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A comparative study of the main international extra virgin olive oil competitions: Their impact on producers and consumers

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ABSTRACT

Background: Extra virgin olive oil (EVOO) arouses the desire to seek maximum gastronomic value, especially from informed consumers. The olive industry therefore rewards the best oils in competitions that add real commercial value to EVOOs. On the basis of competition-specific rules, judges trained in tasting award prizes that distinguish the best oils and serve as a guide for consumers, encouraging them to discover the diversity of EVOO tastes.

Scope and approach: This study compares several international competitions, detailing their rules and practical organization. The article also examines how olive oil competitions impact producers and consumers.

Key findings and conclusions: Competitions operate differently, starting with a selection phase that constrains some EVOOs, not all of which are given a fair chance to participate. Although most international competitions apply selection criteria from the International Olive Council Mario Solinas, the sensory evaluation of the oils takes into account numerous descriptors that involve very subtle distinctions. A more standardized approach to evaluation sheets, while leaving room for competitions to add specific descriptors, would be desirable. A thorough inter-competition classification by continent and country to identify the best "EVOO of the year" is realized by EVOO World Ranking. Although the awards promote high quality EVOOs, consumer preferences do not mirror those of tasting experts, particularly on the intensities of bitterness and pungency. Competition results should inform consumers about the organoleptic diversity of oils, enabling them to choose the best oils for their tastes and needs.

1. Introduction

Olive oil occupies a special place in the Mediterranean subconscious, being associated with mythologies, legends and symbols and mentioned in the texts of monotheistic religions around the Mediterranean (Meneley, 2008; Florentino, 2018). It has become one of the most regulated and controlled agricultural products in response to the fraudulent practices existing since ancient times (Aued-Pimentel et al., 2017; Bimbo et al., 2019; Cugat & Biel, 2016; Rossini, 1999). Olive oil is subject to continually evolving international standards and regulations that define the physico-chemical and organoleptic characteristics of different categories of virgin olive oils: extra virgin (EVOO), virgin (VOO), ordinary virgin olive oil (OVOO) and lampante (LOO) olive oils. These categories, defined by the International Olive Council (International Olive Oil Council (IOC), 2018), have been widely adopted by

European regulation n°2568/91 on organoleptic properties, except for ordinary virgin oil (Commission Regulation (EEC), 2016). Olive oil is currently the only agri-food product that has to be organoleptically analyzed in order to benefit from extra virgin and virgin designations. Under IOC regulations, evaluation by skilled tasters is based on the absence (extra virgin) or the weak presence (virgin) of defects and on three positive attributes: fruitiness, bitterness, and pungency.

However, placing an olive oil in a given category does not fully define the oil's organoleptic characteristics. Each category (extra virgin and virgin) covers a wide variety of oils not only in terms of the intensity of their positive attributes but also in terms of their type of fruitiness. Two main types of fruitiness are defined: green or ripe, and their intensity is broken down into delicate, medium, or robust. Olive oil competitions have adapted the terms they use to reflect the changes recommended by the IOC and the European regulations, replacing

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“intense “and “light” by robust and delicate respectively, as found on the labelling of olive oil bottles (International Olive Oil Council (IOC), 2018; Commission Regulation (EEC), 2016). Very often, in addition to the regulations, tasters employ an analogical description to evaluate the sensory descriptors of oils. Thus, both ortho- and retro-nasal olfactory perception are used to award scores on aromatic notes and aroma based on descriptors like artichoke, almond, banana, apple, tomato, allowing finer definition of monovarietal oils, olive oils with designation of origin, and the particularity of terroirs. Finally, to differentiate top quality EVOOs from standard ones, in some profile sheets, two additional aroma attributes are often considered: harmony and persistence (Bongartz & Oberg, 2011; Bongartz et al., 2016; Oberg, 2017).

Under international standards and regulations, some producers add value to their olive oils through appellations such as Registered Designation of Origin (RDO), Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI). These indicate that the oils possess a certain typicity (specific organoleptic profile in relation with a terroir) and originality, conferred by certain varieties of olive trees, a terroir, and know-how. Olive oil arouses a desire to seek maximum gastronomic value, especially from informed consumers. To satisfy this demand, the olive sector holds regional, national, or international competitions that select the best oils from organoleptic analyses, substantially adding to their commercial value (Balco & Gracia, 2020). On the basis of rules specific to each competition, judges trained in olive oil tasting award prizes to oils with the aim of providing recognition of producers’ work, guiding consumers and leading them to experience the diversity of olive oil tastes. These awards can impact both consumer awareness of high-quality products and the entire olive sector: agricultural production, processing, packaging, logistics, distribution, and suppliers. Competition regulations for selecting samples are often similar of those of International Oil Competition Mario Solinas (IOC Mario Solinas, 2019): (i) some authorize only oils with denomination of origin and group them according to this criterion; (ii) others require that the extra virgin olive oils presented be accompanied by a panel test certificate from a laboratory accredited by the International Oil Council (IOC) and European Union (EU) regulations; (iii) others let the producer decide which category to compete in (self-assessment of fruitiness, bitterness, and pungency intensities). Finally, outside the competitions, guides such as EVOOLEUM, Flos olei, GastrOleum, and Iber Oleum list oils from all sources without distinction, as classified by international tasters according to their organoleptic properties with reference to pre-established criteria. Like the competitions, these guides serve to add value to olive oils and inform consumers.

In the case of competitions rewarding oils with a denomination of origin, the panel of judges seeks conformity of typicity of the origin (PDO) and selects the most representative ones (Vichi et al., 2019). Otherwise, the oils are systematically classified according to type of fruitiness (green or ripe). However, to ensure fairness, subclasses related to the intensity of fruitiness are introduced (robust, medium, and delicate) because it is impossible to objectively compare a delicate ripe fruitiness with a robust green fruitiness. This categorization is either provided by the producer or performed in advance following sample tasting by the competition organizers.

This paper compares how different international competitions select eligible olive oils, analyzing their sensory assessment sheets to determine the diversity and weight of the parameters considered. We present an overview of the different awards and the modes of announcing results, together with the special case of guides. We also present an analysis of various studies on consumer preferences, seeking to determine whether consumers are impacted by these awards, and whether their preferences reflect the selection criteria of expert panels.

2. An overview of olive oil competitions

Like most agri-food products, virgin olive oils are the subject of various competitions: international, national, regional, departmental,

and sometimes even cantonal. We examined as many as possible of the numerous olive oil competitions: their similarities and differences, the different stakeholders (oil producers, organizers, and judges), and the awards’ impact on consumers. Each competition uses a different award system, and the percentage of olive oils awarded prizes can vary from one competition to another. Producers have to comply with sample selection criteria that differ depending on the competition and pay more or less expensive entry fees. Competition organization also differs greatly in the financial and communications means they devote to raising awareness of their competition and of the winning olive oils. Moreover, judges apply sensory evaluation criteria whose weights differ depending on the competition. In addition to the competitions, specialist guides provide further information on olive oils and their production.

2.1. Aims of competitions

Olive oil producers enter competitions to promote their image. The competitions are a useful marketing tool, rewarding the best producers while offering support to non-winners. Awards also serve as a guide, informing the consumer about olive oils of high quality. They aim to promote the diversity of virgin olive oils so as to raise awareness of their sensory differences. Often, requirements arising from the European Union agricultural policy promoting olive oil quality and enhancing sector competitiveness have to be taken into account (Chousou et al., 2020). This policy has very special connotations for certain countries such as Italy and Spain, which have chosen to integrate the promotion of regional produce into the overall development of the production system. These countries promote specific territorial resources as part of a package including nature conservation, tourism, and education (Polenzani et al., 2020). As in Greece, olive oil enjoys a high profile in the food industry and is of great importance to the economic and social life of the country.

2.2. Identification of competitions

The various competitions (Table 1) were identified via website listings such as those of OléOMONDO (an e-commerce retailer selling “Grands Crus” organic olive oil developed by committed producers, all recipients of awards from the most prestigious international competitions), FRANCE OLIVE-AFIDOL (French Interprofessional Olive Association) and EVOO World Ranking. The regulations for olive oil competitions are generally available on-line in varying degrees of detail, explaining to consumers how selection is handled.

2.3. Eligible olive oil samples

Most competitions are open to all olive-oil producing countries, from both the northern and southern hemispheres, provided their oils are extra virgin olive oils. Flavored and infused olive oils are also eligible to participate in some (Athena International Olive Oil competition (ATHIOOC), EVO International Olive Oil competition (EVO IOOC), Los Angeles International Extra Virgin Oil competition (Los Angeles)), while others are open exclusively to organic extra virgin olive oil, certified under EU regulations and/or under the U.S. National Organic Program (NOP), or the Japanese Standard for Organic Agricultural Processed Food (JAS).

All submitted samples must contain olive oil produced in the crop year of the competition and must be submitted in their normal retail packaging when sampling is not directly done from the tanks in the presence of a notary. Olive oil samples must bear an official brand label compliant with the laws of the country of origin or the country they were bottled in. Often, organizers require a recent chemical analyses certificate from an accredited testing laboratory, indicating basic physico-chemical properties (International Olive Oil Council (IOC), 2018; Commission Regulation (EEC) 2568/91, 2016) and submitted with the entry form for each sample. Moreover, some competitions, particularly

Table 1

List of olive oil competitions, their website and the organizing country.

American competitions	Website	Organizing country
Argoliva	http://www.argoliva.com.ar/ (accessed September 6, 2019)	Argentine Republic
Los Angeles International EVOO	https://fairplex.com/competitions/olive-oil-competition/competition (accessed August 30, 2019)	USA
New York Olive Oil (NYIOOC)	https://nyoliveoil.com/ (accessed July 23, 2019)	USA
Olivinus	http://www.olivinus.com.ar/_SP/index.php (accessed September 6, 2019)	Argentine Republic
Olivinus Niños	http://www.olivinus.com.ar/_SP/index.php (accessed September 6, 2019)	Argentine Republic
SIAL Olive D'Or (SIAL)	https://sialcanada.com/en/olive-or-contest/ (accessed August 30, 2019)	USA
European competitions	Website	Organizing country
Athena IOOC (ATHIOOC)	https://www.athenaoliveoil.gr/en/ (accessed August 30, 2019)	Greece
AVPA	https://www.avpa.fr/ (accessed May 6, 2019)	France
BioFach Olive Oil Awards	https://www.biofach.de/en/events (accessed September 6, 2019)	Germany
Biol Prize	https://www.biolprize.it (accessed September 6, 2019)	Italy
Concorso Oleario Aipo D'Argento	www.aipoverona.it (accessed May 11, 2019)	Italy
Concorso Olio Capitale	http://www.oliocapitale.it/en/exhibit/olio-capitale-competition/ (accessed May 11, 2019)	Italy
Concorso de Aceite	http://www.oliveoilagency.org (accessed May 11, 2019)	Italy
DER FEINSCHMECKER OLIO AWARD	https://www.der-feinschmecker.de (accessed October 2, 2019)	Germany
EVO IOOC	https://www.evo-iooc.it/ (accessed July 24, 2019)	Italy
Japan Olive Oil Prize (JOOP)	http://jooprize.com/ (accessed August 30, 2019)	Japan
Leone d'Oro di Mastri Oleari	https://www.oliveitaly.it/en/28-leone-doro-dei-mastri-oleari-2018-2019-we-start/ (accessed December 11, 2019)	Switzerland
Les Olivalies	https://lesolivalies.com/fr/ (accessed October 26, 2019)	France
London IOOC (LIOOC)	http://www.londonoliveoil.com/ (accessed May 20, 2019)	Britain
Mario Solinas	http://www.internationaloliveoil.org/ (accessed May 20, 2019)	Spain
Olive Oil Award Zurich (OOAZ)	https://www.zhaw.ch/en/lfsm/about-us/an-open-university/olive-oil-award-zurich/ (accessed September 19, 2019)	Italy
Ovibeja	https://www.ovibeja.pt (accessed December 14, 2019)	Portugal
Sol d'Oro Northern Hemisphere	https://www.solagrifood.com/ (accessed October 2, 2019)	Italy
Asian competitions	Website	Organizing country
China International Olive Oil	http://www.eoliveoil.com/olive-oil/oliveoilcompetition.html (accessed October 2, 2019)	China
Olive Japan	http://olivejapan.com/en/competition (accessed September 25, 2019)	Japan
TERRAOLIVO	https://www.terraolivo.org (accessed September 2, 2019)	Israel
Oceanian competition	Website	Organizing country
Sol d'Oro Southern Hemisphere	https://www.solagrifood.com/ (accessed October 2, 2019)	Italy
Guides	Website	Organizing country
EVOOLEUM	https://www.evooleum.com/ (accessed August 27, 2019)	Spain
Flos Olei	http://www.flosolei.com/ (accessed August 27, 2019)	Italy
GastroOleum	https://gastroleum.com/ (accessed August 27, 2019)	Spain
Iber Oleum	http://www.iberoleum.es/ (accessed August 27, 2019)	Spain

EVOO: extra virgin olive oil, IOOC: international olive oil competition.

the IOC Mario Solinas and EVO IOOC, ask for a certificate of sensory analysis delivered by a tasting panel holding IOC recognition to prove an oil's extra virgin category. However, [Circi et al. \(2017\)](#) indicated that the organoleptic evaluations of certain EVOOs by nine approved labs were not consistent. The panel test used to assign a sample to its correct category, virgin or extra virgin, is not foolproof ([Albi & Gutiérrez, 1991](#)), and this has been known to penalize some oils. Heated debates and controversies surround the sensory evaluation of the same EVOOs by different testing laboratories and panels of experts, over either an absence of sensory defects in EVOOs or very slight sensory defects only perceived by certain tasters ([Circi et al., 2017](#)). A strategy for avoiding disagreements when divergent results are provided by different sensory testing laboratories (sometimes non-accredited) was proposed by [Aparicio-Ruiz et al. \(2019\)](#), using reference materials such as volatiles and sensory descriptors to enhance taster training. Other authors ([Barbieri et al., 2020](#)) also addressed the issue of monitoring and improving the performance of sensory panels by using a "decision tree", which involved agreeing on a category or a main perceived defect and/or fruitiness attribute; in addition, these authors recommended quality control tools. Their method led to satisfactory classification for 289 out of 334 tested EVOOs, while a formative reassessment enabled 41 out of 45 initially discarded samples to be classified. In addition, chemometric approaches based on sensorial data and chemical measurements were used to discriminate between EVOOs and VOOs or to determine their origins, most being recognized as difficult to accurately classify by the panel test ([Cecchi et al., 2019, 2020](#)).

Besides these chemical and sensory characterizations, some

competitions request supplementary information like the quantity of olive oil produced in the last crop, the average annual quantity produced over the last 4 years, the average age of olive trees, the type of olive grove (traditional or intensive), the collection system (manual, mechanical), the extraction system and temperatures, even including the manufacturer of the extraction system. Generally, competitions are open to all individual producers, olive oil mills, producer cooperatives and cooperative associations, bottlers, exporting companies, and any business that produces, bottles, and trades in branded extra virgin olive oils. Proof of provenance of all the samples must be guaranteed, on request of the organizing committee, with appropriate documentation.

2.4. Competition locations and fees

Competitions take place in the major oil-producing countries such as Spain, Italy, Greece, and Portugal; France organizes two international competitions yearly (Agence pour la Valorisation des Produits Agricoles (AVPA) and Les Olivalies). The largest numbers of olive oil samples are presented in countries with low production such as China, Japan, and the United States of America (USA), or in countries known as large importers such as Germany, England, and Switzerland ([IndexMundi, 2019](#)).

In the most prestigious competitions, many countries are represented and as many as 1000 olive oil samples may be presented (New York International Olive Oil Competition, NYIOOC). Judging brings together numerous foreign experts of international renown for several days of tasting, with registration fees ranging from 50 to 460 euros according to

the reputation of the competition. Lower fees are offered if more than one sample is presented and the registration fees per sample can also be reduced for “early bird” payment. Generally, fees cover the following: (i) sensory evaluation by the tasters, (ii) organization of the awards ceremony, (iii) publication of results in the daily press, specialist magazines and on Internet, (iv) certificates and trophy if applicable.

2.5. Selection of judges

Assessing large numbers of olive oil samples is very expensive, due to the need for an expert tasting panel. There are no official regulations for the selection of judges, who are chosen by the competition organizers. Some require jury leaders, approved by the IOC; others build their juries from experts recognized as trained in oil-tasting skills. Depending on the total number of samples to be evaluated, the team leader may divide the jury into subgroups and appoint one coordinator for each sub-group. A special case is OLIVINUS Children, one of the two competitions in the world judged by children between 8 and 15 years old, who designate the best EVOOs worldwide according to their preference. Sixty children compose this panel, which trains all year round. The section “Biol Kids” in the “Biol Prize” competition is the second case, where a special prize is awarded by a jury of children selected after a series of training sessions in local primary schools. Overall, there appears to be a certain diversity and heterogeneity in the selection of judges.

2.6. Olive oil selection

In some competitions, all oils compete without distinction as to their origin, while in others, categories of fruitiness are established, or selection is restricted to oils with a designation of origin and the categories are judged separately. Thus, some competitions are open to olive oils belonging to the following categories: (i) extra virgin olive oil, (ii) organic extra virgin olive oil, (iii) PDO/PGI extra virgin olive oil (Protected Designation of Origin and the Protected Geographical Indication), (iv) monovarietal extra virgin olive oil, (v) blended extra virgin olive oil. For other competitions, extra virgin olive oils are divided by intensity of fruitiness into: (i) delicate fruitiness, (ii) medium fruitiness, (iii) robust fruitiness. If types of fruitiness (ripe or green) are also distinguished, this yields six subcategories, the commonest approach. An exception is the AVPA competition, where no distinction as to fruitiness is made in the tasting and the six subcategories are used only to announce the results and situate the winning olive oils. Only one competition (London International Olive Oil Competition, London IOOC) addresses health, quantifying the content of the major phenols (oleocanthal, oleacein, oleuropein aglycon (monoaldehyde and dialdehyde forms) and ligstroside aglycon (monoaldehyde and dialdehyde forms)) via Nuclear Magnetic Resonance (NMR) spectroscopy (Karkoula et al., 2012, 2014) to verify the conformity of healthiness claims with [EU Commission Regulation 432/2012](#). There is also a prize for “highest polyphenol content” awarded by the Japan Olive Oil Prize (JOOP) competition. These different types of selection ensure that competitions represent the diversity of olive oils. The mode of sample collection also varies in situ collection or dispatch by the candidate, involving several stages of compliance with competition selection regulations. Since the olive oil samples are tasted anonymously, they must be coded for blind examination; details of anonymity procedures are available from the organizers.

2.7. Selection policy

Since different juries score the oils, it is important to harmonize the scores so they can be compared objectively. However, no details on harmonization are communicated in the regulations of most competitions, except for AVPA, which evens out the scores of the different juries as well as scores at the different selection stages, using the mean and the standard deviation.

Although most often based on the Mario Solinas regulations, the different competitions have established their own sensory evaluation sheets, selecting the criteria that best reflect the objectives of their competition and the targeted olive oil categories: green or ripe fruitiness with a delicate, medium or robust intensity. [Table 2](#) presents a comparative study of the sensory evaluation sheets of 10 international competitions and an international guide. The sensory evaluation method adopted by the majority reflects the tasting process. First, various defects (or negative attributes) are identified and then, positive attributes are quantified through (i) olfactory sensations focusing on harmony and fruitiness, (ii) gustatory-retronasal sensations, where bitterness and pungency are assessed in addition to fruitiness and harmony, and (iii) final gustatory-retronasal sensations enabling the taster to quantify the oil’s complexity and its persistence in the mouth.

Often, olive oils are assessed using a scoring system with a maximum score of 100, and less frequently, with a decimal system ranging from 0 to 10.00 without a total score. Three profile sheets (ATHIOOC, EVO IOO and NYOOC) are clearly based on that of IOC Mario Solinas (IOC Mario Solinas, 2018). Some competitions and guides (Oil China IOOC, Leone d’Oro, and Los Angeles) do not take into account defects, some cite defects but do not name them explicitly (EVOOLEUM and SIAL), while others ask judges to state their perceptions of defects with or without numerical quantification. Generally, positive attributes are given scores out of 100, except in the Olive Oil Award Zurich (OOAZ), Japan Olive Oil Prize (JOOP) and SIAL Olive d’Or (SIAL) competitions, which require evaluation from 0 to 10. For the other six competitions and the EVOOLEUM guide, perception of positive attributes is divided into three sensations: (i) olfactory sensations, (ii) gustatory-retronasal sensations, (iii) final gustatory/retronasal sensations.

Positive and negative attributes contribute differently to the final score. Scores vary from 20 (Los Angeles) to 50 (EVOOLEUM) for olfactory sensations, from 35 (Leone d’Oro) to 50 (Oil China IOOC) for gustatory/retronasal sensations and from 10 (EVOOLEUM) to 35 (Los Angeles) for final gustatory/retronasal sensations. The attributes, bitter and pungent or spicy, are evaluated under gustatory/retronasal sensations for ATHIOOC, EVO IOOC, IOC Solinas and NYIOOC competitions, with scores between 0 and 3 (out of a total of 45 or 50), while the other competitions set a maximum of 10 points. To extend the sensory evaluation of olive oils, other descriptors are included such as complexity, persistence, harmony, and balance. At the end, some competitions require to detect some analogic descriptors (artichoke, apple, banana, tomato, among others) and to qualify or quantify fruitiness intensity (delicate, medium, robust). Thus, from one international competition to another, the principal attributes can be fruitiness, bitterness, pungency, and harmony. Certain competitions assess whether an olive oil is “balanced” (Leone d’Oro) or “unbalanced” (JOOP), instead of its harmony. Others ask judges to quantify the complexity of its fruitiness (JOOP, Leone d’Oro, Los Angeles). But their evaluation sheets contain too many additional attributes whose detection and evaluation can be difficult even for an expert taster.

French competitions AVPA and “Les Olivalies” were not included in these comparisons because their selection system is different. Little information is given on the regulations for “Les Olivalies”, except for the sensory assessment, which is descriptive and includes scores on olfactory, gustatory, retronasal aspects and overall impression. The prizes are awarded exclusively and directly at the end of each sample tasting, on the basis of discussions among the tasters and taking the descriptors into account. Immediate judgements by the members of the jury in real time determine whether or not the sample deserves a prize, and which prize. As regards the sensory evaluation sheets presented above, AVPA uses a simpler procedure to assess the organoleptic properties of EVOOs. Olive oils are judged on five attributes: (i) and (ii) the intensities of bitterness and pungency, defined in IOC regulations ([International Olive Oil Council \(IOC\), 2018](#)) and each evaluated on a 0–10 scale, (iii) aromatic maturity, a specific descriptor representing the maturity of fruitiness (green or ripe) and which is rated on a continuous scale from 0% (green

Table 2

Comparison of specific features of olive oil competitions and guides, based on 2019 regulations.

Name	ATHIOOC	EVO IOOC	IOC Solinas	NYIOOC	Oil China IOOC	EVOOLEUM	OOAZ	JOOP	Leone d'Oro	Los Angeles	SIAL
Country	Greece	Italy	Spain	USA	China	Spain	Switzerland	Japan	Spain	USA	Canada
Total score	100	100	100	100	100	100			100	100	30
Negative attributes		X		X		X	X	X			X
Fusty-Muddy sediment	(0-10)	X		X			(0-10)	(0-6)			
Musty-Humid-Earthy	(0-10)	X		X			(0-10)	(0-6)			
Winey-Vinegary	(0-10)	X		X			(0-10)	(0-6)			
Acid-Sour								(0-6)			
Frostbitten olives							X				
Rancid	(0-10)	X		X			(0-10)	(0-6)			
Dry Hay		X									
Metallic	(0-10)			X			(0-10)				
Others	(0-10)	X		X			X	X			
Olfactory sensations	35 points	35 points	35 points	35 points	35 points	50 points	X		45 points	20 points	
Olive fruitiness	0-7	0-7	0-7	0-7	5-10	0-30	0-10		X		
Other fruits	0-3	0-3	0-3	0-3		X			X		
Green	0-2	0-2	0-2	0-2		X					
Other positive sensations	0-3	0-3	0-3	0-3	1-7	X					
Harmony	0-20	0-20	0-20	0-20	10-18		X		0-10		
Intensity									0-20	0-10	
fruitiness											
Complexity						0-20			0-15	0-10	
fruitiness											
Name	ATHIOOC	EVO IOOC	IOC Solinas	NYIOOC	Oil China IOOC	EVOOLEUM	OOAZ	JOOP	Leone d'Oro	Los Angeles	SIAL
Country	Greece	Italy	Spain	USA	China	Spain	Switzerland	Japan	Spain	USA	Canada
Gustatory-Retronasal Sensations	45 points	45 points	45 points	45 points	50 points	40 points	X		35 points	80 points	
Olive fruitiness	0-10	0-10	0-10	0-10	5-10	0-20	0-10	0-10	0-10		0-10
Green	0-2	0-2	0-2	0-2				X			
Sweet	0-4	0-4	0-4	0-4	3-10	0-5			0-5		
Other fruits			X			X					
Fruity green							X		X		
Fruity ripe							X	X	X		
Bitter	0-3	0-3	0-3	0-3	0-10		0-10	0-10	X		0-10
Pungent		0-3	0-3	0-3			0-10	0-10	X		0-10
Spicy	0-3				0-10						
Other Positive Sensations	0-3	0-3	0-3	0-3							
Harmony	0-20	0-20	0-20	0-20	5-10		X	X		0-35	
Persistence							X	X	0-5		
Unbalanced								X			
Intensity									X	0-20	
fruitiness											
Complexity						0-10		X	0-10	0-25	
fruitiness											
Fluidity								X	X		
Equilibre						0-5			0-5		
Analogic descriptors	X	X		X	X	X	X		X		X
Name	ATHIOOC	EVO IOOC	IOC Solinas	NYIOOC	Oil China IOOC	EVOOLEUM	OOAZ	JOOP	Leone d'Or	Los Angeles	SIAL
Country	Greece	Italy	Spain	USA	China	Spain	Switzerland	Japan	Spain	USA	Canada
Final Olfactory Gustative Sensations	20 points	20 points	20 points	20 points	15 points	10 points			20 points	35 points	
Complexity	0-10	0-10	0-10	0-10							
Persistence	0-10	0-10	0-10	0-10			0-10				
Intensity											
Harmony					10-15		0-10		0-10	0-35	

(continued on next page)

Table 2 (continued)

Name	ATHIOOC	EVO IOOC	IOC Solinas	NYIOOC	Oil China IOOC	EVOOLEUM	OOAZ	JOOP	Leone d'Or	Los Angeles	SIAL
Equilibre									0–10		
Category of fruitiness				0–10					X	X	
Green			(0-10)								
Ripe			(0-10)								
Delicate/Soft	X	(1–3)		(0–3)					X	(2-10)	
Medium	X	(4–7)		(4–6)					X	(4-10)	
Robust/Intense	X	(8-10)		(7-10)					X	(5-10)	

X: cited attributes but not quantified, in bracket: scores not totaled.

fruitiness) to 100% (ripe fruitiness), (iv) the intensity of fruitiness (0–10 scale) and (v) the harmony of fruitiness (0–10 scale). A supplementary parameter is considered, such as the intensity of any defects (only evaluated on a 0–10 scale). Then, four of these parameters are combined into two special descriptors. The first is the fruitiness note (N), obtained by combining the intensity of fruitiness (I) with the harmony of fruitiness (H) and the intensity of the maximum defect (D) according to the equation below (Eq. (1)), to which a score of 10 is added to obtain a total out of 20, easier for the producers to understand and avoiding negative ratings for oils with defects:

$$N = (0.72 \times I) + (0.28 \times H) + 10 - D \quad (1)$$

The second combination of parameters forms a special descriptor named structure (S), obtained by weighting the degree of intensity of bitterness (B) and the degree of intensity of pungency (P) to take into account consumer preferences according to the following equation (Eq. (2)):

$$S = (0.62 \times B) + (0.38 \times P) \quad (2)$$

The aromatic maturity parameter remains untouched. This competition classifies oils differently, without total scores. A novel approach is proposed in which the scores for the three special descriptors (structure, aromatic maturity, and fruity note) are used to build a spatial representation of the different olive oils tasted, defining a 3D scatter plot with a barycentre around which the different oil samples are distributed. A fitting of a mathematical model (linear regression) on the 3D scatter plot makes it possible to obtain a classification of the samples taking into account the three special descriptors simultaneously, and therefore to select the oils during the different tasting rounds, aiming for an equitable distribution of the oils selected in all directions, *i.e.* from robust green to delicate ripe.

Der FEINSCHMECKER, Germany's leading leisure and lifestyle magazine for over forty years, has organized its own competition every year since 2003: the FEINSCHMECKER OLIO Award. Few details are available on its regulations, but several hundred oils (up to 500 from 11 different countries in 2019) are known to be tasted in a blind test by a top-class jury in several days. FEINSCHMECKER tasting follows the rules laid down by the International Olive Oil Council by dividing oils into groups: "slightly fruity", subtle in fragrance and with little bitterness, "medium-fruity" and "robustly fruity", very robust in bouquet, clearly bitter, with an extremely sharp aftertaste. Two criteria determine the classification of oils. The first is intensity of fragrance and taste, called fruitiness: with a maximum of 5 points for fruitiness intensity, an olive oil up to 3.0 has a slightly fruity (delicate) taste, from 3.0 to about 4.5 medium-fruity, and over 4.5 robustly fruity. The second criterion is intensity of bitterness: if the oil tastes mildly sweet and not bitter at all, it is classified in the slightly fruity category.

When design is judged in competitions (BIOL, EVOOLEUM, JOOP, Leone D'Oro, LIOOC, Los Angeles, SIAL, and TERRAOLIVO), a numerical rating is given on the label, the bottle, the cap, and the material used to package the oil. Particular attention is paid to the physical means (paper, inks, and typography), to the artwork or illustrations (packaging designed to appeal to a particular audience), to innovation (an original

illustration can drive package design), to use of color (ordinary or striking), as well as to the general image of the product.

2.8. The different awards

The usual procedure is to award gold, silver, and bronze medals to the olive oil samples obtaining the highest scores (usually maximum 100 points) for each category. The percentage of medals awarded, when known, represents between 30 and 45% of the samples in a category. Sometimes, samples that obtain scores as high as 95.5 are distinguished by a particular prize, like "best in class", "platinum" or "double gold" (ATHIOOC). To further reward participants, the olive oil competitions award special prizes (Table 3). To encourage producers, a compensatory "special gourmet diploma" is awarded to finalist participants who did not receive a medal (AVPA). Since 2019, a special prize has been awarded to highlight the presence of a country of honor in the SIAL Canada competition.

Because packaging of food products influences consumers' sensory expectations and the perceived newness of the product (Miltgen et al., 2016), design competitions attribute awards for label, bottle, innovation, and overall product image (BIOL, EVOOLEUM, JOOP, Leone D'Oro, LIOOC, Los Angeles, TERRAOLIVO and SIAL). Some organizing committees (LIOOC and Los Angeles) award prizes for design of organic extra virgin oils that uses environmentally friendly materials (special prize ecodesign) and reward environmental commitment efforts (special prize for sustainability). A prize may also be granted to the company producing the greatest volume.

2.9. Announcement of results

In addition to broadening taste horizons and enriching human

Table 3
Special awards in olive oil competitions.

Special prizes	Competitions
Best of class (relative to the 3 intensity categories)	Los Angeles
Best olive oil per country of origin	OOAZ, Los Angeles
Best mono-varietal olive oil	EVO IOOC, Leone D'Oro, OOAZ, Oleario Aipo D'Argento
Best entry per variety	ATHIOOC, EVO IOOC, Leone D'Oro
Best blended (multi-varietal) olive oil	ATHIOOC, EVO IOOC, Leone D'Oro
Best coupage	ATHIOOC, EVO IOOC, Leone D'Oro
Best olive oil produced by a winemaker	ATHIOOC
Best olive oil per region (or country)	ATHIOOC, Olive Japan, TERRAOLIVO
Best organic or biologic	China Oil, Leone D'Oro, Oleario Aipo D'Argento, OOAZ
Highest polyphenol content	LIOOC, JOOP
Best infused olive oil	LIOOC
Best flavored	EVO IOOC, CIOO, Olive Japan
Best of show or Top Winners or Top 10	Oleario Aipo D'Argento, Olive Japan, TERRAOLIVO
Best society	TERRAOLIVO
Best Kosher	TERRAOLIVO

encounters, competitions bring together consumers and producers during the final awards ceremony (ATHIOOC and JOOP). In certain cases, there is a full-day presentation of the award-winning olive oils, all available for tasting. Some competitions run seminars and workshops promoting the attendee companies (OOAZ). Others (Oil China IOOC) have specialized events like an edible oil forum, edible oil food matching or an edible oil marketing summit. Strategically, the SIAL competition chooses to realize olive oil selection and to present the winning oils in the showroom of the Canadian agrifood industry's national tradeshow, SIAL Canada, which brings together all the major industry players and more than 25,000 visitors from 60 different countries. Like them, the "BIOFACH Olive Oil Awards", which only examines high-quality organic olive oils in the context of external catering (from the canteen and commercial cuisine to the upscale restaurant), announces its winners on a stand at an international tradeshow. Olive Japan (JOOP) each year designates an "olive ambassador" (generally a public figure) to present the prizes during its awards ceremony. Results can be published in newspapers as well as promoted via news releases and broadcasting media announcements (via radio and television). On-line results are usually available on the competition website, with the opportunity to buy award-winning olive oils. Nevertheless, the scores obtained are rarely made public.

2.10. *The specific case of guides*

Guides in both physical and digital version are also published in English or in the language of the country: EVOOLEUM, Flos Olei (dual-language Italian-English and Italian-Chinese), Gastroleum, and IBER OLEUM. They give details of the management team, the members of the jury, and the prize-winning olive oils (photo of the bottle, its brand name, its score and medals or special awards obtained, its tasting and pairings).

Guides provide more information on EVOO production than can be obtained from competition results. Symbols are employed to indicate the country of origin, the Protected Designation of Origin or Protected Geographical Indication to which oils belong, the olive varieties from which they are obtained (with or without percentages), the packaging in which they are presented (glass or metal container). Other symbols indicate the volume of production, the olive harvesting method (hand-picked or mechanical: beaters, trunk shakers, and vibrators), the altitude of the olive groves, sales contacts, the quantity to be sold, price range, export certificates, and the cultivation and plantation systems, as well as the oils certified as Kosher and Halal. A complete phenolic compound analysis realized by the University of Córdoba (total phenolic compound content and content in specific phenols such as hydroxytyrosol, tyrosol, oleuropein aglycone, and oleocanthal) of the 100 tested oils is included in the EVOOLEUM guide. This guide evaluates the organoleptic qualities of oils as required by IOC regulations, slightly modified so as to give equal weight to the fruitiness, potency, and complexity of oils on the nose and their harmony, sweetness, and balance on the palate. The arithmetic mean of the total scores of all jury members is calculated removing the highest and lowest values, thus resulting in a final score of 0–100 points. In the event of there being two or more oils obtaining the same total score to within two decimal places, they are ranked according to the Global Quality Index determined by analytics. The 100 oils obtaining the highest scores are included in the guide and presented in alphabetical order, featuring the score obtained. The first ten classified, EVOO TOP100, and the best oils in each category (eleven in total based on fruitiness, olive variety, country of production, and packaging design) receive a commemorative trophy at an awards ceremony organized in a European capital during a prestigious gastronomic event. The top 100 winners receive a diploma recording their score and two copies of the EVOOLEUM paper guide. Moreover, this guide is promoted at all forums, competitions, national and international fairs, in trade and gastronomic events where the olive oil sector has a special impact.

The Flos Olei guide takes a slightly different approach, spotlighting

the contribution of a single farm and rewarding all aspects of the production process. Each country is presented in an introductory text containing historical and cultural information on olive varieties, olive-growing areas, and production. Spain and Italy have their own section. A specific card describes each company, with tasting scores and gastronomic combinations. After their organoleptic examination, the tasting panel operates according to the IOC method in "open mode" by reporting their opinions to the panel coordinator, who fills in a specific sensory evaluation sheet. A numerical score (up to 100) is attributed to farms, ranking them on the basis of ownership of olive trees and an oil mill, extraction system, relationships between quality/price, quality/quantity, and quality/packaging. The guide claims to be "geared towards trade professionals as well as foodies who want to learn more about the wonderful world of extra virgin olive oil" with supplementary "articles about the art of olive oil tasting, international olive-growing, an analysis of the global evolution of olive oil production, EVOO and gastronomy, the most stunning points of sale around the world, centuries-old olive trees, EVOO and health, an olive oil dictionary and others". A Smartphone application of Flos Olei guide is now available in three languages, Italian, English and Chinese.

In contrast to the Flos Olei guide's international approach, Iber Oleum restricts its selection of the best EVOOs to those of Spain. All the people and entities who participate in the production and marketing of olive oils are represented (oil-producing companies, co-operatives, packaging manufacturers, exporters, restaurant owners, and all those involved in the olive sector). There is one condition: each oil sample must come from a minimum homogeneous batch of 3000 kg, either from conventional production or organic production, and oil samples must be collected by Iber Oleum technical staff. The oils presented in the 2020 guide are therefore classified in two categories: (i) robust fruitiness, (ii) delicate to medium fruitiness. As in the AVPA regulations, the two categories of oils are tasted during different sessions to guarantee a fair score and avoid the "contrast" effect that can occur between samples from different categories tasted at random. This guide offers more consumer-oriented advice, allowing anyone to choose, without fear of error, which oils they want to acquire, the sensations they want to experience, and/or the oils they require for different uses.

GastrOleum is a free application available in Spanish and English, offering a very large database of Spanish and international extra virgin olive oils, geo-located on an interactive map and harmonized according to their sensory profile. Their organoleptic characteristics can be tracked using a barcode. GastrOleum also includes a series of recipes and cooking techniques using excellent extra virgin oils; as well as restaurant names, tips, and tricks of the trade by prestigious chefs. It connects the world of extra virgin oil with gastronomy, through multimedia content: links, music, image gallery, audio, videos, and interactive elements, for a "good" user experience. The objective of GastrOleum, like other guides, is to teach users (chefs, hospitality professionals, and consumers, among others) how to use EVOOs in the kitchen so as to enjoy the full potential of this raw material. It also aims to publicly disseminate the EVOO culture through new technologies and to increase world demand through participatory conversations about its gastronomic uses. The samples are evaluated and defined according to their organoleptic parameters, classed according to a practical system based on the IOC method ([International Olive Oil Council \(IOC\), 2018](#)). To this end, the evaluation team perform sensory analysis defining the qualities of each sample, which is thus given a culinary classification A, B, or C (A: Aromatic; B: Balanced; C: Full-bodied) depending on its characteristics and recommended culinary uses. The organizers recommend that oils should be presented to GastrOleum on the date on which the producer obtains the fresh oil, as this is when the oil reaches its maximum expression. Nevertheless, all those interested can apply to GastrOleum when they deem it appropriate. The data listed by oil on the GastrOleum application are extensive and, like those provided by EVOOLEUM and Flos Olei guides, constitute excellent teaching tools for consumers and hospitality professionals around the world.

2.11. Inter-competition classification by EVOO World Ranking

The [EVOO World Ranking](#) website deserves mention for its initiative and the major contribution it makes in collecting the annual results of international competitions to classify award-winning olive oils. The website was set up a few years ago, based on the ranking system WRW & S (World Ranking Wine & Spirit) created in 1997 by the WAWWJ (World Association of Writers and Journalists of Wines and Spirits). Its aim is to promote the EVOOs participating in the 30 best-known international competitions during the year, except for classifications by books or magazines. This website lists the EVOOs that have won the most prizes worldwide, as well as the producers, the best oils by variety or type, and what area of the world they come from. Competitions are classed by continent and country, with the IOC Mario Solinas considered as reference. The rating system considers the competition's importance in the world, the number of samples, the number of participating countries, and its impact in the major olive oil consumption areas. First, the competition is attributed a score: 10 points for IOC Mario Solinas, the number one, and between 5 and 9 points for the remaining competitions. Then, a second score is attributed for each award, taking the awards from all competitions as equal. For each EVOO, the scores for competitions and awards are multiplied. The scores obtained by a given EVOO in all competitions are added up to obtain the total score for the year. Only EVOOs having accumulated more than 160 points are awarded a diploma and stickers (which can be printed out and used freely).

2.12. Disconnect between consumer preferences and expert evaluation

Competitions are a way to promote the winning producers to buyers, consumers, international markets, and through the various media. However, consumers have been found not to appreciate the same sensory characteristics as experts ([Delgado & Guinard, 2011, 2012](#); [Delgado et al., 2013](#); [Pagliuca & Scarpato, 2014](#); [Valli et al., 2014](#); [Barbieri et al., 2015](#); [Fernandes et al., 2018](#); [Cavallo et al., 2017, 2019](#); [Caracciolo et al., 2020](#)). A review ([Del Giudice et al., 2015](#)) summarized the literature between 1994 and 2014 on consumer preferences relating to EVOO characteristics; the selected papers analyzed intrinsic (taste, appearance, and color) and extrinsic (packaging, certifications, label, brand, etc.) product attributes. In most cases, consumers were found not to appreciate the complex sensory profile of virgin olive oil, particularly its bitterness and pungency. The experts, on the other hand, associate these characteristics with the presence of healthy substances. Unlike the many untrained consumers, these experts are used to tasting this type of oil. This discrepancy between evaluations by experts and consumers could represent a serious limit to consumer demand for an olive oil with health benefits ([Cavallo et al., 2017](#)).

[Cavallo et al. \(2019\)](#) revealed that although a bitter taste provoked aversion for a large number of consumers, this bitterness was sometimes promoted in innovative or organic products, or simply sought after in certain widely consumed foods such as coffee, chocolate, and alcoholic beverages. The econometric model proposed in the study of [Caracciolo et al. \(2020\)](#) showed that the bitterness of EVOOs constituted a commercial disadvantage because consumers preferred EVOOs with a sweet sensory profile, unlike trained judges, for whom bitterness and pungency had a positive connotation. A preference mapping based on IOC expert panel and consumer preference data (blind session) ([Delgado & Guinard, 2011](#)) showed that while consumers appreciated fruitiness and, to some extent, pungency, they preferred olive oils with limited bitterness and pungency, attributes linked to richness in phenolic compounds. Although they found that consumers learned to accept strong sensory features after personal experiences with local products, consumer expectations depended on their cultural, historic, and gastronomic practices. Moreover, [Vázquez-Araújo et al. \(2014\)](#) used a cross-cultural study to reveal clear differences between Spanish and US consumers. Spanish consumers preferred extra virgin olive oil characterized by bitter, pungent, and more green notes, while US consumers

liked olive oils characterized by fruity, floral, and sweet notes. They concluded that if Spanish producers wanted to sell olive oils to US consumers, they had to adapt their olive oil production to the US consumer's expectations by offering oils with the right intensity of fruitiness notes but with limited bitterness or pungency.

These studies suggest the relevance of public and/or private interventions aimed at increasing consumer awareness of the direct link between olive oil's healthiness and its sensory profile. While current labelling policy promotes this health approach, consumers do not really pay much attention to it. Another remark by [Cavallo et al. \(2017\)](#) was that the nutritional details given by the brands today are focused on chemical characteristics, which generally fail to catch the attention of the consumer enough to have a dissuasive effect. They recommended that firms make health claims easier for the consumer to understand, an incontestable way to increase the market for high-quality virgin olive oils. However, it is important to avoid consumers confusing an oil's "organic" label with the "healthiness" conferred by phenolic compound content ([Rizzo et al., 2020](#)).

Unlike expert panels tasting EVOOs in blind conditions, consumers are influenced by packaging, label, and brand. A recent study involving 488 consumers in Thessaloniki ([Baziana & Tzimitra-Kalogianni, 2019](#)) investigated the impact of branding on the behavior of Greek consumers regarding olive oil products. This survey revealed that preference for an olive oil brand is correlated with brand awareness, and that it is positively correlated with recognition of the label, quality perception, and loyalty. Research on the impact of religious and cultural information about olive oils ([Kitagawa et al., 2020](#)) showed that Japanese consumers had a preference for Italian over Tunisian and Spanish olive oils, perhaps because they were familiar with Italy as the country of origin of olive oil. The rich cultural and religious background of the Mediterranean regions (largely Greco-Roman) is used to promote Mediterranean olive oils.

[Delgado et al. \(2013\)](#) found a link between liking, purchase intent, sensory and nutritional expectations of consumers and the packaging and labelling of commercial extra virgin olive oils. When EVOOs were certified as "organic", consumers gave them higher scores because of their expectations of higher nutritional value for organic products, even though the EVOOs tasted had strong bitterness and pungency and the consumers had expressed a dislike of bitter tastes. An analysis of the factors influencing Italian consumers' purchase of organic extra virgin olive oil confirmed that organic certification of extra virgin olive oil reminded them of safety, nutritional, and health aspects ([Liberatore et al., 2018](#)). However, when different options are offered to consumers, the organic attribute becomes less important than local origin and origin certification, according to an investigation on Catalan consumers' behavior towards organic extra virgin olive oil ([Yangui et al., 2019](#)).

In addition to summarizing several aspects of quality, EVOO certification allows consumers to take a quick decision when shopping for oil ([Caracciolo et al., 2020](#)). This supports the idea that quality olive oils need to be promoted and regularly consumed to be appreciated. This is particularly true for consumers who are relatively new to olive oil, and who should be offered the whole range of virgin olive oils (from robust green to delicate ripe fruitiness).

3. Conclusion

Many countries organize international olive oil competitions, even countries that are not major producers, either because olive oil is an integral part of the national culture, or because the competitions are aimed at exploiting olive oils' commercial potential elsewhere. In this case, the reputation of some producer countries in the Mediterranean basin is a significant asset. In addition to the competitive aspect, some competitions play social, technical, and commercial roles through the potential for exchanges between judges, producers, and consumers. The competitions differ in logistics-organization, type of tasters, tasting conditions, method of collecting scores, processing of scores, and nature of prizes awarded, which may lead to different results. From one

international competition to another, there are differences in the sensory evaluation sheets used to rank the best extra virgin olive oils according to certain attributes, which are very specific and difficult to quantify, even by a tasting expert. The division of fruitiness into two main categories, green and ripe, each of which is subdivided into three sub-categories (delicate, medium, robust), can penalize producers who may sometimes have to submit their sample in one category and one sub-category. However, the borderline between these fruitiness categories is rather arbitrary, which can be an unfair advantage or disadvantage, especially when samples are close to this limit. The AVPA approach, which uses this categorization solely for the awarding of prizes, provides a solution to this problem. Generally based on the regulations for the IOC Mario Solinas, some competitions differ by focusing on the health aspect (phenolic compound content) or the oils' biological nature, or by introducing children to awareness of sensory properties, forming future tasting experts or informed consumers. The number of competitions with such special features is likely to grow in coming years.

Producers seek to participate in the competitions to enhance the value of their oils, recognized through the awards as high quality oils with high added value. The notoriety gained for their names, brands, and products grows when producers are regularly rewarded, as does their commercial visibility. However, participation requires significant efforts from the producers, especially financially. Moreover, certain competitions require producers to enter samples in a fruitiness category, which can raise real problems and questions for them.

The awards serve as a guide for consumer choice, but the number of competitions and prizes does not always help consumers to make the right choice. EVOO World Ranking's summarizing work on prize-winning oils from all international competitions is one way of informing consumers about the most frequently rewarded oils and producers. It appears, however, that consumers often do not appreciate the same types of oils as experts. Experts appreciate bitter and pungent olive oils, while consumers usually prefer olive oils with a mild sensory profile. Ultimately, however, it is the consumers who decide their preferences and thus guide the market. Training activities that introduce consumers to the diversity of fruity olive oils by informing them of their "health" aspect, their organoleptic diversity, and their gastronomic uses should enable them to better choose oils according to their own taste and to the uses they wish to make of them.

CRedit authorship contribution statement

Catherine Rébufa: Conceptualization, Writing - review & editing.
Christian Pinatel: Conceptualization. **Jacques Artaud:** Conceptualization, Writing - review & editing. **Fabien Girard:** Conceptualization.

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