codex alimentarius commission

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS	WORLD HEALTH ORGANIZATION

Agenda Item 7 (c)   **CX/PR 08/40/12**
                                                                March 2008

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON PESTICIDE RESIDUES
Fortieth Session
Hangzhou, China, 14 - 19 April 2008

THE EUROPEAN MODEL FOR PESTICIDE RESIDUE ANALYSIS: EXPERIENCE GAINED THROUGH EUROPEAN PROFICIENCY TESTS[1]

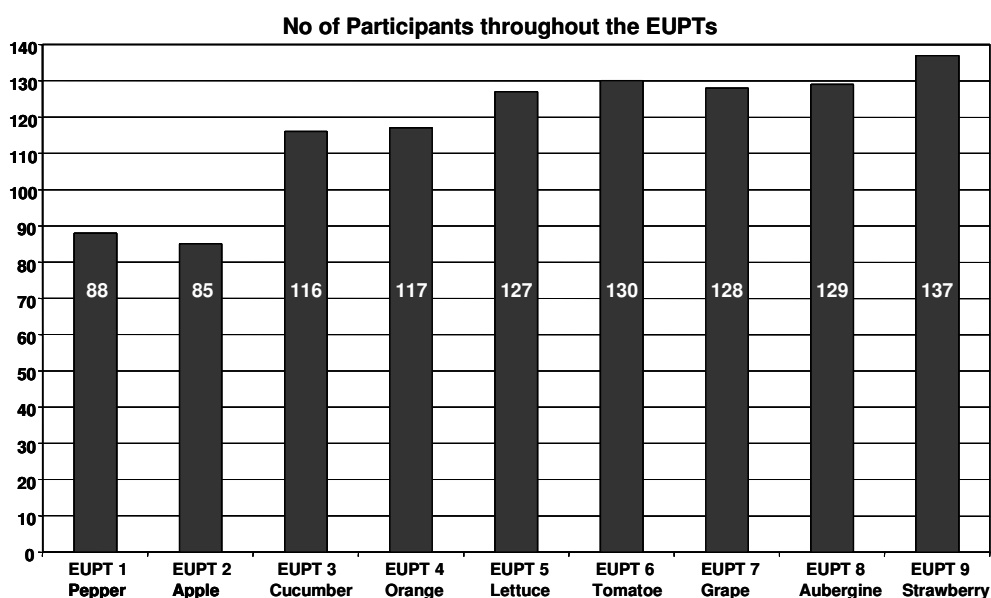#### Prepared by the European Community

1.   The European Commission Proficiency Tests on Pesticide Residues (EUPTs) in fruit and vegetables for testing multiresidue methods (MRMs) started on 1997. It was organized by the National Food Administration (Sweden) and thereafter, from 2002 to the present, by the Pesticide Residue Research Group (PRRG) of the University of Almeria (Spain), which from 2006 has chaired the Community Reference Laboratory for pesticide residues in Fruits and Vegetables (CRL-FV) in the EU.
The official European laboratories have performed a total of 9 EUPTs so far, creating an important database with more than 10,500 results stored. The results have been produced by around 150 EU food control laboratories (Figure 1). They have applied their own validated analytical methods on 9 different commodities. The test results have been produced with around 30 different analytical procedures based mainly on GC-MS and LC-MS methods. These procedures can be easily classified into 5 broad groups (look at Figure 4).

---

[1] To be considered by the CCPR Working Grouop on Methods of Analysis and Sampling.

No of Participants throughout the EUPTs

|								
88	85	116	117	127	130	128	129	137
EUPT 1 Pepper	EUPT 2 Apple	EUPT 3 Cucumber	EUPT 4 Orange	EUPT 5 Lettuce	EUPT 6 Tomatoe	EUPT 7 Grape	EUPT 8 Aubergine	EUPT 9 Strawberry

2.   The most important features of these EUPTs are:
  -Test samples treated/spiked with a high number of pesticides (14-18)
  -Working over a wide range of concentration levels, from 21 ppb to 6 ppm
  -Application of important harmonization targets, such as minimum scope
    required, fit for purpose standard deviation and weight sum Z-score as a
    combined Z-score value.

3.   Evaluating such amount of data and predicting relevant inter-laboratory standards, as achievable harmonization targets, has been a very important objective to promote confidence in the results for pesticide residue testing in food.

4.   A great effort has been made over the recent years to evaluate the data dispersion corresponding to the interlaboraty reproducibility. This dispersion could reasonably be attributed to the pesticide residue concentrations present in the sample. Undoubtedly, based on PT data, the most relevant is the Horwitz model. However, in order to use it, important correction factors have to be applied (Horwitz-Thompson model) in the case of modern pesticides, low fat matrices and the new techniques based on GC-MS and LC-MS.

5.   According to the EC experience, the effect of the concentration level on the data dispersion is minimal, and usually negligible when the concentrations range between tens of   g/kg up to hundreds   g/kg. These are typically the concentration values of interest for MRL enforcement. Conversely, above or below these limits, the problems can be far greater, probably due to the difficulties associated with the application of extra-dilution or pre-concentration steps for the regular analytical procedures applied. As an example, in Figure 2, the Y axis shows the standard relative deviation data, measured as Qn of the EUPTs versus concentration (X axis - median of the population).

Figure 2

Qn RSD (%)

Concentration (mg/kg)

□ PT1   ◦ PT2   ▵ PT3   ◦ PT4   ▵ PT5   ◦ PT6   ◦ PT7   ▵ PT8   ◇ LC1   ━ Horwitz
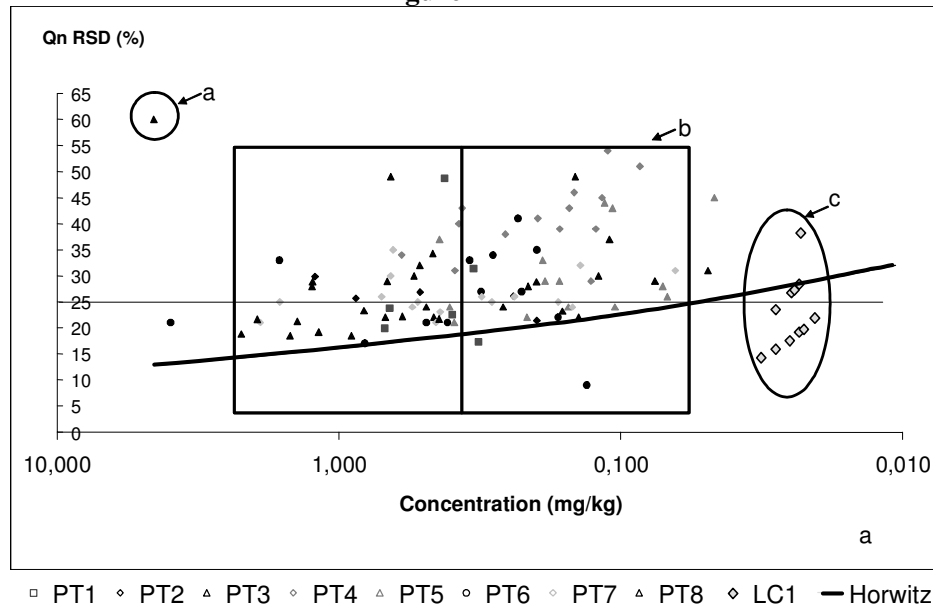
6.   As it is shown, lower concentrations (right side of square b or group c) report similar or even lower Qn values as higher ones (left side of square b). It can be observed that the worst case measured (a) represents a concentration of around 6 mg/kg. It had obtained the highest Qn value in all of the EUPTs carried out. Furthermore, it is clear that the points do not follow the Horwitz line and it is also clearly detectable that a value of 25% represents a good fit for purpose at all levels evaluated.

7.   A more detailed evaluation of the data presented - considering the matrices used in each PT and the degree of expertise of the participating laboratories – leads us to conclude that by using multi-matrix multiresidue methods, with very low or no clean up at all, the main contribution that causes data dispersion is the matrix complexity. Obviously, other contribution to the data dispersion may be the lack of enough laboratory skill related at the same time with analysis difficulty.

8.   As participation in PTs provides the laboratories with important information and knowledge to correct its operational errors, the monitoring of the Qn by the EUPT laboratories over time will trend towards the "optimum Qn" achievable. This trend is presented in Figure 3.

Figure 3
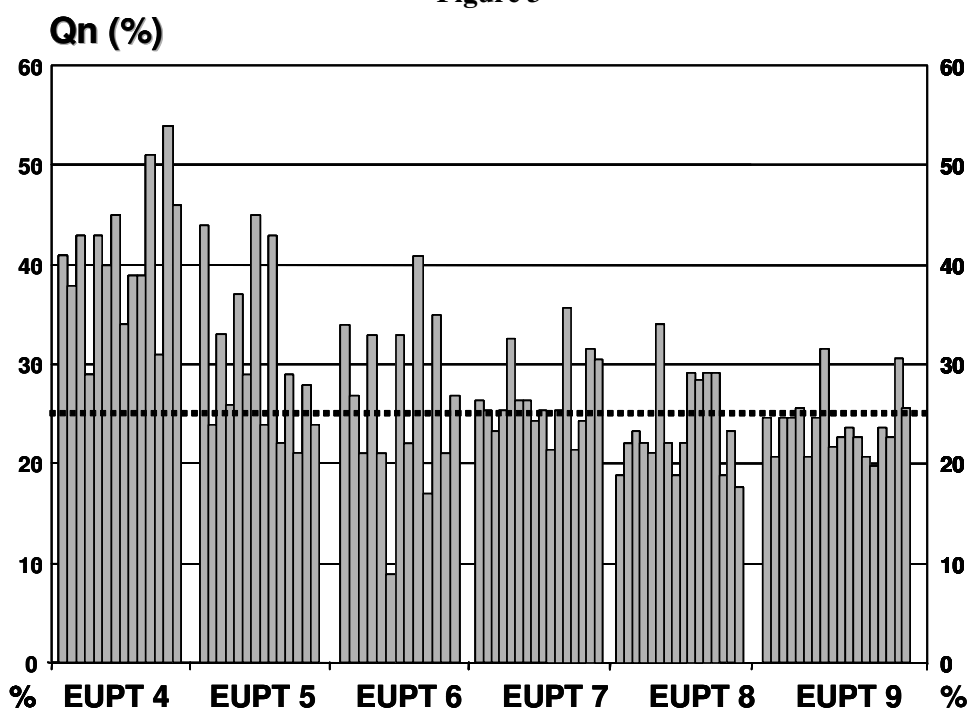
9.   As we can see in Figure 3, where Qn of each pesticide is represented -EUPT versus Qn- the global trend of 25% during this period of time is evident as it is the stabilization on this value. Obviously, the selection of 25% as a "magic" number does not mean that other more finely-adjusted values, depending on the compound/matrix, can not be obtained. However, considering that the effort to achieve a harmonized value as paramount, it should not be disproportionate, more detailed values could be considered not necessary. At the same time, 25% can be considered generally acceptable in terms of reproducibility. Therefore, it is the fit for purpose value selected in our EUPTs as the standard deviation.

10.   On this basis, an uncertainty value of 50% (K = 2) is considered as the general default value in the "Method Validation and Quality Control Procedures for Pesticide residue Analysis in Food and Feed". (Document N° SANCO/2007/3131).

11.   The results obtained by the laboratories are not affected by the method applied on every pesticide/commodity. It has not been observed any relationship between data quality and method applied. As it is shown in Figure 4 (i.e: Dimethoate from EUPT07) the Z-score values obtained are not related with the analytical method applied.

Figure 4

EUPT 7 – Dimethoate z-Scores

| Quechers | Ethyl Acetate | § 35 LMBG |
| Klein & Alder | Luke | |
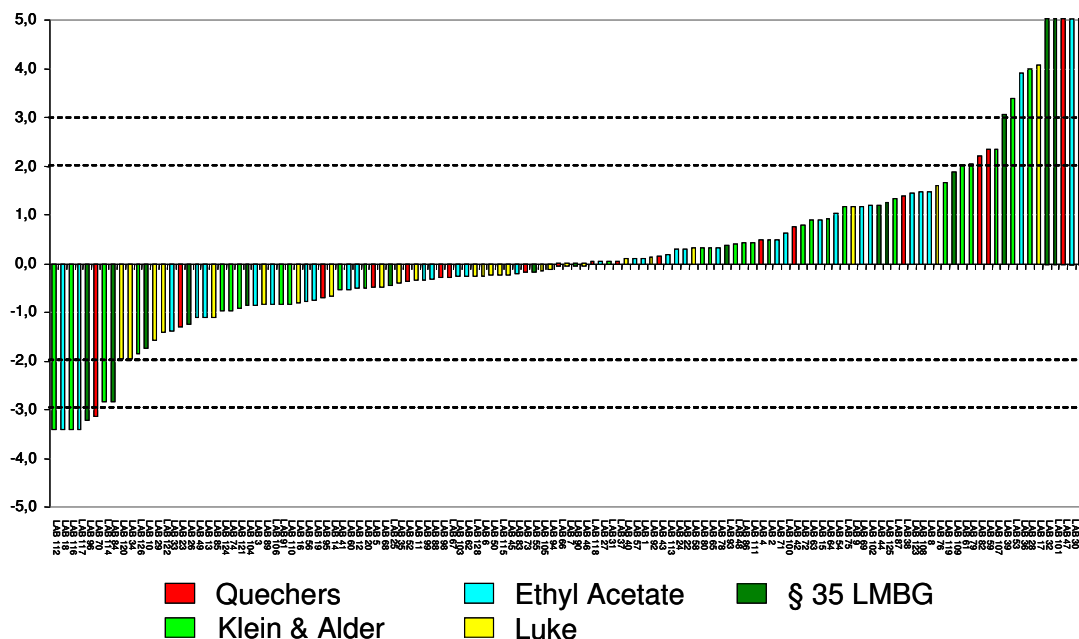
12.   Regarding the data dispersion, in those cases where the residue definition is comprised by more than one analyte or measure the EUPTs database can produce also some useful information. In Table 1 interesting information about the propagation of the dispersion value is shown in the case of two or more single results are evaluated applying individual analytical standards to independently measured peaks.

Code	Endosulfan I	Endosulfan II	Endosulfan Sum	Carbendazim	Thiophanate-Methyl (only)	Sum of Carbendazim + Thiophanate-Methyl
Median	0,411	0,326	0,750	0,414	0,273	0,449
Qn (%)	27	26	25	34	68	29

13.   As it can be seen in the case of Endosulfan I and Endosulfan II versus Endosulfan sum (Endosulfan sulphate was not present in the sample), in one hand, the difference between the Qn values obtained, around 25% in all cases, is practically negligible (single versus combined). This is the case of analytes that have no interactions/transformations among themselves during the analytical procedure. In the other hand, it is the case of Carbendazim and Methyl Thiophanate. This first compound can be present alone or derived from Methyl Thiophanate during the analytical procedure applied. Here, the two dispersion data are very different. In this case, the sum has a Qn a little bit higher than 25% but the single compounds clearly duplicate this percentage. It is a clear example in which the differences between the methods applied greatly affect the data dispersion of the single compounds belonging to the same residue, but no or negligible to the combined residue value.

14.   **These data support that a 25% target value could be also applicable for multi-component residue data** but, more experimental data are necessary to confirm this fit for purpose value.

15.   As well as data dispersion, which is a very important issue for pesticide residue harmonization, it is even more important at the moment to get an uniform routine MRM scope of pesticide residues,

among laboratories. Normally, the EU official laboratories have scopes in the range of 100-350 pesticide residues in their routine MRMs. However, this important amount is not fully harmonized.

16. In our experience, while 80-90% of the EUPT Z-scores obtained by the participating laboratories are usually acceptable, the list of pesticides sought can vary by as wide a range as 20-40%.

17. In order to promote uniform and minimum target scope, we have established in the EUPT data treatment, two categories, A and B: A when the positive findings were >90% of the compounds present in the sample and B <90%. At the same time, over the course of the EUPTs development, the list of possible compounds has been increased from 50 to 108. An important increase of laboratories can be seen in Category A in recent years, even given that the number of possible pesticides has been duplicated.

18. The objective in the next coming years is to get a minimum harmonized scope of around 170-200 pesticide residues. Of course, it does not mean that these compounds are the only target compounds for the food control laboratories but, it will cover the most toxic and used compounds in a harmonized routine control.