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GENERAL CRITERIA FOR ARRIVING AT A SENSORY ASSESSMENT
OF THE FLAVOUR OF VIRGIN OLIVE OILS

The purpose of this document is to establish a systematic, uniformly-applied criterion for the quality evaluation of the organoleptic characteristics of virgin olive oils. Another aim is to ensure that the quality gradings awarded are consistent with the intensity of the sensory notes that are perceptible in the flavour of these oils.

Table I has been prepared to make it easier to understand the criteria that have been followed in associating both aspects. It should be pointed out that a minimum amount of experience is needed to use this table.

PRELIMINARY COMMENTS

This table does not reduce the dispersion between the data of different tasters which can be attributed to the varying perception thresholds they have for different olfactory-gustatory-tactile stimuli; nor does it reduce the discrepancies produced by the psycho-physiological response of the taster in the whole process of impression-sensation-perception that each stimulus prompts. Although such reductions are much to be desired, at this point in time they can only be considered something to be hoped for. What the table does attempt to do is to reduce the dispersion between the gradings given by the different tasters or panels caused by their different interpretations of the concept of quality. It will also prove useful when teaching tasters who are at the training stage with the help of a homogeneous grading criterion.

Table I has emerged from the data handed in by the tasters on the different laboratory panels by establishing a relationship between the intensity of the attributes perceived in each sample and the quality grading awarded.

Taking flavour to be a set of stimuli, the table has been arranged in such a way that positive sensory notes help to raise the quality grading, whereas those notes that are considered defective lower the grading.

DESCRIPTION OF THE TABLE

The attributes that tasters most commonly use to identify the sensory notes perceived most often in the flavour of olive oil are listed under "descriptors".

Several groups of sensory notes have been combined under the descriptors "other tolerable attributes" and "other unpleasant attributes" (some of which are later listed) in order to prevent the tasters' judgements from becoming unnecessarily diversified. Such diversification would detract in quantitative terms from the importance of the fact that "there is something" that in some cases may be tolerable and in others very unpleasant but which, whatever the situation, affects the quality of the oil to varying degrees.

In the first column on the left-hand side of the table are listed three groups (I, II and III). Group II is the most complex because even although its attributes may be perceived with exactly the same intensity, they can have varying effects depending on what other "sensory notes" are present. On the other hand, opposing attributes (sweet and bitter) can have a similar effect on the quality of an oil.

Group I: This group is confined to a basic perception which can be identified as "olive fruity". This descriptor attempts to define the olfactory-gustatory-tactile perception of the flavour of oils that are obtained from sound, clean olives that have been recently harvested at their optimum ripening stage, crushed and whose oil has been extracted employing faultless methods.

The presence of this sensory note to varying degrees of intensity or its complete absence in a virgin olive oil is a fundamental element in the proper classification of these oils.

TABLE I

GRADING

GROUPS	DESCRIPTORS	1	2	3	4	5	6	7	8	9
I	Olive fruity						1	2	3	4,5
	Apple					5,4,3,2,1	1,2	1,2,3	2,3,4,5	4,5
	Green					5,4,3,2,1	1,2	1,2,3	2,3,4,5	
II	Bitter					5,4,3,2,1	1,2	1,2,3	2,3,4,5	
	Pungent					5,4,3,2,1	1,2	1,2,3	2,3,4,5	
	Sweet				5,4	5,4,3,2,1	1,2	1,2,3	4,5	
	Other ripe fruit			5	4,3	3,2,1	1,2	1,2,3		
	Rough			5	4,3	2,1				
III	Other tolerable attributes			5,4	3	2,1				
	Metallic	5	4,3	2	1					
	Winey	5	4,3	2	1					
	Mustiness	5	4,3	2	1					
	Muddy sediment	5,4	3	2	1					
	"Atrojado" (fusty)	5,4	3	2	1					
	Rancid	5,4	3	2	1					
	Other very unpleasant attributes	5,4	3	2,1						

Group II: This group covers descriptors that define a variety of sensory notes (olfactory, gustatory or tactile) which, when encountered, must be considered positive in the overall flavour of the olive oil, particularly if they are detected along with the basic "olive fruity" note.

These attributes should be considered positive because they are naturally present in the oils. Group II therefore includes notes like "apple", "green" (which is reminiscent of the smell of the fruit and even of grass or green leaves) and "other ripe fruit" that are produced by volatile chemical constituents related to the variety or degree of ripening of the olives; these are factors with which the "bitter" and "sweet" tastes and the pungent sensation are associated.

Group III comprises:

A) Attributes that may be considered tolerable, especially when they are perceived in small concentrations. The "tart" or "rough" descriptor is given a prominent position because it is the note that can be least ascribed to defective handling, a feature which begins to become apparent in the attributes that follow it under "other tolerable attributes". Some of the sensory notes that could be encountered under this descriptor are those reminiscent of "cucumber", "butter", "legumes", "old oil" etc. which are usually discerned in oils that have been stored for a very long period. Other attributes that are included under this section are "heated oil", "plastic", "vegetable water" (very fresh vegetable water, otherwise it would be a very serious defect), "olive brine" and "green soap". Although tolerable when detected in barely perceptible or small concentrations, when these attributes are perceived with great or very great intensity they should be marked as being on the borderline of acceptability or even unacceptable.

B) Attributes that are plainly defective and even very unpleasant. They appear because the oil has been extracted from fruit that has been stored for too long and as a result has gone rotten, or because of serious defects in the extraction or storage of the oil. These sensory notes are identified by descriptors such as: "metallic", "winey", "mustiness" (also associated with wet soil or to be more precise with the smell of soil when rain first falls), "muddy sediment", "atrojado" (fusty), "rancid" and "other very unpleasant attributes". The "very unpleasant" category includes sensory notes that tasters usually associate with descriptors like: "medicine", "phenol", "fetid", "disgusting", etc. which are all the more serious the greater the intensity with which they are perceived.

Table I attempts to establish a relationship between the attributes of the oil and intensity with which they are discerned by the taster and the quality grading he should award the oil. To give an example, if an oil does not have any but does have a dull aroma or if it has minor defects that are "almost perceptible" or "slightly perceptible" (which would earn it 1 or 2 on the intensity scale), it should be graded 6.

The greater the intensity of the basic "olive fruity" attribute (I), the higher the grading of the oils.

On the other hand, the more serious a defect is in an oil and the greater the intensity with which it is perceived, the lower the grading awarded.

GRADING OF THE SAMPLE

The grading that the sample is awarded will be the arithmetic mean of the gradings assigned to its different attributes.

HOW TO USE THE TABLE

Group I: As we said earlier, "olive fruity" is the basic note in virgin olive oils. Depending on the intensity of this attribute, award a grading of 6 if it is perceived with an intensity of 1; 7 if it is perceived with an intensity of 2; 8 if it is perceived with an intensity of 3, and 9 if it is perceived with an intensity of 4 or 5.

Group II: The grading for the attributes in this group varies depending on whether or not they are perceived along with the "olive fruity" sensory note (I), and is awarded in accordance with the following criteria.

IIa) When the attributes are preceded by the "olive fruity" note with an intensity of 2 or more: in this case award the attributes in group II the highest possible grading appropriate for their intensity.

Example 1

	<u>Attributes</u>	<u>Intensity</u>	<u>Grading</u>	
(I)	Olive fruity	2	7	
	Apple	2	8	
	Green	3	8	
(II)	Sweet	1	7	Sample grading awarded by a taster = 7.5
	Pungent	2	8	
	Other fruit	1	7	
			Σ	= 45

IIb) When these attributes are preceded by "olive fruity" with an intensity of 1 or less: grade all the sensory notes above 5, but give as low a grading as their intensity permits.

Example 2

	<u>Attributes</u>	<u>Intensity</u>	<u>Grading</u>	
(II)	Apple	2	6	
	Green	3	7	
	Sweet	1	6	Sample grading awarded by a taster = 6.2
	Pungent	2	6	
	Other fruit	1	6	
			Σ	= 31

Group III: When the defects included in this group are noted in an oil, the procedure that has to be followed to grade the sample will vary depending on the different cases:

IIIa) When the sum of the intensities of the sensory notes in groups I and II is greater than the sum of the defects included under group III grade the positive attributes in accordance with IIa) and IIb) and award the group III defects the grading appropriate for their intensity.

Example 3

	<u>Attributes</u>	<u>Intensity</u>	<u>Grading</u>	
(I)	Olive fruity	1	= 5	6
	Green	2		6
(II)	Bitter	2		6
	Other tolerable attributes	1		5
(III)	Metallic	1	= 4	4
	Winey	2		3
				<u>Σ = 30</u>

IIIb) When the sum of the intensities of the sensory notes in groups I and II is equal to or less than the sum of the defects in group III, proceed as follows: award any positive attribute a grading of 5, irrespective of its intensity, and grade the negative attributes according to their intensity.

Example 4

	<u>Attributes</u>	<u>Intensity</u>	<u>Grading</u>	
(I)	Olive fruity	1	5	
	Green	2	5	
(II)	Bitter	3	5	Sample grading awarded by a taster = 4.1
	Other tolerable attributes	1	5	
(III)	Metallic	2	3	
	Winey	3	2	
			= 25	

Example 5

	<u>Attributes</u>	<u>Intensity</u>	<u>Grading</u>	
(II)	Green	1	5	
	Bitter	1	5	
	Other tolerable attributes	1	5	Sample grading awarded by a taster = 4.0
(III)	Metallic	2	3	
	Winey	3	2	
			= 20	

IIIc) When the taster detects group III attributes only, the grading awarded shall be that of the defect detected with the greatest intensity.

Example 6

	<u>Attributes</u>	<u>Intensity</u>	<u>Grading</u>	
	Metallic	1	4	
(III)	Winey	2	3	Sample grading awarded by a taster = 2.0
	Muddy sediment	2	3	
	"Atrojado" (fusty)	3	2	

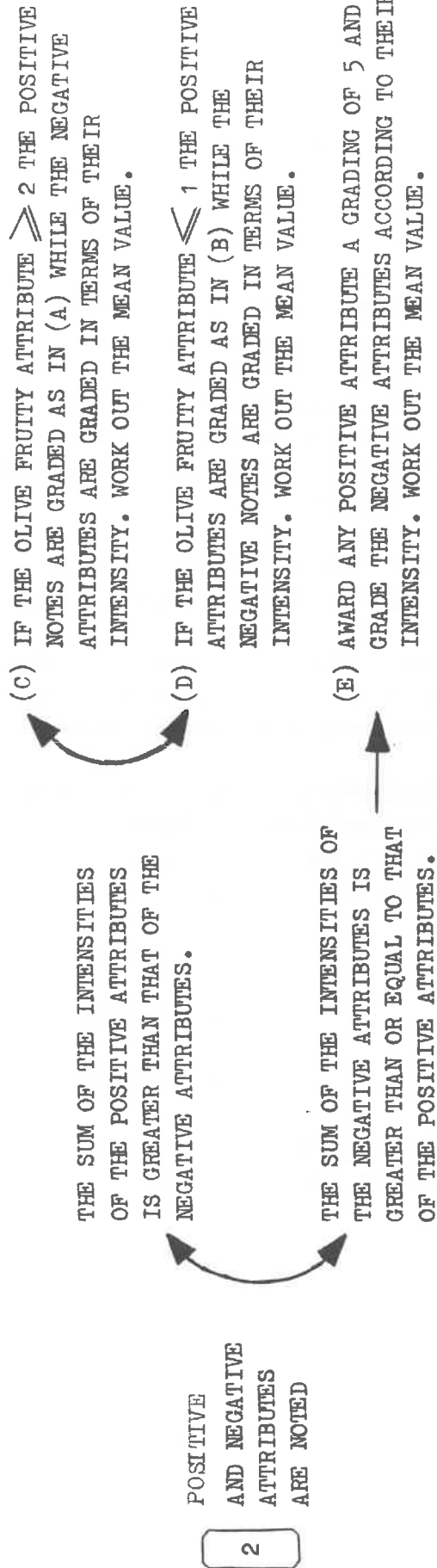
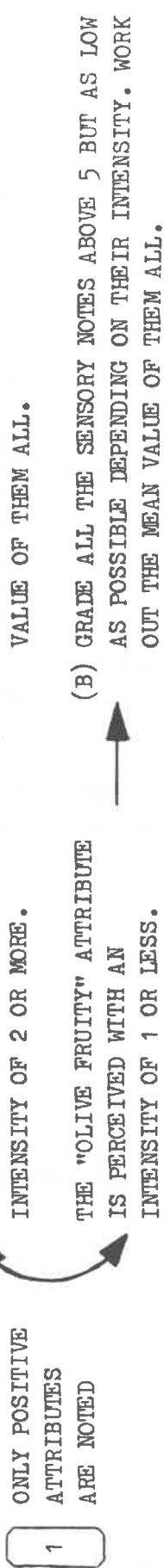
Defect with the highest intensity: "ATROJADO" (FUSTY).

See Annex A for a summary of the above explanations.

ANNEX A

NOTES ON THE PROFILE SHEET

HOW TO GRADE



As was pointed out at the start of this document, this table which converts profile intensities into absolute gradings was arrived at after running repeated tests in which a relationship was established between the profile scores and the gradings which were awarded to each one of the many samples of virgin olive oil that underwent sensory analysis.

To find out whether the way the table worked was useful and applicable to any panel or sample, the panel profiles of one of the collaborating laboratories (no. 3) were drawn at random. On the basis of the 168 data collected (for 21 samples and 8 tasters) the gradings that would be obtained according to the profile attributes for each taster and sample were calculated with the aid of Table I, and the results were compared to the quality grading given by each taster for the appropriate sample.

The grading each sample was awarded by the panel was also compared to the corresponding mean that could be obtained by calculation.

Table II compares both sets of results. We can see that the gradings calculated on the basis of the profile data are highly consistent with the gradings awarded directly by the same tasters as quality gradings.

In order to statistically analyse this closeness of agreement we calculated the coefficient of correlation (r) between the 168 pairs of data as well as the angular coefficient (B) and the ordinate at the origin (A) of the line of regression, and obtained the following results:

$$r = 0.8956$$

$$A = 0.4583$$

$$B = 0.8629$$

These data have been obtained by taking the values calculated from the Table according to the method described as abscissae and the awarded values as ordinates.

From the correlation between the mean calculated values and the sample gradings awarded by the panel we obtained:

$$r = 0.9710$$

$$A = 0.1214$$

$$B = 0.9298$$

The high coefficient of correlation (r) obtained, the angular coefficient (B), which is a tangent very close to that of a 45° angle, and the small ordinate at the origin (A) of the line of regression depicted graphically (fig. 1) all go to show that correct quality gradings for any sample can be obtained from detectable attributes and their intensities in accordance with a homogeneous criterion obtained from real gradings awarded by experts.

Owing to the great complexity and variability noted in the flavour of virgin olive oils, the outline presented does not try to strictly shape the criterion of the taster and thereby the final grading he awards.

Since a method should state as explicitly as possible how the operators should proceed, so as to reduce operational error as far as possible, we considered it advisable to include this method for assessing the flavour characteristics of olive oils by relating them to a quality grading since the sensory method is in this way elaborated on and completed.

TABLE II
SAMPLES

Taster	1		2		3		4		5		6		7		8	
	Grading		Grading		Grading		Grading		Grading		Grading		Grading		Grading	
	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC
1	4	4,25	6	6,0	4	4,5	4	5,75	3	4,0	4	4,0	6	6,0	2	2,83
2	7	7,33	6	6,75	4	4,0	3	2,5	3	3,6	3	3,2	5	5,0	4	3,83
3	6	6,66	5	4,5	4	4,0	4	3,66	3	3,0	4	3,25	4	4,0	3	3,0
4	7	6,0	5	6,0	3	2,0	4	3,66	5	6,0	5	6,0	5	6,0	4	4,0
5	6	5,5	6	5,6	4	4,6	2	2,0	4	4,75	3	3,83	4	4,25	4	4,75
6	6	5,0	6	6,75	4	3,5	5	3,8	4	4,0	4	2,75	4	3,0	4	3,75
7	6	6,0	6	5,75	5	4,16	3	3,16	4	4,2	2	2,5	4	3,8	2	1,5
8	6	7,0	5	5,0	5	3,8	3	4,0	4	4,0	2	3,75	4	4,0	3	3,8
\bar{X}	6	5,97	5,63	5,79	4,12	3,82	3,5	3,57	3,75	4,19	3,4	3,66	4,5	4,51	3,25	3,43

Taster	9		10		11		12		13		14		15		16	
	Grading		Grading		Grading		Grading		Grading		Grading		Grading		Grading	
	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC
1	3	3,66	5	5,5	3	1,5	6	6,4	3	4,28	7	7,66	6	7,25	6	6,6
2	5	5,0	4	5,2	3	3,87	5	7,25	2	2,0	5	6,8	5	5,0	7	7,8
3	2	4,0	5	5,0	4	4,0	6	5,5	7	7,33	7	7,0	6	7,0	7	7,33
4	5	4,33	6	6,0	5	6,0	6	6,0	7	8,0	7	6,0	6	6,0	7	7,25
5	3	3,66	4	4,6	3	4,12	6	5,33	5	6,0	7	5,85	6	6,33	6	5,43
6	3	2,6	5	5,0	4	3,0	5	4,0	6	7,0	8	7,75	6	7,0	7	7,5
7	4	4,28	5	4,5	3	3,33	5	5,71	6	5,83	6	6,0	6	6,28	4	4,16
8	3	4,37	4	4,75	5	6,0	7	6,0	7	7,5	8	7,5	7	7,0	7	7,33
\bar{X}	3,5	3,99	4,75	5,07	3,75	3,98	5,75	5,77	5,38	5,99	6,88	6,82	6,0	6,48	6,38	6,68

Taster	17		18		19		20		21	
	Grading		Grading		Grading		Grading		Grading	
	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC	AWARD	CALC
1	6	6,4	6	6,4	4	4,2	2	2,0	3	4,33
2	5	6,8	3	4,8	3	4,0	2	2,71	3	3,66
3	6	7,25	6	6,0	4	3,33	2	2,0	4	3,0
4	5	6,66	3	3,33	5	5,0	1	1,0	2	2,0
5	6	5,5	4	4,0	5	4,83	2	2,0	3	3,4
6	7	6,0	5	5,5	4	3,8	2	2,0	4	3,25
7	4	4,12	5	4,8	3	3,2	2	2,0	3	3,2
8	5	5,25	7	7,0	5	4,4	2	2,21	2	3,33
\bar{X}	5,5	6,0	4,88	5,23	4,12	4,09	1,87	1,99	3,0	3,27

AWARDED GRADING

FIGURE 1

