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SENSORY ANALYSIS OF OLIVE OIL

METHOD FOR THE ORGANOLEPTIC ASSESSMENT OF VIRGIN OLIVE OIL

1. PURPOSE

The purpose of this international method is to determine the procedure for assessing the organoleptic characteristics of virgin olive oil and to establish the method for its classification on the basis of those characteristics.

2. FIELD OF APPLICATION

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

It also provides indications for optional labelling.

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

4.1. Negative attributes

Fusty/muddy sediment Characteristic flavour of oil obtained from olives piled or stored in such conditions as to have undergone an advanced stage of anaerobic fermentation, or of oil which has been left in contact with the sediment that settles in underground tanks and vats and which has also undergone a process of anaerobic fermentation.

Musty-humid-earthy 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 or of oil obtained from olives that have been collected with earth or mud on them and which have not been washed.

Winey-vinegary Characteristic flavour of certain oils reminiscent of wine or vinegar.

Acid-sour This flavour is mainly due to a process of aerobic fermentation in the olives or in olive paste left on pressing mats which have not been properly cleaned and leads to the formation of acetic acid, ethyl acetate and ethanol.

Rancid Flavour of oils which have undergone an intense process of oxidation.

Frostbitten olives (wet wood) Characteristic flavour of oils extracted from olives which have been injured by frost while on the tree.

4.2. Other negative attributes

Heated or burnt 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.

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

Rough Thick, pasty mouthfeel sensation produced by certain old 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 which has undergone fermentation processes.

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

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.

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 heavily attacked by the grubs of the olive fly (*Bactrocera oleae*).

Cucumber 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.

4.3. 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 and/or through the back of the nose.

Bitter Characteristic primary taste of oil obtained from green olives or olives turning colour. It is perceived in the circumvallate papillae on the "V" region of the tongue.

Pungent Biting tactile sensation characteristic of oils produced at the start of the crop year, primarily from olives that are still unripe. It can be perceived throughout the whole of the mouth cavity, particularly in the throat.

4.4. OPTIONAL TERMINOLOGY FOR LABELLING PURPOSES

Upon request, the panel leader may certify that the oils which have been assessed comply with the definitions and ranges corresponding solely to the following expressions according to the intensity and perception of the attributes.

Positive attributes (fruity, bitter and pungent): According to the intensity of perception:

- **Robust,** when the median of the attribute is more than 6.0;
- ***Medium*****,** when the median of the attribute is between 3.0 and 6.0;
- ***Delicate***, when the median of the attribute is less than 3.0.

Fruitiness Set of olfactory sensations characteristic of the oil which depends on the variety of olive and comes from sound, fresh olives in which neither green nor ripe fruitiness predominates. It is perceived directly and/or through the back of the nose.

Green fruitiness Set of olfactory sensations characteristic of the oil which is reminiscent of green fruit, depends on the variety of olive and comes from green, sound, fresh olives. It is perceived directly and/or through the back of the nose.

Ripe fruitiness Set of olfactory sensations characteristic of the oil which is reminiscent of ripe fruit, depends on the variety of olive and comes from sound, fresh olives. It is perceived directly and/or through the back of the nose.

Well balanced Oil which does not display a lack of balance, by which is meant the olfactory–gustatory and tactile sensation where the median of the bitter and/or pungent attributes is two points higher than the median of the fruitiness.

Mild oil Oil for which the median of the bitter and pungent attributes is 2.0 or less.

List of expressions according to the intensity of perception:

Expressions subject to production of an organoleptic test certificate	**Median of the attribute (Me)**
Fruitiness	-
Ripe fruitiness	-
Green fruitiness	-
Delicate fruitiness	≤ 3.0
Medium fruitiness	3.0 < Me ≤ 6.0
Robust fruitiness	> 6.0
Delicate ripe fruitiness	≤ 3.0
Medium ripe fruitiness	3.0 < Me ≤ 6.0
Robust ripe fruitiness	> 6.0
Delicate green fruitiness	≤ 3.0
Medium green fruitiness	3.0 < Me ≤ 6.0
Robust green fruitiness	> 6.0
Delicate bitterness	≤ 3.0
Medium bitterness	3.0 < Me ≤ 6.0
Robust bitterness	> 6.0
Delicate pungency	≤ 3.0
Medium pungency	3.0 < Me ≤ 6.0
Robust pungency	> 6.0
Well balanced oil	The median of the bitter attribute and the median of the pungent attribute are not more than 2.0 points above the median of the fruitiness.
Mild oil	The median of the bitter attribute and the median of the pungent attribute are 2.0 or less.

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 tasters to perform their 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 °C ± 2 °C;
- profile sheet (see Figure 1) on hard copy, or on soft copy provided that the conditions of the profile sheet are met, together with the instructions for its use if necessary;
- pen or indelible ink;
- trays with slices of apple and/or water, carbonated water and/or rusks;
- glass of water at ambient temperature*;*
- sheet recalling the general rules listed in sections 9.4 and 10.1.1;
- spittoons.

8. PANEL LEADER AND TASTERS

8.1. Panel leader

The panel leader must be a suitably trained person with an expert knowledge of the kinds of oils which he or she will come across in the course of their work. They are the key figure in the panel and responsible for its organisation and running.

The work of the panel leader calls for basic training in the tools of sensory analysis, sensory skill, meticulousness in the preparation, organisation and performance of the tests and skill and patience to plan and execute the tests in a scientific manner.

They are the sole person responsible for selecting, training and monitoring the tasters in order to ascertain their level of aptitude. They are thus responsible for the appraisal of the tasters, which must always be objective and for which they must develop specific procedures based on tests and solid acceptance and rejection criteria. See standard COI/T.20/Doc. no. 14, "Guide for the selection, training and monitoring of skilled virgin olive oil tasters".

Panel leaders are responsible for the performance of the panel and hence for its evaluation, of which they must give reliable, objective proof. In any case, they must demonstrate at all times that the method and tasters are under control. Periodic calibration of the panel is recommended (COI/T.20/Doc. 14/Rev 4, § 5).

They hold ultimate responsibility for keeping the records of the panel. These records must always be traceable. They must comply with the assurance and quality requirements laid down in international sensory analysis standards and ensure the anonymity of the samples at all times.

They shall be responsible for inventorying and ensuring that the apparatus and equipment needed to comply with the specifications of this method is properly cleaned and maintained and shall keep written proof thereof, as well as of the compliance with the test conditions.

They shall be in charge of the reception and storage of the samples upon their arrival at the laboratory as well as of their storage after being tested. When doing so, they shall ensure at all times that the samples remain anonymous and are properly stored, for which purpose they must develop written procedures in order to ensure that the entire process is traceable and affords guarantees.

In addition, they are responsible for preparing, coding and presenting the samples to the tasters according to an appropriate experimental design in line with pre-established protocols, as well as for assembling and statistically processing the data obtained by the tasters.

They shall be in charge of developing and drafting any other procedures that might be necessary to complement this standard and to ensure that the panel functions properly.

They must seek ways of comparing the results of the panel with those obtained by other panels undertaking the analysis of virgin olive oil in order to ascertain whether the panel is working properly.

It is the duty of the panel leader to motivate the panel members by encouraging interest, curiosity and a competitive spirit among them. To do so, they are strongly recommended to ensure a smooth two-way flow of information with the panel members by keeping them informed about all the tasks they carry out and the results obtained. In addition, they shall ensure that their opinion is not known and shall prevent possible leaders from asserting their criteria over the other tasters.

They shall summon the tasters sufficiently in advance and shall answer any queries regarding the performance of the tests, but shall refrain from suggesting any opinion to them on the sample.

8.1.1 Deputy panel leader

The panel leader may, on justified grounds, be replaced by a deputy panel leader who may stand in for duties regarding the performance of the tests. This substitute must have all the necessary skills required of a panel leader.

8.2. Tasters

The people acting as tasters in organoleptic tests carried out on olive oils must do so voluntarily. It is therefore advisable for candidates to submit an application in writing. Candidates shall be selected, trained and monitored by the panel leader in accordance with their skills in distinguishing between similar samples; it should be borne in mind that their accuracy will improve with training.

Tasters must act like real sensory observers, setting aside their personal tastes and solely reporting the sensations they perceive. To do so, they must always work in silence, in a relaxed, unhurried manner, paying the fullest possible sensory attention to the sample they are tasting.

Between 8 and 12 tasters are required for each test, although it is wise to keep some extra tasters in reserve to cover possible absences.

9. TEST CONDITIONS

9.1. Presentation of the sample

The oil sample for analysis shall be presented in standardised tasting glasses conforming to the standard COI/T.20/Doc. No 5 "Glass for oil tasting".

The glass shall contain 14–16 ml of oil, or between 12.8 and 14.6 g if the samples are to be weighed, and shall be covered with a watch-glass.

Each glass shall be marked with a code made up of digits or a combination of letters and digits chosen at random. The code will be marked by means of an odourfree system.

9.2. Test and sample temperature

The oil samples intended for tasting shall be kept in the glasses at 28^{o} C ± 2^{o} C throughout the test. This temperature has been chosen because it makes it easier to observe organoleptic differences than at ambient temperature and because at lower temperatures the aromatic compounds peculiar to these oils volatilise poorly while higher temperatures lead to the formation of volatile compounds peculiar to heated oils. See the standard COI/T.20/Doc. No 5 “Glass for Oil Tasting” for the method which has to be used for heating the samples when in the glass.

The test room must be at a temperature between 20^{o} and 25^{o} C (see COI/T.20/Doc. No 6).

9.3. Test times

The morning is 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.

However, this criterion should not be taken to the extreme where hunger may distract the tasters, thus decreasing their discriminatory capacity; therefore, it is recommended to hold the tasting sessions between 10.00 in the morning and 12.00 noon.

9.4. Tasters: general rules of conduct

The following recommendations apply to the conduct of the tasters during their work.

When called by the panel leader to participate in an organoleptic test, tasters should be able to attend at the time set beforehand and shall observe the following:

- They shall not smoke or drink coffee at least 30 minutes before the time set for the test.
- They must not have used any fragrance, cosmetic or soap whose smell could linger until the time of the test. They must use an unperfumed soap to wash their hands which they shall then rinse and dry as often as necessary to eliminate any smell.
- They shall fast at least one hour before the tasting is carried out.
- Should they feel physically unwell, and in particular if their sense of smell or taste is affected, or if they are under any psychological effect that prevents them from concentrating on their work, the tasters shall refrain from tasting and shall inform the panel leader accordingly.
- When they have complied with the above, the tasters shall take up their place in the booth allotted to them in an orderly, quiet manner.
- They shall carefully read the instructions given on the profile sheet and shall not begin to examine the sample until fully prepared for the task they have to perform (relaxed and unhurried). If any doubts should arise, they should consult the panel leader in private.
- They must remain silent while performing their tasks.
- They must keep their mobile phone switched off at all times to avoid interfering with the concentration and work of their colleagues.

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

10.1. Tasting technique

10.1.1. The tasters shall pick up the glass, keeping it covered with the watch-glass, and shall bend it gently; they shall then rotate the glass fully in this position so as to wet the inside as much as possible. Once this stage is completed, they shall remove the watch-glass and smell the sample, taking slow deep breaths to evaluate the oil. Smelling should not exceed 30 s. If no conclusion has been reached during this time, they shall take a short rest before trying again.

When the olfactory test has been performed, the tasters shall then evaluate the buccal sensations (overall retronasal olfactory, gustatory and tactile 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 and throat, since it is a known fact that the perception of tastes and tactile sensations varies in intensity depending on the area of the tongue, palate and throat.

It should be stressed that it is essential for a sufficient amount of the oil to be spread very slowly over the back of the tongue towards the palate support and throat while the taster concentrates on the order in which the bitter and pungent stimuli appear. If this is not done, both of these stimuli may escape notice in some oils or else the bitter stimulus may be obscured by the pungent stimulus.

Taking short, successive breaths, drawing in air through the mouth, enables the taster not only to spread the sample extensively over the whole of the mouth but also to perceive the volatile aromatic compounds via the back of the nose by forcing the use of this channel.

N.B. When the tasters do not perceive fruitiness in a sample and the intensity of the classifying negative attribute is 3.5 or less the panel leader may decide to arrange for the tasters to analyse the sample again at ambient temperature (COI/T.20/Doc. No 6/Rev. 1, September 2007, section 3 – General specifications for installation) while specifying the context and concept of ambient temperature. When the sample reaches room temperature, the tasters should re-assess it to check solely whether fruitiness is perceived. If it is, they should mark the intensity on the scale.

The tactile sensation of pungency should be taken into consideration. For this purpose it is advisable to ingest the oil.

10.1.2. When organoleptically assessing a 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 is recommended which, after being chewed, can be disposed of in the spittoon. Then rinse out the mouth with a little water at ambient temperature. At least 15 minutes shall lapse between the end of one session and the start of the next.

10.2. 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. They shall then enter the intensity with which they perceive each of the negative and positive attributes on the 10-cm scale shown in the profile sheet provided.

Should the tasters perceive any negative attributes not listed in section 4, they shall record them under the "others" heading, using the term or terms that most accurately describes the attributes.

10.3. Use of the data by the panel leaders

The panel leader shall collect the profile sheets completed by each taster and shall review the intensities assigned to the different attributes. Should they find any anomaly, they shall invite the taster to revise his or her profile sheet and, if necessary, to repeat the test.

The panel leader shall enter the assessment data of each panel member in a computer program like that appended to this method with a view to statistically calculating the results of the analysis, based on the calculation of their median. See sections 10.4 and Annex 1 of this method. The data for a given sample shall be entered with the aid of a matrix comprising 9 columns representing the 9 sensory attributes and n lines representing the n panel members used.

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

The value of the robust coefficient of variation which defines classification (defect with the strongest intensity and fruity attribute) must be no greater than 20.0%.

If the opposite is the case, the panel leader must repeat the evaluation of the specific sample in another tasting session.

If this situation arises often, the panel leader is recommended to give the tasters specific additional training (COI/T.20/Doc. No 14/Rev. 4, November 2012, § 5) and to use the repeatability index and deviation index to check taster performance (COI/T.20/Doc. No 14/ Rev. 4, November 2012, § 6).

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

1/ They may refrain from tasting an oil when they notice any extremely intense negative attribute by direct olfactory means, in which case they shall record this exceptional circumstance in the profile sheet.

10.4. Classification of the oil

The oil is graded as follows in line with the median of the defects and the median for the fruity attribute. The median of the defects is defined as the median of the defect perceived with the greatest intensity. The ***median*** of the defects and the median of the fruity attribute are expressed to one decimal place.

The oil is graded by comparing the median value of the defects and the median for the fruity attribute with the reference ranges given below. The error of the method has been taken into account when establishing the limits of these ranges, which are therefore considered to be absolute. The software packages allow the grading to be displayed as a table of statistics or a graph.

(a) Extra virgin olive oil: the median of the defects is 0.0 and the median of the fruity attribute is above 0.0;

(b) Virgin olive oil: the median of the defects is above 0.0 but not more than 3.5 and the median of the fruity attribute is above 0.0;

(c) Ordinary virgin olive oil: the median of the defects is above 3.5 but not more than 6.0, or the median of the defects is not more than 3.5 and the median of the fruity attribute is 0.0;

(d) Lampante virgin olive oil: the median of the defects is above 6.0.

Note 1: When the median of the bitter and/or pungent attribute is more than 5.0, the panel leader shall state so on the test certificate.

For assessments intended to monitor compliance, one test shall be carried out. In the case of counter assessments, the analysis must be carried out in duplicate in different tasting sessions. The results of the duplicate analysis must be statistically homogenous. (See section 10.5). If not, the sample must be reanalysed twice again. The final value of the median of the classification attributes will be calculated using the average of both medians.

Should the panel not confirm the category declared as regards the organoleptic characteristics, at the interested party's request the national authorities or their representatives shall have carried out without any delay two counter-assessments by other approved panels, at least one by a panel approved by the producer Member State concerned. The characteristics concerned shall be deemed consonant with the characteristics declared if at least two of the counter-assessments confirm the declared grade. If that is not the case, the interested party shall be responsible for the cost of the counter-assessments.

10.5 Criteria for the acceptance and rejection of duplicates

The normalised error, defined below, shall be used to determine whether the two results of a duplicate analysis are homogenous or statistically acceptable:

$$En = \frac{|x_1 - x_2|}{\sqrt[2]{U_1^2 + U_2^2}}$$

where x_1 and x_2 are the two values of the duplicate and U_1 and U_2 are the expanded uncertainties obtained for the two values, calculated as follows as specified in Annex I:

$$U_1 = c \times s^* \text{and } s^* = \frac{CV_r \times M_{e1}}{100}$$

For the expanded uncertainty, c = 1.96; hence:

$$U_1 = 0.0196 \times CV_r \times M_{e1}$$

where CV_r is the robust coefficient of variation and M_{e1} is the median of the first analysis.

For it to be stated that the two values obtained are not statistically different, E_n must be equal to or less than 1.0.

Figure 1

PROFILE SHEET FOR VIRGIN OLIVE OIL

INTENSITY OF PERCEPTION OF DEFECTS

Fusty/muddy sediment _____

Musty/humid/earthy _____

Winey/vinegary acid/sour _____

Frostbitten olives (wet wood) _____

Rancid _____

Other negative attributes: _____

Descriptor:

Metallic ☐ **Dry hay** ☐ **Grubby** ☐ **Rough** ☐

Brine ☐ **Heated or burnt** ☐ **Vegetable water** ☐

Esparto ☐ **Cucumber** ☐ **Greasy** ☐

INTENSITY OF PERCEPTION OF POSITIVE ATTRIBUTES

Fruity _____

Green ☐ **Ripe** ☐

Bitter _____

Pungent _____

Name of taster: **Taster code:**

Sample code: **Signature**:

Date:

Comments:

Annex 1

METHOD FOR CALCULATING THE MEDIAN AND THE CONFIDENCE INTERVALS

Median

$$Me = [p\,(X < x_m) \leq ½ \wedge p\,(X \leq x_m) \geq ½]$$

The median is defined as 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 simpler terms, 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

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 (4). The formula gives the asymptotic robust standard deviation, i.e. the robust estimate of the variability of the data considered where N is the number of observations and IQR is the interquartile range which encompasses exactly 50% of the cases of a given probability distribution:

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

The interquartile range is calculated by calculating the magnitude of the difference between the 75th and 25th percentile.

IQR = 75th percentile - 25th percentile

Where 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 hundreth 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.

$$percentile = [p\,(X < x_{pc}) \leq \frac{n}{100} \wedge p\,(X \leq x_{pc}) \geq \frac{n}{100}]$$

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.

In this method percentiles are computed on the basis of the real values which appear in the data matrix (percentiles computing procedure).

Robust coefficient of variation (%)

The *CVr%* 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.

$$CV_r = \frac{s^*}{Me} 100$$

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 starting from the assumption that it is possible to repeat it many times. As with the *CVr%*, the interval helps to assess the reliability of the test.

$$C.I._{upper} = Me + (c \times s^*)$$

$$C.I._{lower} = Me - (c \times s^*)$$

where C = 1.96 for the confidence interval at the 95% level.

Explanation on the type of algorithm to compute the *25th and 75th percentiles*

IOC uses a unique algorithm (xxx-algorithm), presented below, for the computation of the 25th and 75th percentiles.
It is possible to calculate the statistics either manually or through any data acquisition system but the algorithm MUST BE the following.

The IOC provides an MS Excel worksheet in which the algorithm is applied successfully and monitors panel performance.

Percentiles computing procedure

There are several ways of calculating a percentile but let's describe and use the following algorithm, also implemented in a function {PERCENTILE*(array;k) k:0.25 and 0.75 or QUARTILE(array;q) q:1 and 3} in MS-Excel.
[*in French version of MS-Excel CENTILE(array;k) or QUARTIL(array;q)]

Step 1 - Sort the list of numbers into ascending order and score these numbers from 1 to n

Step 2 - Use the following formula to calculate the corresponding **ranking** (***split*** into an ***integer*** and a ***decimal***).

R=1+(P(n-1)/100)=I+D {ranks computation}

where:

P: percentile wanted
n: total number of values
I: integer part of ranking
D:decimal part of ranking

Step 3 - Use the following formula to **interpolate** between the necessary two numbers.

$p=Y_I+D(Y_{I+1}-Y_I)$ {interpolation}

Example (EVEN NUMBER OF TASTERS)

Computation of percentiles

Raw data
1.3
2.1
1.5
1.2
1.6
2.4
2.3
1.9

Ordered data
1.2
1.3
1.5
1.6
1.9
2.1
2.3
2.4

Median=1.8

Computing ranking

r=1+(P(n-1)/100) {ranks computation}

P: percentile (25 or 75)
n: number of cases

I: integer part of ranking
D: decimal part of ranking

1+((25*(8-1))/100)=2.75

I=2 (integer)
D=0.75 (decimal)

1+((75*(8-1))/100)=6.25

I=6 (integer)
D=0.25 (decimal)

Interpolating

$p=Y_I + D(Y_{I+1} – Y_I)$ {interpolation}

1.3+0.75*(1.5-1.3)=**1.45 (25th percentile)**

2.1+0.25*(2.3-2.1)=**2.15 (75th percentile)**

From excel {PERCENTILE(A2:A9;0.25 or 0.75)}

25th percentile=1.45
75th percentile=2.15

Computation of IQR

IQR*= 75th percentile – 25th percentile*

IQR=2.15-1.45=0.7

Computations of s*

s*= Coefficient * IQR / Square root (Number of Judges)*

s*=0.925*0.7/2.828=0.23

***CVr%** = (s* / Median) * 100*

CVr%=(0.23/1.75)=13.1%

The classification is reliable

Example (ODD NUMBER OF TASTERS)

Computation of percentiles

Raw data
1.3
2.1
1.5
1.2
1.6
2.4
2.3
1.9
1.6
1.8
2.7

Ordered data
1.2
1.3
1.5
1.6
1.6
1.8
1.9
2.1
2.3
2.4
2.7

Median=1.8

Computing ranking

r=1+(P(n-1)/100)

P: percentile (25 or 75)
n: number of cases

I: integer part of ranking
D: decimal part of ranking

1+((25*(11-1))/100)=3.5

I=3 (integer)
D=0.5 (decimal)

1+((75*(11-1))/100)=8.5

I=8 (integer)
D=0.5 (decimal)

Interpolating

$p=Y_l + D(Y_{l+1} – Y_l)$

1.5+0.5*(1.6-1.5)=**1.55 (25th percentile)**

2.1+0.5*(2.3-2.1)=**2.20 (75th percentile)**

From Excel {PERCENTILE(A2:A9;0.25 or 0.75)}

25th percentile=1.55
75th percentile=2.20

Computation of IQR

IQR*= 75th percentile – 25th percentile*

IQR=2.20-1.55=0.65

Computations of s*

s*= Coefficient * IQR / Square root (Number of Judges)*

s*=0.925*0.65/3.317=0.18

CVr% *= (s* / Median) * 100*

CVr%=(0.18/1.80)=10.0%

The classification is reliable

Function PERCENTILE in different languages

Language	Function "PERCENTILE"
Czechoslovak	PERCENTIL
Danish	FRAKTIL
Finnish	PROSENTTIPISTE
French	CENTILE
Norwegian	PERSENTIL
Dutch	PERCENTIEL
Polish	PERCENTYL
Portuguese	PERCENTIL
Russian	ПЕРСЕНТИЛЬ
Spanish	PERCENTIL
Swedish	PERCENTIL
German	QUANTIL
Turkish	YÜZDEBIRLIK
Hungarian	PERCENTILIS

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(7) COI/T.20/Doc. No 14 Rev.3 November 2011

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