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Guidelines for the accreditation of sensory testing laboratories with particular reference to virgin olive oil according to standard ISO/IEC 17025:2005

Introduction

The guidelines are divided into two parts. The first deals with the correct organisational management of the laboratory in line with the requirements of ISO 9001:2000 while the second deals specifically with the application of the sensory assessment of virgin olive oil according to the methodology laid down in COI/T.20/Doc. No 15/Rev. 1, as interpreted for the purposes of standard ISO/IEC 17025:2005.

Scope and field of application

The guidelines outline the steps for achieving compliance with the requirements stipulated in ISO/IEC 17025:2005 for the accreditation of sensory testing laboratories, with particular reference to virgin olive oil, under the international testing laboratory accreditation scheme.
The object is for the guidelines to be a reference tool for laboratories interested in earning accreditation and a source of guidance and uniformity for the inspectors responsible for auditing systems for the sensory analysis of virgin olive oil.

Normative references

ISO/IEC 17025:2005
ISO 9001:2000
ISO/IEC Guide 2
EA-4/09
COI/T.20/Doc. No 4
COI/T.20/Doc. No 5 (ISO/DIS 16657:2003)
COI/T.20/Doc. No 6
COI/T.20/Doc. No 13
COI/T.20/Doc. No 14
COI/T.20/Doc. No 15/Rev.1
COI/T.20/Doc. No 22
EN ISO 5555:

Terms and definitions

The terms and definitions given in ISO/IEC Guide 2 are applied in the general section of the guidelines and the terms given in COI/T.20/Doc. No 4 are used for the specific section.

Scope of accreditation

Approved accreditation bodies only accredit objective sensory tests which are suitably documented and validated. Laboratories should prove that tests are under control by demonstrating that they obtain the same results within defined limits. In so far as possible, they should also demonstrate that they obtain equivalent results to those obtained by other laboratories.

Accredited sensory testing must be supported by adequate documentation demonstrating the repeatability and reproducibility of testing within the specific laboratory and between a significant number of laboratories (interlaboratory test).

Laboratories undertaking the sensory analysis of virgin olive oils should prove to the accreditation inspectors that when performing such analysis they comply with the parameters of the testing methodology.

Part one: guidelines for the accreditation of laboratories undertaking the sensory analysis of virgin olive oil according to ISO/IEC 17025:2005

Management requirements (4)

Organisation (4.1)

4.1.1. The laboratory or its parent organisation should be a **legally responsible** body, i.e. it should enjoy a legal status that is recognised by the Member State: corporate enterprise or partnership, cooperative, consortium, etc.

4.1.2. The laboratory is **responsible** for performing all the **calibration** and **testing** activities (interlaboratory tests) designed to fulfil the sections of the standard and to satisfy the requirements of customers as well as of the authorities or approved organisations in the Member State.

4.1.3. The laboratory management system should make provision for work to be carried out in **fixed** locations of the laboratory outside the permanent installations.

4.1.4. If the laboratory undertaking the sensory analysis of virgin olive oils is part of an organisation involved in other activities (e.g. consortium), the quality system implemented should clearly state the names of the laboratory officers-in-charge in order to highlight possible conflicts of interest.

4.1.5. The laboratory should:

- Have **suitably qualified** managerial and technical **personnel** who are familiar with the tasks assigned to them. This should be demonstrated by using the fact sheets for the management of laboratory personnel to specify the training background of each individual assessor (taster) and of the technical and managerial (panel leader) personnel, which should be in accordance with the national regulations in force;
- Have such arrangements in place as to prove that the personnel involved cannot be subjected to economic, commercial or any other pressure;
- Adopt working policies and procedures to guarantee the **protection** of **confidential information** and the proprietary rights of customers and to enable standard handling of samples and of the resultant data (coding management);
- Define the **tasks** and **responsibilities** for each function concerned, and the horizontal relationships between such functions: role of the panel leader and of the laboratory officer-in-charge vis-à-vis the sensory assessors of virgin olive oils and the technicians involved in sample management;
- Provide technical personnel with suitable supervision;
- Have **technical managers** who will hold overall responsibility for the laboratory and related activities;
- Assign a member of staff who is suitably trained (proven by supporting documentation) as the quality management officer (**QMO)**, who will have access to the entire system and to all data up to the highest level of the organisation;
- Designate the representative of the Management for laboratory management purposes.

The same person may perform several functions or tasks.

Quality system (4.2)

4.2.1 Laboratories undertaking the sensory analysis of virgin olive oils should **draw up**, **implement** and **maintain** a quality system consonant with their activities.

The quality policies (strategy), systems, programmes, procedures (tactics) and working instructions should be documented to the extent necessary to ensure the quality of the tests covered by accreditation, namely the classification and determination of the sensory profile of virgin olive oils. The system should be described in a document in printed or digital format, as appropriate.

The quality policy – strategy – should be defined and announced by the Management. It will be the starting point for the other actions of the laboratories undertaking the sensory analysis of virgin olive oils.

4.2.2 The quality policy should comprise the following at the very least:

- A commitment on the part of the Management to ensure good professional practice;
- A statement by the Management on the standard of services offered;
- The objectives of the quality management system;
- A requirement whereby all personnel involved in sensory assessment activity have to be familiar with the quality documentation and knowledgeable about implementing the quality policy (sharing of objectives);
- A commitment on the part of the facility and of the Management to conform to the normative reference (ISO/IEC 17025:2005).

4.2.3 The quality manual (QM) should include or refer to the technical or managerial support procedures.

4.2.4 The QM should also define the role of the Management and of the QMO.

Document control (4.3)

4.3.1. The laboratory should ensure optimal implementation of the technical and managerial procedures relating to the management of the quality system.

- Managerial procedures: these are very brief, effective procedures for managing specific in-house activities in conformity with the standard (e.g. procedure for document management).
- Technical procedures: these are procedures relating to the working arrangements for performing the specific sensory tests.
  The reference documents of the International Olive Council (IOC), now listed, comprise the technical procedures for the sensory assessment of virgin olive oil: COI/T.20/Doc. Nos 4, 5 (ISO/DIS 16657: 2003), 6, 13, 14, 15, and 22. These documents provide specific working instructions for the optimal performance of the sensory analysis of virgin olive oils (classification and determination of the sensory profile).

4.3.2. Documents should be:

- Approved before being distributed;
- Released according to the distribution list contained in the document concerned and kept readily available thereafter;
- Checked periodically to ensure that the correct version is always distributed;
- Stored.

Obsolete documents should be taken out of circulation.

Quality system documents should be clearly identified by specifying the date of issue and revision, the total number of pages and the officer responsible for the specific document.

4.3.3 Amendments of documents should be re-examined by the officer who carried out the initial review, if present. Amendments should be identified (by underlining, highlighting, etc.) in the most current text.

Example: Procedure for document management and control

Introduction
The document management procedure is structured in such a way as to describe the arrangements for managing the QM and procedures and any other documents concerning the direct or indirect management of quality system processes.

Field of application
Quality management system of laboratories undertaking the sensory analysis of virgin olive oils, hereafter abbreviated to LANs.

1. Managing the quality manual

Responsibility
The administrative officer (QMO) is responsible for the documentary management of the QM.

Working arrangements
The QM has to be considered a single document; hence, any revisions concern the entire document.
The QM should contain a table at the end (quality manual management table) summarising all the revisions and dates of revision and specifying the officers responsible for drafting, checking and approving them.
The manual should be divided into chapters encompassing the main system processes, which should be cross-linked to the sections of the standard in a conversion table.
The date and version should be indicated at the bottom of the pages; this will help to check from the quality manual management table that the correct version is being used (i.e. the most current one).
Outdated hard-copy versions of the QM should be destroyed when they have been replaced by the new versions; digital forms should be kept in an appropriate directory of old versions.
Any amendments should be temporarily highlighted in the document by underlining, and the page and chapter concerned should be indicated in the quality manual management table.
The distribution of controlled copies of the QM should be recorded in the distribution column of the document list form.

2. Management of QM procedures

Responsibility
The administrative officer (QMO) is responsible for the documentary management of QM procedures.

Characteristics
The control system for procedures is the same as for the QM in that they also comprise a page (the last one) containing the procedure management table. The table specifies all the revision changes and current revision status, which should coincide with the details indicated at the bottom of the pages.

Working documents
The revision status of forms relating to specific procedures is modified at the same time as the procedures themselves.

Record of analyses
It is compulsory to keep a record of all samples.

The Management should periodically check the record to make sure it is being kept properly.

Structure

Fields:
- Name
- Date
- Sample ref.
- Customer ref.
- Confidentiality code ref.
- Type of analysis
- Testing officer
- Result
- Test report ref.
- Issue date of test report
- Final verification

Testing pathway

Document ref. COI/T.20/Doc. No 15/Rev. 1 1996 or Doc. No 22

Test report

The test reporting form should contain:
- Name of the organisation
- Name of the customer
- Type of test performed and normative reference
- Description of sample tested and sampling arrangements
- Result
- Verifications and signature
- Most current version of form

NC & Action form

This is the electronic document for recording nonconformities (NCs) and any action taken – corrective, preventive or improvements – at the LAN.

Structure of NC management

N: sequence number
Date: date of detection
Type: type of NC (complaint, internal audit finding, etc.)
Extent of detection: (Mi) minor, (Ma) major, (F) fundamental
Description of NC: description of NC
Disposition of NC: type of disposition to close NC
Cause of NC: cause, when possible
Corrective action (CA) reference: ref N actions
Control: control by officer-in-charge
Time limit: solution time limit
Close: control of close of NC by officer-in-charge

Structure of action management

N: sequence number
Date: date of action
Type: (C) corrective, (P) preventive, (I) improvement
Description of action: description
NC reference: ref.
Solution: verification of solution
Control: control by officer-in-charge
Time limit: solution time limit
Close: control of close by officer-in-charge

LAN spreadsheet

- Excel spreadsheet for classifying virgin olive oils (IOC)
- Spreadsheet for determining the sensory profile of virgin olive oils and for checking for compliance with the reference profile (PDO, PGI).

3. Management of external documents

Field of application
Quality management system for laboratories undertaking the sensory analysis of virgin olive oils, hereafter abbreviated to LANs.

Responsibility
An officer – the quality management officer or the panel leader – should be designated to carry out this task.

Working arrangements
External documents may encompass regulations, directives or other European Union texts, national laws, IOC documents, ISO standards, or other documents.
These documents are managed by registering them in an appropriate record and filing them in an easily located place.

Review of requests, bids and contracts (4.4)
The laboratory should draw up and keep procedures for the review (control and verification) of requests for testing, bids submitted to potential customers and contracts (accepted bids).
4.4.1 Contracts should ensure that:
- Requirements are carefully specified and care is taken to cite the methods used and any bibliographical or normative references;
- The laboratory has the capabilities and resources to fulfil requirements.

4.4.2 Contracts should be recorded or kept for the requisite length of time (usually two years). Meetings with customers to establish requirements should also be documented and recorded.
4.4.3. Any subcontracting of services should also be covered by this review process.
4.4.4. Customers should be advised of any deviation from the contract.
4.4.5. If the contract has to be amended to incorporate non-scheduled activities, the review process should be repeated from the very beginning.

Subcontracting (4.5)
If a laboratory has to subcontract tests for the sensory assessment of virgin olive oils, the customer should be advised accordingly and subcontracting management should be placed under full control through the appropriate management procedure and control forms (internal audit).

Procurement of services and supplies (4.6)
4.6.1. Laboratories undertaking the sensory analysis of virgin olive oils should draw up, implement and maintain procedures for the selection, assessment and management of suppliers of services or products relating to laboratory activity, such as the suppliers of glasses for the sensory assessment of olive oils or the suppliers of stationery.
4.6.2. Supplies inherent to the quality of service provided should only be used after undergoing prior inspection for conformity with specifications.
4.6.3. Procurement documents (bids, orders, invoices, packing lists, etc.) should be checked and approved from the technical standpoint prior to release.
4.6.4. Laboratories should apply a procedural methodology to assess the efficiency of suppliers who provide products critical to the quality of the system.

Example: procedure for assessment of suppliers

Introduction
This procedure should establish the criteria for the selection, assessment and re-assessment of service or product providers.

Assessment of suppliers

Field of application
LAN quality management system

Responsibility
The LAN is responsible for the supplier assessment process.

Stages
Supplier selection
The General Management and the procurement officer jointly draw up the list of suppliers required for the day-to-day management of the LAN.

Supplier qualification
Suppliers of services are divided into two categories:
1. Long-standing suppliers linked with the LAN for at least two years;
2. Newly hired suppliers.

The suppliers in the first category are qualified for the activity they perform; however, their annual activity is controlled.

Supplier control
General suppliers should be assessed in terms of the quality of their supplies, which may vary greatly.
Hence, the administrative officer is entrusted with carrying out an overall quality assessment by inspecting incoming supplies according to the quality rating scale listed below:
1. Bad
2. Inadequate
3. Adequate
4. Good
5. Optimal

All suppliers belonging to the first category should be included in a list of qualified suppliers that specifies the rating awarded to each one and the frequency of rating.

Customer services (4.7)
Customer management is intended to collect useful information to achieve full customer satisfaction and to ensure LAN transparency.
Cooperation with customers may encompass:
- Providing partial access to testing areas;
- Continuing communication;
- Sharing methods;
- Other.

Handling of complaints (4.8)
Example of handling complaints and customer communication
Communication with external customers varies depending on the stage concerned.

When requesting the LAN for information, users/customers should be provided with all the important details to enable them to evaluate the chosen test; most of such details are set out in the LAN quality policy.

Complaints are handled through a permanent desk where customers can outline their concerns and grievances orally or via post, e-mail or fax.
Complaints are entered in the NC & ACTION form and may be extracted for the purpose of reviewing management and introducing improvements.
Communication with internal customers is conducted orally through the panel leader, who is the most appropriate channel for this purpose.

Control of non-conforming testing and/or calibration (4.9)
The laboratory should have a clear procedure for managing any nonconformities that occur during the performance of tests or the handling of samples.
This procedure should enable the laboratory to:
- assign the responsibilities and authority for dealing with each nonconforming action;
- assess the danger and extent of the NC;
- take corrective action (CA) straight away;
- inform the customer;
- specify the responsibilities and authority for the continuation of NC activities.

When very major in-depth NCs are observed, it is necessary to review the entire system.

Example: NC management

Types of nonconformity
The following types of nonconformity are identified according to their nature:
- Nonconformity of testing services:
  - Failure of a test report to provide the requested service (classification instead of profile);
  - Failure to comply with the maximum permitted variability (CVr% defect most prominently perceived > 20%);
  - Failure to present the test report in the required manner
- Nonconformity of processes: failure of a process to comply with the relevant specifications;
- Nonconformity with the quality management system requirements for all the system processes: such cases are detected in internal audits (IAs);
- Customer complaints;
- Complaints (nonconformity) by in-house customers (assessors, panel leader, technical departments, etc.).

<u>Cases of NC may be:</u>
- Major; or
- Minor;

depending on the extent of the problem that arises.

Detecting and documenting nonconformity
Any service, activity or other instance that does not conform to plan generates the following actions:
1. Detection
2. Reporting
3. Recording
4. Solution
5. Close

Nonconformities are detected by the personnel who carry out the scheduled controls, i.e. the administrative officer and the quality system management officer.
Nonconformities are recorded in the relevant action management form:

Form structure
N: sequence number
Date: date of detection
Type: type of NC
Detection: reporting arrangements
Description of NC: description
Disposition of NC: disposition to resolve simple NCs
Cause of NC: determination of any causes of NC
CA reference: start of CA
Control: record control
Time limit: time limit for disposition or CA
Close: control of close of NC

Any NCS can be recorded and handled through the form.

The Management or the quality system management officer decides how to resolve the NC and records the solution in the same form.

Documents
Action management form

Corrective action (4.10)
4.10.1 The laboratory should implement the corrective action procedure when an NC is detected.
4.10.2 A precise analysis should be carried out of the causes of the NC.
4.10.3 The corrective action should be chosen and implemented.
4.10.4 The corrective action should be monitored and recorded.

Example: procedure for ACTION management

Responsibility
The administrative officer (QMO) is responsible for the documentary management of the QM.

Working arrangements
Action may be corrective or preventive or may entail improvements.

The LAN may implement the following action on the basis of NC detection and management:
- Corrective: to correct any NCs;
- Preventive: to prevent any unforeseen NCs;
- Improvements: to improve process management.

Corrective action (CA) is initiated straight away when major NCs are detected; minor NCs can be resolved without such action by direct disposition of the NC.

The NC & ACTION form is used for this purpose:

Form structure
N: sequence number
Date: date of action
Type: type of action (corrective, preventive, improvement)
Description of action

NC reference: NC reference number
Solution: description of solution
Control: record control
Time limit: solution time limit
Close: control of close of NC

Documents
Form specially designed for NC & Action management.

Preventive action (4.11)
4.11.1. Necessary improvements should be identified to prevent the occurrence of sources of nonconformity.

Control of records (4.12)
4.12.1 Records should be controlled, updated and monitored. They should be filed on a specific form, specifying the type of document and the time and place of filing.

Internal audits (4.13)
Internal audits are the tool for the internal control of the quality management system.
They are carried out on the basis of the following principles:
- Regular control of all processes;
- Use of third parties not directly involved in the process being audited;
- Use of a suitable checklist for control and verification purposes;
- Recording of every audit;
- Reporting of findings to the General Management.

Example: procedure for management of internal audits (IAs)

Introduction
The procedure for managing IAs describes the arrangements for managing in-house audits.

Field of application
LAN quality management system.

Responsibility
The quality system management officer is responsible for IAs.

IA planning
After review, the quality system management officer draws up the IA plan for the next year, taking into account the criticality of the different areas, and submits it to the Management for approval. The plan should be entered in the IA form.

Criticality is assessed on the basis of:
- earlier IA findings;
- assessments by the Management;
- requests;
- findings of external audits.

All processes should undergo assessment at least once during the course of the year.

Preparing internal audits
Near the deadline specified in the plan the quality management system officer notifies the date of the IA to the audit team leader.

The audit team leader must be qualified for this purpose, i.e. he or she must have received training and conducted an audit under supervision. The other members of the team become qualified by conducting at least one audit under the supervision of a qualified person.

Outside audit personnel must also be properly qualified.
Audit personnel may not audit their own area of responsibility.

Auditing is facilitated by using the internal audit form containing the main points for inspection, divided by process.

Implementing internal audits
The audit team carry out their tasks as follows:
- They hold an initial meeting with the Management and personnel involved in the audit in order to confirm the proposed plan;
- They perform the audit by checking those facts providing "objective evidence" of nonconformity with the requirements laid down in the audit reference documents.

Closing internal audits
At the end of the IA, the audit team leader has to analyse the findings against the scope of the audit, on the basis of the cases of nonconformity detected and noted down in the check-list, and to issue a summary document, namely the final internal audit report.

Documents
Internal audit form
Final internal audit report

Review by the Management (4.14)
During the implementation of annual activities the Management should arrange regular meetings to review the performance of the quality management system.

General requirements
This Management review of the quality management system entails checking the suitability, adequacy and effectiveness of the system and assessing the room for improvement and any modifications required to fine-tune processes.

Review input
- Internal audit results;
- Customer satisfaction feedback, including complaints;
- Process performance;
- Corrective and preventive action taken;
- Any action prompted by earlier reviews;
- Proposed necessary modifications of the system;
- Recommendations and proposals for improvements made by task officers.

Review output
- Review of quality policy in the light of the new instructions issued by the Management and of the new objectives;
- Instructions on modifications/improvements to be made to the system;
- Planning of internal audits;
- Planning of training by instructors, when possible;
- Requirements for the procurement of new resources.

Management reviews are the tool employed for the joint management of long-term (strategic) and short-term (tactical) objectives. Hence, the frequency with which they take place depends on:
- LAN activity;

- political–administrative events;
- achievement of previously set objectives;
- generic and specific requirements.

Quality objectives
LAN objectives can be divided into two categories:
- Strategic or long-term objectives;
- Tactical objectives regarding the improvement of process effectiveness and efficiency.
Each objective is planned to ensure it can be measured and managed with the utmost ease and speed.

Achievement of the objectives laid down by the General Management depends on correct planning of the procedural steps, which help to attain the proposed goals by making use of personnel and financial resources.
To ensure optimal planning of the activities for attaining short-term and long-term objectives the LAN should adopt a planning facilitation system based on the following principles:
- Clear identification of long-term objectives;
- Identification of the short-term sub-objectives for attaining the long-term objectives;
- Identification of the steps for achieving the short-term and long-term objectives;
- Allocation of general and specific responsibilities;
- Allocation of the human and financial resources for each plan;
- Setting of the start and end of each plan;
- Identification of the step-by-step controls for checking that the approach taken is correct;
- Recording of each basic activity.

Technical requirements (5)

General (5.1)
5.1.1 The factors determining whether tests and/or calibrations are performed correctly and reliably by a laboratory are:
- Human factors;
- Environmental and workstation conditions;
- Testing, calibration and validation methods;
- Equipment;
- Traceability of measurements;
- Sampling;
- Handling of devices.

5.1.2 The laboratory should take the above factors into consideration when developing testing methods and related procedures and when training or qualifying technical personnel and sensory analysis assessors of virgin olive oils.

Personnel (5.2)
5.2.1 The laboratory Management should **ensure** that all the persons involved in testing are competent and **aware** of their roles.
In the case of laboratories undertaking the sensory analysis of virgin olive oils personnel may be divided into two groups: technical personnel, who ensure the method can be applied and who prepare the necessary apparatus for this purpose; and sensory analysis assessors of virgin olive oils, who are the specific analytical tools for performing the test. The technical personnel include the panel leader.

5.2.2 Panel leader

The panel leader is the highly qualified person who assumes full, comprehensive responsibility for the functioning of the complex, laborious technical system of the sensory testing laboratory. The Management should assign the panel leader a post in the organisation chart of the Organisation. It should provide all the pertinent, necessary means and sufficient time for the panel leader to carry out his or her tasks and should give adequate recognition of the work carried out.
5.2.2.1 The laboratory Management should set the minimum qualifications and experience required to hold key posts in the laboratory. Sensory analysis should be performed by, or under the supervision of, a properly qualified, experienced panel leader. Two years' work experience in sensory analysis is usually required for the post of panel leader. The requirements for each post should be included in the job descriptions of personnel.
5.2.2.2 The education and training of the panel leader should encompass the intended area of sensory testing and should include the following at least:

(a) Selection of testing methods, experimental design and analysis.
(b) Product preparation and performance of testing.
(c) Data entry and processing.
(d) Reporting.
(e) Record keeping.
(f) Maintenance of all necessary supplies and services.
(g) Procedures for the pre-screening, screening, training and monitoring of sensory assessors.
(h) Importance of assessor health and security.

The standard referenced **COI/T.20/Doc. No 15/Rev. 2** defines the role and characteristics required of the panel leader and the tasks and responsibilities in the context of the sensory testing laboratory. The standard referenced **COI/T.20/Doc. no. 14/Rev. 2** specifies the training required of the panel leader and of the sensory assessors of virgin olive oil. It also lays down the methodology for determining the mean perception threshold of the panel and **a technique for monitoring panel proficiency**.

5.2.3 Assessors (tasters)
By international definition, assessors are persons who are selected for their ability to perform sensory analysis owing to their acuity, sensitivity and solid training. Hence, **qualification** and **training** are the characteristics of assessors and are what should be accredited. Assessors are the central figures in the sensory system and the key element of the instrument of measurement, i.e. the panel, and they should be recognised as such by the laboratory Management. Maintaining assessor **qualification** is the basis for the smooth operation of the laboratory.
5.2.3.1 A sensory analysis panel is a measurement tool and the results of all the analyses performed depend on the members of the panel. Sensory assessors should be screened and trained carefully (for instance, the use of "internal assessors" might introduce systematic error into the results).
5.2.3.2 The recommended procedures include:
(a) Recruitment, preliminary screening and initiation
(i) The laboratory should confirm that the candidates recognise and perceive the primary odours and tastes. Where necessary, it should also confirm their colour vision, their ability to detect extraneous olfactory–gustatory sensations or specific odours and their ability to describe the characteristics of the product. The personality and personal habits of the sensory assessors should also be taken into consideration to the extent that they might affect the test.
(b) Education and training in general principles and methods
(i) This should encompass the use of the senses, familiarisation with the test procedure and knowledge of the effect of the presence of extraneous factors such as foods and perfumes.

(ii) Assessors should know what types of products they may encounter in the test. Special attention should be paid to the safety of sensory assessors. Any dietary, medical or ethical considerations concerning assessors should be recorded and taken into consideration. Sensory assessors should at all times notify any adverse effects they may suffer.
(iii) The laboratory should document the screening and training programme to make sure that all the sensory assessors are properly trained for the tasks they are entrusted. The programme should establish the levels of proficiency and other relevant requirements to be fulfilled by sensory assessors before taking part in a test. Whenever possible, objective measurements should be used, for instance repeatability, to evaluate personnel proficiency.

(c) Screening for specific purposes

The laboratory should confirm the ability of personnel to perform the test procedure. To do so, it may modify the concentration of the component in the sample, record the test results, analyse replicate samples or, in the case of descriptive analyses, analyse a scale of a type of product.

(d) Monitoring of each individual panel member to ensure satisfactory performance

(i) The laboratory should keep a full, exhaustive record of the training received by each member of the sensory analysis panel. After training, the laboratory should regularly monitor the results of each sensory assessor. The results obtained, date of testing and product analysed should be included in their individual records. The record system should be easy to access in order to facilitate this task.
(ii) The laboratory should also monitor the results to detect any possible effect of fatigue. Whenever this effect is observed, the number of samples analysed per session, or the number of sessions performed per day, should be reduced and recorded.

(e) Health factors

The laboratory should record the health factors or other related circumstances which might affect the performance of the sensory assessors and should consider whether or not to withdraw a particular assessor from the test. Such factors may be allergic reactions, colds, stomach upsets, toothache, pregnancy, certain types of medication or psychological stress.
At the start of the tasting sessions, any incidents concerning these factors and affecting the panel members should be entered in a record.

(f) Additional training, when necessary

(i) The laboratory should have procedures and criteria in place for additional training of sensory assessors who have not performed a test for some time or whose results do not lie inside acceptable limits.

Workstation and environmental conditions (5.3)

5.3.1 The laboratory should have all the equipment for the optimal performance of the sensory tests.
The environmental conditions should ensure that the results are not rendered invalid or lowered in quality.
The tests should be carried out in an area dedicated specifically for this purpose. In general, the premises used for carrying out sensory tests should be quiet and free from distractions. They should have controlled lighting, individual booths to reduce visual contact to a minimum, odour-free surfaces and adequate ventilation; the walls should be neutral in colour. A separate area should be set aside for preparing the samples.
The laboratory should be aware of the importance of keeping the test and sample preparation areas clean and tidy. If the sample preparation area is not near the test area, care should be taken over transporting the samples and keeping them at the right temperature for presenting them for analysis. **Access of sensory assessors to the sample preparation area should be**

controlled to prevent visual cues from influencing the analysis. This is particularly important when the samples are being prepared prior to analysis.
The standards cited specify the optimal temperature conditions to enable the assessors to realise their perceptive abilities to the full.
Special attention should be paid when **sampling** virgin olive oil. Suitable facilities should be in place for storing the product in temperature-controlled conditions by means of systems which can be checked and recorded.
5.3.1 Laboratory ware should be such as to facilitate the performance of the tests.
Tasting glasses and the device for heating the glasses to optimal temperatures are the chief specific items of ware for tasting virgin olive oils. The technical details of the tasting glass and heating device are given in standard COI/T.20/Doc. no. 5 (ISO/DIS 16657:2003).
5.3.2 The laboratory manager should **monitor, control and record** the environmental conditions (temperature, relative humidity, light), which should comply with the specified conditions. The recommended temperature levels are specified in the reference standard for the installation of a laboratory undertaking the sensory analysis of virgin olive oils, ref. COI/T.20/Doc. no. 3. These conditions are recommendations aimed at ensuring the **comfort** of tasters when performing the analyses.

Testing methods (5.4)
The procedures complementing the sensory assessment method should be short, clear, simple and effective.

One of the objectives of accreditation in requiring the application of a quality management system is to make **the laboratory prove that the method is under control.**

Proof that the method is under control is provided by the following means, *inter alia*:

(a) method validation;
(b) test documentation;
(c) training and authorisation of test personnel;
(d) provision of suitable test premises;
(e) laboratory planning, organisation and functioning;
(f) equipment maintenance and calibration;
(g) procedures for the screening and training of sensory assessors;
(h) procedures for continuous quality control;
(i) continuous supervision of the results of panel functioning and of each of the sensory assessors;
(j) use of reference materials and suitable training materials;
(k) data verification procedures;
(l) records of test operation and results.

The laboratory should document the method in the necessary detail to ensure its correct application and repeatability.
The method of sensory analysis should include:

(a) training requirements of sensory assessors;
(b) sample **preparation** and **presentation**;
(c) panel **composition**;
(d) assessor **supervision** and **monitoring**;
(e) environmental conditions and special facilities;
(f) **methods for statistical analysis** of the results.

The testing method used entails robust techniques, also called distribution-free techniques, which are not sensitive to outliers. The underlying statistical system of the method helps to overcome two fundamental constraints, namely that:

- the oils have to be **classified** in a finite series of legally defined categories;
- as a result, there cannot be mobile or variable limits according to the random error, i.e. there cannot be categories in between those legally defined.

Calculation of the median and the mean and control based on the CVr% (non-linear value inversely proportional to the intensity of the defect) make it possible to overcome these constraints.
The pertinent methodology is based on the ISO standard for the determination of the sensory profile (ISO 19932:2003).
The standard referenced COI/T.20/Doc. no. 13 sets out the general methodology for the sensory assessment procedure, COI/T.20/Doc. no. 15/Rev. 1 specifies the statistical methodology and standard COI/T.20/Doc. no.14 covers the selection, training and monitoring of panel assessors undertaking the sensory analysis of virgin olive oil.

Records (ISO 17025, section 4.12.2)
The records of each test should contain all the necessary information to be able to repeat it in conditions as similar as possible to the original conditions. The following information is of particular importance in sensory analysis:

(a) instructions and questionnaires issued to sensory assessors;
(b) test results sheets or references to computer files;
(c) time elapsed between samples;
(d) identification codes of subsamples;
(e) method of sample preparation and equipment used;
(f) identity of the personnel who prepare the samples;
(g) order in which the samples are presented to each assessor and details of the presentation;
(h) identity of the sensory assessors and suitable level of qualification for the method used;
(i) identity of the panel leader;
(j) method of data collection;
(k) method of statistical analysis.

Calibration methods
5.4.1 The laboratory should equip itself with appropriate procedures for all the tests and/or calibrations that have a direct influence on the quality of the test results.
<u>Sampling, transportation and handling</u>
Sampling of product collected on the market or at production source must comply with the rules laid down in EN ISO 5555: 2001 even if sample collection is not the direct responsibility of the sensory testing laboratory.
The laboratory is responsible for handling the sample inside the laboratory and should follow the rules laid down in the above-mentioned standard.
The store where products are kept prior to analysis should be kept at specific controlled temperatures (recorded daily).The product should be traceable throughout the test, i.e. permanent records should be kept of the movement of the sample inside the laboratory.
The sampler is responsible for transporting the sample to the laboratory, which should be carried out in appropriate conditions (EN ISO 5555: 2001).
In the case of the analysis of samples which are not at ambient temperature, the laboratory should have facilities for bringing the sample to the correct, homogeneous temperature and for keeping that temperature for as long as

required. The laboratory should keep records proving that this requirement is met.
When it is necessary to mark sample containers, the use of strong-smelling felt-tip pens should be avoided.

Validation methods
The method for the determination of the commercial category of virgin olive oils according to their sensory profile has been validated by a two-year IOC proficiency test entailing the participation of an international group of official, highly qualified panels in the sensory assessment of virgin olive oils and an accompanying in-depth statistical validation (documents available at IOC, Madrid).
Sensory analyses are a category of test which do not permit strict, metrological, statistically valid calculation of the uncertainty of measurement.
In some cases, when a numerical result is expressed, the estimation of the uncertainty can be based on repeatability and reproducibility data exclusively.

Data control
Data are controlled using a spreadsheet or other statistical method constructed specifically for determining and checking robust statistics (COI/T.20/Doc. No 15).
The data are monitored by the panel leader who is trained as necessary for this purpose. The panel leader may decide to repeat the test or to approve and sign it, so authorising and releasing the test report.

Equipment (5.5)
The laboratory should carry out regular maintenance and checks to ensure that equipment complies with the required technical specifications. It is particularly important to keep the equipment clean and tidy and to bear in mind the possibility of equipment contamination or cross-contamination owing to previous uses of equipment. Equipment not used directly in the analyses or tests, such as washers or water purifiers, should undergo a suitable maintenance and cleaning programme. **The laboratory should keep a record of maintenance work.**
Calibrations and checks are necessary when the equipment may have a significant influence on the result of the test.

5.5.1 The laboratory should have all the equipment required for sampling, storing and performing the sensory assessment of oils.
5.5.2 Laboratory equipment should ensure the necessary accuracy.
Specific calibration schemes should be arranged (national public or private interlaboratory tests).
5.5.3 Equipment should be used solely by suitably trained staff.
5.5.4 Each piece of equipment should be identified.
5.5.5 Regular calibrations and any maintenance should be recorded for each piece of identified equipment. Recording should include:
- Identification;
- Name of manufacturer;
- Conformity checks;
- Location in laboratory;
- Manufacturer's instructions;
- Calibration dates and certificates;
- Maintenance plan;
- Evident NCs.

5.5.6 The laboratory should also have safety procedures in place.
5.5.7 NC apparatus should be taken out of use.
5.5.8 Equipment should be labelled.

The equipment required for the sensory assessment of virgin olive oils comprises:
- Glass for tasting virgin olive oils (COI/T.20/Doc. No 5 – ISO/DIS 16657:2005);
- Thermostat-controlled heating device (COI/T.20/Doc. No 5);
- Sensory testing laboratory (COI/T.20/Doc. No 6).

The performance of the heating devices will depend on a series of variables. If they are critical, it may be necessary to establish heating profiles and to give clear instructions on how to use the devices on the basis of the profiles.

It is strongly recommended not to use yoghurt makers, which are used by many laboratories as a cheaper alternative to the heating device. The reason is that they do not have a temperature control mechanism and the temperature is not uniform across the whole of the surface. Hence, it is very difficult to control and check the temperature of the oil during the test and so prove that all the assessors have tasted the oil at the same temperature.

Traceability of measurements (5.6)
Reference samples and calibration are used primarily in the panel proficiency check tests run by the International Olive Council or by the national body designated to award accreditation to applicant panels.
5.6.1 Each piece of equipment should be calibrated prior to use.
5.6.2 Calibration for the purposes of panels undertaking the sensory analysis of virgin olive oils is carried out at two very different levels:
- Calibration and inspection of accessory equipment (heating devices);
- Calibration of the sensory analysis panel (profile samples and known classification).

Panel leaders may use known samples from IOC interlaboratory tests, when available, to carry out regular panel calibrations.

5.6.3 The International Olive Council distributes reference samples and reference material to official panels.

Sampling and handling (5.7 and 5.8)
5.8.1 The laboratory should initiate a series of procedures for the sampling of virgin olive oil in full compliance with the existing standards: Reg. 5555/20.
Sampling is crucial to the quality of test results. Sampling arrangements should also be noted down in the test report.
5.8.2 A system should be put in place for the blind identification of samples during testing while ensuring that the samples are not mixed up.
5.8.3 Any sampling anomaly activates a case of NC which should be appropriately recorded.
5.8.4 The laboratory should have suitable procedures to ensure that samples do not undergo spoilage or damage.

Quality assurance of test and calibration results (5.9)
5.9.1 Internal quality control

One **possible** means of monitoring assessors is to determine the repeatability index for each of the assessors, which actually indicates the within-laboratory reproducibility. To do so, samples (**if possible these should be representative of the categories tested most often by the laboratory**) are prepared for tasting as double-blind samples by an assessor within a maximum

period of time of 6 months, depending on the attributes. The repeatability index is defined as:

$$RI_p : 1 + \frac{\sum (x_{i1} - x_{i2})^2}{n}$$

where RI_p is the repeatability index of the assessor, x_{i1} is the value of the **intensity** of the attribute which the assessor gave in the first assessment of sample x_i, x_{i2} is the value in the second, etc. and n is the number of samples. **If this index is more than 3, refresher training should be arranged for the assessor**.

The repeatability index determines how assessors perform against themselves over time. However, it is also necessary to evaluate their performance with respect to the panel over time. In this case, assessor performance is evaluated against the value for the panel. The deviation index is defined as follows:

$$DI : 1 + \frac{\sum \left[(x_{i1} - \bar{x}_{i1})^2 + (x_{i2} - \bar{x}_{i2})^2 \right]}{2n}$$

where x_{i1} and x_{i2} mean the same as for the repeatability index and $\bar{x}_{i1}$ and $\bar{x}_{i2}$ are the panel medians. As in the case of the repeatability index, **refresher training should be arranged for the assessor if this index is more than 3**.
Assessor performance should be evaluated on a continuing basis at each tasting session. The panel leader should keep a record of the historical performance of the assessors in an appropriate database as well as in tabulated form.
5.9.1.1 The laboratory should have adequate quality control procedures in place to check the validity of the results obtained every time the sensory method is used. The quality control systems adopted by the laboratory will depend on the type of sample, the methods of analysis and the frequency of the determinations. Nevertheless, the level of quality control should be sufficient to prove the validity of the results.
5.9.1.2. Some of the procedures employed for the purposes of quality control are:

(a) **replicate analysis** of samples in a specific percentage of all the samples analysed;
(b) **inclusion of randomly repeated samples** in the sample testing system at adequate intervals;
(c) **use of reference materials** and characterised materials as part of the quality control system.

Irrespective of the method employed, the same one should be used at each tasting session. It should be documented, complete with clearly defined acceptance and rejection criteria. The corresponding evidence should exist and should concur with the documented information.
5.9.1.3 The level and type of quality control will depend on the nature and frequency of the analysis, and the difficulty and reliability of the tests. For guidance, the level of quality control may vary between 5% and 10% of all the samples analysed, although more complex procedures may call for a higher percentage.

5.9.1.4 The laboratory should also control the activity of each sensory assessor as part of the internal quality control system.
5.9.1.5 The laboratory should clearly define all the quality control measures in the quality system documentation.

5.9.2 External quality control (proficiency tests)
5.9.2.1 Laboratories should participate in proficiency tests relating to the scope of their accreditation, preferably proficiency tests which use appropriate matrices, if they exist. In some specific cases, participation may be compulsory.
5.9.2.2 Laboratories should apply external quality control not only to detect possible systematic errors but also to check the validity of the entire quality system.
They should evaluate the quality of the results obtained in these tests and issue the corresponding report. The causes of any nonconforming results should be investigated and corrective measures should be established and evaluated after implementation in order to demonstrate that the causes of the poor results have been remedied. Corresponding records of such activities should be kept.

5.9.3. Reference materials and chemical standards
ISO 17025, section 5.6.3.
5.9.3.1 When appropriate reference materials are available (**including certified reference material**), the laboratory should use them to train the sensory assessors, to supervise the laboratory results and to validate and compare methods.
In the case of virgin olive oil, commercial reference materials are not available. The only ones that can be obtained are samples from interlaboratory tests conducted by the IOC. Using such samples, which are supplied together with the statistical values obtained in the tests, the laboratory is able to prepare sufficient quantities of internal reference material and to compare it against the value of the sample supplied by the IOC. When this procedure is not possible, the laboratory should prepare sufficient quantities of internal material and should compare it with other accredited or IOC-recognised panels.
5.9.3.2 Reference materials and chemical standards should be clearly labelled so that they can be readily identified. Information should be available on the period of validity, the storage conditions, the applicability and the restrictions on their use. All the containers should be properly labelled and should state the identity, concentration, date of preparation and/or date of expiry. Reference materials and standards should be handled in such a way as to keep them away from all contamination. The records should permit identification of the personnel responsible for their preparation and handling.

Reporting of results (5.10)
Results should be presented in a test report comprising the following sections:
- Title (test report);
- Name and address of the laboratory and place where the tests were carried out;
- Clear identification of the test report on each page;
- Name and address of the customer;
- Clear specification of the method used;
- Description, status and identification of the test samples;
- Date of receipt of the samples;
- Reference to sampling plans actually implemented;
- Test results – Precise classification of the sample or identification of the sensory profile determined;
- Name, post and signature of the person authorising the report.

When necessary for the interpretation of the results, the following should also be included in the test report:

- Uncertainty of measurement (if the panel participates in interlaboratory tests);
- Additional information on methods;
- Useful information on sampling.

Check list

File: Audit form 17025.xls

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