TestQual, S.L.

(Proficiency Testing Schemes)

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TestQual 112 PROTOCOL

Pesticides Residues and PCBs

in Olive Oil

1. INTRODUCTION

This document describes the **protocol** of the **TestQual 112** Proficiency Test (P.T.), belonging to the analysis of **pesticides and PCBs** in **Olive Oil**.

TestQual, S.L. is committed to maintaining confidentiality with the information of each laboratory from the beginning of the proficiency test.

2. OBJECTIVE

The objective of the **TestQual 112** Proficiency Test is to evaluate the quality and accuracy of the results sent by the participating laboratories. Because of this, proficiency testing is an essential element of laboratory quality assurance. It will help to control and detect errors in their results or methods of analysis.

3. CALENDAR

The following table shows the program for this proficiency test:

Date	Activity	Carried out by
Week 14	*Final date to receive applications*	*Participants*
Week 14	*Sample delivery*	*TestQual*
03/May/19	*Final date to receive results*	*Participants*
Week 20 to 21 (May)	*Final report*	*TestQual*

The dates of this calendar can slightly change according to the development of the P.T. during the year. However, any modification in the dates will be announced in advance on our website *www.testqual.com*.

The **coordinator** of this proficiency test will be Jose Pedro Navarro and maría Ángeles Garrido. Any question regarding the development of the PT can be consulted by email to jpnavarro@testqual.com or magarrido@testqual.com.

4. REGISTER AND PARTICIPATION REQUEST (APPLICATION FORM)

NEW CLIENT

If your laboratory has not participated before in one of our proficiency tests you will have to register on the REGISTER form.

Once you have completed and sent the form you will have to wait until the activation of the account from the website administrator. If some more information is needed someone from our team will get in contact with you through the phone or email you used during your registration.

In case of urgency or if you have a doubt you can contact our team through the Contact tab from our website.

For those laboratories that require more than one contact per account or that works with more than one laboratories at the same time will have to contact us using the Contact tab to be instructed how to proceed.

APPLICATION FOR THE PROFICIENCY TEST

To participate in this proficiency test is needed to apply through the website.

In the Proficiency Tests Tab on our website will have to be selected the P.T. you want to participate, by clicking it you will enter the page with general information regarding that proficiency test, the present document (the protocol) and at the bottom of the page will be a link to start the APPLICATION FORM, all inscriptions must be done before the scheduled date in the calendar.

During the application you will have to enter your Limit Of Quantification (LOQ) for the pesticides you will study. Those compounds that are left as NA (NOT ANALYSED) will NOT appear in the Results form and therefore will not be able to send results through the form.

Once send the application, as soon as possible, it will be checked by the website administrator and you will be sent an email with the participation code. This code will be just known by the organizer and the laboratory, and will be kept confidential at all times.

Just one application per exercise can be sent by each laboratory, being not allowed for a laboratory to participate with two different codes.

The applications of the laboratories will be studied and accepted in base of the quantification limits of the analytes of the P.T. and its geographical location, so the logistics allow the sample shipping without risk of deterioration.

According to the experience, TestQual can anticipate that the number of participants of this P.T. will be around 20, being 11 the minimum participants of any proficiency test.

5. TEST MATERIAL

TestQual 112 scheme is a proficiency test based in the analysis of **pesticide residues and PCBs** in **Olive Oil** that has been treated with pesticide **standards**. The material has been bought in an ecological shop in Murcia and analysed by a subcontracted laboratory (Laboratorio Químico Microbiológico, S.A.) that holds the standard UNE-EN ISO/IEC 17025 into force.

The material is spiked with a solution with the analytes of the P.T., homogenised and stored in a dry, fresh place without light until further distribution to participants.

For *homogeneity* assessment purpose, ten of the prepared samples are analysed in duplicate by TestQual collaborator laboratory under repeatability conditions.

For *stability* assessment purpose, three samples are analysed, in duplicate, before, during and at the end (once all laboratories have sent the results) of the proficiency test.

6. SAMPLE SHIPMENT

The shipment of the test materials will take place on the date shown in the calendar, to the address provided by each laboratory in the application. Specific delivery dates can change from the scheduled dates of the calendar, but all changes will be announced both in the website and by email to the registered laboratories.

About **100 g** of test material will be sent by courier service (MRW, DHL or TNT, depending on the destination). The material will be sent in a sealed flask within a padded envelope.

A second test material can be requested if the participating laboratory justify, within two days from the reception of the sample, if they received the package or the sample damaged.

7. CONCENTRATION RANGES, SIGMA OBJECTIVE AND ANALYTES

In this proficiency test, any of the analytes to inform are in a concentration higher than **10 µg/Kg.** The **sigma objective ($\hat{\sigma}$)** which works in this scheme will be the **25 % of the assigned value**. This value has been chosen according to the experience of similar proficiency tests organized by TestQual.

The possible **pesticides and PCBs** in the Olive Oil are from the list below:

Abamectina	Fenazaquina	Tebufenocida
Acetamiprid	Fenbuconazol	Tecnaceno
Acrinatrina	Fenpropimorfo	Terbutrina
Aldrin	Fention	Tiacloprid
Atrazina	Fenvalerato	Triazofos
Azinfos-etilo	Fluquinconazol	Terbutilacina
Azoxistrobina	Flusilazol	
Bifentrina	HCH-Beta	PCB Nº018
Boscalida	HCH-Delta	(2,2´,5-Trichlorobiphenyl))
Bromopropilato	HCH-Gamma (lindano)	
Carbendazina	Hexaclorobenceno	PCB Nº028
Cimoxanilo	Hexitiazox	(2,4,4´-Trichlorobiphenyl)
Ciproconazol	Imazalil	
Ciprodinilo	Imidacloprid	PCB Nº052
Clorfenvinfos	Indoxacarbo	(2,2´,5,5´-Tetrachlorobiphenyl)
Clorpirifos	Linuron	
Clorpirifos-metilo	Metazacloro	PCB Nº101
Clorprofam	Metidation	(2,2´,4,5,5´-Pentachlorobiphenyl)
Deltametrina	Miclobutanil	
Desmetrina	Nitrofeno	PCB Nº138
Diazinon	Oxidemeton-metilo	(2,2´,3,4,4´,5,5´-
Dieldrin	Oxifluorfen	Hexachlorobiphenyl)
Dimetomorf	Paration	
EMA B1a	Paration-metilo	PCB Nº153
EMA B1b	Pendimetalina	(2,2´,4,5,5´-Pentachlorobiphenyl)
Endosulfan-alfa	Pirazofos	
Endosulfan-beta	Pirimifos-metil	PCB Nº180
Endosulfan-sulfato	Profenofos	(2,2´,3,4,4´,5,5´-
Endrin	Propargita	Heptachlorobiphenyl)
Epoxiconazol	Quintoceno	
Famoxadona	Tebuconazol	

8. RESULTS EXPRESSION

Each participant laboratory must analyse the sample received according to their routine procedure, and fill up the RESULTS form of its private are of the website www.testqual.com with just one value.

The results should be expressed in **µg/Kg**. The number of significant figures and the units are shown as they were sent by the laboratories.

The method used for the analysis of each compound informed should be sent when filling up the results form.

The organizer should get the results before the previously shown deadline for the test.

9. STATISTICAL EVALUATION

TestQual will develop the following statistical evaluation:

TestQual considers as an **extreme outlier** any data which differs more than **50 %** of the average of all results reported by the laboratories, according to the Harmonize Protocol of the IUPAC. These extreme values will not be included in the calculation of the assigned value.

Once received all the results, TestQual evaluates the unimodality of all the values by Kernel test, being explained in the final report which is the followed procedure in case there is more than one distribution.

The **assigned value (_X_)** is determined using the robust average of the results considered valid for statistical computing (after eliminating the extreme outliers), according to the standard ISO 13528 into force.

The **standard uncertainty _(u_x)_** is calculated using robust statistics from the following formula:

$$u_x = 1{,}25 \cdot (s^*/\sqrt{p})$$

Being s^* the robust standard deviation of the data and p the number of results considered.

The following condition must be fulfilled in order to discard the contribution of the uncertainty:

$$u_x \leq 0{,}3\ \hat{\sigma}$$

In case this condition is not fulfilled, the participants of the scheme will be informed in the report, and the uncertainty will have to be taking into account for the assigned value assessment.

The **standard deviation for proficiency assessment**, also named **target standard deviation, ($\hat{\sigma}$),** comes from this formula:

$$\hat{\sigma} = b_i \cdot X$$

Being $b_i = \%_{DSRA} / 100$, and $\%_{DSRA}$ is the assigned relative standard deviation.

In this case, the assigned relative standard deviation is **25 %**. This value is fixed previously by the organizer based in the experience of TestQual organizing similar proficiency tests.

Proficiency assessment (z-score): This parameter shows the competence and accuracy of the laboratory. It is calculated using the following formula:

$$z = (x_i - X)/\hat{\sigma}$$

Where x_i is the value reported by the laboratories, X is the assigned value, and $\hat{\sigma}$ is the target standard deviation for each analyte.

The criteria for defining the z-score values are:

$$
\begin{array}{llll}
& |z| & \leq 2 & \textit{Satisfactory} \\
2 < & |z| & \leq 3 & \textit{Questionable} \\
& |z| & > 3 & \textit{Unsatisfactory}
\end{array}
$$

False negatives: Any analyte not reported in the results that is in the sample above the limit of quantification previously established to the proficiency test established by the organization **(10 µg/Kg for pesticides and 0.2 µg/Kg for PCBs)**. TestQual assigns to all false negatives a result equal to half the laboratory limit of quantitation (LOQ/2).

False positives: Those analytes reported in the results, which is not present in the test material, and is reported by the participant at concentrations higher than the limit of quantification of the P.T. **(10 µg/Kg for pesticides and 0.2 µg/Kg for PCBs).**

Testing for sufficient homogeneity:
Once the samples are prepared ten of them will be chosen at random and sent to be analysed by TestQual's collaborator laboratory. Once received the results, a statistical evaluation will be performed, according to the IUPAC Harmonic Protocol.

The acceptance criterion to ensure that the randomly chosen samples are homogeneous is that the square of the estimated sampling standard deviation is below the critical value for accepting proper homogeneity:

$$S_{sam}^2 < c$$

In the first place to check the criterion, S_{sam}^2 which is the estimated sampling standard deviation, was calculated from:

$$S_{sam} = \left(\frac{Vs}{2} - S_{an}\right)$$

Firstly *Vs* is the variance of the sums S_i:

$$Vs = \sum \frac{(S_i - \bar{S})^2}{m - 1}$$

Where S_i was obtained from the addition of each duplicate result from the homogeneity; $\bar{S}$ is the mean of all S_i and m is the number of samples (10 samples).

And secondly S_{an}^2 , which is the experimental estimate of analytical standard deviation, is obtained following the next formula:

$$S_{an}^2 = \frac{\sum D_i}{2m}$$

where D_i is the result of the subtraction of each pair of replicates from the homogeneity and *m* is the number of samples.

In second place to check the criterion for sufficient homogeneity the critical value *c* was obtained from:

$$c = F_1 \cdot \sigma_{all}^2 + F_2 \cdot S_{an}^2$$

Being F_1 and F_2 constants with values equal to 1.88 and 1.01 respectively for 10 samples. S_{an}^2 has already been calculated and σ_{all}^2 is obtained from:

$$\sigma_{all}^2 = (0.3 \cdot \hat{\sigma})^2$$

where $\hat{\sigma}$ is the target standard deviation, which is calculated with the formula:

$$\hat{\sigma} = 0.25 \cdot \bar{X}$$

Being $\bar{X}$, the mean of the 20 values from the homogeneity.

Testing for sufficient stability:

Three samples will be analysed, in duplicate, before, during and at the end (once all laboratories have sent the results) of the proficiency test. With these values, a study will be performed according the SANCO guide (SANCO/12571/2013 *Guidance document on analytical quality control*), referred to analysis under reproducibility conditions. The acceptance criteria to ensure the samples have been stable during the whole P.T. are the following:

$$|(X_{t1} - X_{t2})/ X_{t1}| \cdot 100 \leq 10\%$$
$$|(X_{t1} - X_{t3})/ X_{t1}| \cdot 100 \leq 10\%$$

Being $|(X_{t1} - X_{tn})/ X_{t1}|$ the difference between the average of the samples analysed before, during and at the end of the proficiency test.

10. EVALUATION REPORT

Once received and statistically evaluated all of the participating laboratories results, TestQual will send a final report that summarizes the participation of each laboratory.

This final report will be received by the laboratories via e-mail in PDF format, but also can be downloaded from the private area of each participant in www.testqual.com.

If desired, the laboratory may request the report in paper, and it will be sent to its laboratory by mail.

In the event that a participant wishes to appeal against the assessment program performance, a written appellation must be sent by e-mail to jpnavarro@testqual.com or magarrido@testqual.com explaining the reasons for it.

11. REFERENCES

TestQual Proficiency Testing Schemes are based on the following standards:

<u>UNE-EN ISO/IEC 17043, first edition 2010-02-01</u>. Conformity assessment- General requirements for proficiency testing.

<u>ISO13528:2015</u>, second edition 2015-08-01. Statistical methods for use in proficiency testing by interlaboratory comparison.

<u>THE INTERNATIONAL HARMONIZED PROTOCOL FOR THE PROFICIENCY TESTING OF ANALYTICAL CHEMISTRY LABORATORIES</u>

<u>SANTE/11945/2015</u>, 30 November-1 December 2015 rev.0 Guidance document on analytical quality control and method validation procedures for pesticides residues analysis in food and feed.