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OLIVE OIL IN CATALONIA

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Departament d'Agricultura, Ramaderia, Pesca i Alimentació
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INTRODUCTION

Jordi Ciuraneta i Riu
Minister

The Ministry of Agriculture, Livestock, Fisheries and Food is publishing this *Technical Dossier* devoted to olive oil as a continuation of the dossier dedicated to olive cultivation published almost 10 years ago.

This *Technical Dossier* aims to highlight the state of the art of olive oil in Catalonia, and to raise awareness of everything that all the stakeholders have achieved during this period, with the sole aim of obtaining exceptional oils.

It has not been an easy task, but thanks to a clear objective and help from everyone, all those involved have joined forces, starting with the producers of olives and olive oil, the oil cooperatives and the food and agriculture industry, the Protected Designations of Origin, research centres such as the IRTA, with the recovery and preservation of olive tree varieties to be planted, and the institutions that value and ensure that the resulting product maintains these quality levels, such as the Tasting Panel and Olive Oils Laboratory and the Catalan Agri-food Laboratory.

The Mediterranean diet is the healthiest eating pattern and is the most effective in the prevention of chronic diseases. This eating pattern of the peoples living around the Mediterranean Sea is based on consumption of olive oil as the primary source of fat, among other products.

We believe that the culture of olive oil not only includes oil as its distinguishing feature, but that it is also a product that has much a much greater value and an economic benefit. For this reason, the Ministry of Agriculture, Livestock, Fisheries and Food (DARP) is participating in the European ENPI CBC Mediterranean Sea Basin Programme, a European Union initiative which funds cooperation projects between countries in the Mediterranean region which contribute to the economic, social, environmental and cultural development of the regions concerned.

And because we are also committed to wine and olive oil tourism as a strategy for the future of the primary sector, taking advantage of the symbolic value of our products, which is what creates tourist expectations, and gives our regions their appeal. Nobody travels to places that are not worth visiting.

Catalonia's five protected designations of origin are a guarantee of quality, tradition and products linked to the territory where they are prepared and produced. This is because all the products that are marketed with a protected designation of origin hallmark must be certified by a certification authority that ensures compliance with a series of conditions, which includes all the designation's requirements and specific characteristics.

High quality olive oils, virgin olive oils and extra virgin olive oils are obtained directly from olives by mechanical means, and they are fruit juices that preserve the fruit's nutritional and organoleptic properties. The diversity of olive varieties means that the oils obtained are also very varied and have their own distinctive features, are well defined and have a high gastronomic value.

Another strategy to raise awareness of our products and culinary values has been our participation in the European Region of Gastronomy 2016, a distinction which has been conferred on Catalonia. This distinction, which is a pioneer in its field in Europe, aims to highlight and promote Europe's different food cultures, increase education for healthy and sustainable eating habits, foster gastronomic innovation and ultimately contribute to a better quality of life for individuals.

This project aims to promote the relationship between gastronomy, food and the landscape as a distinctive feature, a specific identifying characteristic and a positioning of Catalonia in Europe and the world, to encourage and consolidate gastronomy as a strategic sector for the country, and finally, to generate synergies with other regions and gastronomic cultures to help preserve our local gastronomic agri-food heritage.

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THE AGRI-FOOD LABORATORY, THE TASTING PANEL AND THE OLIVE OILS LABORATORY
TOOLS AT THE INDUSTRY'S SERVICE

Figure 1: *Olive oils laboratory. Spectrophotometer. Photo: F. Xavier Vicens Burgués.*

01 Introduction

The Agri-food Laboratory is a body attached to the Ministry of Agriculture, Livestock, Fisheries and Food of the Government of Catalonia, which works all over Catalonia.

The Laboratory is also an official service and the technical benchmark of the Catalan government in terms of its specific analytical requirements aimed at controlling and monitoring the quality and safety of food and agriculture.

On the basis of neutrality, it aims to obtain technically competent and reliable results using various techniques for the analysis of food products, in order to become a benchmark for all food and agriculture laboratories and their users.

The Laboratory carries out the official analysis for the means of production and products for food and agriculture in Catalonia by analysing informative or initial, contradictory and final samples from inspection procedures, lawsuits and monitoring campaigns in the sphere of food and agriculture and foreign trade.

The Agri-food Laboratory has two centres: one in Cabrils, in the Maresme region, and another in Reus, in the Baix Camp region, which is the home of the Reus Olive Oils Laboratory and the Official Virgin Olive Oil Tasting Panel of Catalonia.

The laboratory is accredited according to the requirements of EN ISO/IEC 17025: 2005 and has a wide range of accredited measurements in agricultural and food matrices, including a number of physicochemical and sensory measurements for olive oil.

02 The Reus Olive Oils Laboratory

The Reus Olive Oils Laboratory is jointly owned by leading olive oil producing organisations in Catalonia and the Ministry of Agriculture, Fisheries and Food. The Laboratory's services are available to the olive oil sector in Catalonia, and include physicochemical determinations of olive oil complemented by the range of services at the Cabrils Agri-Food Laboratory.

03 The Official Virgin Olive Oil Tasting Panel of Catalonia

The Official Virgin Olive Oil Tasting Panel of Catalonia is responsible for the organoleptic assessment of virgin oils. It is officially recognised by the Ministry of Agriculture, Food and the Environment and the International Olive Council.

Figure 2. *The Tasting Panel. Tasting glass heater. Photo: F. Xavier Vicens Burgués.*

Figure 3. *The Tasting Panel. Tasting booth. Photo: F. Xavier Vicens Burgués.*

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The aim of the Olive Oil Tasting Panel is to replace the individual and subjective judgement with the objective criteria of an expert group.

03.01 **Background**

The Regulation EC/2568/91 was published on 11 July 1991, and stipulated the official method for the chemical and sensory analysis of olive oils and defined their commercial categories, according to the results of those analyses.

At that time, Spain had only three official panels for the sensory evaluation of virgin olive oils: the Arbitration Laboratory (MAP, Madrid), the Atarfe Food and Agriculture Laboratory (Andalusia, Granada) and the Fat Institute (CSIC, Sevilla).

The process for selecting and training an initial group of 110 tasters which would be the basis for the Official Virgin Olive Oil Tasting Panel of Catalonia began in October 1994. This initiative was organised by the company Olis de Catalunya, SA and carried out by the IRTA in collaboration with the Regional Office of Baix Camp (Reus) and the Mas Bové School of Agricultural Training (Constantí), of the Catalan Ministry of Agriculture, Livestock and Fisheries.

This training process culminated on 22 May 1997 with the publication in the Official Journal of the Government of Catalonia no. 2396 of an Order from the Ministry of Agriculture, Livestock and Fisheries (DARP), which established and regulated the Virgin Olive Oil Tasting Panel of Catalonia. After that date, it became accountable to the Ministry's Directorate General for Agri-food Production and Industries, and the IRTA was made responsible for instruction, technical advice and training.

In 2004, the Order creating the Panel was replaced by Decree 473/2004 of 28 December, which regulated the Official Virgin Olive Oil Tasting Panel of Catalonia.

The Oil Tasting Panel is a tool for analysis at the service of the olive oil sector. It consists of a group of tasters (8 to 12) selected beforehand and trained according to the standards established by the IOC (International Olive Council) and the European Union.

The objective of the Tasting Panel is to replace individual and subjective judgements with the common and objective criteria of a group of experts.

Unlike other foods, virgin olive oil must undergo sensory analysis by a Panel before it can be classified into different commercial categories, according to a series of clearly defined rules.

What makes a group of tasters eligible for consideration as an official tasting panel is the range of mechanisms that monitor its reliability and the independence of its ratings.

03.02 **Tasks of the Panel**

The tasks of the Panel are mainly to classify virgin olive oils commercially, produce descriptive profiles and provide a criterion for independent assessment. The role of the Official Tasting Panel is therefore to verify the organoleptic characteristics of virgin olive oils according to the requirements and specifications laid down in the legislation.

The Panel is also a tool that provides support for the production sector in terms of the quality control and management of oil mills; for the marketing sector, for which it provides criteria for distinction, and acts as the conformity assessment body for both the Government (the Agri-food Inspection and Control Service and the Catalan Consumer Agency) and for certification bodies and the various olive oil PDOs. It also acts as an objective and reliable laboratory instrument in the research field, and as part of the Quality Protection Service, it promotes the dissemination and promotion of olive oil and supports the Catalan PDOs (the Les Garrigues PDO, the Siurana PDO, the Oli de Terra Alta PDO, the Oli de Baix Ebre - Montsià PDO and the Oli de Empordà PDO).

03.03 **Composition of the Panel and eligibility to be a taster**

The Catalan panel is made up of 23 official tasters from different producing areas, a technical secretary, the head of the Panel and a director.

Contrary to what most people might think, a taster must not only have highly developed physiological skills in order to be able to identify and distinguish the different aromas and tastes, but must also be a person with a great deal of perseverance and a strong personality who does not allow themselves to be influenced but who at the same time is capable of respecting other opinions; a tolerant person who is able to fit in harmoniously within the group.

For the assessments of the different types of oil to be reliable, the tasters undergo a thorough training programme and a process of weekly continuous evaluation, guided by the IRTA. This process provides training in the application of new sensory analysis techniques, and monitors the reliability of each taster on an individual basis.

03.04 **Analyses carried out by the Panel**

The Catalan Panel offers three basic types of tasting, each of which provides different information:

Certification tasting: this attests to the category of the commercial sample of the oil. This tasting includes the repetitions necessary to validate the results statistically, and includes a report with the oil's descriptive profile.

Descriptive tasting: this provides a descriptive profile of the oil, without any commercial classification. This information is very useful for managing warehouses and marketing the product.

Rapid classification-declassification tasting: designed for quick decision on whether an oil has any shortcomings; this is very useful in the manufacturing process.

Other more specific types of tasting, but which are used regularly, are the Descriptive extended tasting for extra virgin oils, requested by research centres, and the Competitive tastings adapted to the specific conditions of each call.

In short, the sensory analysis service for virgin oils offered by the Catalan panel is very comprehensive and varied to suit the different needs of the sector.

03.05 **The Panel's Clients**

The Panel could be said to constitute all stages in the oil industry, from the producer, to the bottler, the distributor and marketer to the consumer, the government and public and private research.

The Panel continues its work at the service of the Catalan olive oil sector at all levels so that it can continue to evolve and remain at the forefront of quality.

Figure 4. *The Tasting Panel. Tasting booths. Photo: F. Xavier Vicens Burgués.*

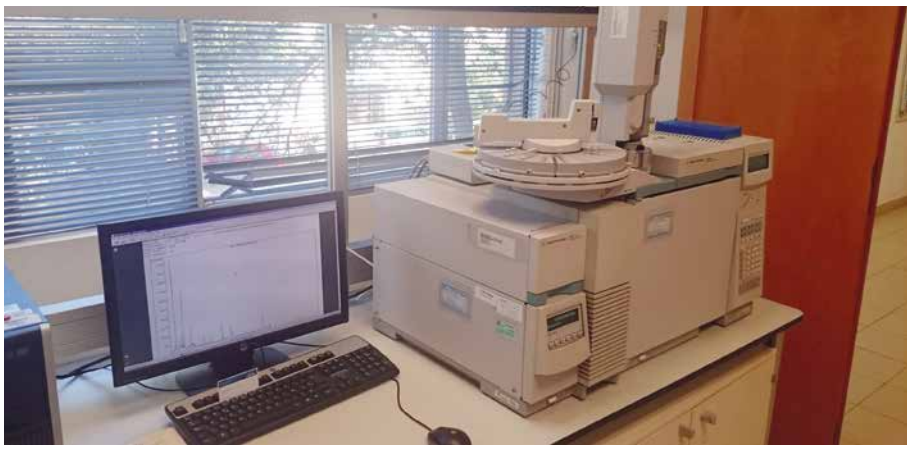

Figure 5. *Olive oils laboratory. Gas chromatographer. Photo: F. Xavier Vicens Burgués*

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Figure 6. *Oenological station Photo: F. Xavier Vicens Burgués.*

THE RECOVERY AND PRESERVATION OF LOCAL VARIETIES OF OLIVE TREE

Figure 1. *Traditional olive plantation Photo: Antònia Ninot.*

01 Introduction

The structural variety of the Catalan olive tree, which has more than 50 reported varieties, is characterised by a high level of genetic diversity (Fig. 1) and its limited geographical coverage, except 'Arbequina' which accounts for about 50% of the acreage. Besides 'Arbequina,' production in Catalonia is primarily based on three other local varieties: 'Morrut', 'Empeltre' and 'Sevillenca'. It is estimated that these four varieties account for over 85% of Catalan production. In economic terms, this represents a high risk of genetic erosion and in commercial terms, a tendency to produce rather uniform oils, due above all to the production of oil from the 'Arbequina' variety.

Fig. 2 shows the distribution of olive cultivation in Catalonia. The leading Catalan region in olive cultivation is Baix Ebre with 22,383 ha, followed by Les Garrigues (21,462 ha), Montsià (14,932 ha) and Segrià (12,891 ha). In many regions, the olive grove is a piece of the landscape that is part of the traditions and culture. In Catalonia there are five PDOs (Fig. 3), which account for 40% of the area of Catalonia's olive groves, and there are around a hundred production companies in these five denominations using a logo to market 7,500 t of oil (2013).

The origins of the cultivated olive tree lie in the wild olive (Breton *et al.*, 2006). Popular tradition places the origin of the domestication of the olive tree in the eastern Mediterranean, subsequently spreading from east to west. Recent studies have shown that the origin of the domestication of the olive tree is more complex, with at least two centres of domestication on both sides of the Mediterranean, but the exchange and dissemination of the culture of olive oil certainly took place from the Middle East towards Europe and the Maghreb. (Kaniewski *et al.*, 2012). The expansion of the olive tree flourished in Roman times, at the same time as the emergence of structures for extracting the oil. Olive oil, which was part of the Mediterranean triad (with vineyards and wheat), was one of the most important trading products and created a major trading network along the Catalan coast (Buxó, 2005). However, the most important expansion of the olive groves on the Catalan coast came much later, in the late eighth century, when the Christians reconquered the territories from the Muslims (Riera-Mora and Esteban-Amat, 1994).

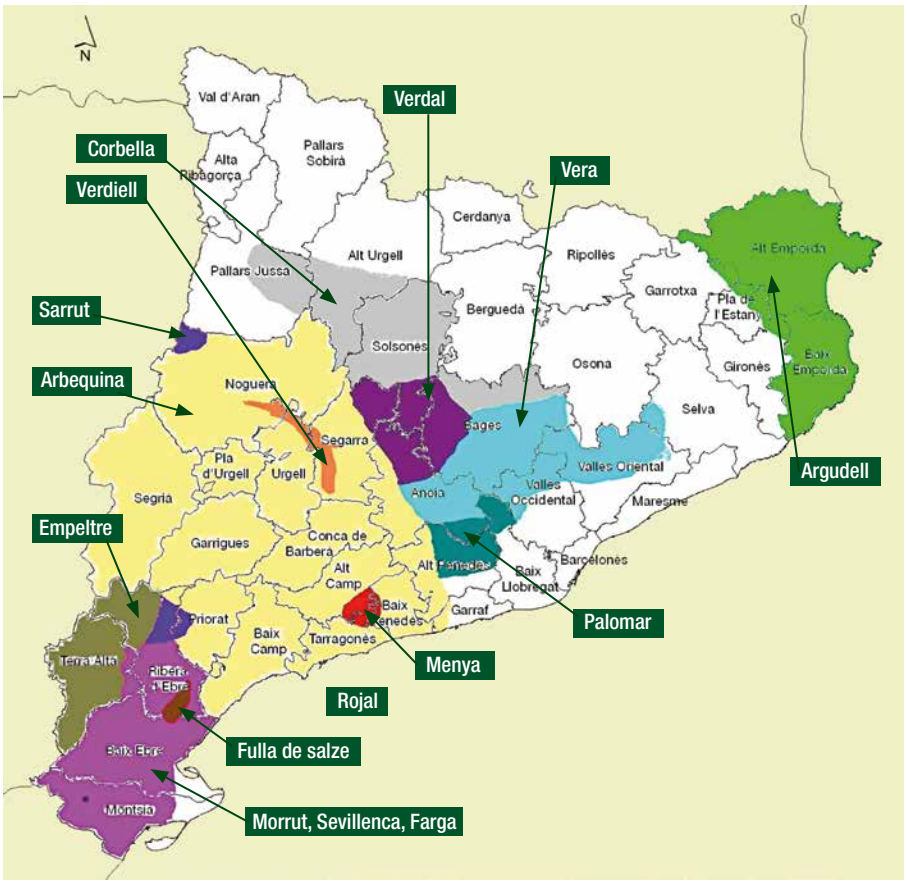


Figure 2. *Varietal structure of Catalan olive groves.*

02 The recovery of varieties

The importance of olive cultivation in Catalonia and the high risk of the loss of native genetic resources due to the standardisation and intensification of farming led the IRTA to begin work on prospecting varieties in 1984, based on a pomological pattern for characterisation. This project identified four main varieties and up to 33 local varieties (Tous and Romera-Aroca, 1993). The number of local varieties has since increased with the study of materials in new production areas. Some of these varieties seem to have grown in Catalonia for hundreds of years, as is the case with the 'Farga' and 'Negret' varieties.

The IRTA founded the Bank of Catalan olive varieties in 1988, and it now covers an area of 0.6 ha. The Bank is at the Mas de Bover Centre in Constantí (Tarragonès). The Bank's objectives are to introduce and preserve the genetic resources of the Catalan olive *ex situ* and simultaneously to study and assess their growing conditions and genetic variability and features of agronomic and technological (oil) interest in the local varieties, in addition to their morphological characterisation. The collection includes three trees for each variety, in a plantation of 7 x 5 m. It currently contains a total of 50 genotypes of Catalan origin, from surveys carried out in Catalonia (Table 1).

Interest in local olive tree varieties has been high for some time. Part of the olive oil industry has shown an interest in restoring and cultivating local varieties. The industry has made a commitment to the strategy of differential quality, emphasising authenticity, relevance and distinction. There are currently single-variety oils on the market which include the concept of tradition; among others, oils from the following local varieties: 'Arbosana', 'Argudell', 'Corbella', 'Farga', 'Fulla de Salze', 'Marfil', 'Menya', 'Morrut', 'Palomar', 'Sarrut', 'Sevillenca' and 'Vera'.

03 Characteristics of local varieties

Catalan olive trees are found in an agronomically wide range of environments. Moreover, the range of single-variety oils on the market present very diverse characteristics which appeal to certain specific markets.

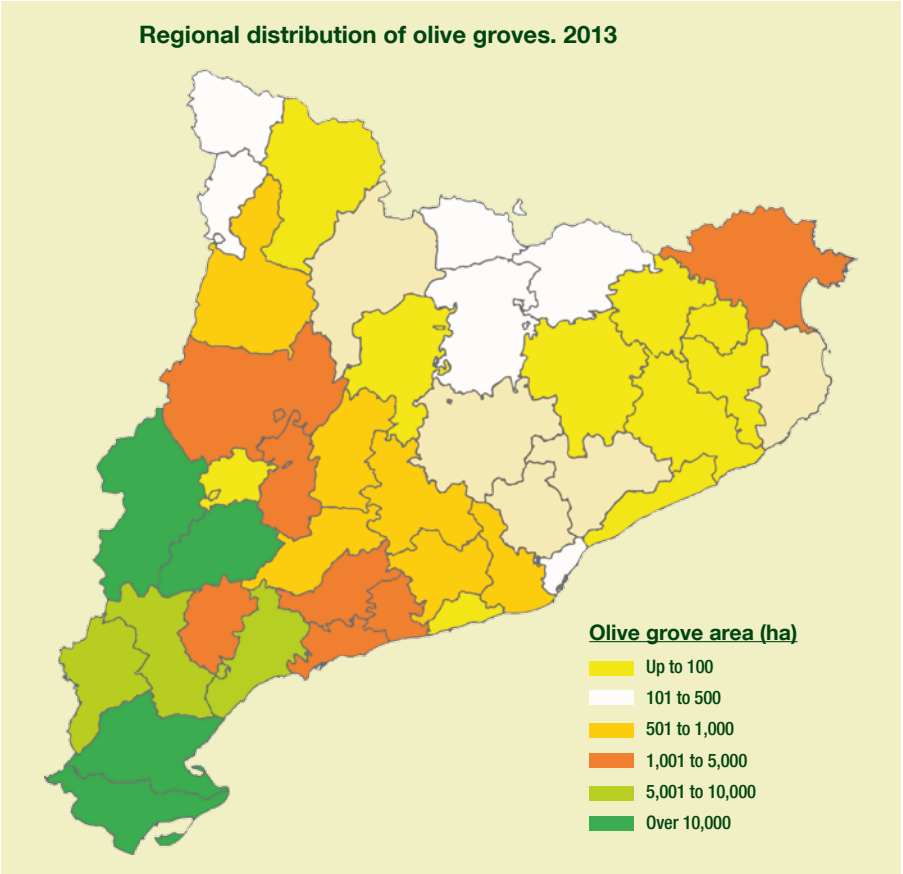


Figure 3. *Regional distribution of olive groves. 2013.*

Figure 4. *Traditional olive plantation Photo: Antònia Ninot.*

Catalan olive varieties have a tolerance to some pests and diseases that may be very important in the future. The variety's sensitivity to the olive fruit fly *(Bactrocera oleae)* is a clear example of this. Catalan olive groves have a wide range of susceptibility to the olive fruit fly, ranging from insensitive varieties such as 'Canetera' and 'Marfil' to highly sensitive varieties such as 'Grossal Vimbodí'. There is also a different response to diseases such as verticillium wilt *(Verticillium dahliae)* and bitter response *(Colletotrichum gloeosporioides)* depending on the variety grown.

At a sensory level, Catalan varieties cover a whole range of possibilities. It is therefore possible to produce tangy and bitter oils (single-variety 'Marfil), sweet and mild oils (single-variety 'Sevillenca'), green oils (single-variety 'Morrut'), oils with hints of grass (single-variety 'Arbosana'), mint (single-variety 'Vera') as well as green and ripe fruited oils.

An oil's oxidative stability as a reference for its useful life measures its ability to cope with oxidation. An oil's stability basically depends on two factors: the fatty acid profile, which determines how fragile the substrate is in terms of oxidation and the antioxidants in the oil, which are polyphenols. The fatty acid composition is a characteristic that depends on the variety but is modulated by the environment. The monounsaturated fatty acid present in the largest quantities in olive oil is oleic acid (C18:1). The Catalan varieties 'Arbosana', 'Farga' and 'Vera del Vallès' have a high content of this fatty acid (> 73%), while the 'Argudell' variety has it in small amounts (63%).

The polyphenol content also depends on the variety and is very variable. Polyphenols also decrease with maturation. The current trend towards producing increasingly early oils means that the higher polyphenol content is synonymous with health. These include the 'Marfil' variety (803 mg/kg) with a polyphenol content three times higher than oil produced using the 'Arbequina' variety (228 mg/kg). Besides 'Marfil', oil is made from olives of the varieties 'Argudell' (301 mg/kg), 'Menya' (449 mg/kg), 'Morrut' (348 mg/kg) and 'Vera del Vallès' (322 mg/kg). Their high content of polyphenols, which are a powerful antioxidant, gives the oils considerable bitterness.

Table 1. List of officially registered Catalan varieties and their distribution

Variety	Registered area (ha)	Region where most common
Arbequina	51,783	Very widespread. The basis of the Garrigues and Siurana PDO
Argudell	1,370	Alt Empordà and Baix Empordà
Arracada d'Aldover	--	The Aldover area (Baix Ebre)
Becarut	22	Baix Llobregat, Alt Penedès and Vallès Occidental
Blanqueta	38	Widespread throughout Catalonia
Corbella	61	Bages and Segarra
Curivell	5	Alt Empordà
Dolça	3	Ribera d'Ebre
Empeltre	4,105	The basis of the Terra Alta PDO
Farga	3,430	The basis of the Baix Ebre-Montsià PDO
Fulla de Salze	263	Ribera d'Ebre
Gravell	20	Noguera
Grossal	69	Generic name of the fat olive
Joanenca	1	Alt Penedès
Llei Valero	--	Ribera d'Ebre
Llei de Cadaquès	25	Alt Empordà
Llumeta	43	Montsià
Manzanenca	90	Generic name of the round olive
Marfil	--	Montsià
Marons	4	Montsià
Mas de Bot	--	Montsià, Baix Ebre and Ribera d'Ebre
Menya	172	Alt Camp
Mollassa	--	Empordà
Morquera	55	Baix Ebre and Montsià
Morruda	15,702	The basis of the Baix Ebre-Montsià PDO
Morrut de la Faldeta	--	Ribera d'Ebre and Priorat
Negral	23	Scattered, especially in Pallars Jussà
Negret	1	Priorat and Conca de Barberà
Palomar	53	Baix Llobregat
Rogeta	--	Noguera and Pallars Jussà
Rojal	340	Ribera d'Ebre and Terra Alta
Sarruda	25	Noguera
Sevillenca	4,793	The basis of the Baix Ebre-Montsià PDO
Tinenta	--	Vallès Occidental - Oriental
Vera	155	Vallès Occidental and Vallès Oriental, Anoia, Baix Llobregat and Selva
Verdal de Manresa	56	Bages and Vallès
Verdiell	538	Scattered, especially in Noguera, Segarra and Urgell

VARIETY 'Corbella'

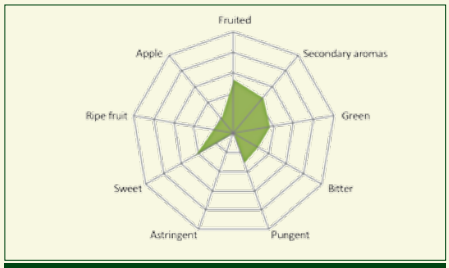
Also known as: *'Montserratina', 'Corbell', 'Curbiella'*

Cultivated in Central/Northern Catalonia, in the Bages, Solsonès, Segarra and Urgell regions.

A vigorous, productive and low alternate bearing variety. Maturation between early and medium, but very uniform on the same tree. Tolerant of bird's eye spot and susceptible to the olive fruit fly.

Tree		*Fruit*	
Vigour	Strong	*Weight of fruit (g)*	*2.31*
Growth habit	Open	*Flesh/stone ratio*	*3.67*
Density of crown	Compact	*Oil content (% db)*	*48.34*
Entry into production	Medium		
Production potential	Medium-high		
Maturation	Early and medium and grouped		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*13.22*	*Saturated fatty acids*	15.72
C16:1	*1.71*	*Unsaturated fatty acids*	84.28
C18:0	*2.06*	*Monounsaturated fatty acids*	69.80
C18:1	*67.76*	*Polyunsaturated fatty acids*	14.48
C18:2	*13.68*		
C18:3	*0.80*		
	Total polyphenols	202.0 mg/kg caffeic acid	
	Bitterness index K225	0.205	
	Stability (Rancimat)	5.0 (h at 120°C)	



Sensorial profile

A highly aromatic virgin olive oil, with various connotations of ripe fruit, apples and herbs. Very soft and sweet on the palate, little bitterness, with a slight pungency and without astringency.

An oil suitable for local and Christmas markets. It is also useful for mellowing bitter oils, providing chromatic complexity. Its low stability means that storage and packaging conditions must be carefully monitored.

VARIETY 'Fulla de Salze'

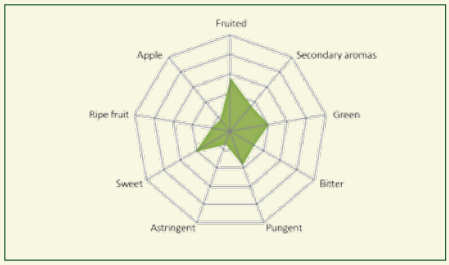
Also known as: *'Salzenya', 'Salzenca'*

Originally from the town of Ginestar (Ribera d'Ebre). It is grown in the regions of Ribera d'Ebre and Baix Ebre in the province of Tarragona.

A variety that is productive, regular and has rapid entry into production. Early and grouped maturation. The fruits have low resistance to detachment. Male-sterile variety. Sensitive to the olive fruit fly.

Tree		*Fruit*	
Vigour	Strong	*Weight of fruit (g)*	*2.20*
Growth habit	Open	*Flesh/stone ratio*	*4.85*
Density of crown	Medium	*Oil content (% db)*	*45.62*
Entry into production	Early		
Production potential	High		
Maturation	Early		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*14.38*	*Saturated fatty acids*	12.25
C16:1	*2.24*	*Unsaturated fatty acids*	87.75
C18:0	*1.36*	*Monounsaturated fatty acids*	69.17
C18:1	*66.35*	*Polyunsaturated fatty acids*	18.58
C18:2	*17.52*		
C18:3	*1.06*		
	Total polyphenols	232.4 mg/kg caffeic acid	
	Bitterness index (K225)	0.212	
	Stability (Rancimat)	5.3 (h at 120°C)	



Sensorial profile

An intensely fruited virgin olive oil, with green and ripe connotations. Secondary aromas reminiscent of cut grass, apple and various ripe green fruit, such as the banana. It is predominant on the palate, with a mild bitterness and pungency and a noticeable final astringency, but this does not alter the profile. As a whole, it is a complex and balanced oil, very suitable for high-end and Christmas markets, although its low stability means that storage and packaging conditions must be carefully monitored.

VARIETY 'Vera del Vallès'

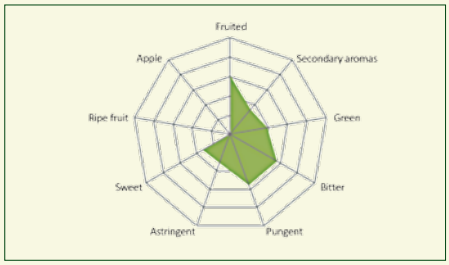
Also known as: 'Verdal de Manresa', 'Salar d'Arbúcies'

Grown mainly in the Anoia, Bages, Baix Llobregat, Vallès Occidental and Vallès Oriental regions of the province of Barcelona. There are scattered examples in the Selva region.

A productive variety with low alternate bearing. The fruit matures late. Male-sterile variety. Sensitive to tuberculosis. Damage due to the olive fruit fly is not severe, but once the attack has begun, eggs are laid at considerable speed.

Tree		*Fruit*	
Vigour	Strong	*Weight of fruit (g)*	*2.92*
Growth habit	Upright	*Flesh/stone ratio*	*3.30*
Density of crown	Compact	*Oil content (% db)*	*50.82*
Entry into production	Early		
Productivity	Medium and low alternate bearing		
Maturation	Medium and grouped		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*11,70*	*Saturated fatty acids*	15.35
C16:1	*1,10*	*Unsaturated fatty acids*	84.65
C18:0	*3,00*	*Monounsaturated fatty acids*	76.75
C18:1	*75,25*	*Polyunsaturated fatty acids*	7.90
C18:2	*7,15*		
C18:3	*0,75*		
	Total polyphenols	322.0 mg/kg caffeic acid	
	Bitterness index (K225)	-	
	Stability (Rancimat)	13.7 (h at 120°C)	



Perfil sensorial

A virgin olive oil with intense green fruitiness, rich in secondary aromas. It is pungent and bitter on the palate, although its level of sweetness is sufficient to enhance its acceptability. A strongly evident final astringency. Secondary hints of flora (mainly leaves or nursery plants). An oil well suited for spring and summer markets, and for gourmet distribution networks.

VARIETY 'Palomar'

Also known as: 'Olesana'

Grown in the Baix Llobregat and Anoia regions. Originally from Olesa de Montserrat (Barcelona).

A variety with early entry into production, with a medium and alternate bearing productivity. Early maturation and the fruits have very low resistance to detachment, which facilitates harvesting. Male-sterile variety. Not considered rough. Sensitive to bird's eye spot and the olive fruit fly (early attack). Both the oil content of the fruit and the chemical composition vary significantly depending on the planting location.

Tree		*Fruit*	
Vigour	Weak	*Weight of fruit (g)*	*2.96*
Growth habit	Upright	*Flesh/stone ratio*	*5.21*
Density of crown	Compact	*Oil content (% db)*	*45.31*
Entry into production	Early		
Productivity	Medium and alternating		
Maturation	Early		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*14.39*	*Saturated fatty acids*	16.20
C16:1	*2.20*	*Unsaturated fatty acids*	83.80
C18:0	*1.69*	*Monounsaturated fatty acids*	69.01
C18:1	*66.43*	*Polyunsaturated fatty acids*	14.79
C18:2	*13.71*		
C18:3	*1.08*		
	Total polyphenols	219.3 mg/kg caffeic acid	
	Bitterness index (K225)	0.242	
	Stability (Rancimat)	5.8 (h at 120°C)	

Sensory profile

A medium fruited virgin oil with mature green notes. Secondary retronasal aromas reminiscent of grass and ripe green fruits, such as bananas and sensations of vegetables. A sweet sensation on the palate, with some slow progressing pungency and bitterness. The overall result is balanced and particularly interesting on the palate, where the flavours and aromas complement each other. An oil suitable for Christmas and local markets. Its low stability means that storage and packaging conditions must be carefully monitored.

VARIETY 'Marfil'

Also known as: 'Blanca'

Cultivated in the Montsià region as isolated trees.

A variety with low productivity and low alternate bearing. Late maturation, and the fruits have low resistance to detachment. Tolerant to the olive fruit fly. The fruit has very sensitive skin, which stains with phytosanitary treatment and handling.

Tree		*Fruit*	
Vigour	Weak	*Weight of fruit (g)*	*2,06*
Growth habit	Open	*Fresh/stone ratio*	*4,13*
Density of crown	Medium - clear	*Oil content (%db)*	*39,41*
Entry into production	Late		
Productivity	Low and low alternate bearing		
Maturation	Late		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*12.15*	*Saturated fatty acids*	13,85
C16:1	*1.27*	*Unsaturated fatty acids*	86,15
C18:0	*1.43*	*Monounsaturated fatty acids*	73,82
C18:1	*71.97*	*Polyunsaturated fatty acids*	12,33
C18:2	*11.15*		
C18:3	*1.18*		
	Total polyphenols	803.6 mg/kg caffeic acid	
	Bitterness index (K225)	0.685	
	Stability (Rancimat)	13.7 (h at 120ºC)	

Sensory profile

An intensely fruited virgin olive oil, with excessive bitterness, pungency and astringency, giving it a distinctly 'tiring' character. Virtually no sweetness, which means that it has no appeal in many markets. An oil with very marked secondary aromas, of plants (leaves and garden plants) that accompany the fruitiness and are partially balanced by the strong sensations on the palate. A powerful but very unbalanced profile, which is only significant if linked to its unique colour and rarity on the market.

VARIETY 'Menya'

Grown mainly in the Alt Camp and Baix Penedès regions.

A variety that is very vigorous, rough, productive and low alternate bearing. Early to medium maturation, and the fruits are highly resistant to detachment.

Tree		*Fruit*	
Vigour	Very strong	*Weight of fruit (g)*	*1.65*
Growth habit	Upright	*Flesh/stone ratio*	*3.13*
Density of crown	Compact	*Oil content (% db)*	*46.09*
Entry into production	Medium		
Productivity	High and regular		
Maturation	Early - medium		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*14.55*	*Saturated fatty acids*	16.88
C16:1	*1.69*	*Unsaturated fatty acids*	83.12
C18:0	*1.97*	*Monounsaturated fatty*	74.80
C18:1	*72.47*	*Polyunsaturated fatty acids*	8.32
C18:2	*7.76*		
C18:3	*0,56*		
	Total polyphenols	449.3 mg/kg àcid cafeic	
	Bitterness index (K225)	0.373	
	Stability (Rancimat)	14.3 (h a 120ºC)	

Sensory profile

A fruited green virgin oil of medium intensity. Its characteristics are intense on the palate rather than aromatic. Tangy, bitter and pungent on the palate, although it retains a high level of sweetness. Secondary aromas of plants (artichoke or nuts and cut grass). The overall result is intense on the palate with a good balance between astringency and sensations of vegetables.

VARIETY 'Arbosana'

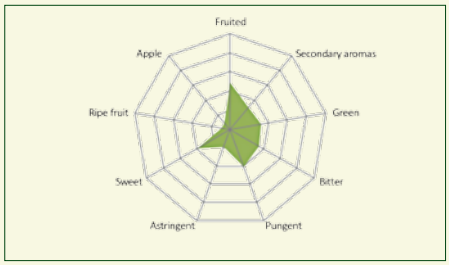
Also known as: 'Arboçana'

Originally from the town of L'Arboç (Baix Penedès), it has subsequently become widespread internationally due to its good adaptation to the super-intensive plantation system.

A variety with early entry into production and high productivity. Its limited vigour is well suited to high-density plantations. Sensitive to cold, small fruit, with late maturation. Low sensitivity to the olive fruit fly. The fruit bunches tend to be close to the shoots, which makes the cleaning process on entry to the mill difficult. Resistant to bird's eye spot.

Tree		Fruit	
Vigour	Very weak	*Weight of fruit (g)*	*1.37*
Growth habit	Open	*Flesh/stone ratio*	*4.46*
Density of crown	Compact	*Oil content (% db)*	*47.58*
Entry into production	Early		
Productivity	Very high and regular		
Maturation	Very little late and few clusters		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*13.51*	*Saturated fatty acids*	15,77
C16:1	*1.64*	*Unsaturated fatty acids*	84,23
C18:0	*1.86*	*Monounsaturated fatty acids*	75,43
C18:1	*73.15*	*Polyunsaturated fatty acids*	8,80
C18:2	*7.92*		
C18:3	*0.87*		
	Total polyphenols	263.2 mg/kg caffeic acid	
	Bitterness index (K225)	0.228	
	Stability (Rancimat)	10.5 (h at 120°C)	



Sensory profile

An intense green fruited virgin olive oil, with hints of leaves and vegetables. Its secondary aromas are usually reminiscent of ripe fruit, flowers and honey.

The bouquet is very complex, with a positive balance between sweet, tangy and bitter sensations. It has a clear final astringency, which enhances the perception of retronasal greenish notes.

VARIETY 'Argudell'

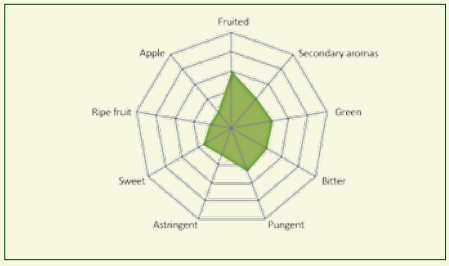
Also known as: 'del País', 'Mollasa', 'Saladora'

The main variety in the 'Oli de l'Empordà' PDO.

A variety of medium vigour, very productive and alternate bearing. Maturation between middle and late. The ripe fruits have low resistance to detachment, which allows mechanised harvesting. Considered rough and adaptable to different edaphic conditions. Despite being sensitive to the olive fruit fly, its late maturation means that damage is not severe.

Tree		Fruit	
Vigour	Medium	*Weight of fruit (g)*	*2.23*
Growth habit	Upright	*Flesh/stone ratio*	*5.56*
Density of crown	Clear	*Oil content (% db)*	*46.47*
Entry into production	Medium		
Productivity	Low and alternate bearing		
Maturation	Medium-late		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*16.87*	*Saturated fatty acids*	18.93
C16:1	*1.81*	*Unsaturated fatty acids*	81.07
C18:0	*1.80*	*Monounsaturated fatty acids*	66.09
C18:1	*63.67*	*Polyunsaturated fatty acids*	17.97
C18:2	*13.64*		
C18:3	*1.33*		
	Total polyphenols	301.0 mg/kg caffeic acid	
	Bitterness index K225	0.312	
	Stability (Rancimat)	9.1 (h at 120°C)	



Sensory profile

An intensely fruited virgin olive oil. It is pungent and bitter on the palate, with only a slight sweetness, masked by the astringency. An oil rich in secondary aromas of plants - mainly grass clippings and sensations of tomato and almonds, with hints of green walnuts, fennel and artichoke, and connotations of fig leaf and mint. The result is powerful and complex.

VARIETY 'Rojal'

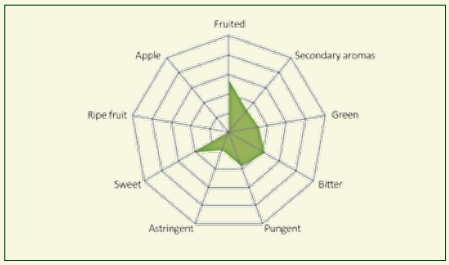
Also known as: 'Comú'

Grown mainly in the Ribera d'Ebre and Priorat regions.

Productive variety and highly alternate bearing. Medium maturation; the fruits have low resistance to detachment, which facilitates harvesting. Considered rough and not very sensitive to drought. Tolerant to cold. Sensitive to the olive fruit fly.

Tree		*Fruit*	
Vigour	Weak	*Weight of fruit (g)*	*1.93*
Growth habit	Open	*Flesh/stone ratio*	*4.59*
Density of crown	Medium	*Oil content (% db)*	*52.90*
Entry into production	Late		
Productivity	High and very high alternate bearing		
Maturation	Medium		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*14.21*	*Saturated fatty acids*	17,19
C16:1	*1.36*	*Unsaturated fatty acids*	82,60
C18:0	*2.37*	*Monounsaturated fatty acids*	67,00
C18:1	*65.11*	*Polyunsaturated fatty acids*	15,59
C18:2	*14.82*		
C18:3	*0.77*		
	Total polyphenols	290.0 mg/kg caffeic acid	
	Bitterness index (K225)	0.227	
	Stability (Rancimat)	5.9 (h at 120ºC)	



Sensory profile

An intensely fruited virgin olive oil of medium intensity. The perception of bitterness usually predominates on the palate, and it can be enhanced by a very clear final astringency.

Secondary retronasal aromas reminiscent of leaves and rose flowers.

VARIETY 'Farga'

Also known as: 'Comú', 'Farg'

Grown mainly in the Baix Ebre and Montsià regions in the province of Tarragona and in the Baix Maestrat region (Castellón).

A very old and vigorous variety. Production is low and alternate bearing. Entry into production is late. Early and clustered maturation. Male-sterile variety. The fruits have a high level of retention, making mechanised harvesting difficult. Sensitive to the olive fruit fly.

Tree		*Fruit*	
Vigour	Very strong	*Weight of fruit (g)*	*1.63*
Growth habit	Very open	*Flesh/stone ratio*	*3.80*
Density of crown	Compact	*Oil content (% db)*	*50.20*
Entry into production	Late		
Productivity	Low and alternate bearing		
Maturation	Early and grouped		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*10,92*	*Saturated fatty acids*	12,75
C16:1	*0,65*	*Unsaturated fatty acids*	87,25
C18:0	*1,65*	*Monounsaturated fatty acids*	79,23
C18:1	*78,37*	*Polyunsaturated fatty acids*	8,02
C18:2	*7,54*		
C18:3	*0,48*		
	Total polyphenols	201.70 mg/kg caffeic acid	
	Bitterness index (K225)	0.147	
	Stability (Rancimat)	17.45 (h at 120ºC)	

Sensory profile

A medium-high fruited virgin oil with evident hints of green (cut grass and hints of green bananas or nuts, tomatoes and artichokes), with a tendency to give oils with a great balance between sweet, sour and pungent, and a mild final astringency. This is a very interesting oil as a variety for use in blends and which keeps well, especially after an early harvest.

VARIETY 'Sevillenca'

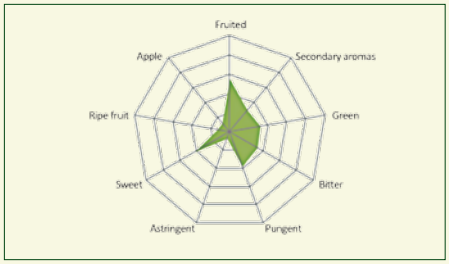
Also known as: 'Sevillenc', 'Solivenc', 'Sevillana', 'Serrana', 'Serrana de Espadán', 'Falguera', 'Mas del Bot', 'Morrundel'

Grown mainly in the Baix Ebre and Montsià regions, and in Castellón.

Average early entry in production, with average levels of productivity and low alternate bearing. A variety that is not very rough. Sensitive to drought and average resistance to frost. Sensitive to the olive fruit fly, which lays eggs at considerable speed and causes severe damage.

Tree		*Fruit*	
Vigour	Weak	*Weight of fruit (g)*	*2.88*
Growth habit	Upright	*Flesh/stone ratio*	*4.63*
Density of crown	Medium	*Oil content (% db)*	*49.00*
Entry into production	Medium		
Productivity	Medium and low alternate bearing		
Maturation	Early		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*13.07*	*Saturated fatty acids*	15.38
C16:1	*0.72*	*Unsaturated fatty acids*	84.62
C18:0	*1.99*	*Monounsaturated fatty*	65.64
C18:1	*64.24*	*Polyunsaturated fatty acids*	18.98
C18:2	*18.12*		
C18:3	*0.86*		
	Total polyphenols	182.4 mg/kg caffeic acid	
	Bitterness index (K225)	0.158	
	Stability (Rancimat)	4.5 (h at 120°C)	



Sensory profile

A medium fruited green virgin oil with complex aromas, with mature notes (apple, banana and strawberry) and hints of vegetable (fennel, anise, almonds, cut grass). Sweet and nutty on the palate; it is an excellent base oil for blending. It is also very suitable for Christmas markets. Its low stability restricts its sale in distant markets, and makes considerable precautions in storage conditions necessary. An oil well suited for chefs seeking oils with a 'not very dominant' profile.

VARIETY 'Empeltre'

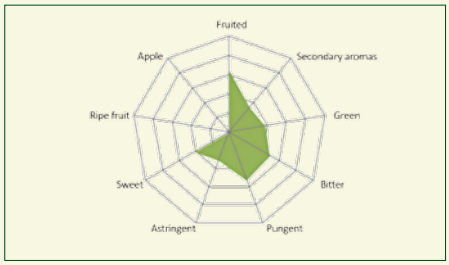
Also known as: 'Aragonesa', 'Comú', 'De Aceite', 'Fina', 'Injerto', 'Macho', 'Navarro', 'Negral', 'Salsenya', 'Terra Alta', 'Zaragozana', 'Farga', 'Llei'

The main variety in the 'Oli de Terra Alta' and 'Bajo Aragón' PDOs. Cultivated in the valley of the Ebro, and in Castellón and the Balearic Islands.

A productive and alternate bearing variety. Entry into production is late. Early ripening and very compact maturation. The fruits have a low resistance to detachment, which facilitates mechanised harvesting. A rough variety that adapts well to poor quality land and drought. Sensitive to the olive fruit fly. A fruit that is highly appreciated for the table.

Tree		*Fruit*	
Vigour	Strong	*Weight of fruit (g)*	*3,14*
Growth habit	Upright	*Flesh/stone ratio*	*5,46*
Density of crown	Compact	*Oil content (% db)*	*52,70*
Entry into production	Late		
Productivity	High and alternate bearing		
Maturation	Early and grouped		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*14.23*	*Saturated fatty acids*	16,26
C16:1	*1.57*	*Unsaturated fatty acids*	83,80
C18:0	*1.51*	*Monounsaturated fatty acids*	69,10
C18:1	*66.91*	*Polyunsaturated fatty acids*	14,70
C18:2	*13.75*		
C18:3	*0.95*		
	Total polyphenols	338.6 mg/kg àcid cafeic	
	Bitterness index (K225)	0.399	
	Stability (Rancimat)	10.3 (h at 120°C)	



Sensory profile

An intensely fruited virgin olive oil with mature green notes that complement each other. It is pungent and bitter on the palate, with a final astringency that enhances the perceptions of bitterness. However, it usually has an evident sweetness that balances the profile. The secondary aromas have low complexity but are clearly reminiscent of nuts. It has a very specific profile, which is usually widely accepted for cooking because it is not predominant in aromatic terms. The sensory profile of the oil made from overripe olives is very sweet, flat, and clearly of ripe fruit.

VARIETY 'Morrut'

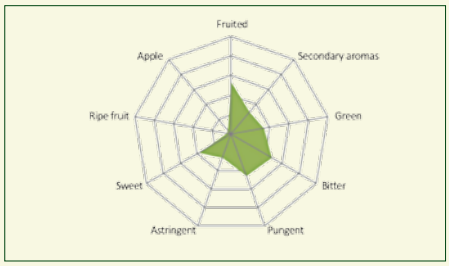
Also known as: 'Regués', 'Morrut de Regués', 'Roja', 'Roig', 'Morrut del Perelló'

Grown in the Baix Ebre and Montsià regions and in Castellón. Originally from the town of Reguers (Tortosa).

A productive variety, alternate bearing and with slow entry into production. Very late maturation in years of greater production. Not very rough, limited resistance to drought, and sensitive to cold. Moderately resistant to bird's eye spot. Attacks from the olive fruit fly may be delayed, but they can progress very rapidly.

Tree		*Fruit*	
Vigour	Strong	*Weight of fruit (g)*	*2.98*
Growth habit	Open	*Flesh/stone ratio*	*3.71*
Density of crown	Medium	*Oil content (% db)*	*45.48*
Entry into production	Very late		
Productivity	Medium and alternate bearing		
Maturation	Late		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*10.83*	*Saturated fatty acids*	14.11
C16:1	*0.56*	*Unsaturated fatty acids*	85.89
C18:0	*2.72*	*Monounsaturated fatty acids*	69.93
C18:1	*68.94*	*Polyunsaturated fatty acids*	15.96
C18:2	*15.14*		
C18:3	*0.82*		
	Total polyphenols	348.0 mg/kg caffeic acid	
	Bitterness index (K225)	0.251	
	Stability (Rancimat)	6.7 (h at 120ºC)	



Sensory profile

A fruited green virgin olive oil with some aromatic complexity, with secondary connotations of grass and hints of artichoke and vegetables. Pungent on the palate (without being unpleasant), while simultaneously bitter and astringent, which can mask the sweetness and enhance a feeling of imbalance, although the final sensation is quite 'fresh' due to the connotations of plants.

VARIETY 'Arbequina'

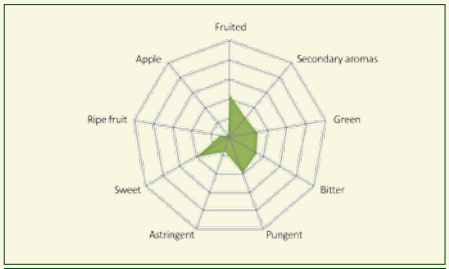
Also known as: 'Arbequí', 'Arbequín'

Originally from the town of Arbeca (Garrigues). This is the most widespread variety in Catalonia. It is the cornerstone of the 'Siurana' PDO in Tarragona and 'Garrigues' in Lleida and is widespread in Aragon. Super-intensive plantations have recently expanded worldwide.

A very productive variety, with early entry into production and low alternate bearing. Rough, resistant to frost and adaptable to different soil and climate conditions, although the characteristics of the oil can vary significantly depending on where it is cultivated.

Tree		*Fruit*	
Vigour	Weak	*Weight of fruit (g)*	*1.20*
Growth habit	Semi-upright	*Flesh/stone ratio*	*3.35*
Density of crown	Compact	*Oil content (% db)*	*49.48*
Entry into production	Early		
Productivity	Very high and regular		
Maturation	Medium and not very grouped		

Chemical composition			
Parameter	*Average content (%)*	*Parameter*	(%)
C16:0	*15.38*	*Saturated fatty acids*	17.41
C16:1	*2.11*	*Unsaturated fatty acids*	82.59
C18:0	*1.59*	*Monounsaturated fatty acids*	69.16
C18:1	*66.50*	*Polyunsaturated fatty acids*	13.43
C18:2	*12.69*		
C18:3	*0.74*		
	Total polyphenols	228.0 mg/kg caffeic acid	
	Bitterness index (K225)	0.185	
	Stability (Rancimat)	7,2 (h a 120ºC)	



Sensory profile

A medium fruited virgin olive oil, with a prominent sweetness, although very light hints of bitterness and pungency are also apparent, denoting the presence of polyphenols.

There are secondary aromas, reminiscent of the freshly cut grass, green almonds and some hints of ripe fruit. Highly suitable for Christmas markets and appreciated by chefs seeking oils with a 'not very dominant' profile. An oil widely used in blends, where the chromatic profile does not interfere and provides smoothness on the palate.

→

The Arbequina variety is the most common in Catalonia and is the basis of the 'Garrigues' and 'Siurana' designations of origin.

04 Further reading

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OLIVE OIL, THE MEDITERRANEAN DIET AND CARDIOVASCULAR DISEASE

Figure 1. *Olive oil is one of the core foods in the Mediterranian Diet. Picture given by "Interprofesional del Aceite de Oliva", Madrid.*

01 Introduction

It is well known that unhealthy habits (smoking, lack of physical activity, excess of or abstinence from alcohol, unhealthy diets and/or maintain an excessively low or high body weight) account for 80% of the risk of suffering from cardiovascular disease in the near or distant future (1-4). Consequently, changing to a healthier lifestyle should be the primary objective of all strategies aimed at preventing cardiovascular disease, which remains the leading cause of death in the world. In fact, these are recommendations of the latest European (5) and American (6) guidelines, which include healthy habits as the basis for the prevention and reduction of cardiovascular risk.

Nutrition is considered one of the cornerstones in strategies aimed at preventing cardiovascular disease and diabetes (7-9). In any analysis of the effects of diet and nutrition on cardiovascular disease, eating patterns are the best explanation for this relationship, to a much greater extent than food or nutrients, because dietary patterns include synergies and antagonism between food and nutrients (10-11). An analysis of dietary patterns also makes it possible to study many aspects apart from each foodstuff, such as the frequency of food intake (12), the effects of nutrition on the length of telomeres in our genes (which is related to ageing) (13), the influence of diet on intestinal microbiota (14) and the interactions between genes and the environment in the modulation of the expression of our genes which makes each of us have a specific phenotype (15).

Based on those assumptions, the information provided by epidemiological studies on nutrition and cardiovascular disease show that the Mediterranean diet is the healthiest eating pattern and the most effective in preventing the most prevalent chronic diseases such as cardiovascular disease and cancer (16). This eating pattern, created by the peoples living around the Mediterranean Sea, is based on the consumption of olive oil as the principal source of fat, frequent consumption of fruit, vegetables, nuts, whole grains, moderate consumption of dairy products (mostly yoghurt and fresh cheese), eggs, fish and wine (always eaten with meals), the occasional consumption of mainly white meat, and less frequently, consumption of cakes, sweets and industrial products in general. The frequency of consumption of these foods is best explained in the form of a pyramid by the Mediterranean Diet Foundation as shown in Figure 1. However, dietary recommendations should always be based on scientific studies of the highest quality and this can only be achieved with randomised nutritional intervention studies. So far, only two studies have used these criteria to assess the effects of the Mediterranean diet on the primary prevention (the PREDIMED Studio) and secondary prevention (Lyon Diet Heart Study) of cardiovascular disease.

02 Olive oil as the basis of the Mediterranean diet

As mentioned above, olive oil is the main source of fat in the Mediterranean diet. The health benefits of olive oil were initially attributed to its content of monounsaturated fatty acids (MUFA). This was the basis of the health claim by the United States Food and Drug Administration (FDA) for olive oil in 2004 (17).

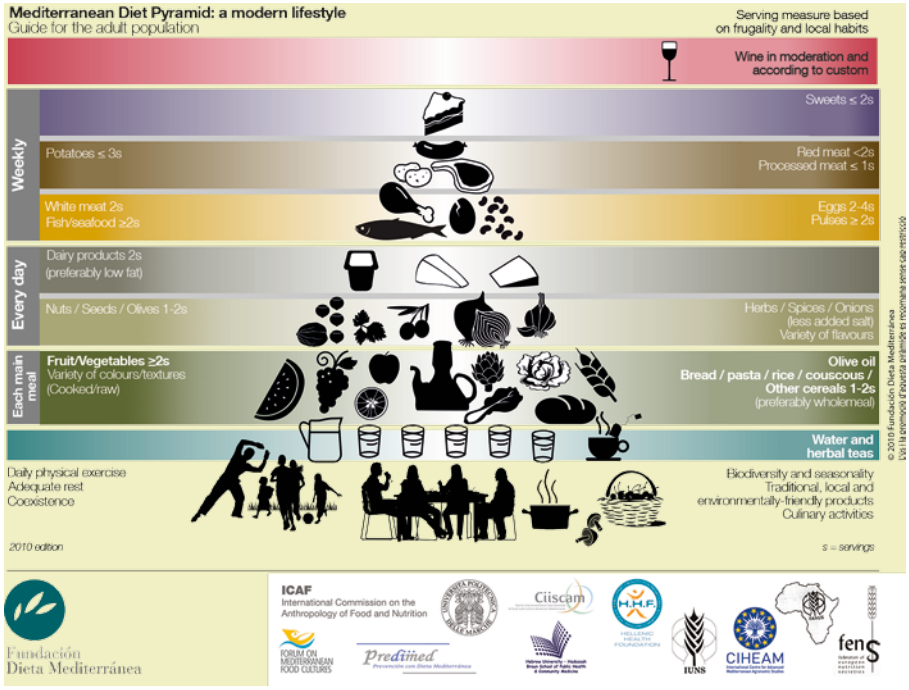

Figure 2. *The Mediterranean Diet Pyramid. Mediterranean Diet Foundation Barcelona*

However, there is an increasing amount of data to suggest that the beneficial effects of olive oil are due to its 'minor components,' which are highly bioactive. These minor components are classified into categories: unsaponifiable (non-polar) and soluble (polar), which includes their phenolic components. These phenolic compounds are bioavailable in humans, and experimental studies have shown that they have a wide range of bioactive properties, including anti-inflammatory, antioxidant, vasodilatory and anti-arrhythmic effects (18).

After the consumption of extra virgin olive oil, which has a minority component content which is much higher than common or refined olive oil, the concentration of triglycerides in triglyceride-rich lipoproteins (TRL) was observed to be higher and the number of TRL particles was lower than after consuming refined olive oil (19). In addition, consuming sunflower oil enriched with oleic acid increases postprandial triglyceride levels more than consuming virgin or extra virgin olive oil (20). Similarly, the insoluble fraction of olive oil inhibits the expression and activity of low density lipoproteins (LDL or 'bad' cholesterol) (21).

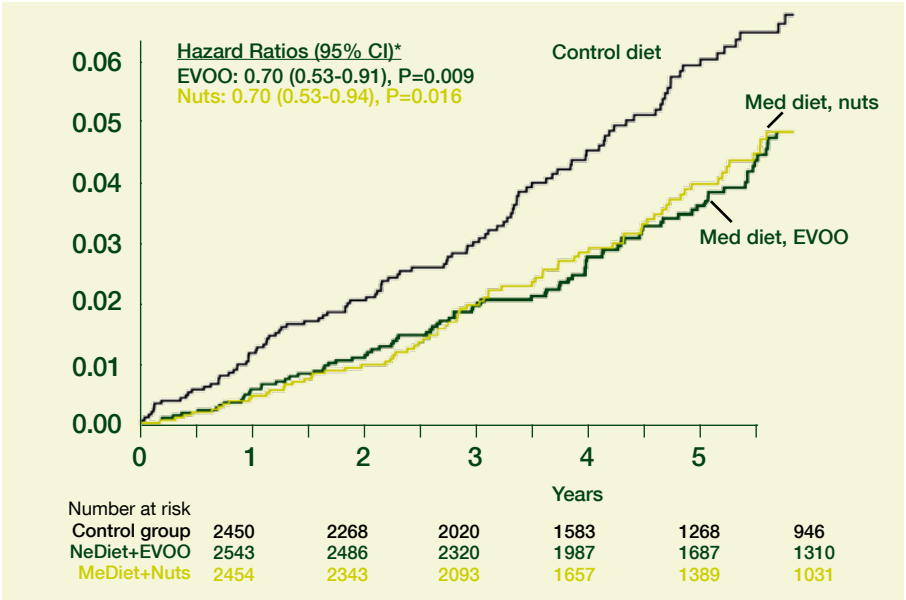

Figure 3. *Incidence of cardiovascular complications during the PREDIMED study in the three intervention groups. Low-fat group: Control diet. Mediterranean diet group, with supplement of extra virgin olive oil: Med diet, EVOO. Mediterranean diet group, with supplement of nuts: Med diet, Nuts. Note the differences between the control group and the two Mediterranean diet groups. Amended from ref. 27.*

Meanwhile, the EUROLIVE study (22) showed that phenolic compounds in virgin olive oil reduce cardiovascular risk factors, and increase plasma concentrations of HDL cholesterol or protective cholesterol. Furthermore, this study also found that consuming oil rich in polyphenols reduced the parameters related to oxidative stress, such as urinary concentration of 8-oxodeoxyguanosine (23).

In recent years, there has been a great deal of research on the anti-inflammatory properties of olive oil, bearing in mind that most chronic diseases (including cardiovascular diseases) are actually inflammatory diseases. It has been reported that consumption of olive oil reduces the concentration of inflammatory biomarkers related to arteriosclerosis such as cytokines and adhesion molecules in both endothelial cells and blood cells (lymphocytes and monocytes) (24-25).

As for coagulation factors, some studies have found that the consumption of virgin olive oil changes the thrombotic profile to a less thrombogenic state, which reduces the risk of coronary or cerebral thrombosis (26).

03 Clinical nutritional intervention studies

Two studies have evaluated the effects of a Mediterranean diet on the prevention of cardiovascular disease (see above), but only the PREDIMED (Prevention with the Mediterranean Diet) study has analysed the effect of a Mediterranean diet enriched with extra virgin olive oil on the prevention of cardiovascular disease. This study included 7,447 participants with high vascular risk, since they were either diabetic or had three or more vascular risk factors. One third of the participants followed a Mediterranean diet enriched with extra virgin olive oil, another third a Mediterranean diet supplemented with nuts (walnuts, hazelnuts and almonds), and the final third (the control group) followed a low-fat diet. After a follow-up period of almost five years, the two groups that were following the Mediterranean diet presented 30% fewer cardiovascular complications

(myocardial infarction, stroke or death of cardiovascular origin) (Figure 2) (27). In addition, the participants with the highest levels of consumption of extra virgin olive oil presented the greatest reduction in overall mortality and incidence of major cardiovascular complications (28). In fact, calculations pointed to a 10% reduction in cardiovascular risk for every increase of 10 grams of extra virgin olive oil a day. However, no effect was found for the consumption of standard olive oil.

A lower incidence of new cases of diabetes was also found in the group which followed a Mediterranean diet supplemented with extra virgin olive oil (29), as well as a lower incidence of arrhythmias (atrial fibrillation) (30) and peripheral vascular disease (31), compared with the control group (a diet low in all types of fat). All these effects were accompanied by improved control of blood pressure, a more favourable lipid profile, a reduction of parameters related to oxidative stress, and a decrease in the serum and cellular inflammatory parameters related to atherosclerosis (32).

04 Conclusions

The PREDIMED study has provided scientific evidence of the highest level that the Mediterranean diet supplemented with extra virgin olive oil provides protection from cardiovascular complications (cardiovascular disease) and diabetes by improving classic and emerging cardiovascular risk factors. This study has shown that following a diet rich in vegetable fat is better than following a diet low in all types of fat. Furthermore, we also found that it is never too late to change one's habits towards a healthier eating pattern such as the traditional Mediterranean diet. Indeed, the beneficial effects on cardiovascular risk markers such as blood pressure, sugar metabolism and lipid profile become apparent only three months after the change (32). This effect is also almost universal, as positive effects have been seen in men and women, in people 70 years old and under, and in those with and without diabetes, with and without hypertension, with and without lipid disorders, and who are overweight or obese. Finally, it is important to note that the 30% reduction in the risk of cardiovascular complications among people who were following the Mediterranean diet supplemented with extra virgin olive oil or nuts is similar to that observed with treatment with drugs such as statins, but with the advantage that the Mediterranean diet has been 'tested' for many years and has no 'side effects' like those produced by many drugs.

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The Mediterranean diet combined with extra virgin olive oil helps prevent the appearance of cardiovascular complications (heart disease) and diabetes.

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Following a diet rich in vegetable fat is better than following a diet low in all types of fat.

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OLIVE OIL TOURISM: OPPORTUNITIES AND CHALLENGES

Figure 1. *Catalonia has been designated European Region of Gastronomy for 2016.*

Figure 2. *The Mediterranean diet was declared Intangible Cultural Heritage of Humanity by UNESCO on 16 November 2010.*

01 The tourist context

Catalonia has been designated European Region of Gastronomy for 2016. This recognition is a further indication of the growing interest in everything related to food and agriculture, its landscapes and its people, and how this becomes an experiential asset through gastronomy.

One of the project's areas of work is tourism as a tool for highlighting products and producers, and as an instrument to raise awareness and increase knowledge of the value of a healthy diet, which in the case of Catalonia is based on the Mediterranean Diet, which has been included on UNESCO's Intangible World Heritage List.

Meanwhile, tourism has become a strategic activity for the economic development of countries and regions. The World Tourism Organization anticipates a steady growth in tourism worldwide, reaching 1,500 million tourists in the world by 2020. Catalonia, which is a premier tourist destination, also foresees steady growth in the number of visitors and aims to surpass the figure of 20 million tourists in the same period.

Tourism will clearly not grow at the same pace everywhere, but it is also true that the new tourists are not satisfied merely with traditional and classic tourist sights, but are instead looking for new activities, new experiences and new places to visit.

A potential growth market is the first major opportunity for olive oil tourism, but in the words of Norman Bourlaug, who won the Nobel Peace Prize in 1970 and who is one of the fathers of the Green Revolution, 'You can't eat potential'.

In recent years, we have seen how wine tourism has grown from being a niche activity to become an important activity for various regions and for many productive wineries. The increased interest in winemaking culture means that it is possible to visit an increasing number of wineries, and activities and business have multiplied in rural areas where economic diversification is a key factor in establishing population, generating jobs and preserving the agricultural landscape.

Wine tourism associated with a type of cultural tourism has had significant side effects, such as conferring dignity on the work of the farmer. It is therefore not surprising that some areas specialising in olive oil production are looking optimistically towards the changes in the world of tourism, where more and more people are becoming interested in the landscape, its products and lifestyles, and in other words, in the people who make them possible.

02 Olive oil tourism

But perhaps we need to start by defining olive oil tourism. Naming things is the first step in saying that they exist, or to paraphrase the linguist Jesús Tuson, it is what allows us to arrange and identify reality.

Olive oil tourism can be defined as the themed leisure activities engaged in by tourists when they travel outside their usual environment, and which are related to the culture of olive oil in any of its manifestations. It includes activities directly related to the culture of olive oil and those which complete the tourist experience without being part of it.

Several issues arise from the definition and need to be taken into account. First, olive oil tourism is a leisure activity, and a form of recreation that takes place by means of the tourism product; it must therefore be considered as a separate business from the production of oil, and as a different activity requiring specific conditions.

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The growth of tourism is an opportunity for individuals and for oil-producing regions.

Figure 3. *What turns places into tourist attractions is the presence of tourists.*
From http://www.jamonturismo.es/Oleoturismo-en-la-zona-Jamonturismo-Julian-Martin.html

Figure 4. *Catalan Oil Cultural Centre.*

→

All tourism products must have three types of utility: functional, experiential and symbolic, which constitute the activity's social and psychological value.

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When the tourist's active participation leads to an emotional attachment to the product, there is an increase in sales.

All tourism products must have three types of utility: functional, which enable the activity to be carried out; experiential, including activities for visitors; and symbolic, which are related to the social and psychological value conferred on the activity. The latter are fundamental and linked to the value of existence, and this is not only a factor in communication and promotion, as the tourists themselves create them with their comments, the photos they share and the reports they produce.

Functional utilities are basic and are not always dealt with. Whether because they are obvious, because of the difficulty of adaptation or the investment costs involved, they may be critical when considering how to include the production centre in the activity. Some functional utilities include how to reach the location, where vehicles are left, how many visitors can be catered for, what type of visitor is expected, how to meet their physiological needs, which safety features should be taken into account and what the opening hours will be.

Indeed, the appeal of this kind of tourism product lies in its level of authenticity, but the activities take place in a location that is not designed or built for tourism, which requires some degree of transformation. These actions take place in a space that is shared with a production area, which is also the living and cultural environment of the local population. This must never be considered an obstacle. On the contrary, it is a value that means that the degree of intervention can be defined when adapting the activity. Indeed, tourism has often led to the restoration of disused heritage sites.

In any case, tourists have different requirements from other traditional users, both in terms of working hours and the types of use. Tourism is ultimately an instrument that should contribute to improving the quality of life of the host population and is not an end in itself. Accordingly, regions and companies must first of all consider whether they want to develop it. Despite being present in an increasing number of areas and activities, tourism is never compulsory and there may even be places where it is not even advisable.

Prior to its development, the role to be played by Olive oil tourism should be very clear in terms of understanding that it will not necessarily be the same for each region, for each producing company or cooperative.

What is the objective? To retain customers, create new consumers, launch new products, diversifying business, increase retail sales, improve your brand image, enhance the regional image? Each of these goals requires different initiatives and they must be clearly defined for a rational management of the financial, material and human resources to be allocated to the activity.

03 **Experiential utilities**

Experiential utilities are related to the emotions and experiences of visitors undertaking the activity. These utilities are often related to ideas for leisure. The basis for providing these utilities are the resources available, including the mill, the landscape, cultural items associated with oil, its history, traditions and characters. However, simply having resources does not give a place tourist appeal. This depends above all on its ability to give those resources a storyline that compacts them into a leisure idea that the consumer can recognise.

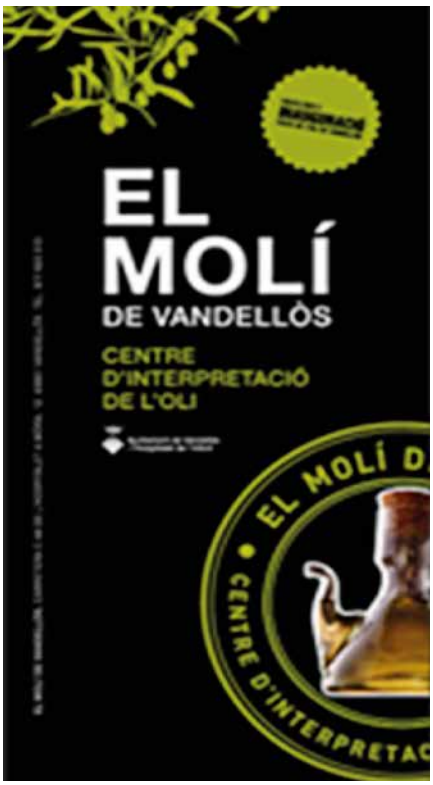

Figure 5. *Centres of oil tourism are emerging across the country.*

New leisure ideas are geared towards the tourist's active participation, making the leisure idea a personal experience. When this is achieved, the emotional attachment to the product is enormous and leads to an increase in sales, which is one of the primary objectives behind promoting oil tourism. While a few years ago tourists were passive spectators of a tailor-made range, they then began to ask to actively participate in the product itself and now want to be its protagonist. The product is turned into an experience. Olive oil tourism still has a long way to go in this respect.

One of the challenges in this field is differentiation. In Catalonia, we are fortunate to have various designations of origin that already give us some idea of the very varied landscapes, varieties and production methods, but nevertheless, today's tourist demands unique experiences. In a general area such as oil tourism, it is necessary to find the distinguishing features that make each place, each landscape, each producer or each mill unique. This is a creative task that is based on highlighting the most individual features of each place.

The liturgy of tourism is essential for conveying the deep meaning of things, giving them value, and conveying the message associated with the quality or qualities of oil. In the case of Olive oil tourism, this liturgy has yet to be created.

Although oil is culturally present in Catalonia, ignorance of the product is widespread in an increasingly urban society. Olive oil tourism is an opportunity to provide informal education all the aspects of the culture of olive oil – its production, the varieties, processing, health, culture and traditions, but it must also take a fundamental aspect into account: it is a leisure activity in which tourists want to have a good time.

04 **Symbolic utilities**

The symbolic value is what creates expectations and gives regions the ability to attract tourists. Nobody travels to places that are not worth visiting. 'Wherever people travel, whatever they eat, the facilities they visit show –meaningful– things about the users and consumers. This is an important consideration from the point of view of the development of tourism and leisure activities as an instrument to boost production at the local level' (Antón, Fernández & González, 2008).

Dean MacCannell (2003) explains how the tourist experience is a ritual aimed at recognising what has been the focus of expectations due to its symbolism. Tourists therefore always travel in search of 'sights' (material or immaterial) that have value in terms of what they represent. This value is constructed and is related to the culture, expectations and knowledge that each individual assigns to a particular subject or area.

According to Salvador Anton, symbolic values are incorporated into the tourism imaginary, structuring the tourist appeal of the territories through three basic components: nodes, meanings and signals.

Nodes are places to visit, interpretation centres, museums, cooperatives, tours, tasting and purchasing centres that stand out in the cultural landscape of the destinations based on socially constructed hierarchies.

Meanings allow tourists to recognise the place's identity and link it to the production of oil to a greater or lesser extent. They create an atmosphere appropriate to the theme based on elements such as the colours of the façades,

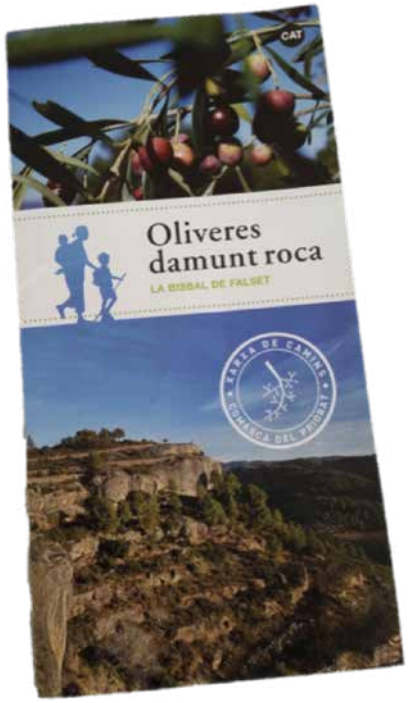

Figure 6. *An idea for discovering the landscape of olive trees.*

the buildings, the typeface of the posters and the local cuisine.

The signals are fragments of reality which link tourism and the region through the subject concerned, such as postcards, guides, books and signs that highlight a place's tourist appeal.

MacCannell relates the appeal of locations to the meanings created by individual narratives. To do so, he states that the symbolic value of sites is constructed based on three elements: sights, tourists and markers.

He argues that sites are the object of the visit. They are the resources of tourism – the elements that make up part of the leisure appeal. However, the existence of resources is not enough in itself.

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The tourist is at the centre of the reflection in the same way as a book has no meaning without a reader, and olive oil has no meaning without its ultimate consumer.

Figure 7. *Catalonia has a wide range of training in tourism.*

From the point of view of tourism, the sight only assumes meaning when the tourist looks at it, in the same way as a sign only has meaning when it represents something to someone. For this reason, the tourist is at the centre of the reflection, as the object also has no meaning without the tourist, as in the same way as a book has no meaning without the reader and oil has no meaning without the consumer.

But as there are many tourists, what ends up defining the relationship between them, what gives it meaning, is the marker. The marker is the information available about the sight, which represents it and creates a mental image of it.

From the perspective of tourism, the tourist's first contact with the sight is the marker, the information available about the place, the signage, the travel guides, books, blogs, designations of origin, prizes, awards, etc. These markers are not limited to conveying things about places, but instead construct their symbolic value. That is why markers are said to come before sights and that is why they are just as important in communication.

The relationships between the sight and the tourist, and between the sign and the individual, are bidirectional and are sometimes personal relationships. The function of the sign, which in this case is olive oil tourism, is to have a widely recognised meaning; however, the function of the marker, the information, is aimed at a specific social group, at some specific individuals, who may be many or few, but who are the final recipients of the tourist action and they must be the facilitators of the financial, social and/or territorial benefits of olive oil tourism. The pricing strategy and the economic potential of the activity will depend on the marker and consequently on the symbolic value that tourism confers on the product.

05 The challenges for the development of wine tourism

To conclude, we can highlight a number of the challenges that are apparent in the development of olive oil tourism. In the order mentioned herein, the first challenge is to take advantage of opportunities. Tourism is a growing industry, but that does not mean it follows a simple path. In the same way that opportunities grow, competition between regions and between activities also grows.

The second challenge is to consider that wine tourism is a different activity from oil production, and as such it has different requirements. The tourism product is not a material asset, it is a service. This means that it cannot be stored: a visit that is not made has been lost forever, and mediation is very important for this reason.

Production and consumption are simultaneous in a tourist service. There is no time to remedy poor service, and given the varied nature of the clients and the diversity of factors that can affect it, the characteristics of the services must be clearly structured and outlined.

The tourist experience is shaped by many factors, some of which depend on the people responsible for the activity and others that depend on external agents. Olive oil tourism is an activity that involves the discovery of a region where many actors public and private are involved, with whom cooperation will be necessary.

This cooperation is essential for increasing the region's appeal and contributing to the generation of the activity's symbolic value.

Finally, just as specific training is necessary to maintain olive groves and for oil production, very specific skills are also necessary for tourism. A command of languages, control of social networks and new marketing systems, attention to changes in tourism models, knowledge of demand and the ability to innovate in new products are all necessary skills. Fortunately, we now have many centres where it is possible to acquire these skills all over Catalonia, and there are frequent courses run by various public and private bodies which contribute to fostering these skills.

Despite everything that remains to be done and the fact that olive oil tourism is an activity in its incipient stages, we already have some good examples of the development of olive oil tourism in Catalonia. In the south, a range of tourism activities are now under way, based on the symbolic value of the ancient olive groves that become a factor for differentiation and distinction. In Les Garrigues, an olive growing region par excellence, there has been an increase in tourism ideas with a firm emphasis on territorial identification. Elsewhere, the main attraction involves other arguments and these are a very unique but complementary initiative. From Priorat to the Emporda, ideas focused on contributing to maintaining an industry, landscapes, producers and a product that links us to the Mediterranean Sea, the cradle of our culture and without which oil would be meaningless, are spreading like oil itself.

06 Further reading:

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THE PROTECTED DESIGNATIONS OF ORIGIN OF CATALAN OILS

Figure 1. *The Protected Designation of Origin (PDO) logo.*

01 Introduction

A protected designation of origin (PDO) is one of the quality standards for food and agriculture products regulated in the European Union. It designates the name that identifies a product originating in a specific place, region or occasionally a country, with a quality or characteristics that are essentially or exclusively due to a specific geographical environment, with inherent natural and human factors and in which the production, processing and preparation processes are carried out entirely in the defined geographical area.

This definition is probably unknown in areas outside the administrative, legal and academic spheres; however, the concept of a 'designation of origin' is widely known to everyone, and has extended far beyond the world of wines, the indisputable benchmark when discussing designations of origin. In fact, the European Union has recognised 594 non-winemaking PDO to date, 18% of which govern olive oils.

The protected designation of origin is a guarantee of quality, tradition and products linked to the territory in which they are prepared and produced. This is because all the products that are marketed with a protected designation of origin must be certified by a certifying body that ensures compliance with a series of conditions, which includes all the designation's requirements and specific characteristics. In addition, the name of the PDO (for which there must be documentary proof of its reputation and tradition of use) is protected, and its use for any other product that is not registered and certified is prohibited.

Having a PDO has become particularly important for olive oils because the regulations governing the marketing of olive oils (Commission Implementing Regulation (EU) No. 29/2012 of 13 January 2012 on marketing standards for olive oil) restricts the designation of origin for olive oils to 3 cases: EU or non-EU, the member state or the name of a registered PDO or PGI. This means that according to European regulations, the only way to sell Catalan oil indicating its origin is for it to be covered by a PDO.

02 Olive oil PDOs in Europe

High-quality olive oils, virgin olive oils and extra virgin oils are obtained directly from olives by mechanical procedures, and are fruit juices which preserve the nutritional properties and organoleptic characteristics of the fruit. The diversity of olive varieties means that the oils obtained are also diverse and have distinctive characters, which are clearly defined and have a high gastronomic value.

The European Union has recognised 104 virgin olive oils as PDOs (practically all of them are in the extra virgin category), accounting for 18% of all the existing designations. As one might expect, given the Mediterranean nature of olive groves, European olive oil production is highly concentrated in geographical terms. In fact, three countries in the Mediterranean basin (Italy, Spain and Greece) produce 86% of oils with PDO (Table 1).

While the proportion of olive oil PDOs is already very significant across the EU as a whole (17.5%), it is obviously a a great deal more so if we focus solely on the producing areas. In these areas, 27% of PDOs are for olive oil (Table 2).

Table 1. Number and proportion of the oil PDO by country

	Number of oils with PDO	% oils PDO
Italy	42	40
Spain	29	28
Greece	18	17
France	7	7
Portugal	6	6
Croatia	1	1
Slovenia	1	1

Table 2. Proportion of the oil PDO compared to the total PDO in the Member State

	Proportion
Italy	40%
Spain	28%
Greece	17%

[1] *There are numerous scientific studies in this field. Some of this knowledge is shown in the list of permitted health claims made for food, approved by R (EU) No. 432/2012 and its amendments, including several statements applicable to olive oils.*

03 Olive oil PDOs in Catalonia

Catalan oil production is very limited in the context of the major producing areas (≈3% of total production in Spain); probably for this reason, the commitment was made in the late 1970s to produce high-quality oils and Spain's first non-winemaking designations of origin were established ('Borjas Blancas', which has since become 'Les Garrigues' and 'Siurana').

The Les Garrigues and Siurana PDOs were the pioneers and are the main PDO-certified Catalan olive oil producers, but they are not the only ones. As a reflection of the diversity and richness of Catalan olive oils, and the fact that virgin olive oils adapt very well to a differentiated quality system, Catalonia has 5 protected designations of origin, covering virtually its entire olive growing area (Figure 1). The 5 Catalan olive oil PDOs account for 45% of PDO non-wine Catalan agricultural and food products, 17% of those in Spain and 5% of the European total. In chronological order of creation, they are as follows:

- Les Garrigues
- Siurana
- Oli de Terra Alta
- Oli del Baix Ebre-Montsià
- Oli de l'Empordà

The overall figures for the PDOs are indicative of their large geographical scale and socio-economic importance (Table 3).

Table 3: Summary of the 5 Catalan PDO in figures (2013)

Producers	16.000
Manufacturers (oil mills + bottlers)	95
Regions	16
Towns	326
Certified annual production (tonnes)	7.500
Production value (M€)	31

The production areas are listed on the next page, with the varieties used and the organoleptic characteristics of each one, according to specifications registered by the European Commission.

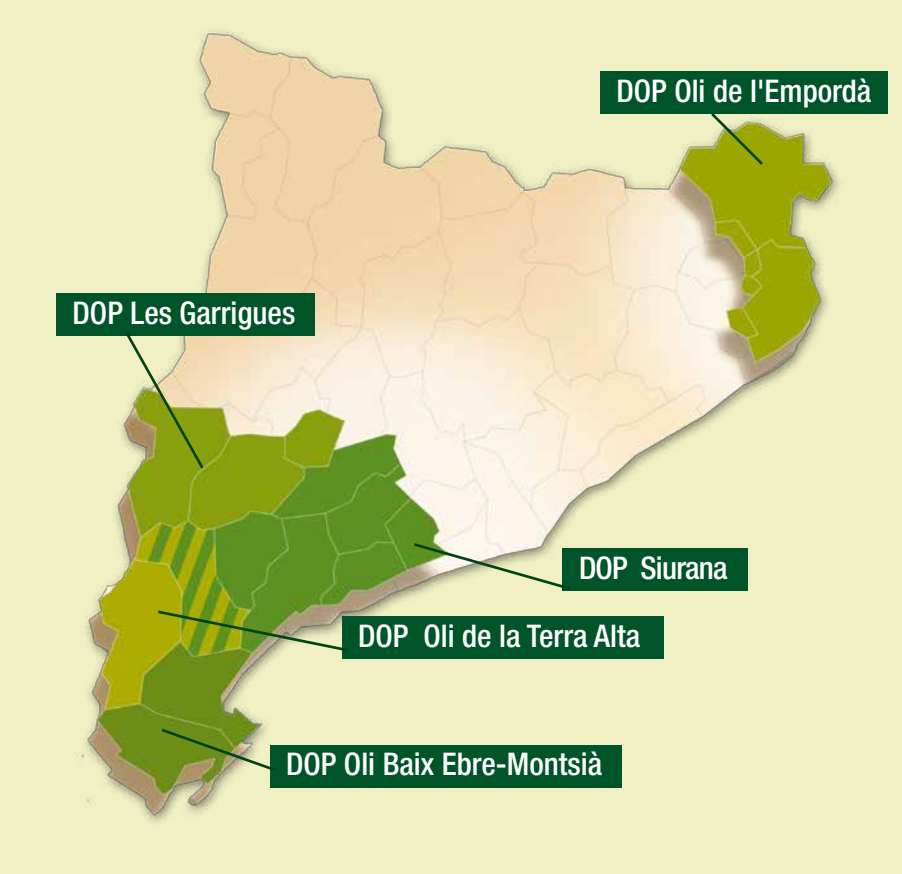

Figure 2. *Olive oil PDOs in Catalonia.*

04 Further reading

http://agricultura.gencat.cat/alimentacio
http://ec.europa.eu/agriculture/quality/index_en.htm
www.olidoplesgarrigues.com
www.acobem.com
www.oliemporda.cat
www.dopoliterraalta.com
www.siurana.info

05 Author

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Les Garrigues PDO

Geographical area	48 municipalities. 3 regions: Garrigues, Segrià and Urgell.
Varieties	**Arbequina*** (≥90%) and verdiell.
Organoleptic description	There are two different types of oil, depending on when they are harvested: • Fruited: from the earlier harvest, greenish, more 'body' and a bitter almond flavour. • Sweet: from the later harvest, yellow in colour, more 'fluid' and with a sweet flavour.

**The main variety that gives the oil its character is shown in bold.*

Oli del Baix Ebre-Montsià PDO

Geographical area	26 municipalities. 2 regions: Baix Ebre and Montsià.
Varieties	Morruda (or morrut), sevillana and farga.
Organoleptic description	Oils with a yellow-greenish to golden yellow colour, depending on the time of harvesting and the geographical location within the production area. These oils are tasty (tangy, astringent, slightly bitter) and very aromatic (rich in green secondary aromas), with a fruity flavour at the beginning of the harvest and slightly sweet as it progresses.

Oli de l'Empordà PDO

Geographical area	115 municipalities. 4 regions: Alt Empordà, Baix Empordà, Pla de l'Estany and Gironès.
Varieties	**Argudell** (≥51%), **arbequina**, curivell and llei de Cadaqués.
Organoleptic description	A yellow to green straw colour of varying intensity. A balanced green fruited virgin olive oil of medium intensity. Medium bitterness and pungency on the palate. The sensory profile, considering other secondary descriptors, is as follows: oils with aromas normally reminiscent of freshly cut grass and/or nuts; aromas of exotic fruit, green fruit or artichoke may also appear, and it may present a final almond sensation on the palate.

**The main varieties are shown in bold (the sum of both ≥ 95%). The Argudell variety is what gives the oil its personality.*

Oli de Terra Alta PDO

Geographical area	15 municipalities. 2 regions: Terra Alta and Ribera d'Ebre.
Varieties	**Empeltre**, morruda, farga i arbequina.
Organoleptic description	A yellow colour with shades ranging from pale yellow to 'old gold' yellow. A tasty, fruity flavour at the beginning of the campaign and slightly sweet as it progresses. With aromatic overtones reminiscent of almonds and/or walnuts.

**The main variety that gives the oil its character is shown in bold.*

Siurana PDO

Geographical area	123 municipalities. 6 regions: Alt Camp, Baix Camp, Baix Penedès, Priorat, Ribera d'Ebre and Tarragonès.
Varieties	**Arbequina** (≥90%), Rojal and Morruda.
Organoleptic description	There are two different types of oil, depending on when they are harvested: • Fruited: from the earliest harvest, greenish, more 'body' and a bitter almond flavour. • Sweet: from the latest harvest, yellow in colour, more 'fluid'.

**The main variety that gives the oil its character is shown in bold.*

INTERVIEW

Jeroni Castell
Entrepreneur and restaurateur.
Ulldecona (Montsià)

'OLIVE OIL IN ALL ITS FORMS AND TEXTURES HAS TAKEN OFF IN HAUTE CUISINE AND IS NOW VERY IMPORTANT'

Excerpt from the interview published in www.ruralcat.net

→

Jeroni Castell is chef and owner of Les Moles restaurant (Ulldecona) which has received a Michelin star (2014), a Repsol Guide sun (2010) and the diploma of honour for tourism merit from the Government of Catalonia (2013), among other awards.
The relationship between Castell and cooking began late, and by accident. When he opened Les Moles, he was in charge of the front of house, but the need to cover for a sick chef led him to realise what his true vocation was: cookery. From then on, Jeroni combined working with learning a profession about which he was passionate. He began his training in the cookery classes for housewives taught by Maria Cinta Bayerri. After a series of books, a few specialist courses and attending conferences, some short stays at Can Bosch, Via Veneto and Arzak gave him an idea of modern cuisine. All this has led to the cuisine at Les Moles, which was initially classic in style, becoming playful and creative cuisine.

In this interview, Jeroni Castell, the chef at Les Moles restaurant (Ulldecona), gives us his thoughts on Catalan olive oil and its organoleptic and gastronomic qualities. He emphasises that is possible to get much more out of this high-quality product.

What does extra virgin olive oil bring to our cuisine?

The balance between haute cuisine and a healthy diet.

What are the main applications of extra virgin olive oil in modern cuisine?

A few years ago it was only used for frying or dressing salads. Today, breakthroughs in technology and culinary research have given us the opportunity to give it other textures. Now it can be applied as a solid or a foam, among other formats. We have increased the ways to taste it, which has enhanced its gastronomic value.

In Catalonia we have five designations of origin of olive oils, which produce very diverse and very high quality oils. What is your opinion of them?

The designations of origin in Catalonia have reached a very high level of quality. In recent years there has been a concerted effort to emphasise quality over quantity. This has been an important breakthrough in the south, where I'm from, where we were perhaps a little slow off the mark in this respect.

'Not all olive oils are the same and not everything that is labelled 'olive oil' is high quality'

Do you think that the characteristics of olive oil are well known to catering professionals in Catalonia?

We have a very high level in the realm of haute cuisine, but in other areas, although some progress has been made, a lot remains to be done. Olive oil is increasingly widely used in our restaurant kitchens and on tables, but not all olive oils are the same; not everything that is labelled 'olive oil' is high quality. I think it is worth paying the difference in price between a good quality oil and one that is not good quality, and we should make a greater commitment to virgin and extra virgin oils from our denominations of origin.

'I think it is worth paying the difference in price between a good quality oil and one that is not good quality, and we should make a greater commitment to virgin and extra virgin oils from our denominations of origin'

What are the benefits of extra virgin olive oil over other oils used for cooking?

Extra virgin olive oil has benefits in terms of both flavour and health. Today, the Mediterranean diet is very highly valued in gastronomic terms, and is also associated with a healthy lifestyle. Olive oil is one of its prime exponents and can benefit from it.

In the near future, what role might extra virgin olive oil play in gastronomy?

Olive oil in all its forms and textures has taken off in haute cuisine and is now very important. I'm sure that this upward trend will continue in the future and extra virgin olive oil will play an even more prominent role in world cuisine.

'in the future, extra virgin olive oil will have an even more prominent role in international cuisine'

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