



**INTERNATIONAL
OLIVE OIL
COUNCIL**

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SENSORY ANALYSIS OF OLIVE OIL

METHOD

**ORGANOLEPTIC ASSESSMENT
OF VIRGIN OLIVE OIL**

1. PURPOSE

The purpose of this international method is to determine the criteria needed to assess the flavour characteristics of virgin olive oil and to develop the methodology for its classification.

2. FIELD OF APPLICATION

The method described is only applicable for the classification of virgin olive oils according to the intensity of the defects as determined by a group of tasters selected and trained as a panel.

3. GENERAL BASIC VOCABULARY FOR SENSORY ANALYSIS

Refer to the standard COI/T.20/Doc. no. 4 "Sensory Analysis: General Basic Vocabulary".

4. SPECIFIC VOCABULARY FOR VIRGIN OLIVE OIL FOR THE PURPOSES OF THE METHOD

4.1. Negative attributes

Fusty Characteristic flavour of oil obtained from olives stored in piles which have undergone an advanced stage of 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.

<u>Muddy sediment</u>	Characteristic flavour of oil that has been left in contact with the sediment that settles in underground tanks and vats.
<u>Winey-Vinegary</u>	Characteristic flavour of certain oils reminiscent of wine or vinegar. This flavour is mainly due to a process of fermentation in the olives leading to the formation of acetic acid, ethyl acetate and ethanol.
<u>Metallic</u>	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.
<u>Rancid</u>	Flavour of oils which have undergone a process of oxidation.
4.2.	Positive attributes
<u>Fruity</u>	Set of the 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 through the back of the nose.
<u>Bitter</u>	Characteristic taste of oil obtained from green olives or olives turning colour.
<u>Pungent</u>	Biting tactile sensation characteristic of oils produced at the start of the crop year, primarily from olives that are still unripe.
4.3.	Other negative attributes
<u>Heated or Burnt</u>	Characteristic flavour of oils caused by excessive and/or prolonged heating during processing, particularly when the paste is thermally mixed, if this is done under unsuitable thermal conditions.
<u>Hay - Wood</u>	Characteristic flavour of certain oils produced from olives that have dried out.
<u>Rough</u>	Thick, pasty mouthfeel sensation produced by certain oils.
<u>Greasy</u>	Flavour of oil reminiscent of that of diesel oil, grease or mineral oil.
<u>Vegetable water</u>	Flavour acquired by the oil as a result of prolonged contact with vegetable water.
<u>Brine</u>	Flavour of oil extracted from olives which have been preserved in brine.

<u>Esparto</u>	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.
<u>Earthy</u>	Flavour of oil obtained from olives which have been collected with earth or mud on them and not washed.
<u>Grubby</u>	Flavour of oil obtained from olives which have been heavily attacked by the grubs of the olive fly (<i>Bactrocera oleae</i>).
<u>Cucumber</u>	Flavour produced when an oil is hermetically packed for too long, particularly in tin containers, and which is attributed to the formation of 2-6 nonadienal.

5. **GLASS FOR OIL TASTING**

Refer to the standard COI/T.20/Doc. no. 5, "Glass for Oil Tasting".

6. **TEST ROOM**

Refer to the standard COI/T.20/Doc. no. 6, "Guide for the Installation of a Test Room".

7. **ACCESSORIES**

The following accessories, which are required by the taster to perform his task properly, shall be supplied in each booth and shall be within easy reach:

- glasses (standardised) containing the samples, code numbered, covered with a watch-glass and kept at $28^{\circ}\text{C} \pm 2^{\circ}\text{C}$;
- profile sheet (see Figure 1), together with the instructions for its use if necessary;
- pencil or pen;
- tray with slices of apple;
- glass of water at ambient temperature.

8. METHODOLOGY

Refer to the standard COI/T.20/Doc. no. 13 "General Methodology for the Organoleptic Assessment of Virgin Olive Oil" and the standard COI/T.20/Doc. no. 14 "Guide for the Selection, Training and Monitoring of Skilled Virgin Olive Oil Tasters".

9. PROCEDURE FOR THE ORGANOLEPTIC ASSESSMENT AND CLASSIFICATION OF VIRGIN OLIVE OIL

9.1. Use of the profile sheet by tasters

The profile sheet intended for use by tasters is detailed in Figure 1 of this method.

Each taster on the panel shall smell and then taste 1/ the oil under consideration, contained in the tasting glass, in order to analyse the olfactory, gustatory, tactile and kinaesthetic perceptions; he shall then enter on the profile sheet provided the intensity with which he perceives each of the negative and positive attributes.

Should the taster perceive any negative attributes that are not given on the list, he shall record them under the "others" heading, using the term or terms among those defined in section 4.3 of the method that most accurately describes the attributes.

9.2. Use of the data by the panel supervisors

The panel supervisor shall collect the profile sheets completed by each taster and shall review the intensities recorded. Should he find any anomaly, he shall invite the taster to revise his profile sheet and, if necessary, to repeat the test.

The panel supervisor shall enter the data of each assessor in the computer program accompanying the method with a view to obtaining the statistical calculations (median). The data for a given sample shall be entered with the aid of the matrix comprising 10 columns representing the 10 sensory attributes and n lines representing the n assessors used.

1/ He may refrain from tasting when he observes any extremely intense negative attribute, and shall record this exceptional circumstance in the profile sheet.

When a defect is entered under the "others" heading by at least 50% of the panel, the panel supervisor shall calculate the median of the defect and shall arrive at the corresponding classification.

The method of calculation is illustrated in an example in the annex hereto.

9.3. Method of classifying the oil

Olive oil shall be classified:

. in the *extra virgin* grade when the median of the defects is equal to 0 and the median of the fruity attribute is more than 0;

. in the *virgin* grade when the median of the defects is more than 0 and less than or equal to 2.5 and the median of the fruity attribute is more than 0;

. in the *ordinary virgin* grade when the median of the defects is more than 2.5 and less than or equal to 6.0 or when the median of the defects is less than or equal to 2.5 and the median of the fruity attribute is equal to 0;

. in the *lampante virgin* grade when the median of the defects is more than 6.0.

Note 1: The median of the defects means the median of the defect that is perceived with the strongest intensity. The value of the robust coefficient of variation for this defect shall be less than or equal to 20%.

Note 2: When the median of the bitter and/or pungent attribute is more than 5.0, the panel supervisor shall indicate this is so on the test certificate for the oil.

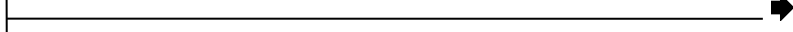
When analyses are carried out to check for compliance with the standard or for a second opinion, the panel supervisor shall have the organoleptic assessment performed in triplicate, with at least one day in between each test. The median of the attributes shall be calculated from the set of profile sheet data for the three tests.

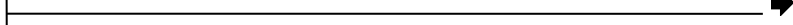
Figure 1

**PROFILE SHEET
(for use by tasters)**

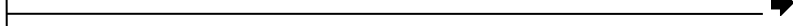
INTENSITY

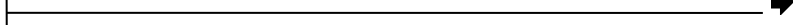
**PERCEPTION OF
DEFECTS:**

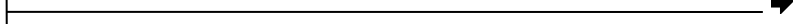
Fusty 

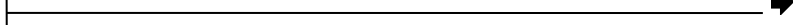
Musty 

Winey - Vinegary -
Acid - Sour 

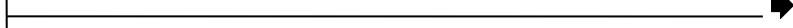
Muddy sediment 

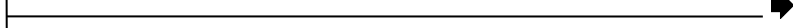
Metallic 

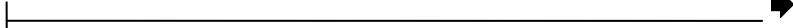
Rancid 

Others (specify) 

**PERCEPTION OF
POSITIVE
ATTRIBUTES:**

Fruity 

Bitter 

Pungent 

Name of taster:

Sample code:**Date:****Annex 1****METHOD FOR CALCULATING THE MEDIAN AND THE CONFIDENCE INTERVALS****Median**

$$Me = [P(X < x_m) \leq 1/2 \wedge P(X \leq x_m) \geq 1/2]$$

The median is the real number X_m characterised by the fact that the probability (P) that the distribution values (X) are below this number (X_m), is less than and equal to 0.5 and that simultaneously the probability (P) that the distribution values (X) are below or equal to X_m is greater than and equal to 0.5. A more practical definition is that the median is the 50th percentile of a distribution of numbers arranged in increasing order. In other words, it is the midpoint of an ordered set of odd numbers, or the mean of two midpoints of an ordered set of even numbers.

Robust standard deviation

$$s^* = \frac{1.25IQR}{1.35\sqrt{N}}$$

In order to arrive at a reliable estimate of the variability around the mean it is necessary to refer to the robust standard deviation as estimated according to Stuart and Kendall. The formula gives the asymptotic robust standard deviation where N is the number of observations, IQR is the interquartile interval or the robust estimate of the variability of the data considered (the interquartile interval encompasses exactly 50% of the cases of a given probability distribution). The interquartile interval is calculated by calculating the size of the difference between the 75th and 25th percentile.

$$IQR = 75\text{th percentile} - 25\text{th percentile}$$

The percentile is the value X_{pc} characterised by the fact that the probability (P) that the distribution values are less than X_{pc} is less than and equal to a specific hundredth and that simultaneously the probability (P) that the distribution values are less than or equal to X_{pc} is greater than and equal to that specific hundredth. The hundredth indicates the distribution fractile chosen. In the case of the median it is equal to 50/100.

$$\text{Percentile} = [P(X < x_{pc}) \leq \frac{n}{100} \wedge P(X \leq x_{pc}) \geq \frac{n}{100}]$$

For practical purposes, the percentile is the distribution value corresponding to a specific area subtended from the distribution or density curve. To give an example, the 25th percentile represents the distribution value corresponding to an area equal to 0.25 or 25/100.

Robust coefficient of variation (%)

$$\text{CVR} = \frac{s^*}{\text{Me}} 100$$

The CV%r represents a pure number which indicates the percentage variability of the set of numbers analysed. For this reason it is very useful for checking the reliability of the panel assessors.

Confidence intervals of the median at 95%

The confidence intervals at 95% (value of the error of the first kind equal to 0.05 or 5%) represent the interval within which the value of the median could vary if it were possible to repeat an experiment an infinite number of times. In practice, it indicates the interval of variability of the test in the operating conditions adopted if it were possible to repeat it many times. As with the CV%r, the interval helps to assess the reliability of the test.

$$\text{Upper C.I.} = \text{Me} + (\text{Cs}^*)$$

$$\text{Lower C.I.} = \text{Me} - (\text{Cs}^*)$$

where $C = 1.96$ for the confidence interval equal to 0.95.

000

Classification is by comparison of the median values with the reference intervals fixed in section 9.3 of the method. On applying the computer program, the classification is displayed on the table of statistical data and the graph.

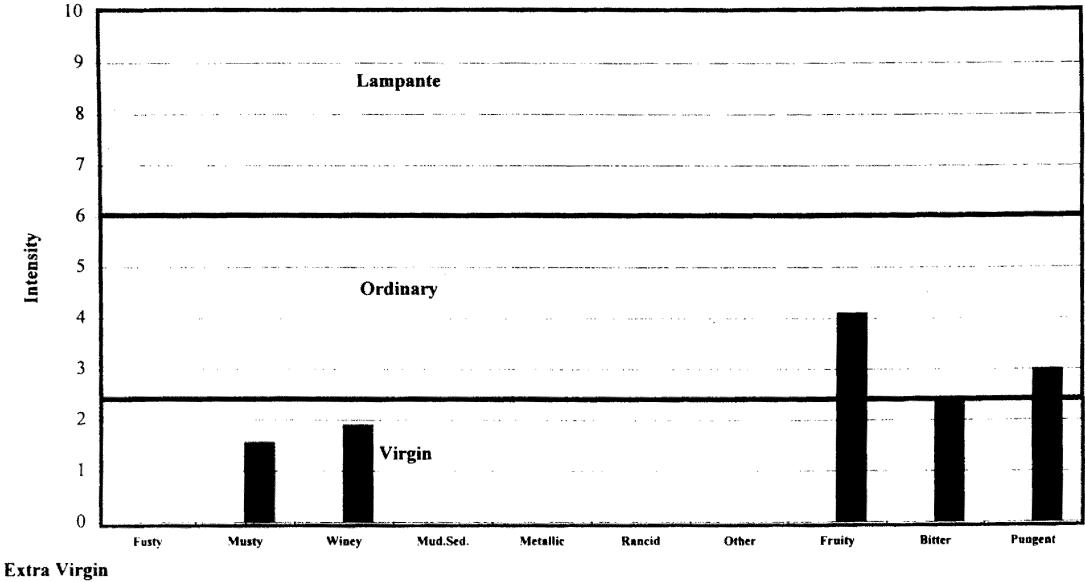
COMPUTER PROGRAM

Annex 2 – Example

Sample	Taster	Fusty	Musty	Winey	Mud.Sed.	Metallic	Rancid	Other	Fruity	Bitter	Pungent
JP1	A	0,0	1,6	2,1	0,0	0,0	0,0	0,0	4,9	2,0	4,5
JP1	B	0,0	1,9	2,1	0,0	0,0	0,0	0,0	4,1	2,6	4,1
JP1	C	0,0	0,8	1,7	0,0	0,0	0,0	0,0	4,7	2,3	1,9
JP1	D	0,0	1,5	1,7	0,0	0,0	0,0	0,0	4,0	2,2	2,0
JP1	E	0,0	1,7	2,0	0,0	0,0	0,0	0,0	4,1	2,6	3,3
JP1	F	0,0	1,7	2,1	0,0	0,0	0,0	0,0	4,4	3,3	3,8
JP1	G	0,0	1,3	1,8	0,0	0,0	0,0	0,0	4,1	2,2	2,7
JP1	H	0,0	1,2	1,5	0,0	0,0	0,0	0,0	4,0	2,5	2,7

Statistics JP1	Fusty	Musty	Winey	Mud.Sed.	Metallic	Rancid	Other	Fruity	Bitter	Pungent
Median	0,00	1,55	1,90	0,00	0,00	0,00	0,00	4,10	2,40	3,00
Interquartile interval	0,0	0,4	0,4	0,0	0,0	0,0	0,0	0,4	0,4	1,4
Robust standard dev.	0,00	0,14	0,13	0,00	0,00	0,00	0,00	0,13	0,13	0,44
Relative robust std. Dev.	0,00	8,98	6,89	0,00	0,00	0,00	0,00	3,19	5,46	14,73
I.C. upper	0,00	1,82	2,16	0,00	0,00	0,00	0,00	4,36	2,66	3,87
I.C. lower	0,00	1,28	1,64	0,00	0,00	0,00	0,00	3,84	2,14	2,13
Assigned category	Virgin									

JP1



Extra Virgin

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McGill, R.; Tukey, J.W.; Larsen, W.A. 1978. Variation of Box Plots. The American Statistician, 32, (2), 12-16.