EUROPEAN COMMISSION
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Directorate F - Food and Veterinary Office
**Unit 4 - Food of plant origin, plant health; processing and distribution**
**In cooperation with JRC Ispra, IHCP, Food Products Unit and DG SANCO E1**

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# Monitoring of Pesticide Residues

# in Products of Plant Origin

# in the European Union, Norway, Iceland and Liechtenstein

# 2000 Report

This report "Monitoring of Pesticide Residues in Products of Plant Origin in the European Union, Norway, Iceland and Liechtenstein - Report 2000 was forwarded to the "Standing Committee on the Food Chain and Animal Health - section plant protection products - pesticide residues working group" for agreement on publication on 24 April 2002. The Standing Committee agreed that publication was desirable and noted that this was also the view of Norway, Iceland and Liechtenstein.

**April 2002**

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## 1. INTRODUCTION

This report covers the national situations in the 15 EU Member States and the three EFTA States, who have signed the EEA agreement[1] (Norway, Iceland and Liechtenstein) for the calendar year 2000. Liechtenstein participated for the first time in 2000. It is evident that this document can only give an overall view on monitoring of pesticide residues. Each Member State and the EEA States have been invited to contribute a short national statement (in English) for inclusion in this document. More detailed information about the situation in individual countries is available from the respective national monitoring authorities and should be requested from them. The issue of pesticide residues in foodstuffs of animal origin, as regulated in Council Directive 86/363/EEC[2], is not covered by this report.

## 2. LEGAL BASE

In Council Directives 86/362/EEC[3] and 90/642/EEC[4], as amended, maximum levels are fixed for pesticide residues in and on products of plant origin. Member States are asked to check regularly the compliance of foodstuffs with these levels. Inspections and monitoring should be carried out in accordance with the provisions of Council Directive 89/397/EEC[5] on the official control of foodstuffs, and Council Directive 93/99/EC[6] on additional measures concerning the official control of foodstuffs. Sampling should be carried out in accordance with Council Directive 79/700/EEC[7].

Besides national monitoring programmes, the Commission services recommended, via Commission Recommendation 2000/43/EC[8], the participation of each Member State in a specific EU co-ordinated monitoring programme. Those programmes have existed since 1996. Their aim is to work towards a system which makes it possible to estimate actual dietary pesticide exposure throughout Europe. The monitoring programme is designed as a rolling programme, which covers all major pesticide-commodity combinations in a series of 5 year cycles, the first cycle being completed with the data of the 2000 report. The choice of commodities includes the major components of the Standard European Diet of the World Health Organisation.

Article 7 of Council Directive 86/362/EEC and Article 4 of Council Directive 90/642/EEC, as amended by Council Directive 97/41/EC[9], require Member States to report to the Commission the results of the monitoring programme for pesticide residues carried out both under their national programme and under the EU co-ordinated programme. A format for the reports on the Community programme was agreed (document SANCO/701/2001). The Commission is required to compile and collate this information annually.

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[1] Agreement on the European Economic Area
[2] Official Journal No L 221, 07/08/1986 p. 0043 - 0047
[3] Official Journal No L 221, 07/08/1986 p. 0037 - 0042
[4] Official Journal No L 350, 14/12/1990 p. 0071 - 0079
[5] Official Journal No L 186, 30/06/1989 p. 0023 - 0026
[6] Official Journal No L 290, 24/11/1993 p. 0014 - 0017
[7] Official Journal No L 207, 15/08/1979 p. 0026 - 0028
[8] Official Journal No L 14, 20/01/2000 p. 0036 - 0041
[9] Official Journal No L 184, 12/07/1997 p. 0033 - 0049

Since 1 April 2000 Commission Regulation (EC) No 645/2000[10] is in force, which provides for detailed implementing rules for the monitoring provisions of Directives 86/362/EEC and 90/642/EEC. This regulation was applicable for most of the year 2000.

## 3. MAXIMUM RESIDUE LIMITS (MRL), ACCEPTABLE DAILY INTAKES (ADI) AND ACUTE REFERENCE DOSES (ACUTE RFD)

Pesticide residue levels in foodstuffs are generally regulated in order to:

- minimise the exposure of consumers to the harmful or unnecessary intake of pesticides;
- control the correct use of pesticides in terms of the authorisations or registrations granted (application rates and pre-harvest intervals);
- permit the free circulation of products treated with pesticides as long as they comply with the MRLs fixed.

A maximum residue limit (MRL) for pesticide residues is the maximum concentration of a pesticide residue (expressed in mg/kg) legally permitted in or on food commodities and animal feed. MRLs are based on Good Agricultural Practice (GAP) data. Food derived from commodities that comply with the respective MRLs are intended to be toxicologically acceptable. Exceeded MRLs are indicators of violations of Good Agricultural Practice. If MRLs are exceeded, comparison of the exposure with ADIs and/or acute RfDs will then indicate whether or not there are possible chronic or acute health risks respectively.

The acceptable daily intake (ADI) is the estimate of the amount of a substance in food, expressed on a body-weight basis, that can be ingested daily over a lifetime without appreciable health risk to the consumer. The ADI is based on the no observed adverse effect levels (NOAEL) in animal testing. A safety factor (usually 100) that takes into consideration the type of effect, the severity or reversibility of the effect, and the inter- and intra-species variability is applied to the NOAEL. The ADI therefore reflects chronic toxicity.

The acute Reference Dose (acute RfD) is the estimate of the amount of a substance in food, expressed on a body-weight basis, that can be ingested over a short period of time, usually during one meal or one day, without appreciable health risk to the consumer. It therefore reflects the acute toxicity. At present, acute Reference Doses have been fixed for certain pesticides.

[10] Commission Regulation (EC) No 645/2000 of 28 March 2000, Official Journal No. L 78, 29/03/2000, p. 0007 - 0009

## 4. NATIONAL MONITORING PROGRAMMES

### 4.1. Monitoring results for 2000

The results of the 18 national monitoring programmes are shown in Tables 1 - 6. In total about 45 000 samples were analysed for, on average, 151 different pesticides. Analysis is usually performed by multi-methods capable of detecting up to 100 or more pesticides. This means that at least an estimated 4.5 million individual determinations were carried out. 61 % of the samples contained no detectable pesticide residues. Detectable residues at or below the MRL were found in 35 % of the samples. In 4.3 % of the samples, the residues exceeded MRLs (both national or EC-MRLs). It was confirmed[11] that EC-MRLs were exceeded in 3.2 % of all samples (sum of fresh (incl. frozen) and processed products).

**The results varied significantly between the different countries. It is important to note that differences between countries in the actual presence of pesticide residues could exist, but that differences in the monitoring programmes as such are very likely to account for an important part of this variation.**

Several factors which could cause these differences in the monitoring programmes can be mentioned:

- The choice of pesticides investigated
- Sampling, e.g. more random or more targeted; the proportion of domestic and imported foodstuffs; the choice of crops
- Methods used, e.g. the addition of single methods to detect specific, often problematic pesticides
- Analytical capabilities of the laboratories (differences in reporting levels)
- Definition of exceeded levels (e.g. including or excluding analytical uncertainties)
- Differences in national MRLs, leading to differences in exceeded levels reported.

No separation of the reporting for fruit/vegetables and cereals was made in 2000 as a consolidation of the residue Directives is currently being discussed, in which the different Directives for fruit, vegetables and cereals are merged. Instead, surveillance and follow-up enforcement sampling were distinguished, since a different sampling strategy (more or less targeted) can lead to considerably different results due to the more targeted nature of the follow-up enforcement sampling.

In this report **fresh** fruit and vegetables always comprise **frozen** fruit and vegetables, although this is not explicitly mentioned everywhere in the text.

[11] The definition of confirmed exceedances varies between Member States, this includes for example cases where the analytical laboratory has certified an exceedance when applying its quality assurance system, cases where official warnings have been issued or where legal or administrative consequences have followed.

In the guidance document (SANCO/701/2001) for reporting the results of the 2000 national and Community monitoring programmes to the European Commission, surveillance sampling was defined as follows:

**Surveillance sampling** means that samples are collected without any particular suspicion towards a particular producer, consignment, etc.. Surveillance sampling may also include more targeted samples, which are directed to a special problem, e.g. methamidophos in peppers or chlormequat in pears from countries where previously problems were found. Samples directed to a special producer or consignment, however, fall within the category follow-up enforcement sampling.

**Follow-up enforcement sampling** means that samples are taken in case of suspicion as a follow-up for previously found violations. Follow-up enforcement sampling is directed to a specific grower/producer or to a specific consignment. Samples directed to a specific problem, but not to a specific producer/consignment fall within the category surveillance sampling.

In 2000 for the first time data about sampling of **processed products** were also collected (as reported in Tables 5 and 6).

Table 1: Overview over the samples analysed in the EU and EEA States

A) Breakdown by fresh (incl. frozen) and processed products

| | | |
|---|---|---|
| **Total number of samples analysed in EU and EEA** | 45213 | |
| **Fresh fruit vegetables and cereals** | 43419 | 96 % |
| **Processed products** | 1794 | 4.0 % |

B) Breakdown by surveillance and follow-up enforcement samples

| | | |
|---|---|---|
| **Total number of samples analysed in EU and EEA** | 45213 | |
| **Surveillance samples** | 42631 | 94 % |
| **Follow-up enforcement samples** | 2582 | 5.7 % |

As this overview shows 96 % of the samples taken in the EU and the EEA States were fresh (incl. frozen) fruit, vegetables and cereals. 4 % of the samples were processed products. About 94 % of the samples were surveillance samples and 5.7 % were follow-up enforcement samples.

In the following Tables 2 - 6 the detailed results by country are shown. Tables 2 - 4 show the results for fresh products, Tables 5 and 6 the results for processed products. Each category is divided into surveillance and follow-up enforcement samples.

Table 2: Results of the eighteen national monitoring programmes[12] for pesticide residues on **fresh (incl. frozen) fruit, vegetables and cereals, sum of surveillance and enforcement** samples. The results **including processed products** are shown in the **last row** of the table.

| | **No. of samples analysed** | **No. of pesticides analysed for** | **No. of different pesticides found** | **% found from sought** | **No. of samples without detec-table residues** | **%** | **No. of samples with residues below or at MRL (national or EC MRLs)** | **%** | **No. of samples with residues above MRL (national or EC MRLs)** | **%** | **No. of samples with confir-med residues above EC-MRLs** | **%** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **B** | 1353 | 146 | 52 | 36 | 730 | 54 | 525 | 39 | 98 | 7.2 | 61 | 4.5 |
| **DK** | 1659 | 137 | 69 | 50 | 1189 | 72 | 436 | 26 | 34 | 2.0 | 33 | 2.0 |
| **D** | 5478 | 84 | 51 | 61 | 3168 | 58 | 2099 | 38 | 211 | 3.9 | 171 | 3.1 |
| **EL** | 1472 | 207 | 47 | 23 | 939 | 64 | 444 | 30 | 89 | 6.0 | 88 | 6.0 |
| **E** | 6512 | 172 | 75 | 44 | 4387 | 67 | 1979 | 30 | 146 | 2.2 | 135 | 2.1 |
| **F** | 4231 | 201 | 106 | 53 | 1850 | 44 | 1917 | 45 | 464 | 11 | 389 | 9.2 |
| **IRL** | 250 | 80 | 36 | 45 | 124 | 50 | 118 | 47 | 8 | 3.2 | 8 | 3.2 |
| **I** | 8320 | 281 | 126 | 45 | 5727 | 69 | 2436 | 29 | 157 | 1.9 | 81 | 1.0 |
| **L** | 175 | 103 | 28 | 27 | 112 | 64 | 56 | 32 | 7 | 4.0 | 3 | 1.7 |
| **NL** | 2703 | 320 | 128 | 40 | 1226 | 45 | 1184 | 44 | 293 | 11 | 119 | 4.4 |
| **A** | 932 | 101 | 52 | 52 | 578 | 62 | 298 | 32 | 56 | 6.0 | 29 | 3.1 |
| **P** | 771 | 109 | 40 | 37 | 539 | 70 | 146 | 19 | 86 | 11 | 86 | 11 |
| **FIN** | 2252 | 171 | 108 | 63 | 1226 | 54 | 940 | 42 | 86 | 3.8 | 73 | 3.2 |
| **S** | 3008 | 196 | 77 | 39 | 1830 | 61 | 1088 | 36 | 90 | 3.0 | 80 | 2.7 |
| **UK** | 1109 | 200 | 65 | 33 | 665 | 60 | 425 | 38 | 19 | 1.7 | 17 | 1.5 |
| **Nor-way** | 2825 | 150 | 68 | 45 | 1842 | 65 | 912 | 32 | 71 | 2.5 | 66 | 2.3 |
| **Iceland** | 320 | 40 | 27 | 68 | 178 | 56 | 119 | 37 | 23 | 7.2 | 22 | 6.9 |
| **Liech-ten-stein** | 49 | 20 | 1 | 5.0 | 47 | 96 | 2 | 4.1 | 0 | 0 | 0 | 0 |
| **Total** | **43419** | **151 (Average)** | **64 (Average)** | **43** | **26357** | **61** | **15124** | **35** | **1938** | **4.5** | **1461** | **3.4** |
| **Total** *incl. proces-sed products* | **45213** | **151 (Average)** | **64 (Average)** | **43** | **27672** | **61** | **15585** | **35** | **1956** | **4.3** | **1469** | **3.2** |

[12] See the explanation about the differences in monitoring results by country under chapter 4.1, p. 6

Table 3: Results of the eighteen national monitoring programmes for pesticide residues on **fresh (incl. frozen) fruit, vegetables and cereals, surveillance sampling only.** The results including **processed products** are shown in the **last row** of the table.

| | **No. of samples analysed** | **No. of pesticides analysed for** | **No. of different pesticides found** | **% found from sought** | **No. of samples without detec-table residues** | **%** | **No. of samples with residues below or at MRL (national or EC MRLs)** | **%** | **No. of samples with residues above MRL (national or EC MRLs)** | **%** | **No. of samples with confir-med residues above EC-MRLs** | **%** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **B** | 1353 | 146 | 52 | 36 | 730 | 54 | 525 | 39 | 98 | 7.2 | 61 | 4.5 |
| **DK** | 1658 | 137 | 69 | 50 | 1188 | 72 | 436 | 26 | 34 | 2.1 | 33 | 2.0 |
| **D** | 5478 | 84 | 51 | 61 | 3168 | 58 | 2099 | 38 | 211 | 3.9 | 171 | 3.1 |
| **EL** | 1472 | 207 | 47 | 23 | 939 | 64 | 444 | 30 | 89 | 6.0 | 88 | 6.0 |
| **E** | 4383 | 172 | 75 | 44 | 2812 | 64 | 1447 | 33 | 124 | 2.8 | 113 | 2.6 |
| **F** | 4000 | 201 | 106 | 53 | 1816 | 45 | 1878 | 47 | 306 | 7.7 | 231 | 5.8 |
| **IRL** | 245 | 80 | 36 | 45 | 120 | 49 | 118 | 48 | 7 | 2.9 | 7 | 2.9 |
| **I** | 8320 | 281 | 126 | 45 | 5727 | 69 | 2436 | 29 | 157 | 1.9 | 81 | 1.0 |
| **L** | 175 | 103 | 28 | 27 | 112 | 64 | 56 | 32 | 7 | 4.0 | 3 | 1.7 |
| **NL** | 2694 | 320 | 128 | 40 | 1225 | 46 | 1176 | 44 | 293 | 11 | 119 | 4.4 |
| **A** | 932 | 101 | 52 | 52 | 578 | 62 | 298 | 32 | 56 | 6.0 | 29 | 3.1 |
| **P** | 760 | 109 | 40 | 37 | 531 | 70 | 145 | 19 | 84 | 11 | 84 | 11 |
| **FIN** | 2252 | 171 | 108 | 63 | 1226 | 54 | 940 | 42 | 86 | 3.8 | 73 | 3.2 |
| **S** | 2900 | 196 | 77 | 39 | 1780 | 61 | 1051 | 36 | 69 | 2.4 | 59 | 2.0 |
| **UK** | 1065 | 200 | 65 | 33 | 625 | 59 | 422 | 40 | 18 | 1.7 | 16 | 1.5 |
| **Nor-way** | 2810 | 150 | 68 | 45 | 1839 | 65 | 907 | 32 | 64 | 2.3 | 60 | 2.1 |
| **Iceland** | 300 | 40 | 27 | 68 | 178 | 59 | 114 | 38 | 8 | 2.7 | 8 | 2.7 |
| **Liech-ten-stein** | 49 | 20 | 1 | 5.0 | 47 | 96 | 2 | 4.1 | 0 | 0 | 0 | 0 |
| **Total** | **40846** | **151 (Average)** | **64 (Average)** | **43** | **24641** | **60** | **14494** | **36** | **1711** | **4.2** | **1236** | **3.0** |
| **Total** *incl. proces-sed products* | **42631** | **151 (Average)** | **64 (Average)** | **43** | **25953** | **61** | **14955** | **35** | **1723** | **4.0** | **1244** | **2.9** |

Table 4: Results of ten national monitoring programmes for pesticide residues on **fresh (incl. frozen) fruit, vegetables and cereals, follow-up enforcement sampling only.** The results including **processed products** are shown in the **last row** of the table.

| | **No. of samples analysed** | **No. of samples without detec-table residues** | **%** | **No. of samples with residues below or at MRL (national or EC MRLs)** | **%** | **No. of samples with residues above MRL (national or EC MRLs)** | **%** | **No. of samples with confir-med residues above EC-MRLs** | **%** |
|---|---|---|---|---|---|---|---|---|---|
| **B*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **DK** | 1 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| **D*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **EL*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **E** | 2129 | 1575 | 74 | 532 | 25 | 22 | 1.0 | 22 | 1.0 |
| **F** | 231 | 34 | 15 | 39 | 17 | 158 | 68 | 158 | 68 |
| **IRL** | 5 | 4 | 80 | 0 | 0 | 1 | 20 | 1 | 20 |
| **I*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **L*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NL** | 9 | 1 | 11 | 8 | 89 | 0 | 0 | 0 | 0 |
| **A*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **P** | 11 | 8 | 73 | 1 | 9.1 | 2 | 18 | 2 | 18 |
| **FIN**** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **S** | 108 | 50 | 46 | 37 | 34 | 21 | 19 | 21 | 19 |
| **UK** | 44 | 40 | 91 | 3 | 6.8 | 1 | 2.3 | 1 | 2.3 |
| **Norway** | 15 | 3 | 20 | 5 | 33 | 7 | 47 | 6 | 40 |
| **Iceland** | 20 | 0 | 0 | 5 | 25 | 15 | 75 | 14 | 70 |
| **Liechten-stein*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **2573** | **1716** | **67** | **630** | **25** | **227** | **8.8** | **225** | **8.7** |
| **Total** *incl. processed products* | **2582** | **1719** | **67** | **630** | **24** | **233** | **9.0** | **225** | **8.7** |

* no follow-up enforcement sampling carried out for fresh products

** follow-up enforcement sampling carried out, but number of samples not reported

Table 5: Results of twelve national monitoring programmes for pesticide residues in **processed products, surveillance sampling only**

| | **No. of samples analysed** | **No. of samples without detec-table residues** | **%** | **No. of samples with residues below or at MRL (national or EC MRLs)** | **%** | **No. of samples with residues above MRL (national or EC MRLs)** | **%** | **No. of samples with confir-med residues above EC-MRLs** | **%** |
|---|---|---|---|---|---|---|---|---|---|
| **B** | 31 | 17 | 55 | 12 | 39 | 2 | 6.5 | 0 | 0 |
| **DK** | 103 | 61 | 59 | 42 | 41 | 0 | 0 | 0 | 0 |
| **D*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **EL** | 161 | 56 | 35 | 101 | 63 | 4 | 2.5 | 2 | 1.2 |
| **E*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **F** | 93 | 26 | 28 | 67 | 72 | 0 | 0 | 0 | 0 |
| **IRL** | 1 | 1 | 100 | 0 | 0 | 0 | 0 | 0 | 0 |
| **I*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **L*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NL** | 40 | 33 | 83 | 5 | 13 | 2 | 5.0 | 2 | 5.0 |
| **A*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **P** | 128 | 86 | 67 | 42 | 33 | 0 | 0 | 0 | 0 |
| **FIN** | 253 | 219 | 87 | 31 | 12 | 3 | 1.2 | 3 | 1.2 |
| **S** | 401 | 365 | 91 | 36 | 9.0 | 0 | 0 | 0 | 0 |
| **UK** | 466 | 354 | 76 | 112 | 24 | 0 | 0 | 0 | 0 |
| **Nor-way** | 82 | 69 | 84 | 13 | 16 | 0 | 0 | 0 | 0 |
| **Ice-land*** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Liech-ten-stein** | 26 | 25 | 96 | 0 | 0 | 1 | 3.8 | 1 | 3.8 |
| **Total** | **1785** | **1312** | **74** | **461** | **26** | **12** | **0.7** | **8** | **0.4** |

* no processed products were analysed

Table 6: Results of the national monitoring programmes for pesticide residues in **processed products, follow-up enforcement sampling only.** Only one country took follow-up enforcement samples for processed products.

| | No. of samples analysed | No. of samples without detec-table residues | % | No. of samples with residues below or at MRL (national or EC MRLs) | % | No. of samples with residues above MRL (national or EC MRLs) | % | No. of samples with confir-med residues above EC-MRLs | % |
|---|---|---|---|---|---|---|---|---|---|
| **B** | 9 | 3 | 33 | 0 | 0 | 6 | 67 | 0 | 0 |
| **Total** | 9 | 3 | 33 | 0 | 0 | 6 | 67 | 0 | 0 |

As Tables 2 – 4 show the more targeted nature of the follow-up enforcement sampling leads to a higher number of MRL exceedances (8.7 % compared to 2.9 % in the surveillance sampling). At the same time the percentage of samples with residues at or below the MRL (national or EC-MRL) is lower in the follow-up enforcement samples (24 % compared to 35 % in the surveillance samples) while the percentage of samples without residues is higher than in the surveillance samples (67 % compared to 61 %)[13]. This may be explained by the fact that in the more targeted follow-up enforcement samples the analytical methods used often are targeted too, e.g. towards one specific pesticide, detectable with a specific single residue method.

The statistics does not change significantly by excluding the processed products as the comparison of the last two rows in Tables 2 – 4 shows. 12 out of 18 countries took surveillance samples of processed products, only one country took follow-up enforcement samples for processed products.

Within the category processed products as compared to fresh products the percentage of surveillance samples with residues at or below the MRL (national or EC-MRL) and with residues exceeding the MRL (national or EC-MRL) is significantly lower (residues at or below the MRL are found in 26 % of the samples, compared to 35 % in fresh products; residues exceeding the MRL are found in 0.7 % of the samples, compared to 4.2 % in fresh products). As a consequence, the percentage of samples without residues is significantly higher in processed products (74 % compared to 60 % in fresh products).

No specific harmonised EC-MRLs for processed products have yet been set on EU level. However, Directives 86/362/EEC and 90/642/EEC contain general provisions for dried, processed and composite products, which specify that in the absence of a specific MRL the MRL for the fresh product shall be applied, taking into account concentration or dilution factors caused by processing. Similarly, for composite products the relative concentrations of

[13] The figures in this paragraph relate to all samples (sum of fresh and processed products).

the ingredients in the mixture are to be taken into account. Specific MRLs for processed products may or may not have been set on national level.

## 4.2. Results of the 2000 national monitoring programmes compared to the previous years

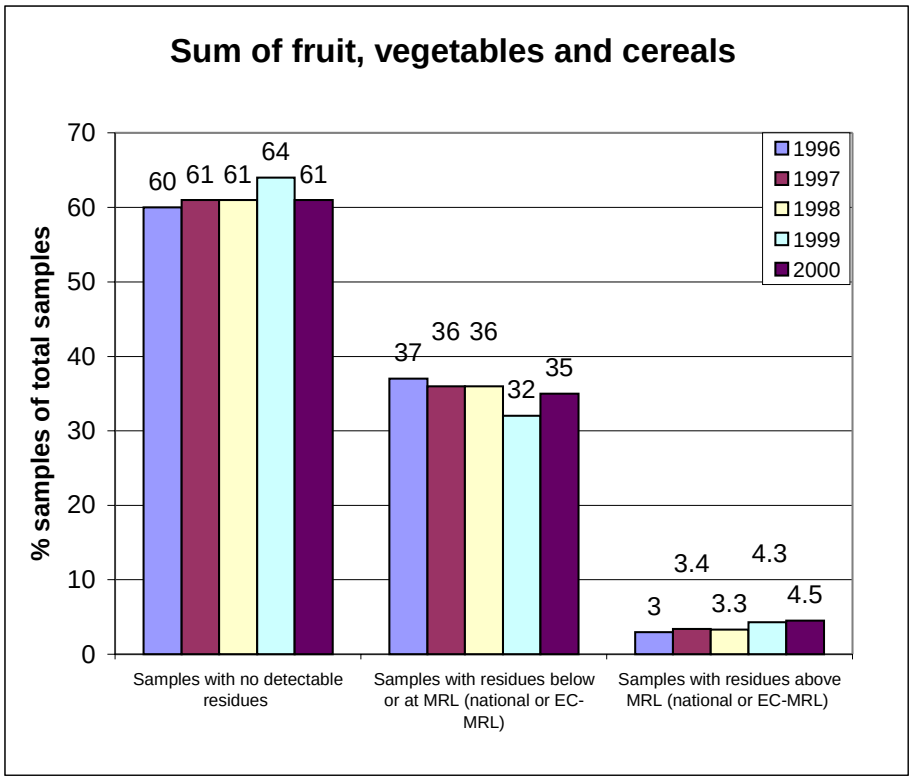


*Figure 1: National monitoring results 1996 - 2000 for fruit, vegetables and cereals (sum of surveillance and follow-up enforcement sampling, fresh (incl. frozen) products only) collected in 18 participating countries*

Figure 1 gives an overview of the residue situation of 2000 compared to the previous years. Only the results for fresh (incl. frozen) fruit, vegetables and cereals have been taken up in this statistics, since only those were reported in previous years. The figure shows that the percentage of samples with no detectable residues remains at the same level as in the years 1996 - 1998 (60 - 61 %), whereas it had increased to 64 % in 1999. However, in 2000 the percentage of samples with residues above the MRL (national or EC-MRL) has increased slightly compared to 1999 (from 4.3 % to 4.5 %) and remains since 1999 at a higher level compared to the data from 1996 - 1998 which were around 3.0 - 3.4 %. Accordingly the percentage of samples with residues at or below the MRL (national or EC-MRL) was slightly lower in 2000, compared to the 36 % - 37 % found in 1996 - 1998, but higher than in 1999.

In conclusion, although the percentage of samples without residues remains relatively stable with regard to the majority of previous data (except those of 1999) the MRL exceedances show an increasing trend over the last 5 years.

A number of factors might have contributed to this evolution and especially to the increase in samples exceeding the MRL. First of all, as outlined in chapter 4.1 before, the national monitoring programmes as such differ considerably from year to year. In most countries priorities for the monitoring programmes are set annually on national level. Most of the countries follow a more or less targeted approach when setting up the monitoring programmes, taking into account information about infringements in the EU (e.g. disseminated via the Rapid Alert System for Food and Feed (RASFF)) and on their national territory detected in their previous' years programmes. The more information is available and the better information communication systems (such as the (RASFF) work, the more precisely the programmes can detect potential problems and will lead to more MRL exceedances.

Secondly, the quality of the analytical laboratories is constantly improving towards lower detection and reporting limits, towards enhanced capability to analyse more active ingredients and towards development and use of more specific single residue methods. In 1997 on average 126 active ingredients were analysed, ranging from 28 to 130 in the different countries. In 1998 the average figure was 147 (ranging from 83 to 257), in 1999 it was 142 (28 to 323) and in 2000 the average was 151, ranging from 20 to 320 analytes. However, comparability of the 1996 - 2000 data is somewhat limited, since the number of countries included in the reports was not the same from 1997 to 2000. The progress in the implementation of the EU QC procedures made in most of the participating countries may also have contributed to the improvements in the analytical sector.

As a last point it should also be mentioned that the legislative situation has changed in the last years and will change in future with more MRLs set to the Limit of determination, which could potentially result in more MRL exceedances.

### 4.3. Samples with multiple residues

Table 7 summarises samples in which more than one pesticide residue had been found. Residues of more than one pesticide were found in about 15 % of the analysed samples. In most of these cases (8.1 %), residues of two pesticides were found, followed by 3.8 % of samples containing three residues. In 2.8 % of the samples, residues of four or more different pesticides were found.

Table 7: Samples with residues of more than one pesticide in fresh (incl. frozen) fruit, vegetables and cereals, sum of surveillance and follow-up enforcement sampling

| | **No. of samples analysed** | **2** | **3** | **4** | **5** | **6** | **7** | **8 and more** | **No. of samples with multiple residues** | **%** |
|---|---|---|---|---|---|---|---|---|---|---|
| **B** | 1353 | 136 | 70 | 23 | 12 | 3 | 1 | 0 | 245 | 18.1 |
| **DK** | 1659 | 116 | 45 | 26 | 3 | 1 | 0 | 0 | 191 | 11.5 |
| **D** | 5478 | 514 | 193 | 81 | 27 | 11 | 1 | 1 | 828 | 15.1 |
| **EL** | 1472 | 62 | 16 | 6 | 1 | 1 | 0 | 0 | 86 | 5.8 |
| **E** | 6512 | 55 | 22 | 6 | 2 | 0 | 0 | 0 | 85 | 1.3 |
| **F** | 4231 | 539 | 298 | 129 | 62 | 18 | 9 | 4 | 1059 | 25.0 |
| **IRL** | 250 | 35 | 12 | 4 | 11 | 1 | 0 | 0 | 63 | 25.2 |
| **I** | 8320 | 550 | 264 | 104 | 54 | 24 | 4 | 6 | 1006 | 12.1 |
| **L** | 175 | 15 | 9 | 7 | 1 | 0 | 0 | 0 | 32 | 18.3 |
| **NL** | 2703 | 346 | 192 | 113 | 58 | 27 | 13 | 14 | 763 | 28.2 |
| **A** | 932 | 69 | 40 | 19 | 3 | 1 | 0 | 1 | 133 | 14.3 |
| **P** | 771 | 38 | 17 | 9 | 1 | 1 | 0 | 0 | 66 | 8.6 |
| **FIN** | 2252 | 327 | 148 | 62 | 26 | 4 | 4 | 0 | 571 | 25.4 |
| **S** | 3008 | 286 | 144 | 83 | 23 | 7 | 0 | 1 | 544 | 18.1 |
| **UK** | 1109 | 150 | 47 | 15 | 3 | 1 | 1 | 1 | 218 | 19.7 |
| **Norway** | 2825 | 263 | 106 | 39 | 7 | 2 | 0 | 0 | 417 | 14.8 |
| **Iceland** | 320 | 32 | 12 | 18 | 7 | 0 | 1 | 0 | 70 | 21.9 |
| **Liechten-stein** | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **43419** | **3533** | **1635** | **744** | **301** | **102** | **34** | **18** | **6377** | |
| **%** | | **8.1** | **3.8** | **1.7** | **0.69** | **0.23** | **0.078** | **0.041** | **14.7** | |

**Samples with multiple residues in the years 1996 - 2000**

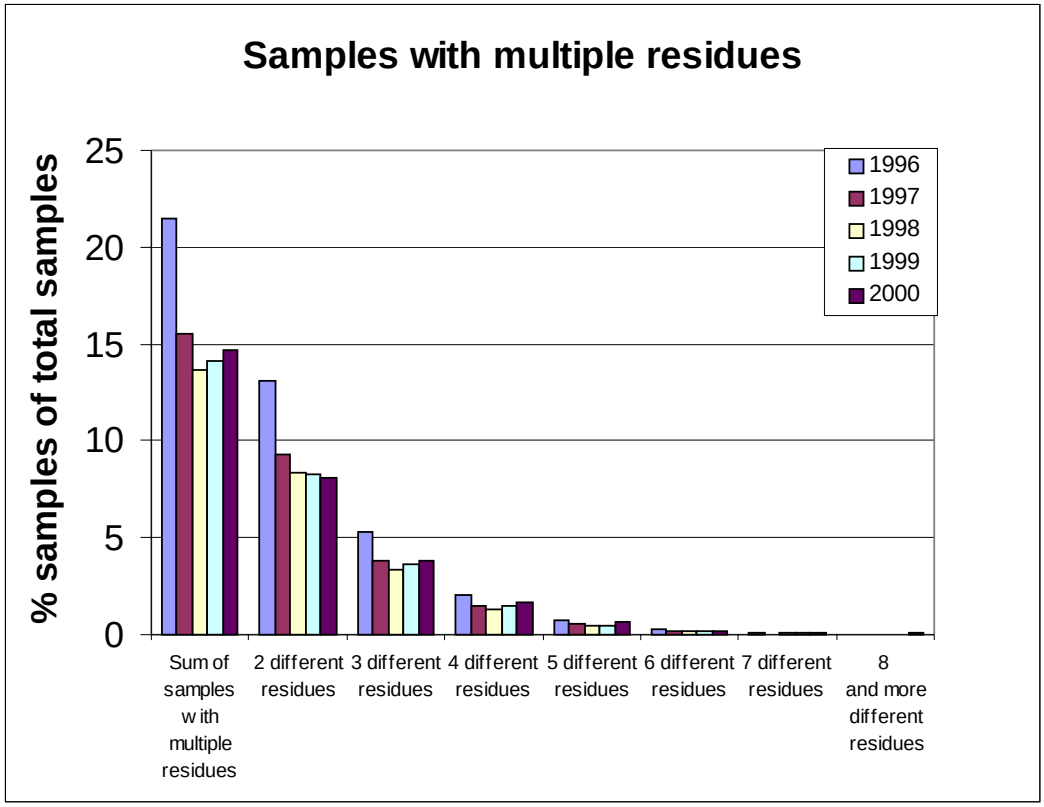


*Figure 2: Samples with multiple residues - Comparison of the years 1996 - 2000, fresh (incl. frozen) fruit, vegetables and cereals only, sum of surveillance and enforcement sampling*

Figure 2 gives an overview over the distribution of samples with multiple residues in the years 1996 to 2000. To facilitate the comparison with previous years, only fresh fruit, vegetables and cereals have been taken into account in this statistics. It can be stated that the number of samples with multiple residues decreased from 1996 to 1998, which is shown throughout the different groups (e.g. samples with 2 residues, samples with 3 residues, etc.). In 1999 and 2000 the total number of samples with multiple residues increased again, which is also shown in the different groups. In particular the sum of samples with 4 or more residues increased in 2000 to 2.8 %, compared to 2.0 % - 2.3 % in 1997 - 1999. When evaluating these data, it has to be considered that the 1996 results are not directly comparable with those of 1997 - 2000, as only eleven countries delivered data in 1996. In 1997 and 1998 fifteen countries out of sixteen delivered data for this overview, in 1999 sixteen countries out of seventeen and in 2000 all eighteen countries delivered data.

### 4.4. Most frequently found pesticides

The pesticides which have been most frequently found in the national monitoring programmes are shown in Table 8 in decreasing order of relative frequency. Member States, Norway, Iceland and Liechtenstein were asked to prepare a list of the ten most frequently found pesticides in decreasing order of frequency. This list was established by calculating the percentages of the findings of this pesticide in relation to the total number of samples analysed for this specific pesticide. It was not based on the absolute number of findings of a specific pesticide as in the years before. The data received have been included as reported by the respective country.

Table 8: Pesticides found most often in the national monitoring programmes in the European Union, Norway, Iceland and Liechtenstein as reported, **surveillance sampling** only

| Country | Pesticides found most often. The last row lists the pesticides mentioned most often from all Member States and Norway, Iceland and Liechtenstein. |
|---|---|
| **B** | Chlormequat, inorganic bromide, iprodione, maneb group, propamocarb, benomyl group, tolylfluanid, imazalil, ethephon and chlorpropham |
| **DK** | Chlormequat, glyphosate, imazalil, ortho-phenylphenol, maneb group, chlorpyriphos, thiabendazol, endosulfan, tolylfluanid and mepiquat |
| **D** | Inorganic bromide, maneb group, cyanide, brompropylate, fenbutaninoxid, ethephon, benomyl group, chlormequat, procymidon and vinclozolin |
| **EL** | Maneb group, benomyl group, chlorpyriphos, endosulfan, methamidophos, captan, parathion-methyl, methidathion, cypermethrin and phosalon |
| **E** | Endosulfan, chlorpropham, chlorpyriphos, imazalil, procymidon, methidathion, dicofol, buprofezin, sulphur and pyridaben |
| **F** | Maleic hydrazide, chlormequat, maneb group, inorganic bromide, ortho-phenylphenol, benomyl group, thiabendazol, iprodione, imazalil and oxadixyl |
| **IRL** | Thiabendazol, chlorpyriphos, benomyl group, captan, dicofol, brompropylate, malathion, methidathion, endosulfan and iprodione |
| **I** | Diafentiuron, kresoxim-methyl, copper, sodium metabisulphite, chlormequat, ethofenprox, procymidon, imazalil, chlorpyriphos and heptachlor epoxyde |
| **L** | Pyrimethanil, iprodione, vinclozolin, chlorpyriphos, procymidon, folpet, brompropylate, tolylfluanid, metalaxyl and maneb group |
| **NL** | Chlormequat, propamocarb, imidacloprid, maneb group, iprodione, imazalil, thiabendazol, benomyl group, captan and chlorpyriphos |
| **A** | Procymidon, chlorpropham, brompropylate, endosulfan, iprodione, tolclophos-methyl, captan, dimethoat, benomyl group and chlorpyriphos |
| **P** | Maneb group, methamidophos, captan, phosalon, acephate, dimethoat, pirimiphos-methyl, methomyl, benomyl group and malathion |
| **FIN** | Bitertanol, inorganic bromide, diquat, hydrogen phosphide, benomyl group, chlormequat, thiabendazol, endosulfan, maneb group and procymidon |
| **S** | Inorganic bromide, diquat, chlormequat, maleic hydrazide, imazalil, maneb group, thiabendazol, cyhexatine, ortho-phenylphenol and ethoxyquin |
| **UK** | Cyprodinil, hydrogen phosphide, chlorpropham, chlormequat, maleic hydrazide, inorganic bromide, propamocarb, maneb group, kresoxim-methyl and dodine |

| Country | Pesticides found most often. The last row lists the pesticides mentioned most often from all Member States and Norway, Iceland and Liechtenstein. |
|---|---|
| **Norway** | Imidacloprid, chlormequat, glyphosate, ortho-phenylphenol, iprodione, imazalil, thiabendazol, propamocarb, maneb group and tolylfluanid |
| **Iceland** | Thiabendazol, imazalil, chlorpyriphos, ortho-phenylphenol, dicofol, tolylfluanid, diphenylamin, methidathion, malathion and iprodione |
| **Liechten-stein** | Mecarbam |
| **Total EU and EEA** | Chlormequat, maneb group, inorganic bromide, chlorpyriphos, imazalil, benomyl group, thiabendazol, iprodione, endosulfan and ortho-phenylphenol |

The table shows that the most frequently found pesticides were mainly fungicides as in the years before. In the year 2000 the majority of the ten most frequently found pesticides, e.g. iprodione, thiabendazole, the maneb group, endosulfane, imazalil, chlorpyriphos and the benomyl group were the same as in the years before.

Changes in the top ten list can be noted in 2000, but it is important to take into account that the procedure to determine the ten most frequently found pesticides has changed in 2000 from reporting the *absolute* number of findings (years 1996-1999) to reporting the *relative* frequency of pesticides' occurrences (year 2000), as explained above. Therefore the results 2000 are not directly comparable with the results of the years 1996 - 1999. With the approach used during 1996-1999 pesticides analysed by multi-residue methods tended to be more prevalent in the top ten list than those analysed by single residue methods as the throughput of samples analysed with multi-residue methods is much higher, resulting in a higher absolute number of samples with positive findings. In 2000 the single residue method analytes tended to be more prevalent, because the single residue methods are targeted towards a specific problem and used for targeted samples. Therefore the relative frequency of positive findings (in relation to the absolute number of samples analysed for this specific pesticide) was higher. This explains why pesticides such as chlormequat (where, due to problems, an extensive targeted sampling took place in 2000), inorganic bromide and orthophenylphenol appear significantly more often on the top ten list in 2000 than in the years before, whereas typical multi-residue pesticides, i.e. captan, procymidon have disappeared from the top ten list in 2000.

## 5. THE EU CO-ORDINATED MONITORING EXERCISE

As an EU co-ordinated monitoring exercise, the Commission recommended in 2000 via Commission Recommendation 2000/43/EC that four commodities should be tested (rice, cucumber, head cabbage and peas) for 20 pesticides (acephate, benomyl group, chlorpyriphos, chlorpyriphos-methyl, deltamethrin, maneb-group, imazalil, iprodione, methamidophos, permethrin, vinclozolin, lambda-cyhalothrin, metalaxyl, methidathion, pirimiphos-methyl, thiabendazol, diazinon, endosulfan, mecarbam and triazophos). The 20 pesticides analysed were the same as in 1998 and 1999.

The benomyl-group comprises three different compounds (benomyl, carbendazim, thiophanate-methyl), which are analysed with the same analytical method and determined as

sum, expressed as carbendazim. The maneb-group, by legal definition, comprises five different dithiocarbamates, which are also determined as sum, expressed as $CS_2$.

All Member States and EEA States participated in the EU co-ordinated programme. Overall, around 3 700 samples were analysed (869 rice samples, 1 176 cucumber samples, 962 head cabbage samples and 730 pea samples). However, not all samples were analysed for all 20 pesticides.

## 5.1. Sampling design applied in the 2000 EU co-ordinated monitoring programme

### *5.1.1. Description of the sampling design*

In order to achieve reliable information concerning the concentration of pesticides in fruit, vegetables and cereals on the European market a suitable sampling plan is required. According to Commission Recommendation 2000/43/EC, each Member State has to take the minimum number of samples specified in the Annex (cf. Table 9).

The sampling design of the co-ordinated programme is based on a statistical method proposed by Codex Alimentarius[14]. Based on a binomial probability distribution it can be calculated that examination of a total sample number of 459 gives a 99 % confidence of detecting one sample containing pesticides above a specific level if it is anticipated that 1 % of products of plant origin will contain residues above this specific level. This level could be the reporting level[15] or the MRL.

The minimum numbers of samples to be taken of each commodity were fixed at a different level for each country, according to their population and consumer numbers, since adjusting the sample size to the largeness of the national markets improves the precision of the sampling design. The required number of samples varied between 12 and 93, resulting in a total of 460 samples for all Member States and 496 samples for all participating countries (incl. EEA States). This procedure was the same as in the 1998 and 1999 exercises. In 2000 the recommended number of samples was taken in most cases, in many cases even more samples were taken than recommended. Iceland did not sample rice and peas. Table 9 shows the required number of samples by Member State compared to the number of samples actually taken.

Table 9: Numbers of samples taken by Member State for each commodity

| Country | Recommended number of samples (for each commodity) | Number of samples taken by commodity | | | |
|---|---|---|---|---|---|
| | | Rice | Cucumber | Head cabbage | Peas |
| **B** | 12 | 41 | 44 | 44 | 34 |
| **DK** | 12 | 12 | 47 | 41 | 7 |

[14] Codex Alimentarius, Pesticide Residues in Foodstuffs, Rome 1994, ISBN 92-5-20372271-1; Vol. 2, p. 372

[15] The reporting level is the routinely achievable limit of quantification (lowest level at which residues will be reported as absolute numbers) for the monitoring laboratories and normally corresponds to the lowest calibrated level.

| Country | Recommen-ded number of samples (for each commodity) | Number of samples taken by commodity | | | |
|---|---|---|---|---|---|
| | | Rice | Cucumber | Head cabbage | Peas |
| **D** | 93 | 287 | 173 | 300 | 258 |
| **EL** | 12 | 22 | 85 | 19 | 47 |
| **E** | 45 | 43 | 44 | 45 | 42 |
| **F** | 66 | 38 | 96 | 64 | 42 |
| **IRL** | 12 | 12 | 12 | 13 | 12 |
| **I** | 65 | 76 | 76 | 102 | 60 |
| **L** | 12 | 15 | 15 | 15 | 15 |
| **NL** | 17 | 43 | 88 | 31 | 16 |
| **A** | 12 | 12 | 13 | 12 | 12 |
| **P** | 12 | 70 | 61 | 69 | 66 |
| **FIN** | 12 | 22 | 115 | 20 | 21 |
| **S** | 12 | 41 | 141 | 53 | 14 |
| **UK** | 66 | 96 | 59 | 72 | 62 |
| **Total EU** | **460** | **830** | **1069** | **900** | **708** |
| **Norway** | 12 | 27 | 84 | 44 | 10 |
| **Iceland** | 12 | 0 | 11 | 6 | 0 |
| **Liechten-stein** | 12 | 12 | 12 | 12 | 12 |
| **Total EU and EEA** | **484** | **869** | **1176** | **962** | **730** |

*5.1.2. Statistical evaluation of the results of the co-ordinated exercise*

As described in section 5.1.1. the statistical approach of Codex Alimentarius requires at least one sample of the whole number of samples must contain a specific concentration of a certain pesticide (e.g. above the reporting level or above the MRL) in order to assess the lowest portion of food items containing pesticides above this specific level in the whole population. In the following section this lowest portion shall be estimated on a 95 % confidence level for each of the 20 pesticides.

The portion of samples with residues below or at the MRL (grey columns) or exceeding the MRL (white columns) of the respective pesticide are shown in Figures 3 and 4. The results are presented in a logarithmic scale in order to accommodate a broad range of data in the figures. In addition, the corresponding confidence interval on the 95 % level is shown, reflecting the sampling error. The sampling error, in this context, reflects the variability of the data due to the different numbers of samples taken for the determination of the respective pesticide. Other

error sources, such as the way how and when the samples were taken are not included in this estimation.

The impact of the sampling error on the final result is illustrated using the reported concentrations of the benomyl group in the food items. 2675 samples have been analysed and 43 of them showed residues below or at the MRL. The number of 2675 samples represents only a part of the whole European market, therefore the calculated fraction of samples with residues below or at the MRL (43/2675 = 1.61 %) is only an estimate for the true but unknown value. The variability of this value can be calculated and is expressed in terms of % samples shown as error bars in Figures 3 and 4. For the example of the benomyl group this means that the true value of the number of samples with residues at or below the MRL would vary between 31 and 58 samples which corresponds to a range of 1.16% and 2.17%.

The relative sampling error increases with decreasing numbers of samples of a certain category. For cases where no samples with exceeding MRLs have been found, those error bars reflect the actual percentage of the specific commodity in the whole population which still could contain residues above the MRL. For example no sample with residues exceeding the MRL for deltamethrin was found in the co-ordinated monitoring exercise, but the upper limit of the error range is 0.12 %, which means that still 0.12 % of the specific commodities in the whole population (European market) could have exceeding MRLs for deltamethrin. This upper limit of the error range is similar for the other pesticides, for which no residues exceeding the MRL have been found (e.g. chlorpyriphos, iprodione, lambda-cyhalothrin, permethrin). The limit of 0.12 % is very low, because in the co-ordinated exercise high numbers of samples (varying from 2373 to 3437 for the individual pesticides) were taken. This ensures sufficient precision of the results and allows for subsequent risk analysis calculations to be carried out.

**Statistical evaluation of the results of the co-ordinated exercise:**
Percentage of samples with residues at or below MRL (national or EC-MRL) or exceeding the MRL (national or EC-MRL) for a specific pesticide with the respective error bars in a logarithmic scale

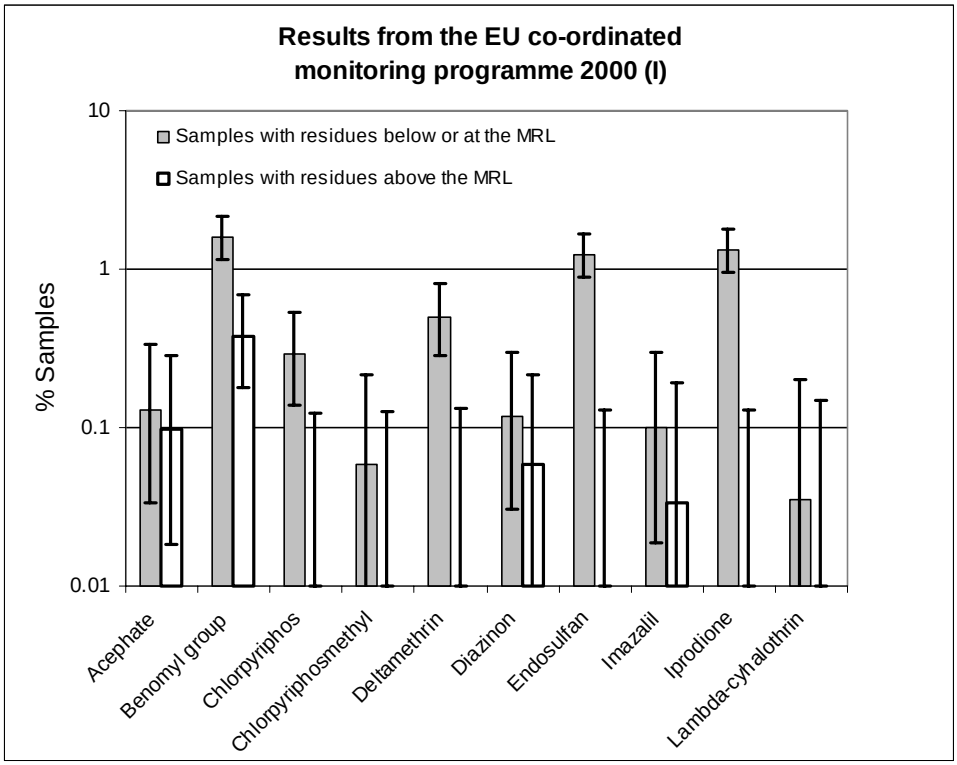


*Figure 3: Results of the monitoring programme (I)*

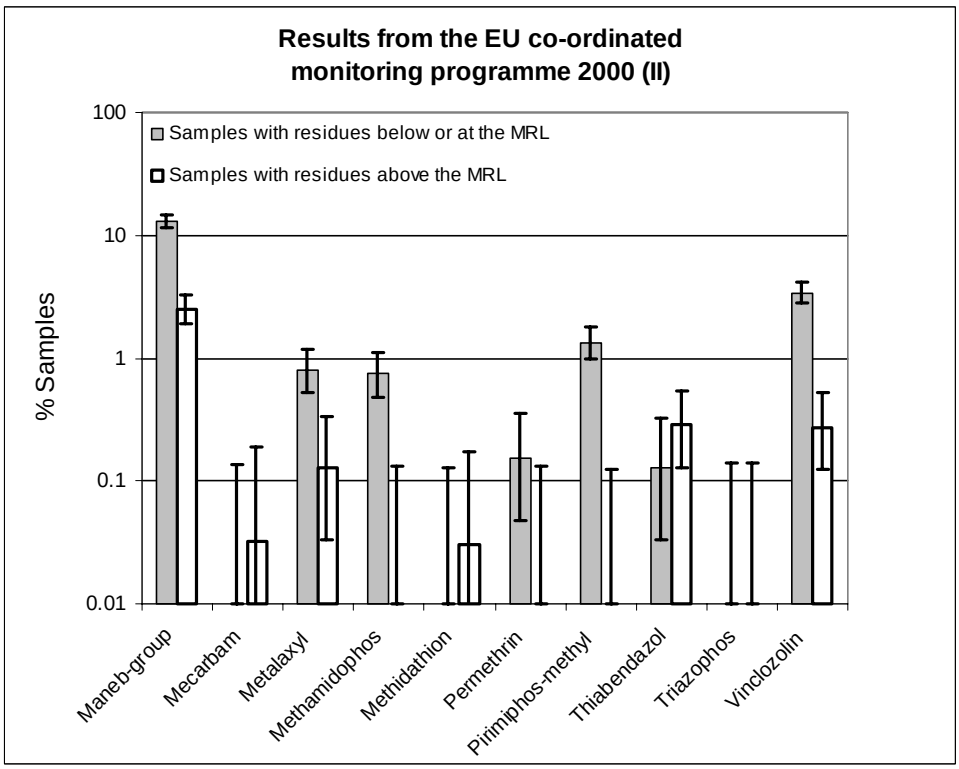


*Figure 4:Results of the monitoring programme (II)*

## 5.2. Evaluation by pesticide

The summarised results are given in Table 10 for all twenty pesticides. The table also gives information on the highest residue of a particular pesticide found in a composite sample in this monitoring exercise. Table 11 shows a selection of the most important pesticide-commodity combinations. More details can be found in Annex 2, where the complete results for all reporting countries and all commodities are given.

The results vary among the twenty different pesticides investigated. In the EU co-ordinated monitoring programmes, residues of the maneb group were found most often (15.6 %* of all samples), followed by vinclozolin (3.7 %*), the benomyl group (2.0 %*), pirimiphos-methyl and iprodione (1.3 %* each).

The maneb group was found mainly in head cabbage, but also to a large extent in cucumbers and peas. 42 %* of all head cabbage samples, 11 %* of all cucumber samples and 7.2 %* of all pea samples contained residues of the maneb group. When evaluating the results for the maneb group in head cabbage it has to be considered that brassica vegetables generate carbon disulfide themselves, which would be analysed together with the carbon disulfide originating from dithiocarbamate residues. Some of the positive findings for the maneb group might be false positives, caused by the natural carbon disulfide content of head cabbage.

Residues of vinclozolin were found most often in peas (17 %* of all pea samples). Residues of the benomyl group were found most often in peas with 3.5 %* of the pea samples containing residues of the benomyl group. Residues of pirimiphos-methyl were found most often in rice (5.4 %* of all rice samples) and residues of iprodione in cucumbers (1.8 %* of all cucumber samples contained iprodione).

Residues of the maneb group exceeded MRLs most often (2.5 % of all samples), followed by the benomyl group (0.37 %), thiabendazol (0.29 %) and vinclozolin (0.27 %).

The MRL for the maneb group was exceeded most often in head cabbage (5.3 % of all head cabbage samples). The residues of the benomyl group exceeded the MRL most often on peas (3.5 % of all pea samples). Residues of thiabendazol and vinclozolin exceeded the MRL most often on head cabbage (1.2 % of the head cabbage samples for thiabendazol and 0.70 % for vinclozolin, respectively).

The maneb group and the benomyl group are the pesticides which are both most often found and for which MRLs (national or EC-MRLs) are most often exceeded.

Figures 5 and 6 illustrate the findings with regard to the 20 different pesticides. In Figures 5 and 6 the scale of the axis has been chosen in a way to that lower values appear clear enough, therefore the highest residues in both figures exceed the scale. However, to show the exact value, this value has been indicated as label above the column.

The highest residues found were 9.4 mg/kg maneb group on rice (EC-MRL: 0.05 mg/kg) and 6.0 mg/kg thiabendazole on head cabbage (EC-MRL: 5 mg/kg).

* Percentages include sum of samples with residues at or below the MRL and exceeding the MRL

Table 10: Results from the EU co-ordinated monitoring programme for pesticide residues for each pesticide analysed for in rice, cucumber, head cabbage and peas

| Pesticide | Total No. of samples | No. of samples without residues | No. of samples with residues below or at MRL | % | No. of samples with residues above MRL | % | Maximum residue found in mg/kg (commodity in which it was found and the EC-MRL in mg/kg) |
|---|---|---|---|---|---|---|---|
| **Acephate** | 3099 | 3092 | 4 | 0.13 | 3 | 0.10 | 0.3 (head cabbage, EC-MRL: 2) |
| **Benomyl group** | 2675 | 2622 | 43 | 1.6 | 10 | 0.37 | 2.0 (head cabbage, EC-MRL: 3) |
| **Chlorpyriphos** | 3437 | 3427 | 10 | 0.29 | 0 | 0 | 0.085 (head cabbage, EC-MRL: 1) |
| **Chlorpyriphos-methyl** | 3413 | 3411 | 2 | 0.06 | 0 | 0 | 0.040 (cucumber, EC-MRL: 0.05) |
| **Deltamethrin** | 3215 | 3199 | 16 | 0.50 | 0 | 0 | 0.86 (rice, EC-MRL: 1) |
| **Diazinon** | 3435 | 3429 | 4 | 0.12 | 2 | 0.06 | 0.05 (rice, EC-MRL: 0.05[16] |
| **Endosulfan** | 3318 | 3277 | 41 | 1.24 | 0 | 0 | 0.36 (head cabbage, EC-MRL: 1.0[17] |
| **Imazalil** | 2997 | 2993 | 3 | 0.10 | 1 | 0.03 | 0.70 (head cabbage, EC MRL: 0.02) |
| **Iprodione** | 3260 | 3217 | 43 | 1.32 | 0 | 0 | 0.80 (head cabbage, EC MRL: 5) |
| **Lambda-cyhalothrin** | 2858 | 2857 | 1 | 0.03 | 0 | 0 | 0.14 (head cabbage, EC MRL: 0.2) |
| **Maneb-group** | 2373 | 2002 | 311 | 13.1 | 60 | 2.5 | 9.4 (rice, EC-MRL: 0.05) |
| **Mecarbam** | 3064 | 3063 | 0 | 0 | 1 | 0.03 | 0.06 (rice, EC-MRL: 0.05) |
| **Metalaxyl** | 3101 | 3072 | 25 | 0.81 | 4 | 0.13 | 0.30 (head cabbage, EC MRL: 1) |
| **Methamidophos** | 3177 | 3153 | 24 | 0.76 | 0 | 0 | 0.39 (cucumbers, EC-MRL: 1) |

[16] 0.02 mg/kg from 1 July 2001

[17] 0.05 mg/kg from 1 July 2001

| Pesticide | Total No. of samples | No. of samples without residues | No. of samples with residues below or at MRL | % | No. of samples with residues above MRL | % | Maximum residue found in mg/kg (commodity in which it was found and the EC-MRL in mg/kg) |
|---|---|---|---|---|---|---|---|
| **Methidathion** | 3304 | 3303 | 0 | 0 | 1 | 0.03 | 0.025 (head cabbage, EC-MRL: 0.02) |
| **Permethrin** | 3266 | 3261 | 5 | 0.15 | 0 | 0 | 0.091 (head cabbage, EC-MRL: 1) |
| **Pirimiphos-methyl** | 3435 | 3389 | 46 | 1.3 | 0 | 0 | 1.6 (rice, EC-MRL:5) |
| **Thiabendazol** | 3142 | 3129 | 4 | 0.13 | 9 | 0.29 | 6 (head cabbage, EC MRL: 5) |
| **Triazophos** | 3001 | 3001 | 0 | 0 | 0 | 0 | Not found |
| **Vinclozolin** | 3315 | 3193 | 113 | 3.4 | 9 | 0.27 | 1.5 (head cabbage, EC-MRL:0.05) |

**Results of the 2000 co-ordinated exercise by pesticide:**

Fig. 5: Percentage of samples at or below MRL (national or EC) and
Fig. 6: Percentage of samples exceeding the MRL (national or EC)

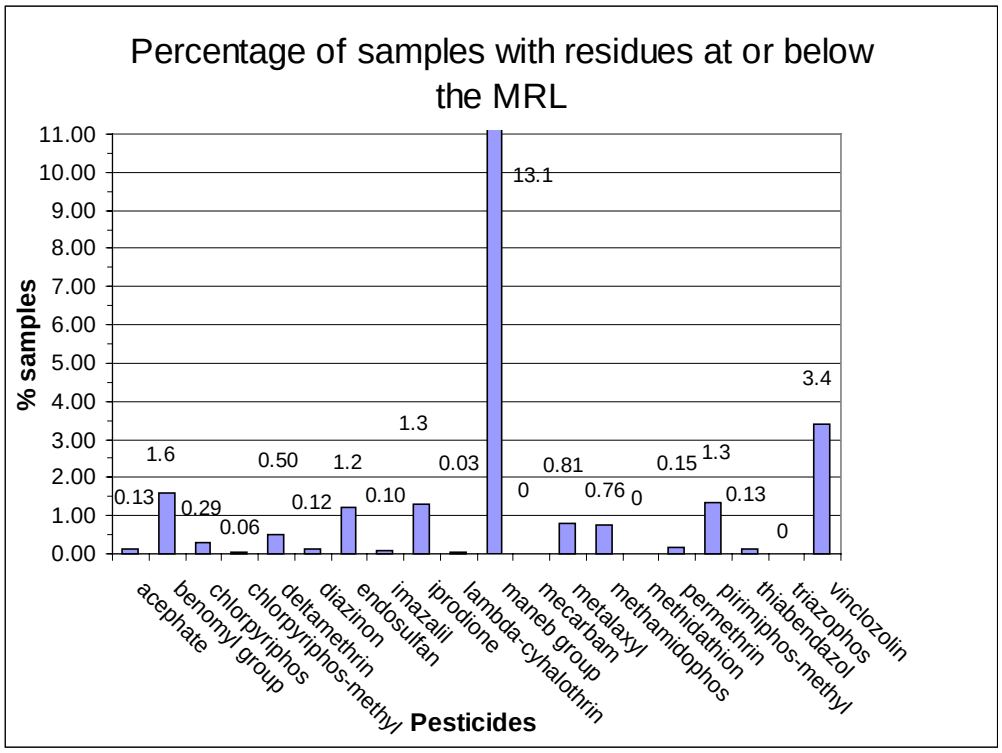


*Figure 5: Samples with residues at or below MRL (national or EC-MRL)*

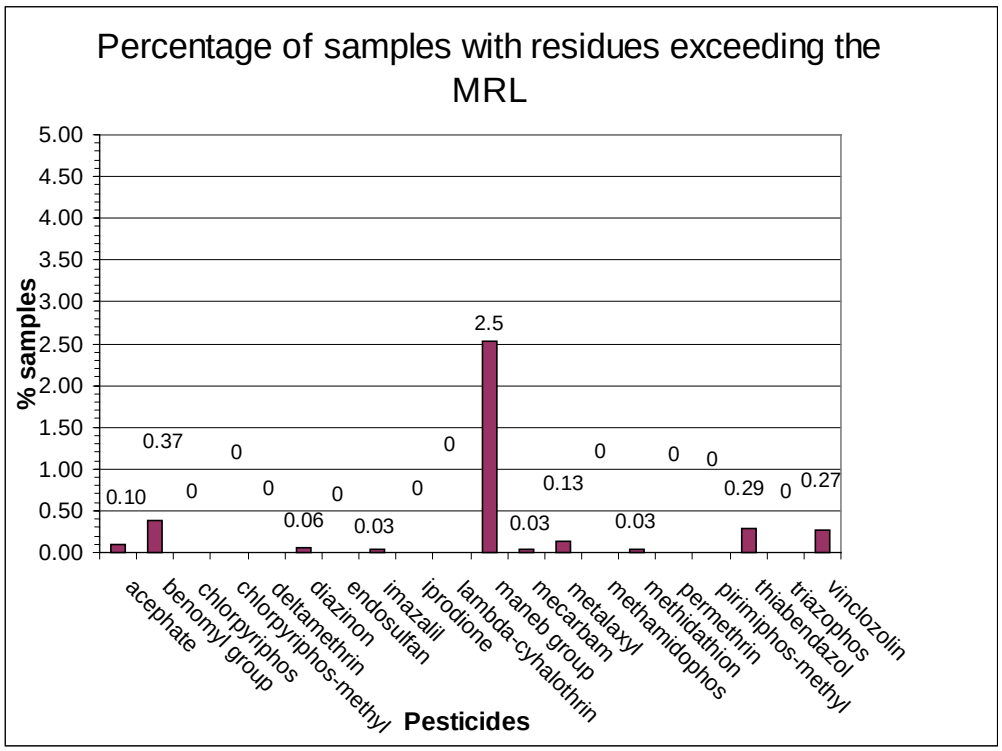


*Figure 6: Samples with residues exceeding the MRL (national or EC-MRL)*

Table 11: Presentation of the most important pesticide-commodity combinations where residues were found (in alphabetical order)

| Pesticides | Detected most often in[18] | MRL exceeded most often in |
|---|---|---|
| **Acephate** | **Head cabbage** (0.56 % of all head cabbage samples, 0.13 % of total samples, respectively) | |
| **Benomyl group** | **Cucumbers** (2.9 % of all cucumber samples, 0.93 % of total, respectively) | |
| | **Peas** (3.5 % of all pea samples, 0.75 % of total, respectively) | **Peas** (1.6 % of all pea samples, 0.34 % of total, respectively) |
| **Chlorpyriphos** | **Rice** (0.61 % of all rice samples, 0.15 % of total, respectively) | |
| **Chlorpyriphos-methyl** | Only 2 findings on cucumbers | |
| **Deltamethrin** | **Rice (**1.7 % of all rice samples, 0.37 % of total, respectively) | |
| **Diazinon** | **Rice (**0.48 % of all rice samples, 0.12 % of total, respectively) | **Rice (**0.34 % of all rice samples, 0.06 % of total, respectively) |
| **Endosulfan** | **Cucumbers** (3.3 % of all cucumbers, 1.1 % of total samples, respectively) | |
| **Imazalil** | **Cucumbers** (0.32 % of all cucumbers, 0.10 % of total samples, respectively) | |

[18] Percentages in this column include samples at or below the MRL and exceeding the MRL

| Pesticides | Detected most often in[18] | MRL exceeded most often in |
|---|---|---|
| **Iprodione** | **Cucumbers** (1.8 % of all cucumbers, 0.58 % of total samples, respectively) | |
| | **Head cabbage** (1.7 % of all head cabbage, 0.43 % of total samples, respectively) | |
| | **Peas** (1.3 % of all peas, 0.25 % of total samples, respectively) | |
| **Lambda-cyhalothrin** | Only one finding on head cabbage | |
| **Maneb group** | **Head cabbage** (42 % of all head cabbage, 9.9 % of total samples, respectively) | **Head cabbage** (5.3 % of all head cabbage, 1.3 % of total samples, respectively) |
| | **Cucumbers** (11 % of all cucumbers, 3.3 % of total samples, respectively) | **Cucumbers** (1.6 % of all cucumbers, 0.46 % of total samples, respectively) |
| | **Peas** (7.2 % of all peas, 3.0 % of total samples, respectively) | **Peas** (1.8 % of all peas, 0.42 % of total samples, respectively) |
| | | **Rice** (1.7 % of all rice samples, 0.38 % of total respectively) |
| **Mecarbam** | Only one finding on rice | |
| **Metalaxyl** | **Cucumbers** (2.0 % of all cucumbers, 0.68 % of total samples, respectively) | **Cucumbers** (0.38 % of all cucumbers, 0.13 % of total samples, respectively) |
| **Methamidophos** | **Cucumbers** (1.9 % of all cucumbers; 0.66 % of total samples, respectively) | |
| **Methidathion** | Only one finding on head cabbage | |

| Pesticides | Detected most often in[18] | MRL exceeded most often in |
|---|---|---|
| **Permethrin** | **Head cabbage** (0.36 % of all head cabbage, 0.092 % of total samples, respectively) | |
| | **Cucumbers** (0.19 % of all cucumbers, 0.061 % of total samples, respectively) | |
| **Pirimiphos-methyl** | **Rice (**5.4 % of all rice samples, 1.3 % of total, respectively) | |
| **Thiabendazole** | **Head cabbage** (1.4 % of all head cabbage samples, 0.35 % of total, respectively) | **Head cabbage** (1.2 % of all head cabbage samples, 0.29 % of total, respectively) |
| **Triazophos** | No findings | |
| **Vinclozolin** | **Peas** (17 % of all pea samples, 3.3 % of total, respectively) | |
| | **Head cabbage** (1.2 % of all head cabbage samples, 0.30 % of total, respectively) | **Head cabbage** (0.70 % of all head cabbage samples, 0.18 % of total, respectively) |

The most important pesticide-commodity combination where detectable residues were found (incl. those at or below the MRL and exceeding the MRL) was maneb group/head cabbage, maneb group/cucumbers, peas/vinclozolin, maneb group/peas and pirimiphos-methyl/rice. With regard to the findings of residues of the maneb group on head cabbage some comments have been made under chapter 5.2, page 24.

With regard to MRL exceedances the most important pesticide-commodity combinations were maneb group/head cabbage, maneb group/peas and maneb group/rice.

It is evident from Table 10 and 11 that the commodity where most often residues were detected and exceeded, and where the highest residues were found, was head cabbage.

Table 12 shows a comparative overview of pesticides found most often with residues at or below the MRL (national or EC-MRL) and pesticides exceeding MRLs (national or EC-MRLs) analysed on different commodities in 1998, 1999 and 2000.

When compared to both, the 1998 and the 1999 commodities, it can be stated that on the 2000 commodities residues of vinclozolin were detected more often than on the commodities of both previous years. Residues of chlorpyriphos-methyl and thiabendazole below or at the MRL and residues of methamidophos above the MRL were detected less often on the 2000 commodities than on both the 1998 and 1999 commodities.

When compared with the 1999 commodities only, residues of metalaxyl at or below MRL were detected more often and residues of two pesticides (endosulfane and pirimiphos-methyl at or below the MRL) were detected less often.

When compared to the 1998 commodities only, residues of the maneb group were detected more often. Residues of ten different pesticides[19]) were detected less often on the 2000 commodities, most of them with regard to the category "below or at MRL".

The pesticides analysed in 1998, 1999 and 2000 were the same.

Table 12: Comparison of pesticides found most often and pesticides exceeding MRLs (national or EC-MRLs) analysed on different commodities in 1998, 1999 and 2000

| **Commodities** | **Oranges, peaches, carrots, spinach (commodities analysed for in the 1998 programme)** | | **Cauliflower, peppers, wheat grains, melons (commodities analysed for in the 1999 programme)** | | **Rice, cucumbers, head cabbage, peas (commodities analysed for in the 2000 programme)** | |
|---|---|---|---|---|---|---|
| | **% samples with residues below or at MRL** | **% samples with residues above MRL** | **% samples with residues below or at MRL** | **% samples with residues above MRL** | **% samples with residues below or at MRL** | **% samples with residues above MRL** |
| Acephate | 0.23 | 0.21 | 0.70 | 0.41 | 0.13 | 0.10 |
| Benomyl group | 3.8 | 0.43 | 1.1 | 0.35 | 1.6 | 0.37 |
| Chlorothalonil | Not analysed | Not analysed | Not analysed | Not analysed | Not analysed | Not analysed |
| Chlorpyriphos | 7.3 | 0.29 | 0.74 | 0.05 | 0.29 | 0 |
| Chlorpyriphos-methyl | 0.83 | 0.06 | 2.4 | 0.07 | 0.06 | 0 |

[19] benomyl group, chlorpyriphos, chlorpyriphos-methyl, diazinon, imazalil, iprodione, lambda-cyhalothrin, mecarbam, methidathion, permethrin

| Commodities | Oranges, peaches, carrots, spinach (commodities analysed for in the 1998 programme) | | Cauliflower, peppers, wheat grains, melons (commodities analysed for in the 1999 programme) | | Rice, cucumbers, head cabbage, peas (commodities analysed for in the 2000 programme) | |
|---|---|---|---|---|---|---|
| | % samples with residues below or at MRL | % samples with residues above MRL | % samples with residues below or at MRL | % samples with residues above MRL | % samples with residues below or at MRL | % samples with residues above MRL |
| DDT | Not analysed | Not analysed | Not analysed | Not analysed | Not analysed | Not analysed |
| Deltamethrin | 0.38 | 0 | 0.58 | 0 | 0.50 | 0 |
| Diazinon | 1.1 | 0.10 | 0.34 | 0.02 | 0.12 | 0.06 |
| Endosulfan | 2.0 | 0.02 | 16.7 | 0.15 | 1.2 | 0 |
| Imazalil | 19 | 0.10 | 0.08 | 0.08 | 0.10 | 0.03 |
| Iprodion | 4.0 | 0.30 | 1.1 | 0 | 1.3 | 0 |
| Lambda-cyhalothrin | 0.61 | 0 | 0.22 | 0 | 0.03 | 0 |
| Maneb group | 5.5 | 2.1 | 10.4 | 1.1 | 13 | 2.5 |
| Mecarbam | 0.43 | 0 | 0.03 | 0 | 0 | 0.03 |
| Metalaxyl | 1.4 | 0.02 | 0.03 | 0.08 | 0.81 | 0.13 |
| Methamido-phos | 0.52 | 0.36 | 1.0 | 8.8 | 0.76 | 0 |
| Methidathion | 6.6 | 0.02 | 0.08 | 0.18 | 0 | 0.03 |
| Permethrin | 0.59 | 0.15 | 0.23 | 0 | 0.15 | 0 |
| Pirimiphos-methyl | 0.89 | 0 | 6.2 | 0.05 | 1.3 | 0 |
| Thiabendazol | 10 | 0.15 | 1.1 | 0.57 | 0.13 | 0.29 |
| Triazophos | 0.07 | 0.02 | 0 | 0.06 | 0 | 0 |
| Vinclozolin | 0.81 | 0.41 | 0.54 | 0 | 3.4 | 0.27 |

## 5.3. Evaluation by commodity

Tables 12 and 13 give an overview over the findings in the different commodities. With regard to all four commodities investigated, about 17 % of the samples contained residues of pesticides at or below the MRL (national or EC-MRL), and 2.7 % above the MRL (2.6 % for EC-MRLs, 0.1 % for national MRLs) (Table 13). Residues at or below the MRL were found most often in head cabbage (24 %), followed by peas (20 %), cucumbers (16 %) and rice (8.7 %). MRLs (including national or EC-MRLs) were exceeded most often in head cabbage (4.9 %), followed by peas (3.0 %), rice (1.7 %), and cucumbers (1.4 %).

In those results no differentiation is made with regard to findings of several pesticides in the same sample, that means a sample where two different pesticides were found would be counted just as one finding with detectable residues in Table 13.

Supplementary to that, Table 14 shows the residues found in individual determinations, that means the findings with regard to every single pesticide. In this table a sample where two different pesticides were found would be counted as two findings with detectable residues. In this table the order of findings is different from Table 13. Residues of a specific pesticide at or below the MRL (national or EC-MRL) were found most often in head cabbage (1.6 %), followed by peas (1.3 %), cucumber (1.0 %) and rice (0.5 %). This corresponds to the results in Table 13. Pesticide residues exceeding the MRL were found most often in head cabbage (0.30 %), followed by peas (0.18 %), rice (0.09 %) and cucumbers (0.08 %). This also corresponds to the results in Table 13.

It can be concluded that head cabbage and peas were the commodities on which pesticide residues were most often found at or below the MRL and where MRLs (national or EC-MRLs) were most often exceeded.

Table 13: Residues found in the four commodities analysed in the EU co-ordinated monitoring programme

| | **Number of samples analysed** | **Without detectable residues** | **%** | **With residues below or at MRL (national or EC-MRL)** | **%** | **With residues above MRL (national or EC-MRL)** | **%** |
|---|---|---|---|---|---|---|---|
| **Rice** | 869 | 778 | 90 | 76 | 8.7 | 15 | 1.7 |
| **Cucumber** | 1176 | 972 | 83 | 187 | 16 | 17 | 1.4 |
| **Head cabbage** | 962 | 682 | 71 | 233 | 24 | 47 | 4.9 |
| **Peas** | 730 | 566 | 78 | 142 | 20 | 22 | 3.0 |
| **SUM** | 3737 | 2998 | 80 | 638 | 17 | 101 | 2.7 |

Table 14: Residues found in individual determinations (ind. det.) in the four commodities analysed in the EU co-ordinated monitoring programme

| | **Total number of ind. det.** | **Number of ind. det. without residues** | **Number of ind. det. with residues below or at MRL (national or EC)** | **%** | **Number of ind. det. where a residue exceeded the MRL (national or EC)** | **%** |
|---|---|---|---|---|---|---|
| **Rice** | 13929 | 13843 | 73 | 0.5 | 13 | 0.09 |
| **Cucumber** | 20717 | 20500 | 200 | 1.0 | 17 | 0.08 |
| **Head cabbage** | 15807 | 15499 | 260 | 1.6 | 48 | 0.30 |
| **Peas** | 12432 | 12248 | 162 | 1.3 | 22 | 0.18 |
| **SUM** | 62885 | 62090 | 695 | 1.1 | 100 | 0.16 |

## 5.4. Evaluation by country

With regard to the twenty pesticides and the four commodities of the co-ordinated programme, residues at or below the MRL (national or EC-MRL) were found in 17 % of the samples. In 2.7 % of the samples these residues exceeded MRLs (national or EC-MRLs). Differences between countries can result e.g. from different sampling approaches (relation of surveillance sampling and follow-up enforcement sampling), amounts of samples analysed for pesticides that are most likely to be found, and reporting levels (cf. chapter 4.1). Table 15 shows the results sorted by country and Figure 7 illustrates those results.

Table 15: Residues of pesticides in the four commodities as analysed in the EU Member States and EEA States

| | **Number of samples analysed** | **Without detectable residues** | **%** | **With residues below or at MRL (national or EC-MRL)** | **%** | **With residues above MRL (national or EC-MRL)** | **%** |
|---|---|---|---|---|---|---|---|
| **B** | 163 | 128 | 79 | 21 | 13 | 14 | 8.6 |
| **DK** | 107 | 103 | 96 | 3 | 2.8 | 1 | 0.9 |
| **D** | 1018 | 628 | 62 | 334 | 33 | 56 | 5.5 |
| **EL** | 173 | 126 | 73 | 34 | 20 | 13 | 7.5 |
| **E** | 174 | 152 | 87 | 21 | 12 | 1 | 0.6 |
| **F** | 240 | 192 | 80 | 43 | 18 | 5 | 2.1 |
| **IRL** | 49 | 45 | 92 | 4 | 8.2 | 0 | 0 |
| **I** | 314 | 290 | 92 | 24 | 7.6 | 0 | 0 |
| **L** | 60 | 48 | 80 | 10 | 17 | 2 | 3.3 |
| **NL** | 178 | 161 | 90 | 17 | 9.6 | 0 | 0 |
| **A** | 49 | 42 | 86 | 7 | 14 | 0 | 0 |
| **P** | 266 | 234 | 88 | 25 | 9.4 | 7 | 2.6 |
| **FIN** | 178 | 150 | 84 | 28 | 16 | 0 | 0 |
| **S** | 249 | 235 | 94 | 14 | 5.6 | 0 | 0 |
| **UK** | 289 | 247 | 86 | 41 | 14 | 1 | 0.3 |
| **Norway** | 165 | 155 | 94 | 10 | 6.1 | 0 | 0 |
| **Iceland** | 17 | 17 | 100 | 0 | 0 | 0 | 0 |
| **Liech-tenstein** | 48 | 45 | 94 | 2 | 4.2 | 1 | 2.1 |
| **Total** | **3737** | **2998** | **80** | **638** | **17** | **101** | **2.7** |

**Evaluation of the results of the 2000 co-ordinated exercise by country:**
Percentage of samples without detectable residues, with residues at or below MRL (national or EC-MRL) and with residues exceeding the MRL (national or EC-MRL)

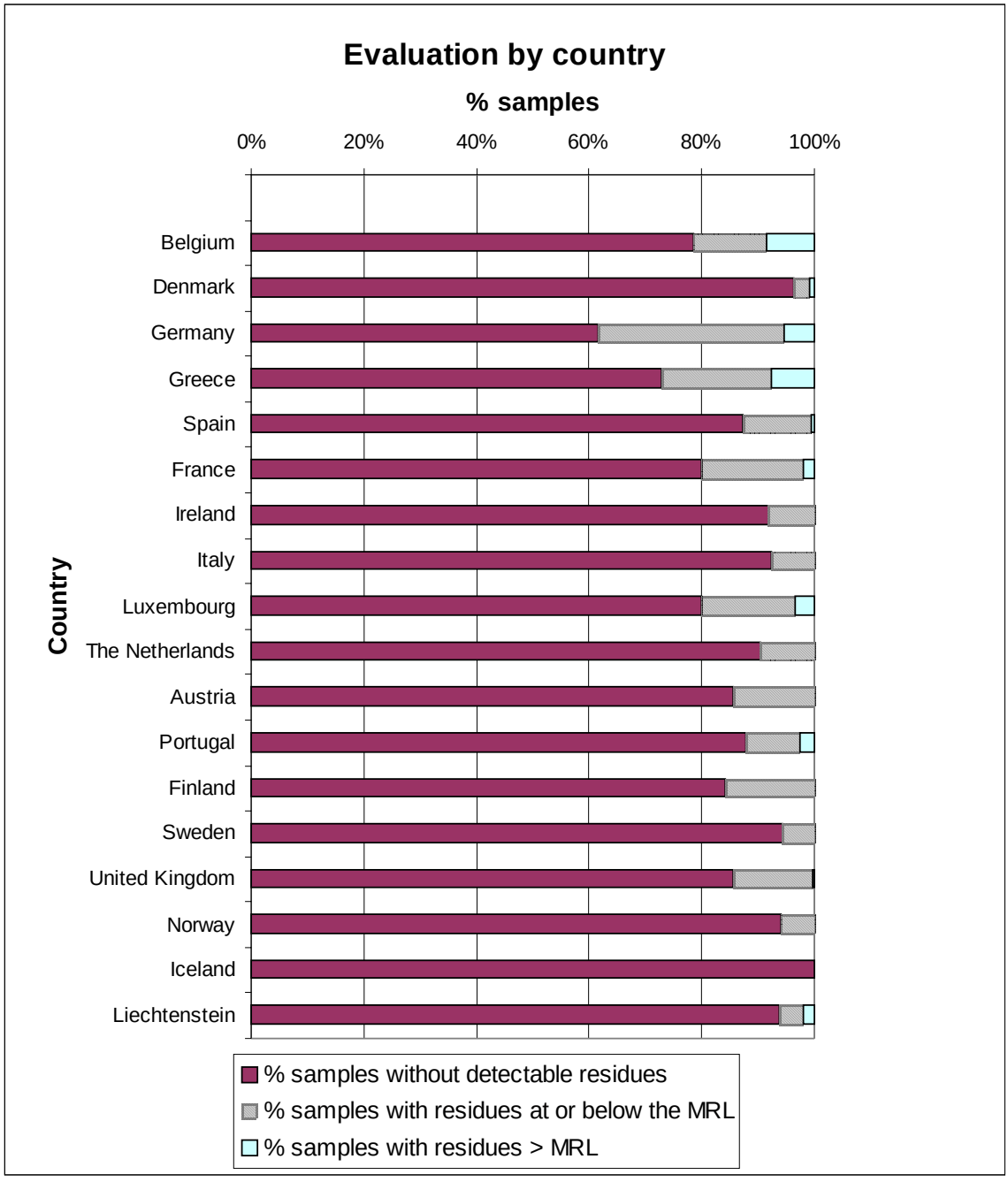


*Figure 7: Percentage of samples without residues, with residues at or below the MRL and with residues exceeding the MRL sorted by country*

## 5.5. Homogeneity exercise

In 2000 for the second time a special exercise was carried out to determine the distribution of pesticide residues in the individual sample units taken from commercial trade, which form part of the analytical sample (composite sample). The residue contents in the individual sample units can differ. This may be partly due to the fact that they do or do not originate from the same producer and therefore may or may not have had the same sample treatment history. But differences can also occur in sample units from the same producer as Tables 16 and 17 show. In order to get an idea of the variability of the single units (and therefore of the homogeneity of the composite monitoring sample) the participating countries were required to carry out this exercise for a pesticide, possibly posing an acute risk. In 2000 methamidophos on cucumbers and/or chlormequat on pears were the recommended pesticide-commodity combinations. It was recommended to take two samples of an appropriate number of items, analyse the first sample as composite sample after mixing the items and, in case of detectable residues in the composite sample, to analyse then the single items of the second sample. The participating countries were also required to give information whether the single units of a sample were taken from a single producer.

The homogeneity of the composite monitoring sample was expressed by calculating a factor, which was called “homogeneity factor” or “factor for the homogeneity of the sample” in order to clearly distinguish this factor from the variability factor (υ) obtained from supervised field trials. The homogeneity factor indicates the variability of the single items’ results of a composite monitoring sample, taken in commercial trade. It was calculated in the same way as the variability factor for supervised field trials is usually calculated, by division of the maximum value of the single items' results by the mean value of the single items' results.

Four out of eighteen countries delivered data for the exercise methamidophos/cucumbers. In two countries all the composite samples were negative (below the reporting limit) and no further single items were analysed. Finally, only five composite samples from two countries could be used to calculate the homogeneity factor. In these five composite samples, between three and six single items were analysed. Table 16 shows the results obtained.

Five countries analysed the combination chlormequat/pears. In one country all the composite samples were negative and no further single items were analysed. In the other four countries between one and ten composite samples were taken and, within each sample, 5 - 10 single items were analysed. Table 17 shows the results obtained.

One country analysed the combination methamidophos/peppers, which was required in the 1999 exercise. The results are not reported here.

The distribution of the homogeneity factors obtained in the composite samples analysed unit-to-unit in the participating countries is illustrated in Figures 8 and 9.

Table 16: Results of the homogeneity exercise for methamidophos in cucumber in four countries

| Country | Commodity/ pesticide analysed | Number of composite samples analysed | Number of single units analysed in each composite sample | Homogeneity factor of each composite sample | Average homogeneity factor | Minimum homogeneity factor | Maximum homogeneity factor | Max. residue found in a single unit (mg/kg) | Samples taken from single producer |
|---|---|---|---|---|---|---|---|---|---|
| **EL** | Cucumber/ methamidophos | 3 | 3-5 | 1) 1.5<br>2) 2.9<br>3) 2.4 | 2.3 | 1.5 | 2.9 | 0.81 | Yes |
| **L** | Cucumber/ methamidophos | 1 | None, composite sample below reporting limit | -- | -- | -- | -- | -- | No |
| **S** | Cucumber/ methamidophos | 2 | 6 | 1) 3.7<br>2) 1.7 | 2.7 | 1.7 | 3.7 | 1.0 | Unknown |
| **Liechtenstein** | Cucumber/ methamidophos | 6 | None, composite sample below reporting limit | -- | -- | -- | -- | -- | No |
| **All 4 countries** | | Range: 1-6<br>Sum: 12 | Range: 3-6 | 2.4 (Average) | -- | 1.5 | 3.7 | Max.: 1.0 | Differs |

*Homogeneity factor of the one sample analysed

Table 17: Results of the homogeneity exercise for chlormequat in pears in five countries

| Country | Commodity/ pesticide analysed | Number of composite samples analysed | Number of single units analysed in each composite sample | Homogeneity factor of each composite sample | Average homogeneity factor | Minimum homogeneity factor | Maximum homogeneity factor | Max. residue found in a single unit (mg/kg) | Samples taken from single producer |
|---|---|---|---|---|---|---|---|---|---|
| **B** | Pears/ chlormequat | 10 | 10 | 1) 1.6<br>2) 1.5<br>3) 2.4<br>4) 2.1<br>5) 2.7<br>6) 1.5<br>7) 1.6<br>8) 1.9<br>9) 1.8<br>10) 1.8 | 1.9 | 1.5 | 2.7 | 9.9 | Yes |
| **I** | Pears/ chlormequat | 1 | 5 | 1) 2.8 | 2.8* | n.a. | n.a. | 0.66 | Yes |
| **FIN** | Pears/ chlormequat | 1 | 10 | 1) 1.6 | 1.6* | n.a. | n.a. | 1.9 | No information |
| **Norway** | Pears/ chlormequat | 8 | 6-10 | 1) 1.7<br>2) 1.4<br>3) 1.7<br>4) 1.9<br>5) 3.2<br>6) 1.4<br>7) 1.7<br>8) 1.5 | 1.8 | 1.4 | 3.2 | 2.8 | No |
| **Liechtenstein** | Pears/ chlormequat | 8 | None, composite sample below reporting limit | | -- | -- | -- | -- | -- |
| **All 5 countries** | | Range: 1-10<br>Sum: 28 | Range: 5-10 | 1.9 (Average) | -- | Min.: 1.4 | Max.: 3.2 | Max.: 9.9 | Differs |

* Homogeneity factor of the one sample analysed

n.a. not applicable, since only one sample was analysed

**2000 Homogeneity exercise for methamidophos in cucumbers in two countries:**

Homogeneity factors calculated for 5 composite samples, analysed unit-to-unit in two participating countries (in two other countries the residues of the composite sample were below the reporting limit).

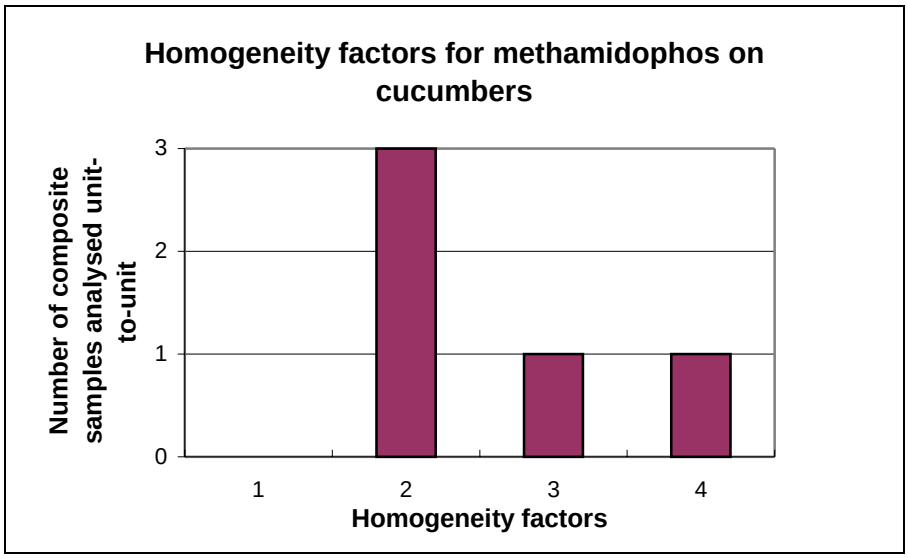


*Figure 8: Homogeneity factors for methamidophos on cucumbers, results of 5 composite samples, analysed unit-to-unit in two countries*[20]

As demonstrated in Table 16 the average factor for the homogeneity of the sample obtained by the two countries, which delivered single unit data, was 2.4. The minimum homogeneity factor was 1.5, the maximum homogeneity factor was 3.7. The highest residue found in a composite sample was 0.38 mg/kg. The maximum residue found in a single unit was 1.0 mg/kg.

[20] Column 1 (homogeneity factor 1) includes all homogeneity factors from 0.5 up to 1.4.
Column 2 (homogeneity factor 2) includes homogeneity factors from 1.5 up to 2.4, respectively. The same scheme applies for columns 3 and 4.

**2000 Homogeneity exercise for chlormequat in pears in four countries:**

Homogeneity factors calculated for 20 composite samples, analysed unit-to-unit in four participating countries (in one other country the residues of the composite sample were below the reporting limit).

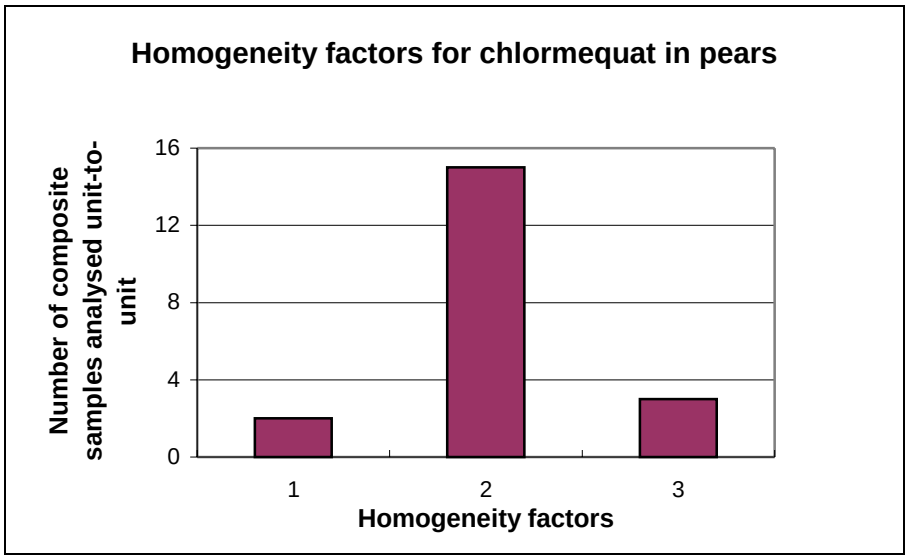


*Figure 9: Homogeneity factors for chlormequat in pears, results of 20 composite samples, analysed unit-to-unit in four countries*[21]

As demonstrated in Table 17 the average factor for the homogeneity of the sample obtained by the four countries, which delivered single unit data, was 1.9. The minimum homogeneity factor was 1.4, the maximum homogeneity factor was 3.2. The highest residue found in a composite sample was 4.8 mg/kg. The maximum residue found in a single unit was 9.9 mg/kg.

## 5.6. Exposure assessment

### *5.6.1. Chronic risk*

To estimate the chronic risk to the consumer of consuming the commodities investigated in the EU co-ordinated programme, calculations can be done based on consumption figures from the World Health Organisation (Standard European Diet). A realistic exposure assessment for those pesticides representing a chronic risk should not be carried out with the highest residues found, but more correctly with the average residues or, to consider worst case conditions, on basis of the 90th percentile[22]. The 90th percentile of the amount of residues found in the monitoring exercise is the value below which 90 % of the values are situated, including those

[21] The grouping of the homogeneity factors to the columns has been done as explained in footnote 20 (Figure 8)
[22] WHO/FSF/FOS/97.7, p. 14

samples with no detectable residues (see calculation example in the footnote)[23]. The risk assessment was carried out for an adult with an average bodyweight of 60 kg. The intake of a specific pesticide via a specific commodity was calculated and compared with the ADI. The results (as percentage of ADI) are given in Table 18.

Table 18: Exposure assessment for the chronic risk from the dietary intake of pesticide residues (based on the 90th percentile), calculated for an adult (60 kg bodyweight), in those commodities of the co-ordinated programme in which the highest residues of the respective pesticides were found, and where the 90th percentile was above 0.01 mg/kg

| **Compound** | **Food item** | **90th percentile** (mg pesticide / kg commodity) | **ADI**[24] (mg pesticide / kg body weight | **Average consump-tion** (kg commodity / day)[25] | **Intake via specific commodity** (mg pesticide / day / kg body weight)[26] | **Intake in % of the ADI** |
|---|---|---|---|---|---|---|
| **Acephate** | Head cabbage | ≤ 0.01 | 0.03 | -- | -- | -- |
| **Benomyl group** | Head cabbage | ≤ 0.01 | 0.03[27] | -- | -- | -- |
| **Chlorpyriphos** | Head cabbage | ≤ 0.01 | 0.01 | -- | -- | -- |
| **Chlorpyriphos-methyl** | Cucumber | ≤ 0.01 | 0.01 | -- | -- | -- |
| **Deltamethrin** | Rice | ≤ 0.01 | 0.01 | -- | -- | -- |
| **Diazinon** | Rice | ≤ 0.01 | 0.002 | -- | -- | -- |
| **Endosulfan** | Head cabbage | ≤ 0.01 | 0.006 | -- | -- | -- |
| **Imazalil** | Head cabbage | ≤ 0.01 | 0.03 | -- | -- | -- |
| **Iprodione** | Head cabbage | ≤ 0.01 | 0.06 | -- | -- | -- |
| **Lambda-cyhalothrin** | Head cabbage | ≤ 0.01 | -- | -- | -- | -- |

[23] Example: the 90th percentile for the content of residues of the maneb group in head cabbage is to be determined: 564 samples were analysed in total in the EU and EEA States, out of which 328 samples contained no detectable residues. 159 samples showed different residue contents, categorised in 7 categories (cat.1: up to 0.01 mg/kg, cat. 2: 0.011-0.020 mg/kg, cat. 3: 0.021-0.050 mg/kg, cat. 4: 0.051-0.1 mg/kg, cat. 5: 0.11-0.2 mg/kg, cat. 6: 0.21-0.5 mg/kg). 40 further samples showed contents between 0.51 and 1.0 mg/kg (cat. 7). 90 % of all values would comprise 564*0.9=507.6 samples. Since 328 samples are without residues and 159 samples have residue contents between the reporting limit and 0.5 mg/kg, the 507th /508th sample falls within the 40 samples of category 7 (0.51-1.0 mg/kg). Because of the categorised reporting format the exact 90th percentile value can not be given, but the 90th percentile can be given as ≤ 1.0 mg/kg as the upper limit of category 7 is 1.0 mg/kg.

[24] WHO/PCS/2000.1

[25] Standard European Diet of the World Health Organization

[26] Calculated only if the 90th percentile is above the general reporting limit of 0.01 mg/kg of the agreed format

[27] ADI of carbendazim, as this pesticide has the lowest ADI of the three pesticides (carbenazim, benomyl, thiophanate-methyl) detected as carbendazim

| | | | | | | |
|---|---|---|---|---|---|---|
| **Maneb-group** | Rice | ≤ 0.01 | 0.03/ 0.007[28] | -- | -- | -- |
| | Cucumber | ≤ 0.05 | | 0.0090 | 0.00000750 | 0.025/ 0.107 |
| | Head cabbage | ≤ 1.0 | | 0.0268 | 0.000447 | 1.5/ 6.4 |
| **Mecarbam** | Rice | ≤ 0.01 | 0.002 | -- | -- | -- |
| **Metalaxyl** | Head cabbage | ≤ 0.01 | 0.03 | -- | -- | -- |
| **Methamidophos** | Cucumber | ≤ 0.01 | 0.004 | -- | -- | -- |
| **Methidathion** | Head cabbage | ≤ 0.01 | 0.001 | -- | -- | -- |
| **Permethrin** | Head cabbage | ≤ 0.01 | 0.05 | -- | -- | -- |
| **Pirimiphos-methyl** | Rice | ≤ 0.01 | 0.03 | -- | -- | -- |
| **Thiabendazol** | Head cabbage | ≤ 0.01 | 0.1 | -- | -- | -- |
| **Triazophos** | Not found | -- | -- | -- | -- | -- |
| **Vinclozolin** | Head cabbage | ≤ 0.01 | 0.01 | -- | -- | -- |
| | Peas | ≤ 0.05 | | 0.0101 | 0.00000842 | 0.084 |

As shown by the results in Table 18 the intake of pesticide residues does not exceed the ADI in any case. It is below a percentage of 6.4 % of the ADI for all pesticides. The exposure ranges from 0.025 % of the ADI for the maneb group on cucumber (calculated with the group ADI of 0.03 for maneb, mancozeb, metiram, zineb) to 6.4 % of the ADI for the maneb group on head cabbage (calculated with the ADI 0.007 for propineb).

### *5.6.2. Acute risk*

Currently, there is no universally accepted methodology for evaluating risks from acute exposure. However, as an example, the acute risk can be evaluated by using the UK Consumer Exposure Model, where an exposure assessment is carried out based on the 97.5th percentile of consumption[29]. That means, in order to include consumers with a high consumption of specific commodities, a large portion value is used. The 97.5th percentile is the value below which the consumption of 97.5 % of all consumers is situated. For the 2000 co-ordinated programme, the evaluation of the acute risk was carried out for those pesticides which have acute toxicity and where acute Reference Doses (acute RfDs) have been set. The highest residue found in a composite sample was used in this calculation. In order to consider worst case conditions a default variability factor of seven[30], taking into account unit-to-unit variability of single units, was used for the medium sized crops with a unit weight ≤ 250 g (e.g. cucumber). For head cabbage (unit weight > 250 g) a default variability factor of five has been used. On the basis of those data an exposure assessment for an adult of 70.1 kg and a toddler of 14.5 kg have been carried out and the intake of the specific pesticide via a specific

[28] Group ADI for maneb, mancozeb, metiram, zineb: 0.03; ADI for propineb: 0.007

[29] UK 1998, Technical Policy on the Estimation of Acute Dietary Intakes of Pesticide Residues, AAHL/3/1998, 13 January 1998, PSD, York

[30] 2000 Joint FAO/WHO meeting on Pesticide Residues, Geneva 20-29 September 2000, p.15

commodity was compared with the acute Reference Dose (acute RfD). The results are shown in Table 19.

For methamidophos on cucumbers additional calculations have been performed: As calculated in Table 19 under b) the average homogeneity factor of 2.4 (as determined in the homogeneity exercise, chapter 5.5) has been used for the highest residue in a composite sample (0.38 mg/kg). Additionally, under c) in Table 19 the highest residue found in a single unit (1.02 mg/kg) has been used without homogeneity factor.

Table 19: Exposure assessment for the acute risk from the pesticides investigated in the 2000 co-ordinated programme for the products with the highest residues found in a composite sample in the European Union. The calculation was performed with the UK Consumer Exposure Model for an adult (70.1 kg) and a toddler (14.5 kg) and only those pesticides which have acute toxicity and where an acute Reference Dose has been set.

| **Compound** | **Food item** | **Maximum residue found in a composite sample** (mg pesticide / kg commodity | **acute Reference Dose** (mg pesticide / kg body weight | **97.5th percentile of consumption** (kg commodity / day)[31] | **Homo-geneity factor** | **Intake via specific commodity** (mg pesticide / day / kg body weight) | **Intake in % of the acute Reference Dose** |
|---|---|---|---|---|---|---|---|
| **Chlorpyri-phos** | Head cabbage | 0.085 | 0.1 | 0.318 (adult)/ 0.086 (toddler) | 5 | 0.00192 (adult) | 1.9 (adult) |
| | | | | | | 0.00252 (toddler) | 2.5 (toddler) |
| **Deltamethrin** | Rice | 0.86 | 0.05 | 0.103 (adult)/ 0.056 (toddler) | none | 0.00126 (adult) | 2.5 (adult) |
| | | | | | | 0.00332 (toddler) | 6.6 (toddler) |
| **Diazinon** | Rice | 0.05 | 0.03 | 0.103 (adult)/ 0.056 (toddler) | none | 0.000073 (adult) | 0.24 (adult) |
| | | | | | | 0.000193 (toddler) | 0.39 (toddler) |
| **Endosulfan** | Head cabbage | 0.36 | 0.02 | 0.318 (adult)/ 0.086 (toddler) | 5 | 0.00817 (adult) | 40.8 (adult) |
| | | | | | | 0.01068 (toddler) | 53.4 (toddler) |
| **Methidathion** | Head cabbage | 0.025 | 0.01[32] | 0.318 (adult)/ 0.086 (toddler) | 5 | 0.000567 (adult) | 5.7 (adult) |
| | | | | | | 0.000741 (toddler) | 7.4 (toddler) |

[31] Consumer Exposure Model, UK
[32] WHO/PCS/2000.1

| Compound | Food item | Maximum residue found in a composite sample (mg pesticide / kg commodity | acute Reference Dose (mg pesticide / kg body weight | 97.5th percentile of consumption (kg commodity / day)[33] | Homo-geneity factor | Intake via specific commodity (mg pesticide / day / kg body weight) | Intake in % of the acute Reference Dose |
|---|---|---|---|---|---|---|---|
| **Methamido-phos** | Cucum-bers | a) 0.38 (max. residue in composite sample) | ADI: 0.004[34] | 0.084 (adult)/ 0.072 (toddler) | 7 | 0.00319 (adult) | 79.7 (adult) |
| | | | | | | 0.01321 (toddler) | 330.2 (toddler) |
| | | b) 0.38 (max. residue in composite sample) | | | 2.4 | 0.0011 (adult) | 27.3 (adult) |
| | | | | | | 0.00453 (toddler) | 113.2 (toddler) |
| | | c) 1.02 (max. residue in a single unit) | | | none | 0.0012 (adult) | 30.6 (adult) |
| | | | | | | 0.00506 (toddler) | 126.6 (toddler) |

As Table 19 shows the intakes for the highest residues in a composite sample for **chlorpyriphos, deltamethrin, diazinon, endosulfan and methidathion** are all well below the acute RfD for adults. They range between 0.24 % of the acute RfD for diazinon (rice) and 41 % of the acute RfD for endosulfan (head cabbage). For toddlers the intakes range between 0.39 % of the acute RfD for diazinon (rice) and 53 % of the acute RfD for endosulfan (head cabbage).

For **methamidophos** on cucumbers the intake has been calculated as 80 % of the acute RfD for adults and as 330 % of the acute RfD for toddlers with the UK consumer exposure model when using the highest residue found in a composite sample (0.38 mg/kg) and a default homogeneity factor of 7 (Example a)) as a worst case scenario. A second calculation has been carried out using the data experimentally collected in the homogeneity exercise (chapter 5.5) with the mean homogeneity factor of 2.4 (Example b)). In this case the intake is 27 % of the acute RfD for adults and 113 % of the acute RfD for toddlers. Thirdly, when calculated with the highest residue found in a single unit (1.02 mg/kg) and without homogeneity factor the intake is 31 % of the acute RfD for adults and 127 % for toddlers (Example c)).

[33] Consumer Exposure Model, UK

[34] The Scientific Committee on Plants, in its opinion of 14 July 1998, states that in the absence of an acute RfD for methamidophos the ADI of 0.004 mg/kg bw could be used as acute RfD based on the toxicological data summarised in the 1990 JMPR Monograph

The data show that calculations b) (with experimental homogeneity factor and max. residue in composite sample) and c) (calculation with max. residue in a single unit and without homogeneity factor) give results which correspond well to each other and which are both considerably lower than the worst case calculation with the default homogeneity factor 7. This underlines the importance of carrying out experimental studies to determine more realistic homogeneity factors and suggests that both scenarios b) and c) are more suitable for dietary intake calculations than the default factor 7. However, it must be noted here that in these experimentally collected data only results of five composite samples from two countries are included.

In all those calculations the intake of methamidophos via cucumbers exceeds the acute RfD for toddlers, but not for adults. However, it has to be borne in mind that this calculation was performed with a default value of 0.004 mg/kg as acute Reference Dose (in accordance with the ADI of 0.004 mg/kg bw), since a finally established acute Reference Dose is not yet available. Nevertheless, the data for methamidophos on cucumbers show that there is some reason for concern and that there might be a health risk, especially for vulnerable groups, such as young children.

## 6. SAMPLING

Commission Directive 79/700/EEC established sampling methods for the official control of pesticide residues in and on fruit and vegetables. Member States are supposed to follow these methods for their pesticide residue monitoring. Table 20 shows the information given in the summaries of the national monitoring reports of the Member States and EEA States on sampling. In most cases, sampling followed national plans that were often established taking into consideration consumption, production, imported and exported products and risks (e.g. results from previous years).

Table 21 shows the distribution of domestic/imported samples and the relation of the number of samples taken to the population size. The relation of domestic and imported samples should reflect the situation in the respective Member State. In total (EU and EEA States) about 57 % of the samples were domestic samples, 37 % were imported samples (incl. those from other EU Member States) and 6.9 % were of unknown origin. Most of the samples of unknown origin were analysed in Italy (3044 samples, corresponding to 37 % of the total of Italian samples). More detailed information can be found in the summaries of the national monitoring reports in Annex 1.

Samples were taken at different points, such as wholesalers and retailers, local and central markets, points of entry (for imported products), and processing industries.

Table 20: Summary on sampling by the national authorities (information taken from the one-page summaries)

| Country | Summary on sampling |
|---|---|
| **B** | Sampling was carried out mostly according to Commission Directive 79/700/EEC, at auctions, importers, wholesalers, processors and exceptionally in retail. The sampling plan took account of average consumption, production figures, results of previous years, analytical and budgetary possibilities and other useful information. |
| **DK** | The sampling plan took account of dietary consumption, production, import data and monitoring results from previous years. The samples were taken mainly at wholesalers and importers, domestic samples also at producers and shops. |
| **D** | Samples were taken at the level of producers, manufacturers, wholesalers, retailers and restaurants, according to a national sampling protocol published as official legal regulation. |
| **EL** | Samples were randomly taken from points of entry, wholesalers, retailers and farm gates. |
| **E** | Samples were taken from domestic crops at production and wholesalers level, following Directive 79/700/EEC. Samples were taken proportional to production, taking into account the EU co-ordinated programme and specific actions with regard to certain crops. |
| **F** | Sampling follows Directive 79/700/EEC. Crops or processed food were sampled at production, wholesalers and retailers. Sampling took into account the dietary patterns, the EU co-ordinated programme, previous results and specific action with regard to particular crops. |
| **IRL** | Samples are taken mainly from imported fruit, vegetables and cereals. Some domestic fruit and vegetables were sampled. |
| **I** | Samples were taken at random on the market and based on foreign and domestic production. |
| **L** | Samples were taken at central markets. Imported products were sampled at wholesaler level. The sampling plan was based on a rolling annual plan. Sampling was done mostly according to Directive 79/700/EEC. |
| **NL** | Both domestic and non-domestic products were sampled, according to the situation on the market. Sampling is directed relatively more to products, where previous results indicated MRL violations. Directive 79/700/EEC (as transposed into national law) was respected. |
| **A** | Sampling was based on a nation-wide sampling plan, taking into account data concerning dietary consumption, production and import of fruit and vegetables, results of former measurements and budgetary capacities. |
| **P** | Samples were mainly collected at wholesale outlets and wholesalers warehouses. Only a minor fraction was taken at retail outlets. Cereals were generally sampled at milling plants and frozen vegetables at processing plants. A small fraction of samples was taken at farm gate. |

| Country | Summary on sampling |
|---|---|
| **FIN** | Imported samples were taken by customs inspectors from wholesalers, domestic samples were collected from farms or retail shops. The sampling procedure of Directive 79/700/EEC was followed as far as practicable. |
| **S** | The number of samples collected of each food was roughly proportional to the food's consumption rate. |
| **UK** | The sampling plan was based on a main commodity-rolling programme, taking into account levels of consumption, information on possible levels of residues and the need to ensure that a wide range of commodities is included. Codex Alimentarius guidelines were followed where practicable. |
| **Norway** | Samples were taken mainly at wholesalers. The sampling of major food commodities reflects partly the average consumption patterns. However, during the last years an increasing number of samples have been taken of dietary less important food items (e.g. exotic fruit and vegetables from third countries), since a high percentage of exceedances has been found in those food items. |
| **Iceland** | Samples are taken at wholesaler's warehouses. Sampling is focused on imported products mainly since fruits for commercial purposes are not grown in Iceland and a great part of vegetables are imported. |
| **Liech-tenstein** | The sampling plan is based on domestic production and the ESA[35] co-ordinated programme. Samples are taken at farms, food processing plants, storage facilities and retailers, mostly in accordance with Directive 79/700/EEC. |

[35] EFTA Surveillance Authority

Table 21: Number and origin of the samples taken by country (**sum of surveillance and follow-up enforcement samples**, **sum of fresh (incl. frozen)** fruit, vegetables and **processed** products

| Country | Total number of samples taken | Number of inhabitants per country[36] | Samples taken per 100 000 inhabitants | No. of domestic samples taken | % from total sample number | No. of imported samples taken[37] | % from total sample number | No. of samples with unknown origin | % from total sample number |
|---|---|---|---|---|---|---|---|---|---|
| **B** | 1393 | 10 239 085 | 14 | 1039 | 75 | 309 | 22 | 45 | 3.2 |
| **DK** | 1762 | 5 330 020 | 33 | 682 | 39 | 1080 | 61 | 0 | 0 |
| **D** | 5478 | 82 163 475 | 7 | 2428 | 44 | 3050 | 56 | 0 | 0 |
| **EL** | 1633 | 10 542 808 | 15 | 1174 | 72 | 459 | 28 | 0 | 0 |
| **E** | 6512 | 39 441 679 | 17 | 6512 | 100 | 0 | 0 | 0 | 0 |
| **F** | 4324 | 59 225 683 | 7 | 2909 | 67 | 1415 | 33 | 0 | 0 |
| **IRL** | 251 | 3 776 577 | 7 | 54 | 22 | 197 | 79 | 0 | 0 |
| **I** | 8320 | 57 679 895 | 14 | 4460 | 54 | 816 | 9.8 | 3044 | 37 |
| **L** | 175 | 435 700 | 40 | 20 | 11 | 155 | 89 | 0 | 0 |
| **NL** | 2743 | 15 863 950 | 17 | 1363 | 50 | 1380 | 50 | 0 | 0 |
| **A** | 932 | 8 102 557 | 12 | 529 | 57 | 403 | 43 | 0 | 0 |
| **P** | 899 | 9 997 590 | 9 | 650 | 72 | 232 | 26 | 17 | 1.9 |
| **FIN** | 2505 | 5 171 302 | 48 | 564 | 23 | 1941 | 78 | 0 | 0 |
| **S** | 3409 | 8 861 426 | 38 | 1101 | 32 | 2308 | 68 | 0 | 0 |
| **UK** | 1575 | 59 623 406 | 3 | 822 | 52 | 753 | 48 | 0 | 0 |
| **Norway** | 2907 | 4 478 497 | 65 | 1183 | 41 | 1724 | 59 | 0 | 0 |
| **Iceland** | 320 | 279 048 | 115 | 52 | 16 | 268 | 84 | 0 | 0 |
| **Liechtenstein** | 75 | 28 000 | 268 | 59 | 79 | 16 | 21 | 0 | 0 |
| **Total** | **45213** | **381 240 698** | **12** | **25601** | **57** | **16506** | **37** | **3106** | **6.9** |

[36] Eurostat, New Cronos database, Population figures for 1 January 2000

[37] Including samples from other EU Member States

## 7. QUALITY ASSURANCE

Council Directive 90/642/EEC, as amended by Council Directive 97/41/EC, requires Member States to control maximum residue levels according to Council Directives 89/397/EEC and 93/99/EEC. This also means that laboratories have to comply with the European Standard EN 45001[38] and that Member States are requested to assess the laboratories by applying the criteria as laid down in European Standard EN 45002. Member States shall also apply proficiency testing schemes where appropriate.

Commission Recommendation 2000/43/EC suggests that Member States, in the 2000 monitoring reports, provide information about the details of accreditation of the laboratories which carry out the analyses for the monitoring exercise and about the criteria applied in establishing quality assurance measures in those laboratories. It also requires the countries contributing to the monitoring to provide the accreditation certificates. Quality assurance measures have been developed and it has been recommended that these should be respected for the 2000 EU co-ordinated monitoring programme. Workshops on Analytical Quality Control (WAQC) are regularly held in order to review these measures. Proficiency tests, supported by the European Commission, are also regularly organised (so far three proficiency tests have been organised, the last was carried out in 1999).

The European Commission's Monitoring Regulation No. 645/2000 (cf. chapter 2), in force since April 2000, ensures the financial contribution of the European Commission to the organisation of proficiency tests and Analytical Quality Control workshops. It also confirms and further specifies the requirements for accreditation of monitoring laboratories and their participation in proficiency tests. This Regulation was applicable for most of the year 2000.

Table 22 and Figures 9 - 11 give an overview of the situation regarding accreditation of monitoring laboratories and participation in proficiency tests. Table 22 is a summary of the information provided by all participating countries in their short written summaries (cf. Annex 1 for further details) and in Table G of the guidance document SANCO 701/2000.

As shown in Table 22 and Figures 9 – 11, in some countries all monitoring laboratories have achieved accreditation for the most important pesticide-commodity combinations, but in other countries laboratories are still in the preparatory phase or only some of the laboratories are accredited. Figures 9 and 11 show that only about 61 % of the countries (11 out of 18), participating in the monitoring exercise, have accredited their laboratories, about 17 % (3 out of 18) have accredited some of their laboratories and there are still about 22 % of the countries (4 out of 18) being in the preparatory phase for accreditation. However, from 1997 to 2000 the number of countries with accreditation of all the monitoring laboratories has increased, whereas the number of countries with accreditation of only some laboratories has decreased. The number of countries with no accreditation has decreased in 2000 from 5 to 4 and is back to the level of 1998. In 1999 the number increased due to the new participant Iceland. It has to be considered that the participating countries have changed from 16 in 1997 to 17 in 1999 and 18 in 2000, so that the total number of countries was not constant during the last years.

In the EU and EEA States in total 45 213 samples (sum of fresh and processed products) were analysed. About 30 300 samples (67 %) were analysed by laboratories accredited for the most important pesticide-commodity combinations, about 1 300 samples (2.9 %) by laboratories

[38] Now ISO 17025

accredited for only some pesticide-commodity combinations and about 13 600 (30 %) by not accredited laboratories. This is illustrated in Figure 10.

In conclusion two thirds of the samples were analysed by laboratories which were accredited for the most important pesticide-commodity combinations, whereas one third was analysed by laboratories either accredited only for some pesticide-commodity combinations or not accredited at all.

The breakdown of the samples analysed by accredited/not accredited laboratories by country is shown in Figure 11.

**Status of laboratory accreditation: Percentage of countries with accreditation of all, of some or of none of the monitoring laboratories in 2000 compared to previous years:**

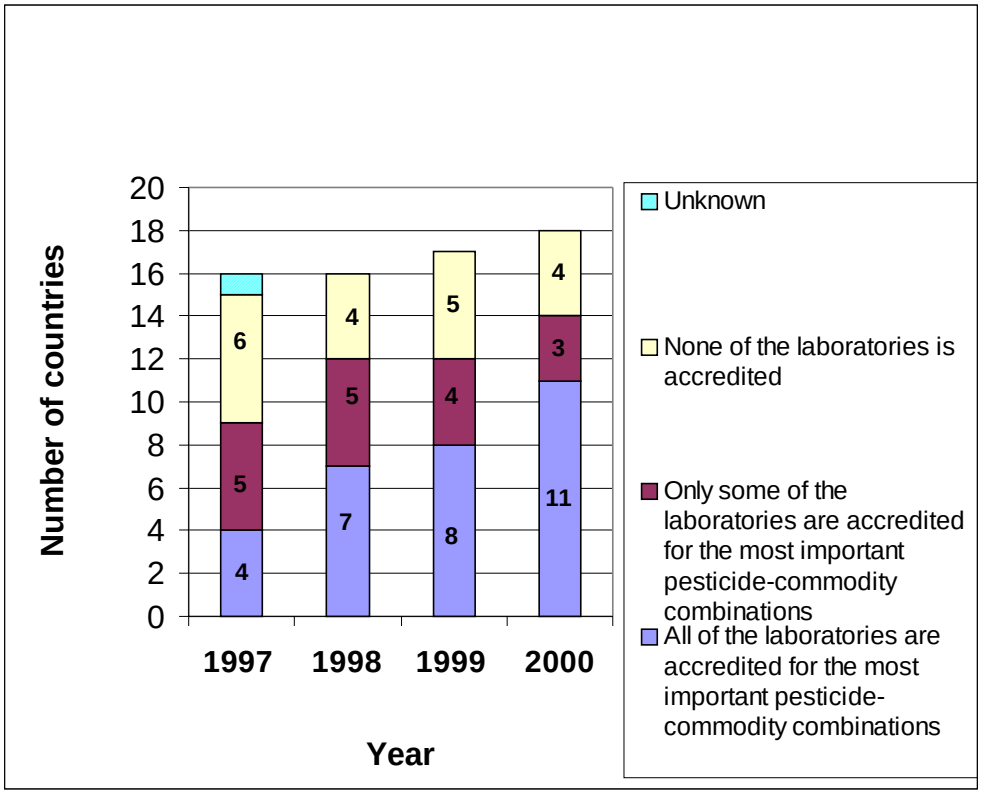


*Figure 9: Number of countries with accreditation of all monitoring laboratories, of some monitoring laboratories and of none of the monitoring laboratories*

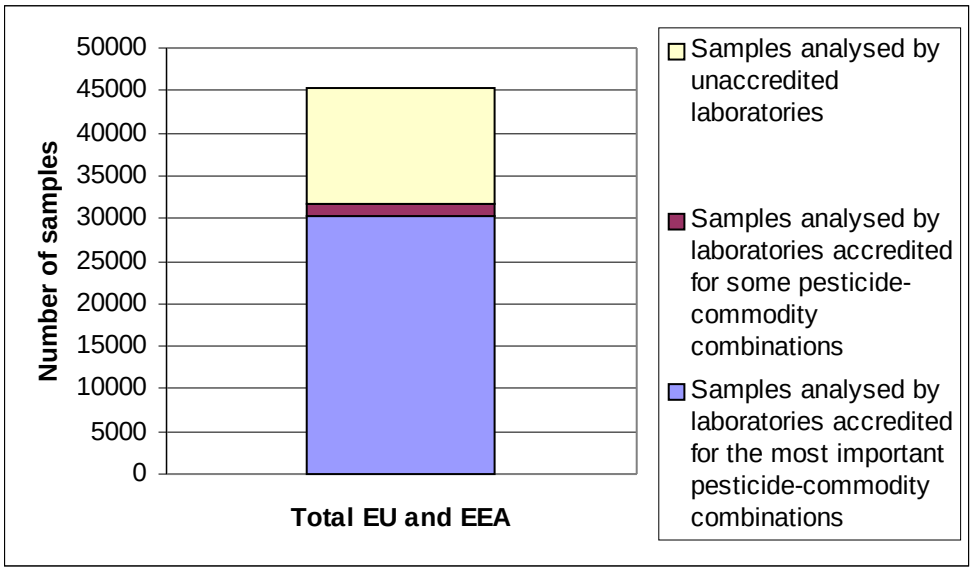


*Figure 10: Numbers of samples analysed by laboratories accredited for the most important pesticide-commodity combinations, accredited for only some pesticide-commodity combinations or by not accredited laboratories in the EU and EEA States in the year 2000*

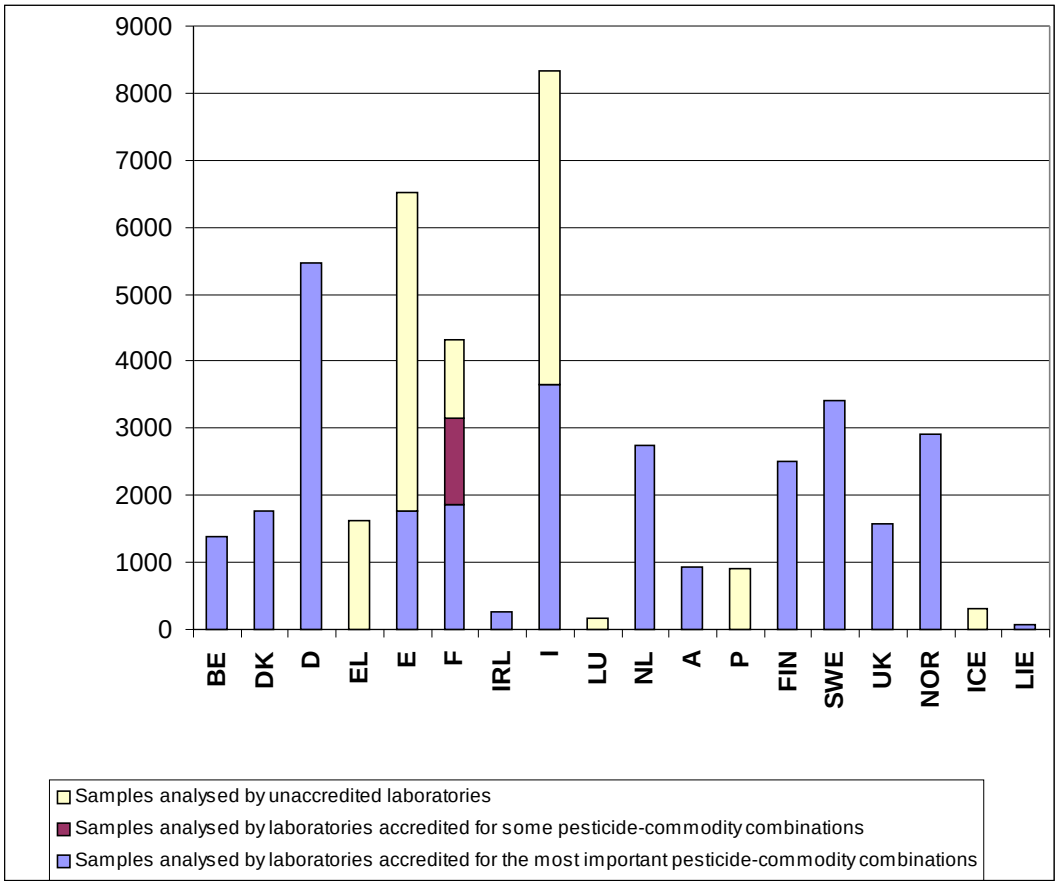


*Figure 11: Numbers of samples analysed by laboratories accredited for the most important pesticide-commodity combinations, accredited for only some pesticide-commodity combinations or by not accredited laboratories by country in the year 2000*

Apart from the information on accreditation of laboratories Table 22 also gives an overview on other laboratory quality issues, such as the implementation of the EU QC procedures and the participation in proficiency tests. 15 out of 18 countries reported on this issue, 3 countries did not give any specific information. According to this information, 10 out of the 15 reporting countries have fully implemented at least 60 % of the EU QC procedures. The remainder of the QC procedures is partly implemented in most of the countries.

All the 15 reporting countries took also part in proficiency tests in 2000. Since no EU proficiency test was organised in 2000 the most often used proficiency test scheme was FAPAS[39] (11 countries took part in some of the FAPAS rounds in 2000). Some countries took also part in other nationally organised proficiency tests.

Table 22: Accreditation, participation in proficiency tests and implementation of the EU Quality Control Procedures of the pesticide residue laboratories

* not applicable, because not yet accredited

| Country | No. of laboratories | Accreditation | Accreditation certificates provided | Participation in proficiency tests | Implementation of EU Quality Control Procedures (QC procedures) |
|---|---|---|---|---|---|
| **B** | 4 (2 main labs performing approx. 95 % of all analyses + 1 lab analysing copper in organic products and 1 lab analysing chlormequat only) | The 2 major laboratories were accredited for the most important analytical methods and commodities and accreditation was gradually extended, the two other labs are also accredited for the analyses they perform | Yes | In 2000 one of the two main labs took part in FAPAS | All four laboratories have implemented at least 70 % of the QC procedures |

[39] Food analysis performance assessment scheme, a proficiency testing scheme organised by the UK

| Country | No. of laboratories | Accreditation | Accreditation certificates provided | Participation in proficiency tests | Implementation of EU Quality Control Procedures (QC procedures) |
|---|---|---|---|---|---|
| **DK** | 3 (1 main lab performing approx. 83 % of all analyses) | Accredited by DANAK | Yes | In 2000 FAPAS participation by two of the three labs, Proficiency tests on the GC multi-residue method, imazalil and thiabendazol | QC procedures have been applied to some extent for all methods; LCL concept not yet implemented for all multi methods; mass selective confirmation applied for part of the GC multi-method and for specialised methods with cereals; at least 70 % of QC procedures implemented |
| **D** | 49 | Accredited | No | No information | No information |
| **EL** | 5 | In preparatory phase | --* | No information | QC procedures are followed as close as possible, e.g. matrix matched standards, bracketing |
| **E** | 13 | 3 ENAC accredited laboratories (doing approx. 30 % of the analyses), the others are in advanced phase of accreditation | Yes | Proficiency test by Almería university | No information |

| Country | No. of laboratories | Accreditation | Accreditation certificates provided | Participation in proficiency tests | Implementation of EU Quality Control Procedures (QC procedures) |
|---|---|---|---|---|---|
| **F** | 6 | 2 laboratories, which performed around 43 % of the analyses, are fully accredited by COFRAC, one laboratory, performing approx. 30 % of the anaylses is partly accredited (for benzimidazoles and benomyl group), the others are not accredited | Yes | All laboratories were involved in some proficiency tests with BIPEA (4 rounds per year), one participated in FAPAS | At least 80 % of the QC procedures are implemented |
| **IRL** | 1 | The laboratory was accredited in December 2000, but operated to the standard ISO 17025 for most of the year 2000 | Yes | FAPAS for pesticides in fruit and vegetables | QC procedures are taken into account; 40 % of the QC procedures are fully implemented, 60 % are partly implemented |
| **I** | 60 | 17 laboratories out of 60 are accredited, performing approx. 45 % of the analyses | No | About 30 laboratories took part in Italian proficiency tests organised by ISS for olive oil | No information |
| **L** | 1 | In preparatory phase for accreditation | --* | Collaborative study organised by German Society of Food Chemistry | 10 % of QC procedures fully implemented, 70 % partly implemented, 20 % not implemented |
| **NL** | 1 | Accredited | Yes | FAPAS | Approx. 80 % of QC procedures fully implemented, 20 % partly implemented |
| **A** | 5 | Accredited | Yes | FAPAS, WHO | At least 80 % of QC procedures implemented |

| Country | No. of laboratories | Accreditation | Accreditation certificates provided | Participation in proficiency tests | Implementation of EU Quality Control Procedures (QC procedures) |
|---|---|---|---|---|---|
| **P** | 4 | None of the laboratories accredited yet | --* | One of the labs participated in FAPAS | Different status of the QC procedure implementation in the 4 laboratories, between 10 % and 60 % of the QC procedures are fully implemented, the main laboratory who does approx. 70 % of the analyses has fully implemented 60 % of the QC procedures fully and partly implemented 40 %. |
| **FIN** | 2 | Accredited | Yes | Main laboratory took part in FAPAS (multi-residue method) | At least 60 % of the QC proceudres are fully implemented, 40 % are partly implemented |
| **S** | 1 contracted laboratory | Accredited by SWEDAC for all methods used | Yes | Three inter-laboratory comparison studies on chlormequat (NL), prochloraz (Norway), dicofol (S) | At least 60 % of the QC procedures are fully implemented, 40 % are partly implemented |
| **UK** | 3 | Accredited | Yes | FAPAS, one lab GLP, one lab NAMAS | Fully implemented by all laboratories |
| **Norway** | 1 | Accredited | Yes | FAPAS (5 rounds), prochloraz, chlormequat | Approx. 80 % of the QC procedures fully implemented, 20 % partly implemented |
| **Iceland** | 1 | In preparatory phase | --* | FAPAS | No information |

| Country | No. of laboratories | Accreditation | Accreditation certificates provided | Participation in proficiency tests | Implementation of EU Quality Control Procedures (QC procedures) |
|---|---|---|---|---|---|
| **Liechtenstein** | 1 | Accredited | --* | No information | Approx. 90 % of QC procedures implemented |

## 8. RAPID ALERT SYSTEM

The Rapid Alert System for Food and Feed (RASFF) was established by Council Directive 92/59/EEC[40] on General Product Safety[41].

Products entailing a serious and immediate risk to the health and safety of the consumer are classified as ALERT notifications according to Article 8 of Directive 92/59/EEC. The notifying Member State informs the Commission, which then notifies this to the contact points in all Member States. After receiving an ALERT notification, Member States should take appropriate action.

Notifications which do not fulfil the requirements laid down in Article 8 of Council Directive 92/59/EEC on General Product Safety, but which are nevertheless regarded as important information, are forwarded by the Commission to the contact points in the Member States as information notifications (NON-ALERTS).

In 2000, seven ALERTs and 27 NON-ALERTS were notified. Six of the ALERTS came from Member States and one from a third country. With regard to the NON-ALERTS three came from Member States and 24 from third countries. One ALERT coming from a Member State and 11 NON-ALERTS from third countries related to herbs and spices. The ALERTS from Member States related to chlormequat (3), dicofol + parathionmethyl (1), methamidophos (1) and roxymidone + heptenophos (1). The one ALERT from a third country related to monocrotophos.

However, the notification criteria are at the discretion of the Member States and vary considerably between Member States. In order to give guidance to Member States a guidance document "Proposal on how to notify pesticide residues in foodstuffs in the Rapid Alert System for Foodstuffs" has been developed by the Commission (document SANCO/3346/2001).

The rapid dissemination of information via the RASFF plays an important role in the Member States' planning of monitoring programmes, since it allows to identify at an early stage specific problems and to adapt the sampling programmes accordingly, if necessary.

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[40] Official Journal No. L 228, 11/08/1992 p. 0024 - 0032

# 9. SUMMARY

## 9.1. National Monitoring programmes

All fifteen Member States and the EFTA States, who signed the EEA agreement[42] (Norway, Iceland and Liechtenstein), monitored pesticide residues in foodstuffs of plant origin. Overall, some 45 000 samples were analysed for, on average, 151 different pesticides. About 96 % of the samples analysed were fresh (incl. frozen) fruit, vegetables and cereals, about 4 % were processed products.

In 35 % of the fruit, vegetable and cereal samples and processed products, residues of pesticides at or below the MRL (national or EC-MRL) were detected. In 4.3 % of all samples, residues above the MRL (national or EC-MRL) were found. 61 % of the samples contained no pesticide residues. When only fresh products are considered the percentage of MRL exceedances changes to 4.5 % instead of 4.3 %.

Compared to previous years the percentage of fruit, vegetable and cereal samples with no detectable residues has remained at about the same level (60 – 61 %), except for 1999 where this figure increased to 64 %. The percentage of samples exceeding MRLs (national or EC-MRLs), however, has increased over the years 1996 to 2000 from 3.0 % in 1996 to 4.5 % in 2000. At the same time the percentage of samples with residues at or below the MRL (national or EC-MRL) has decreased slightly from 37 % in 1996 to 35 % in 2000 (in 1999 this figure was lower (32 %))[43].

The trend of decreasing percentages of samples with multiple residues in fresh fruit, vegetables and cereals which was shown from 1996 to 1998 was not continued in 1999 and 2000, where the percentages of samples with multiple residues rose from 14 % in 1999 to 15 % in 2000. In particular the percentage of samples with four or more residues was higher than in the years before (2.8 % in 2000 compared to 2.0 – 2.3 % in 1997 – 1999).

It is important to note that, when comparing the results of the years 1996 to 2000 some precaution is necessary. It has to be taken into account that the data have not been collected under exactly the same conditions. Differences existed in a number of factors, e.g. in the number of participating countries, which rose from 16 to 18, in the design and priorities set for the national programmes (the sampling may have been more or less targeted towards specific problems), in the total number of samples taken, in the legislation (more harmonised EU-MRLs have been set over the years, national MRLs may have changed), as well as in the enhanced analytical possibilities of the laboratories.

The increase in samples exceeding the MRL for example, is likely to be partly linked to factors such as changes in MRLs set to lower limits, more sensitive analytical methods, a broader spectrum of analytes sought and a better information flow within the EU via the

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[41] This Directive will be repealed by Directive 2001/95/EC of the European Parliament and of the Council of 3 December 2001 on general product safety from 15 January 2004

[42] Agreement on the European Economic Area

[43] All the percentages given in the comparison of this paragraph relate to fresh fruit, vegetables and cereals only, since in the years 1996-1999 no processed products were analysed.

Rapid Alert System for Food and Feed (RASFF). The RASFF is an important element in the transmission of information from country to country and allows for an early identification of potential problems in Member States and Third Countries. It therefore facilitates adjustments of programmes and sampling priorities in the Member States towards a more targeted approach to specific problems.

The majority of the most frequently found pesticides were the same as in the previous years. However, mainly as a result of a changed procedure for reporting of the ten most frequently found pesticides in 2000 compared to 1996-1999, residues detected by single residue methods (i.e. chlormequat, inorganic bromide, orthophenylphenol) were more prevalent on the top ten list than in the years before.

## 9.2. EU co-ordinated monitoring programme

In a special co-ordinated programme, four commodities (rice, cucumbers, head cabbage and peas) were analysed for twenty different pesticides. In this programme, about 3 700 samples were analysed. However, not every sample was analysed for all twenty pesticides. In 17 % of the samples, residues of one of the twenty pesticides were found below or at the MRL (national or EC-MRL), and in 2.7 % of the samples MRLs (national or EC-MRLs) were exceeded.

In this co-ordinated programme residues of one of the twenty pesticides at or below the MRL were found most often in head cabbage (24 %), followed by peas (20 %), cucumbers (16 %) and rice (8.7 %). Residues exceeding the MRL were found most often in head cabbage (4.9 %), followed by peas (3.0 %), rice (1.7 %) and cucumbers (1.4 %).

Of the twenty pesticides under the co-ordinated programme, residues of the maneb group were found most often (16 %), followed by vinclozolin (3.7 %), the benomyl group (2.0 %), pirimiphos-methyl and iprodione (1.3 % each).[44]

Residues of the maneb group exceeded MRLs most often (2.5 %), followed by the benomyl group (0.37 %), thiabendazol (0.29 %) and vinclozolin (0.27 %). The highest residue found in a composite sample in this co-ordinated programme was 9.4 mg maneb group/kg rice. The most important pesticide-commodity combinations where detectable residues have been found at or below the MRL and above the MRL were maneb group/head cabbage[45], maneb group/cucumbers, vinclozolin/peas, maneb group/peas and pirimiphos-methyl/rice. With regard to MRL exceedances the most important pesticide-commodity combinations were maneb group/head cabbage, maneb group/peas and maneb group/rice.

Chronic exposure assessments demonstrate that ADI[46] values were not exceeded for these pesticide/commodity combinations. For methamidophos/cucumbers several calculations for acute exposure were done using the highest residue found in a composite sample and different homogeneity factors, as well as using the highest residue found in an individual unit without homogeneity factor. In all cases the ARfD[47] was exceeded for toddlers, but not for adults. The calculations show that for methamidophos on cucumbers there was some reason for concern. However, it has to be borne in mind that there is currently no scientifically established ARfD

[44] Percentages in this paragraph include sum of samples with residues at or below the MRL and exceeding the MRL
[45] this was commented under chapter 5.2, p. 24
[46] Acceptable Daily Intake
[47] Acute Reference Dosis

for methamidophos available and that therefore worst case conditions based on the ADI have been used for calculation.

## 9.3. Quality assurance and sampling

Samples for the national and the EU co-ordinated programmes were taken at different points such as retailers, wholesalers, markets, points of entry and processing industries. National sampling plans exist in most countries, taking into consideration e.g. consumption data, production figures, import/export relation and risks (e.g. results from previous years).

Accreditation of laboratories has been completed in only some of the countries, whereas in other countries accreditation has been achieved only for a part of the laboratories. Although there was some progress in 2000 compared to 1999 in the accreditation status of laboratories, there were only 11 out of 18 countries (about 60 %) which have accredited all of their laboratories. The remaining 7 countries (about 40 %) have either accredited some but not all of their laboratories or are still in the preparation phase for accreditation.

With regard to the monitoring samples (national and EU programmes) taken in the EU and EEA States about two thirds were analysed by laboratories, which were accredited for the most important pesticide-commodity combinations, whereas about one third was analysed by laboratories which either were accredited for only some pesticide-commodity combinations or not accredited at all.

However, it can also be stated that considerable improvements have been made in the EU and EEA States with the implementation of the EU QC procedures. In the majority of the participating countries at least 60% of the EU QC procedures have been fully implemented, the remaining 40 % are partly implemented in most of the countries.

15 countries reported that they took part in proficiency tests in 2000. No information is available for the remaining 3 countries. Since in 2000 no EU proficiency test was organised, most countries took part in schemes such as FAPAS[48] or in nationally organised proficiency tests.

[48] Food analysis performance assessment scheme, a proficiency testing scheme organised by the UK