j.jrurstud.2008.08.003

Galmarini, M.V. (2020). The role of sensory science in the evaluation of food pairing. Current Opinion in Food Science.

Gabinete de Planeamento, Politicas e Administração Geral [GPP]. (2020). Análise Setorial Azeite.

Harrington, R.J. and R. Hammond, The Direct Effects of Wine and Cheese Characteristics on Perceived Match. Journal of Foodservice Business Research, 2005. 8(4): p. 37-54.

Harrington, R.J., M. McCarthy, and M. Gozzi, Perceived Match of Wine and Cheese and the Impact of Additional Food Elements: A Preliminary Study. Journal of Foodservice Business Research, 2010. 13(4): p. 311-330.

Hernández-Mogollón, J. M., Di-Clemente, E., Folgado-Fernández, J. A., & Campón-Cerro, A. M. (2019). Olive oil tourism: State of the art. Tourism and Hospitality Management, 25(1), 179-207. doi:10.20867/thm.25.1.5

Hwang, Y. & Quadri-Felitti, D. (2021). A quest for the healthy lifestyle and learning experiences in olive oil tourism. Journal of Tourism and Cultural Change, DOI: 10.1080/14766825.2021.1917586

International Olive Council (IOC) (2005). Method for the organoleptic assessment of extra virgin olive oil applying to use a designation of origin. COI/T.20/Doc. no. 22

International Olive Council (IOC). (2007). Sensory analysis of olive oil standard glass for oil tasting. COI/T.20/Doc. No 5/Rev. 1

King, M. and M. Cliff. (2005). Evaluation of ideal wine and cheese pairs using a deviation-from-ideal scale with food and wine experts. Journal of food quality, 28(3): p. 245-256.

de Klepper, M. (2011). Food Pairing Theory: A European Fad. Gastronomica: The Journal of Critical Food Studies, 11(4): p. 55-58.

Lahne, J. (2018). Evaluation of Meals and Food Pairing.

López, N. L.; Acevedo, R. L.; Carraco, C. A. (2008). Sensorial and analytical evaluation of the extra-virgin oil quality. Vviorlguemnen 26, No 2: 27-2474.

López-Guzmán, T., Cañero Morales, P. M., Moral Cuadra, S., & Orgaz-Agüera, F. (2016). An exploratory study of olive tourism consumers. Tourism and Hospitality Management, 22(1), 57–68. https://doi.org/10.20867/thm.22.1.1

Manisa, K., Yerliyurt, B. & Gül, H. (2013). In the perspective of the new trends in the tourism sector, the Evaluation of Zeytinilik and olive oil production in the Aegean region through alternative Tourism types, Ayvacik example, Istanbul: Mehmet Kemal Dedeman Research and Development Project Competition.

Meneley, A. (2004). Extra Virgin Olive Oil and Slow Food. Anthropologica, 46, 165-176.

Millán, M. G., Pablo-Romero, M. P. & Sánchez-Rivas, J. (2018). Oleotourism as a sustainable product: An analysis of its demand in the south of spain (andalusia). Sustainability (Switzerland), 10(1) doi:10.3390/su10010101

Monteiro, B. (2012). Selection and training of a panel of taster for oganoleptic evaluation of Port Wines. [Master´s thesis, Universidade de Trás-os-Montes e Alto Douro]. Scientific Repository of Universidade de Trás-os-Montes e Alto Douro

Monteiro, B.; Salvado, J.; Silva, J. A.; Araújo, M. S. (forthcoming). Olive Oil Digital Menu (OODM) in Olivotourism sensorial experience: the case of the northern region of Portugal.

Moral-Cuadra, S.; Cruz, R., A.; López, r., r; Cuadrado, E. S. (2020). Relationship between Consumer Motivation and the Gastronomic Experience of Olive Oil Tourism in Spain. Sustainability, 12(10), 4178; https://doi.org/10.3390/su12104178

Murgado-Armenteros, E.; Parrilla-González, J.A. & Medina-Viruel, M.J. (2021). What does the olive oil tourist value at the destination? A criterion for olive oil tourism segmentation. International Journal of Gastronomy

New Nutrition Business. (2020). 10 Key Trends in Food, Nutrition & Health 2021, Industry Report.

Nunes, A. (2014). The importance and use of the Internet as a source of information for the wine tourists visiting Portuguese regions. Dissertação de Mestrado. Instituto Politécnico do Porto. Instituto Superior de Contabilidade e Administração do Porto. https://recipp.ipp.pt/handle/10400.22/5425

Paulsen, M.T., Rognså, G.H., & Hersleth, M. (2014). Consumer perception of food–beverage pairings: The influence of unity in variety and balance. International Journal of Gastronomy and Food Science, 2, 83-92.

Pulido-Fernández, J., Casado-Montilla, J. & Carrillo-Hidalgo, I. (2018). Introducing olive-oil tourism as a special interest tourism. Heliyon, 5(12): e02975. https://doi.org/10.1016/j.heliyon.2019.e02975

Soares, I. C. (2022). The regeneration of the olive heritage in Portugal supported by Creative Tourism [Master's Thesis, Polytechnic of Leiria]. https://iconline.ipleiria.pt/bitstream/10400.8/7914/3/Mestrado%20Turismo%20e%20Ambiente%20-%20%20Dissertação%20Inês%20Costa%20Soares%20.pdf

Sousa, A. da C. de. (2015). Determination of the optimum harvest time for olive cultivars belonging to the protected designation of origin «Azeite de Trás-os-Montes». https://core.ac.uk/reader/143407610

Tregua, M.; D´Auria, A.; Marano-Marcolini, C. (2018). Oleotourism: Local Actors for Local Tourism Development.

Vázquez de la Torre, G. M., & Pérez, L. M. (2014). Comparison of the profile of wine tourists and olive oil tourists in Spain. A case study. Cuadernos de Desarrollo Rural, 11(74), 167-188. http://doi.org/10.11144/Javeriana.CRD11-74.cpec

Vilela, A., Monteiro, B., & Correia, E. (2015). Sensory profile of Port wines: Categorical principal component analysis, an approach for sensory data treatment. Ciência e Técnica Vitivinícola, 30(1), 1–8. https://doi.org/10.1051/ctv/20153001001

World Health Organization (WHO). (2020, november 26). Salt Redution. https://www.who.int/news-room/fact-sheets/detail/salt-reduction