# OF SENSORY EVALUATION

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## INTRODUCTION

ngesting food or drink arouses different sensory stimuli that may be analysed as qualitative perception, quantitative perception or hedonic response.

## Hedonic tests

are used to determine the acceptability or likability of a product in a given group of consumers. They are based on the evaluation of the level of preference that consumers experience when testing the product, whereas analytical tests include all techniques and methods whereby specific sensory characteristics of the product can be measured.

#### **Sensory Analysis**

is a scientific discipline that measures, analyses and interprets reactions to those attributes of foodstuffs that are perceived using five primary senses: sight, taste, smell, hearing and touch. The first attempts to classify taste were made by Aristotle, who distinguished between two primary and opposite tastes: sweet and bitter, from which other tastes derived—e.g., fatty from sweet and salty from bitter. Modern methods of foodstuffs sensory evaluation are linked to the development of science in the field of food analytical methods and the physiology of sensory perception concerning the appearance, colour, odour, taste, texture, and/or the overall flavour of foodstuffs The importance of the sensory acceptability of food was not

only known to Napoleon, who considered it crucial to provide his troops with food of adequate quality, but also to the US Army, which has made enormous investments in the development in this field since World War II.

Today, sensory analysis may be performed by properly trained expert tasters with the use of different evaluation techniques under controlled conditions that ensure international comparability and repeatability of results. By definition, sensory analysis involves the evaluation of all sensory perceptions and is carried out under specified conditions. The techniques used enable a qualitative and quantitative evaluation. The results are statistically analysed. The term

"ORGANOLEPTIC ANALYSIS", which was previously used in place of "sensory analysis", is **NO LONGER APPLICABLE**, since evaluation does not take place involving the direct use of sense organs. A sense organ is a part of the nervous system that receives stimuli and transforms them into an electric impulse that travels along a neural pathway

towards the areas in the brain that are responsible for processing sensory information. Different sensory impressions trigger sensory processes in living beings that translate into perceptions from what is experienced.

The term degustation is used in relation to amateur evaluation of products.

Sensory evaluation OF OLIVE OIL

Wirgin olive oil is juice from olive fruit obtained solely by mechanical procedures that can provide a distinctive flavour or olive sensory profile immediately after processing.

The quality of oil and, hence, the characteristic flavour are influenced above all by changes in fatty acid, biophenol and volatility profiles that occur during the stages of ripening, harvesting and processing the olive fruit, as well as storage. Poor quality virgin oils are processed into refined olive oils. During the refining process, both negative flavours (sensory defects) and the positive attributes of olive oil are removed. SINCE DEGRADED FLAVOURS ARE ALSO CHARACTERI-STIC OF OLIVE OILS OBTAINED FROM OLIVE POMACE, SENSORY EVALUATION OR CLASSIFICATION INTO QUALITY CLASSES ONLY APPLIES TO VIRGIN OLIVE OILS. On the basis of chemical analysis and sensory evaluation, virgin olive oils are categorised into extra

virgin olive oil, virgin olive oil and lampante olive oil, which is unfit for consumption. The term lampante olive oil signifies lamp oil and has a historical relevance, since poor quality oils were once used for lighting.

VIRGIN OLIVE OIL EXTRA VIRGIN OLIVE OIL VIRGIN OLIVE OIL LAMPANTE OLIVE OIL

**FIGURE 1:** quality classification of virgin olive oil

Since sensory attributes are often the decisive criteria for determining the quality of olive oil, it is vital that the method of sensory evaluation of olive oils is as objective and internationally harmonised as possible. The method of sensory evaluation of virgin olive oils, introduced in 1991 by Commission Regulation (EEC) No. 2568/91, had been drawn up by an international group of experts under the International Olive Council (IOC) since 1982. The method lays down the procedure for evaluating the sensory attributes of virgin olive oils and quality classification (categorization). It specifies the criteria for sensory evaluation of virgin olive oil, as well as providing a special vocabulary and standardized conditions for evaluation. The method is regularly complemented by updating



the statistical data analysis as well as the descriptions of the characteristics of virgin olive oils.

The flavour of olive oil is defined as an integrated combination of the olfactory, gustatory and trigeminal sensations perceived during tasting. The trigeminal nerve is involved in the perception of taste, odour, touch, heat and pain. Odour or olfactory stimuli are perceived directly (by smelling through the nose) and retronasally (while oil tasting, when the odour of ingested food travels along the paths between the mouth and nose). The perception of flavour may also be affected by kinaesthetic perceptions. Receptors are located in joints, muscles, tendons, temporomandibular joints and mastication muscles, and relate to sensations through

movement.

Only through sensory analysis is it possible to determine the presence and intensity of the positive attributes of extra virgin olive oils (e.g., fruitiness with notes of olive, apple, leaves, grass, artichoke, green, pungent) and perceive possible defects (e.g., muddy sediment, fusty, winey, rancid). In order to avoid the shortcomings of sensory analysis (high cost of maintaining the sensory laboratory, work or training of tasters and possible deviations that may result from subjective sensory evaluation), researchers have aimed to develop a reliable instrumental method that would yield accurate and repeatable results. Instrumental methods based on analytical equipment (GC/MS or GC-olfactometer [electronic nose]) only detect the volatile part of the

compounds that constitute the flavour.

Whereas the identification of components with the electronic nose is highly repeatable, the calibration of the device is still tied to human recognition of individual odours. Experience shows that the sensitivity of human senses is often higher than that of detectors. In other words, the human nose may perceive substances to which a detector does not react and



which sometimes prove to be crucial components for a typical flavour. Nevertheless, instrumental determination of volatile component concentration has contributed to the perfection of methods and to the understanding of reactions in which volatile components are formed or decomposed.

The Institute for Oliveculture at the Scientific and Research Centre of the University of Primorska has conducted research on volatile compounds in olive oils of Slovenian Istria with the use of a static headspace sampler (SHS), gas chromatograph and the HS SPME method. We have determined the presence and concentrations of certain compounds. We also performed a sensory evaluation of oils. The results of the analyses are presented in Table 1.

# TABLE 1: SOME TYPICAL COMPONENTS RESPONSIBLE FOR THE FLAVOUR OF EXTRA VIRGIN OLIVE OILS, THEIR RECOGNITION THRESHOLDS AND SENSORY ATTRIBUTES (*Morales, 2005*)

Component	Sensory recognition threshold (µg/kg)	Description (olfactory sensation)
hexanal	75	green, sweet
cis-3-hexenal	3	green
trans-2-hexenal	1125	green, peppery
hexyl acetate	1040	green
cis-3-hexenyl acetate	750	green
ethanol	400	undesirable
cis-3-hexenol	6000	green
1-penten-3-on	50	green
trans-2-pentenal	300	green, bitter almond
pentanol	470	fruity

pathway yielding volatile compounds that contribute to the flavour of olive oil. Negative sensory attributes may also be due to unsuitable oil storage. Oil should be stored in a dark-coloured container in a dry place. Rancidity of oil is caused by autoxidation or photo-oxidation of oil.

Presented below is a selection of data from literature showing the compounds present in positive and negative sensory attributes of olive oils.



Morales et al. (2005) determined the following concentrations of suitable compounds in oils showing sensory defects: the concentration of propionic acid in fusty oil is approximately 15 mg/kg, the concentration of butyric acid 10 mg/kg, and the concentration of their ethyl esters between 2 and 4 mg/kg. Rancid oil contains as much as 34 mg/kg hexanal, 8 mg/kg octanal and 4 mg/ kg octane. It is interesting to note that hexanal is formed in both "good" and "bad" processes and that it is actually the quantity and type of other substances that indicates the course of the lipoxygenase

# **TABLE 2:** DETECTION THRESHOLD CONCENTRATIONS AND ODOURSOF INDIVIDUAL VOLATILE COMPOUNDS CHARACTERISTIC OF VIRGINOLIVE OILS (Koprivnjak, 2006)

Volatile compound	Detection threshold (µg/kg)	Odour
4-methoxy-2-methyl-2- butanethiol	0.045	black currant
1-penten-3-ol	0.7	mustard, very intense
ethyl-2-methyl-butyrate	0.8	ripe fruit
cis-3-Hexenal	1.7	green, sweet
hexanal	80	green, apple, sweet
cis-3-hexenyl acetate	200	green, green banana
trans-2-pentenal	300	green, tomato, bitter almond
hexanol	400	ripe fruit
trans-2-hexenal	420	green, bitter almond, astringent
pentanol	470	very intense, sweet
hexyl acetate	1040	green, apple, sweet
cis-3-hexenol	1100	green, banana
trans-2-hexenol	5000	green, astringent

## TABLE 3: ODOURS OF COMPOUNDS IN STANDARD SAMPLE FOR "WINEY/VINEGARY" DEFECT (Koprivnjak, 2006)

Volatile compound	OAV*	Odour
hexanal	23.9	green apple, grass
acetic acid	12.4	vinegar, dilute acetic acid
trans-2-hexenal	7.9	bitter almond, green
3-methyl-butan-1-ol	7.1	wood, whisky, sweet
ethyl acetate	3.8	fusty, sweet
butyric acid	2.1	rancid, cheese
2-butanol	2.1	winey
propanoic acid	2.0	very intense, acid
hexanoic acid	1.8	very intense, rancid
pentanoic acid	1.7	unpleasant, very intense
2-methylbutan-1-ol	1.3	wine, spices
octane	1.2	sweet
heptanoic acid	1.2	rancid, lard
2-octanone	1.2	mould, green

\*odour activity value for the compound in the oil sample

The odour activity value for a volatile compound in the oil sample is expressed as the ratio between the concentration of the compound in the sample and the threshold concentration of the compound.

## TABLE 4: ODOUR OF COMPOUNDS IN STANDARD SAMPLE FOR "FUSTY/MUDDY SEDIMENT" DEFECT (Koprivnjak, 2006)

Volatile compound	OAV*	Nuobo			
ethyl butanoate	123.3	sweet, fruity			
propionic acid	21.7	very intense, acid			
butanoic acid	17.7	heated olive fruits, strong, cheese			
butyl acetate	7.4	green, fruity, very intense			
ethyl propanoate	6.7	very fruity			
3-methylbutan-1-ol	4.8	wood, sweet			
pentanoic acid	4.1	rotten, very intense			
trans-2-hexenal	4.1	bitter almond, green			
hexanal	4.0	green apple, grass			
heptanoic acid	2.2	rancid, lard			
octane	2.2	sweet			
acetic acid	2.1	vinegar, dilute acetic acid			
propyl butanoate	1.3	pineapple, sharp			
2-butanol	1.1	wine			
2-methylpropyl butanoate	1.0	unpleasant, winey, rancid fruits			

*\*odour activity value for the compound in the oil sample* 

## TABLE 5: ODOUR OF COMPOUNDS IN STANDARD SAMPLE FOR "MUSTY/HUMID" DEFECT (Koprivnjak, 2006)

Volatile compound	OAV*	Odour
1-octen-3-ol	250.0	mould, earthy
trans-2-heptenal	68.0	very intense, soapy
hexenal	26.0	green apple, grass
1-octen-3-on	13.0	mould, very intense
2-heptanol	13.0	earth, sweet
3-methylbutan-1-ol	3.8	wood, sweet
guaiacol	3.5	wood, smoke, spices



\*odour activity value for the compound in the oil sample

## TABLE 6: ODOUR OF COMPOUNDS IN STANDARD SAMPLE FOR "RANCID" DEFECT (Koprivnjak, 2006)

Volatile compound	OAV* Odour			
hexanal	423	lard, strong, green		
trans-2-octenal	275	herbs		
trans-2-heptenal	236	oxidised, tallowy, very intense		
trans-2-decenal	154	colour, fish, lard		
nonanal	48	lard, wax, very intense		
octanal	26	lard, sharp		
butanoic acid	13	rancid		
pentanal	11	wood, bitter, oil		
hexanoic acid	9.2	rancid, very intense		
heptanal	7.5	oil, lard, wood		
acetic acid	6.4	very intense, acid		
octanal	4.1	sweet		
nonanol	2.7	lard		
6-methyl-5-hepten-2-one	2.5	oil, very intense		
heptanoic acid	2.2	rancid		
trans-2-hexenal	2.0	bitter almond, green		



\* odour activity value for the compound in the oil sample

## TABLE 7: SENSORY ATTRIBUTES OF SOME COMPOUNDS IN VIRGIN OLIVE OILS (Koprivnjak, 2006)

Secoiridoids	and their	derivatives	

## tyrosol deacetoxy-oleuropein aglycone (dialdehyde form) derivative of oleuropein aglycone I derivative of oleuropein aglycone II deacetoxy ligstroside-aglycone (dialdehyde form) isomer of ligstroside-aglycone I isomer of ligstroside-aglycone II derivative of oleuropein aglycone III isomer of oleuropein aglycone

## Sensation in the mouth astringent, not bitter astringent, bitter, peppery, numbness especially of the tongue bitter, sharp, astringent, causes a cooling sensation, peppery bitter, astringent, slightly peppery very peppery, especially at the root of the tongue, slightly bitter, astringent astringent, slightly peppery, bitter dry sensation in the mouth, not bitter bitter, astringent, salty very bitter, very astringent

## THE INTERNATIONAL OLIVE COUNCIL'S METHOD FOR THE ORGANOLEPTIC ASSESSMENT OF VIRGIN OLIVE OIL



he method is described in Commission Regulation (EEC) No. 2568/91 on the characteristics of olive oil and olive-residue oil and is regularly complemented by new documents or standards provided by the International Olive Council.

The prescribed method uses documents or standards of the International Olive Council relating to:

- general basic vocabulary for sensory analysis,
- \* specific vocabulary for olive oil,
- glasses for sensory oil analysis,
- **∗** test room,
- guide for the selection, training and monitoring of tasters.

## SPECIFIC VOCABULARY FOR OLIVE OIL

## POSITIVE ATTRIBUTES

## FRUITY:

Set of olfactory sensations characteristic of the oil which depends on the variety and comes from sound, fresh olives, either ripe or unripe. It is perceived directly or retronasally.

## BITTER:

Characteristic taste of oil obtained from green olives or olives turning colour.

## PUNGENT:

Biting tactile sensation especially characteristic of oils produced at the start of the crop year, from olives that are still unripe.

## NEGATIVE ATTRIBUTES

### FUSTY:

Characteristic flavour of oil obtained from olives piled or stored in such conditions as to have undergone anaerobic fermentation.

## MUSTY/HUMID:

Characteristic flavour of oils obtained from fruit in which large numbers of fungi and yeasts have developed as a result of its being stored in humid conditions for several days.

## MUDDY SEDIMENT:

Characteristic flavour of oil which has been left in contact with the sediment that settles in tanks and vats (anaerobic fermentation).

WINEY/VINEGARY: Characteristic flavour of certain

oils reminiscent of wine or vinegar. This flavour is mainly due to the process of fermentation in the olives that leads to the formation of acetic acid, ethyl acetate and ethanol. **FROSTBITTEN OLIVES (WET** 

## WOOD):

Characteristic flavour of oils extracted from olives which have been injured by frost. METALLIC:

Flavour that is reminiscent of metals. It is characteristic of oil which has been in prolonged contact with metallic surfaces during crushing, mixing, pressing or storage.

#### RANCID:

Flavour of oil which has undergone oxidation. HEATED OR BURNT:

Characteristic flavour of oils caused by excessive and/ or prolonged heating during processing, particularly when the paste is thermally mixed under unsuitable thermal conditions.

## HAY/WOOD:

Characteristic flavour of certain oils produced from olives that have dried out.

### ROUGH:

Characteristically thick, pasty mouth-feel sensation produced by certain oils.

#### **GREASY:**

Flavour of oil reminiscent of that of diesel oil, grease or mineral oil. Vegetable water: Flavour acquired by the oil as a result of prolonged contact with vegetable water during processing.

## BRINE:

Flavour of oil extracted from olives which have been preserved in brine.

### ESPARTO:

Characteristic flavour of oil obtained from olives pressed in new esparto mats. The flavour may differ depending on whether the mats are made of green esparto or dried esparto. **GRUBBY:** 

Flavour of oil obtained from olives which have been attacked by the grubs of the olive fly (*Bactrocera oleae*).

## CUCUMBER:

Flavour produced when oil is hermetically packed for too long, particularly in tin containers, and which is attributed to the formation of 2.6-nonadienal.

## Accessories for sensory evaluation OF VIRGIN OLIVE OIL

he work of the tasting panel is performed in a special room, a sensory lab, designed to ensure that the work will take place in a suitable, comfortable and standardised environment. Only such an environment can ensure the repeatability and comparability of the results. In accordance with the international standard for sensory evaluation, the following accessories, which are required by tasters to perform their task properly, shall be supplied in each booth:

- prescribed glasses containing the samples (14-16 ml or 12.8-14.6 g of oil), covered with a watch glass and marked with a code consisting of digits or a combination of letters and digits selected at random (the marks shall be made with an indelible, odourless pencil),
- \* profile sheet, together with
  the instructions for its use,
- pencil or indelible
   ink (modern sensory
   laboratories use a
   computerised input system),
- slices of apple for taste neutralisation,
- \* glass of water at ambient temperature.



he glass must be darkcoloured, so that the colour of oil does not affect the taster's evaluation. The colour of oil depends on the variety and is not evaluated for the purposes of categorisation. Oils with high chlorophyll content are green and those with high carotene content are yellow. In some competitions, the colour is evaluated to determine the presence of particles or a high level of oxidation, but the results have a negligible effect on the total score.

#### TASTERS

Persons acting as tasters in olive oil sensory evaluation must be trained and selecteo on the basis of their skills in distinguishing between similar samples. Their accuracy improves with continuous training.

### TASTE PANEL

A taste panel is composed of the panel leader and a group of eight to twelve tasters. The panel leader must be a suitably trained person with expert knowledge of various kinds of oils. Tasters are selected on the basis of their skills in distinguishing between similar samples, according to specified instructions on the selection of tasters, described in the sensory evaluation method.

Code of the sampl	Name and surnam	Pungent	Bitter	Fruity			Descriptors:		Other negative at	Rancid	Frostbitten olives	Winey/vinegary	Musty/humid/ea	Fusty/muddy sed		Regulation (EEC) PROFILI
ē	e of the taster:	1	I	I	NTENSITY OF I	esparto	brine	metallic	ributes:		(wet wood)	1	-thy	iment	INTENSI	No. 2568/91 3 <b>SHEET FOR S</b>
			9	2	PERCE										ITY OF	SENSC
					PTION OF	cucumber	heated or	hay 🗌							PERCEPT	)RY EVALI
Signature o	Code of the		Nje		POSITIVE /		burnt	grubby							ION OF DEH	UATION 0
of the t	taster		г	1	ATTRI										FECTS	FVIR
aster:					BUTES	greasy	vegetable wa	rough								GIN OLIVE
							iter 🗆									OIL
An example olive oil u	e of a profile nder Commi	sheet fo ssion R	or sensor egulation	y evalua 1 (EEC)	tion of vii No. 2568	rgin /91										

## Sensory ASSESSMENT PROCEDURE

il samples are evaluated in standardised glasses covered with watch glasses. Each glass must contain 14-16 ml of oil kept at 28±2 °C. This temperature makes it is easier to observe the sensory differences than the ambient temperature at which oil is used. Moreover, at lower temperatures the aromatic components peculiar to these oils volatilise poorly, while higher temperatures lead to the formation of volatile components characteristic of heated oils. Morning is prescribed as the best time for tasting oils. It has been proved that there are optimum perception periods as regards taste and smell during the day. Meals are

preceded by a period in which olfactory-gustatory sensitivity increases, whereas afterwards this perception decreases. Hunger may distract the tasters and thus decrease their discriminatory capacity and, in particular, their preference and acceptance criteria. The tasters shall pick up the dark-coloured and heated glass, covered with the watch glasses, and shall rotate the glasses so as to wet the inside as much as possible. Once this stage is completed, they shall remove the watch glasses and smell the sample, taking even, slow deep breaths to evaluate the oil. Smelling should not exceed 30 seconds. When the olfactory test has been performed, the tasters

shall then judge the flavour (overall olfactory-gustatorytactile sensations). To do so, they shall take a small sip of approximately 3 ml of oil. It is very important to distribute the oil throughout the whole of the mouth cavity, from the front part of the mouth and tongue along the sides to the back part and to the palate support, since it is known that the perception of four primary tastes (sweet, salty, acid and bitter) varies in intensity depending on the area of the tongue and palate. When performing sensory assessment of virgin olive oil, it is recommended that four samples at the most be evaluated in each session, with a maximum of three sessions per day, to avoid the contrast effect that could be produced by immediately tasting other samples. As successive

tastings produce fatigue or loss of sensitivity caused by the preceding samples, it is necessary to use a product that can eliminate the remains. of the oil from the preceding tasting from the mouth. The use of a small slice of apple (15 g) is recommended, which, after being chewed, can be disposed of in a spittoon. Then the tasters must rinse out their mouths with a little water at ambient temperature. At least 15 minutes should lapse between the end of one session (comprising a set of four samples) and the start of the next. The perceived attributes shall

be recorded in the profile sheet. The intensity with which each attribute is perceived shall be described on the 10cm scale, with the descriptor intensity values ranging from 0 to 10 (0 = unperceivable).



The panel leader shall enter the assessment data of each taster into a computer programme with a view to statistically calculating the results of the analysis. This stage shall include the calculation of median values of individual sensory attributes, robust coefficients of variation and other statistical parameters. **MEDIAN** is the midpoint of a set of data ordered by size. It separates the data into two parts with the same number of values below as above that point. The advantage of the median over the mean is that it is less susceptible to the effects of outliers (extreme values in the data).

The median may also be calculated manually by first arranging the intensities of individual sensory attributes in an increasing order and then determining the median.

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Classification OF THE OIL

O il is categorised on the basis of the calculated median of negative attributes (defects) and the median of positive attributes (fruitiness). The median of negative attributes is calculated by taking into account the

negative attribute showing maximum intensity. The value of the robust coefficient of variation for this negative attribute must not exceed 20%. Limit values were determined by taking into account the defects or uncertainty of the

## TABLE 8: CLASSIFICATION OF VIRGIN OLIVE OIL

CATEGORY	MEDIAN OF DEFECTS	MEDIAN OF FRUITINESS
Extra virgin olive oil	Me = 0	Me > 0
Virgin olive oil	0 < Me ≤ 3.5	Me > 0
	Me > 3.5	-
Lampante olive oil		Or
	Me ≤ 3.5	Me = 0

method; therefore, these values are considered absolute. The described method is intended for oil categorisation and conformity assessment of olive oil with the declared category, in most cases for the purposes of inspection analyses and monitoring. Sensory evaluation of olive oils is carried out in many international competitions where each taster has their own profile sheet with a different grading for odour, flavour, even colour and balance. The highest scores are given to well-balanced oils that present the broadest possible range of sensory attributes. Indications of sensory attributes relating to taste and/ or odour are only admitted for extra virgin and virgin olive oils, provided that they are based on the results of sensory evaluation performed by an

authorised sensory evaluation panel according to the method provided in Regulation (EEC) No. 2568/91. Therefore, the label may contain the term "Intense" when the median of the positive attribute is more than 6, "Medium" when the median of the positive attribute is between 3 and 6, "Light" when the intensity is less than 3, and "Mild oil" for the intensity in which the median of the attributes bitter and pungent is less than or equal to 2. The term "well balanced" may

be used for oil that does not display a lack of balance. Lack of balance means an odour, taste and sensation of oil where the median of the bitter and/or pungent attributes is more than 2 points higher than the median of the fruitiness.

## Intensity of perception OF POSITIVE ATTRIBUTES

FRUITY, BITTER, PUNGENT



Intensity of perception (mild, medium, intense)

SENSORY EVALUATION OF VIRGIN OLIVE OIL

SENSORY	ATTRIBUTES		OF PER	CEPTIC	NO	
		0	1 2	°.	4	5
Olive fruitiness (green)						
Olive fruitiness (ripe)			_		-	
Apple			_		+	
Other ripe fruit			+		+	
Green leaves (olive)			+		+	
Grassy (green) – (dried) Aromatic harks		-	+	1	+	
Leafy (green) vegetables			+		+	Τ
Bitter			+	ļ	+	Γ
Punaent					+	Γ
Sweet			+	Ĺ	+	Γ
Unripe (green)					$\vdash$	
Astringent					$\left  \right $	
Fluidity (1 weak / 3 optimum / 5 exc	sessive)					
						ΙΓ
Other positive sensory attributes			+		ŀ	
Artichoke / cardoons		1	+		+	
Tomato (green)—(ripe)		+	+	ļ	+	
Red fruit—wild fruit					+	
Exotic fruit			+		┢	
Pine nut						
Citrus					╞	
Vanilla			+		$\vdash$	
						1
Negative sensory attributes						
Winey / vinegary / acid					$\square$	
Rough						
Metallic						
Musty / humid						
Muddy sediment / fusty						
Kancid			-			٦
		-				Γ
DEFECTS	ATTRIBUTES		тота	T SCO	ORE	
None	Olive fruitiness and/or other fresh fruit		7	œ	6	
Weak and hardly perceptible	Weak flavour of any fruit			9		
Perceptible	Fairly unclean flavour of fruit, unusual odours and tastes			2	1	
Considerable, on the border of acceptable	Pronounced unclean, unpleasan odours and tastes			4		
Strong and/or serious, clearly perceptible	Odours and tastes completely unacceptable for consumption		÷	2	3	
	-					[
NAME SURNAME	DATE	AMPLE	CODE			
	-					1

An example of an assessment (scoring) sheet used in competitions



U ntil 2003, the scoring sheet with a scale of 1 to 9 was also used for the purposes of inspection. Oils graded at least 6.5 were classified extra virgin olive oils. 'Istrska belica'
'Leccino'
'Maurino'



ARTICHOKE

Sensory attributes of extra virgin olive oil from the varieties 'Istrska belica', 'Leccino' and 'Maurino'

Megative attributes ARE DUE TO VARIOUS CAUSES

## CAUSES OF

**I** IMPROPER IMPLEMENTATION OF AGROTECHNICAL MEASURES AND **UNSUITABLE** STORAGE OF OLIVE FRUIT BEFORE PROCESSING,

2 WRONG PROCESSING PROCEDURE,

> UNSUITABLE OIL STORAGE CONDITIONS.

## UNSUITABLE AGROTECHNICAL MEASURES AND FRUIT STORAGE CONDITIONS

Flavour of oil obtained from olives which have been attacked by the grubs of the olive fly (Bactrocera Oleae).

Flavour of oil

extracted from olives

which have been

preserved in brine.

Characteristic flavour of oil obtained from olives piled or stored in such conditions as to have undergone anaerobic fermentation.

Characteristic flavour of certain oils produced from olives that have dried out.

Characteristic flavour of oils obtained from fruit in which large numbers of fungi and yeasts have developed as a result of its being stored in humid conditions for several days.

Characteristic flavour of certain oils reminiscent of wine or vinegar. This flavour is mainly due to the process of fermentation in the olives that leads to the formation of acetic acid, ethyl acetate and ethanol.

## Wet wood:

Characteristic flavour of oils extracted from olives which have been damaged by frost.

## SENSORY DEFECTS

## UNSUITABLE OIL STORAGE CONDITIONS

## UNSUITABLE PROCESSING PROCEDURES

#### HEATED OR BURNT:

Characteristic flavour of oils caused by excessive and/or prolonged heating during processing, particularly when the paste is thermally mixed under unsuitable thermal conditions.

### **ESPARTO:**

Characteristic flavour of oil obtained from olives pressed in new esparto mats. The flavour may differ depending on whether the mats are made of green esparto or dried esparto.

#### VEGETABLE WATER:

Flavour acquired by the oil as a result of prolonged contact with fermented vegetable water.

#### EARTHY:

Characteristic flavour of oils obtained from olives that have been collected with earth or mud on them and which have not been washed before pressing.

### METALLIC:

Flavour that is reminiscent of metals. It is characteristic of oil which has been in prolonged contact with metallic surfaces during crushing, mixing, pressing or storage.

#### MUDDY SEDIMENT:

Characteristic flavour of oil which has been left in prolonged contact with the sediment that settles in tanks and vats and which itself has undergone anaerobic fermentation.

### RANCID: Flavour of oil which has undergone intense process of oxidation.

#### CUCUMBER:

Flavour produced when oil is hermetically packed for too long, particularly in tin containers, and which is attributed to the formation of 2.6-nonadienal.

## Sensory evaluation OF TABLE OLIVES

ensory evaluation of table olives is based on the qualitative and quantitative descriptive sensory analysis. The sensory evaluation method, specific vocabulary and criteria for quality classification of table olives are described in the document COI/OT/MO/No 1/Rev.2 Sensory analysis of table olives, issued by the International Olive Council (IOC) in 2011. THE SENSORY **EVALUATION OF** TABLE OLIVES IS DONE BY A GROUP OF 8-10 EXPERT TASTERS.

THE SAMPLE OF TABLE OLIVES FOR ANALYSIS SHALL **BE PRESENTED IN** STANDARD TASTING **GLASSES THAT ARE** ORDINARILY USED IN THE SENSORY **EVALUATION OF** VIRGIN OLIVE OIL. Each glass shall contain as many table olives as the bottom of the glass can hold when the olives are placed side by side in a single layer and a sufficient quantity of brine to fully cover the sample. Samples, intended for sensory evaluation, shall be kept in the glasses at a temperature from 20 to 25 °C.

## GUSTATORY SENSATIONS:

Salty: Basic taste produced by aqueous solutions of sodium chloride.
Bitter: Basic taste produced by aqueous solutions of quinine and caffeine.
Acid/sour: Basic taste produced by aqueous solutions of tartaric acid or citric acid.

IN ACCORDANCE WITH THE STANDARD, NO MORE THAN THREE TASTING SESSIONS SHOULD BE CONDUCTED IN ONE DAY AND EACH TASTING SESSION SHOULD ENTAIL THE SENSORY EVALUATION OF NOT MORE THAN THREE SAMPLES, HENCE A TOTAL OF 9 SAMPLES PER DAY.

## NEGATIVE ATTRIBUTES – DEFECTS:

**Abnormal fermentation:** Characteristic olfactory sensation, perceived directly or retronasally, after abnormal fermentation. Abnormal fermentation may be described as follows:

- *putrid fermentation* (rot): sensation reminiscent of the odour of decomposing organic matter;
- *butyric fermentation* (butter): sensation reminiscent of butter or cheese;
- *zapateria* (rotten leather): sensation caused by a combination of volatile fatty acids.

**Musty:** Olfactory sensation, perceived directly or retronasally, characteristic of olives attacked by moulds.

**Rancid:** Olfactory sensation, perceived directly or retronasally, characteristic of olives that have undergone a process of rancidity. **Heated/burnt:** Olfactory sensation, perceived directly or retronasally, characteristic of olives that have undergone excessive heating in terms of temperature and/or duration during pasteurisation or sterilisation.

**Soapy:** Characteristic odour and taste reminiscent of soap. **Metallic:** Characteristic odour and taste reminiscent of metals. **Earthy:** Characteristic odour and taste reminiscent of soil or dust.

## KINAESTHETIC SENSATIONS:

Hardness: Mechanical property of the texture related to the force required to obtain the deformation or penetration of a product (olive fruit). It is perceived through the compression of the product between the teeth (solid products) or between the tongue and palate (semi-solid products). The perceived hardness of the fruit shall be described as soft, firm and hard. Fibrousness: Geometric textural attribute related to the perception of the shape and the orientation of particles in a product. Fibrousness refers to the elongated conformation of the particles, oriented in the same direction. It is evaluated by perceiving the fibres between the tongue and palate when chewing the olive.

**Crunchiness:** Mechanical property of the texture related to the cell-to-cell adhesion and the force required in breaking or fracturing the product. It is determined by compressing the fruit between the molars.

Classification OF TABLE OLIVES

The perceived sensory attributes are recorded in the profile sheet. The intensity of perceiving each descriptor is described on the 10 cm scale, with the descriptor intensity values ranging from 1 to 11 (1 = not perceived).

TABLE OLIVES ARE CLASSIFIED ON THE BASIS OF THE MEDIAN OF THE MOST INTENSE DEFECT (MID).

## TABLE 9: CLASSIFICATION OF TABLE OLIVES

Category	Median of the most intense defect (MID)
Extra	MID ≤ 3.0
First	3.0 < MID ≤ 4.5
Second	4.5 < MID ≤ 7.0
Olives unfit for const	umption MID > 7.0

EXTRA	FIRST category	SECOND category	OLIVE UNFIT for consumption						
				-					
<mark>ر 2</mark>	3 4 4,	5 5 6	7 8	9 10	II				

Range of intensity values from 1 to 11





Sensory attributes of table olives obtained from the 'Istrska belica' and 'Štorta'

	Code of the sample:	Name and surname of the taster:		Crunchiness	Fibrousness	Hardness	INTENSITY OF KINAESTHETIC SENSAT	Bitter	Salty	INTENSITY OF GUSTATORY SENSATIO	Other defects (determine)	Abnormal fermentation (type)	INTENSITY OF PERCEPTION OF NEGAT	PROFILE SHEET FOR SENSORY EVA
	Signature of the taster:	Code of the taster:					TIONS			SNG			TIVE ATTRIBUTES—DEFECTS	ALUATION OF TABLE OLIVES
Anex	ample	of a pr	rofile sheet for se	nsory o	evalua	tion of	table olives							





- Commission Regulation (EEC) No. 2568/91, Annex XII
- Commission Implementing Regulation (EU) No. 1348/2013
- European Accreditation: EA-4/09 Accreditation for sensory testing laboratories
- Decision No DEC-6/25-V/15: On the method for the organoleptic assessment of virgin olive oil
- COI/T.20/Doc. 4/Rev.1 2007 Sensory analysis: general basic vocabulary
- COI/T.20/Doc. 5/Rev.1 2007 Glass for oil tasting
- COI/T.20/Doc. 6/Rev.1 2007 Guide for the installation of a test room
- COI/T.20/Doc.14/Rev. 4 2013 Guide for the selection, training and monitoring of skilled virgin olive oil tasters
- COI/T.20/Doc.15/Rev. 7 2015 Sensory analysis of olive oil method for the organoleptic assessment of virgin olive oil
- Decision No DEC-20/95-V/2007 Guidelines for the accreditation of laboratories undertaking the sensory analysis of virgin olive oils
- COI/T.28/Doc.1 2007 Guidelines for the accreditation of sensory testing laboratories with particular reference to virgin olive oil according to standard ISO/IEC 17025:2005
- COI/OT/MO/Doc. No 1/Rev.2 Sensory analysis of table olives
- Koprivnjak O. 2006. Djevičansko maslinovo ulje od masline do stola. Poreč, MIH d.o.o.: 156 pages.
- Morales, M.T., Luna, G.; Aparicio, R. 2005. Comparative study of virgin olive oil sensory defects, Food Chemistry, 91, 2, 293-301.





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Projekt delno financira Evropska unija Instrument za predpristopno pomoč



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