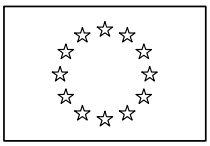

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Monitoring of Pesticide Residues

in Products of Plant Origin

in the European Union, Norway, Iceland and Liechtenstein

2006

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ABBREVIATIONS & SPECIAL TERMS USED IN THE REPORT

ADI	Acceptable Daily Intake
ARfD	Acute Reference Dose
EEA	European Economic Area
EFSA	European Food Safety Authority
EU	European Union
FAPAS	Food Analysis Proficiency Assessment Scheme
GAP	Good Agricultural Practice
JMPR	Joint FAO/WHO Meetings for Pesticide Residues
LOQ	Limit of Quantification
MRL	Maximum Residue Level
RASFF	EU Rapid Alert System for Food and Feed

1. INTRODUCTION

This is a report on pesticide residues monitoring for the calendar year 2006 in the 25 Member States of the EU and the three EFTA States who have signed the EEA agreement[1] (Norway, Iceland and Liechtenstein).

The report gives an overview of the monitoring data on pesticide residues. More detailed information about the situation in individual States is available from the respective national monitoring authorities. To complement the data, Member States and the EEA States contribute a short summary (two pages) for inclusion in this document (see Annex 2). Pesticide residues in foodstuffs of animal origin, as regulated in Council Directive 86/363/EEC[2], are not covered by this report.

2. LEGAL BASIS

In Council Directives 76/895/EEC[3], 86/362/EEC[4] and 90/642/EEC[5], as amended, maximum levels are fixed for pesticide residues in and on products of plant origin[6]. Directives 86/362 and 90/642 require Member States to check regularly the compliance of foodstuffs with maximum residue levels (MRLs). In 2006, inspections and monitoring had to be carried out in accordance with the provisions of Regulation (EC) No 882/2004 of the European Parliament and of the Council of 29 April 2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare[7]. Sampling methods have been specified in Commission Directive 2002/63/EC[8] establishing Community methods of sampling for the official control of pesticide residues in and on products of plant and animal origin and repealing Directive 79/700/EEC.

In addition to national monitoring programmes, the Commission recommended, via Commission Recommendation 2006/26/EC[9], the participation of each Member State in a specific EU co-ordinated monitoring programme. These programmes began in 1996. Their aim is to work towards a system which makes it possible to estimate actual dietary pesticide exposure throughout Europe. The monitoring programme was designed as a rolling programme covering major pesticide-commodity combinations in a series of cycles. A first 5-year cycle was completed in 2000. Subsequently, the time span of the cycles was reduced to 3 years in order to have a picture of the dietary intake situation after a shorter period of time. The first 3-year cycle was completed in 2003. This 2006 report is the last report of the second 3-year cycle. The choice of commodities includes the major components of the Standard European Diet of the World Health Organisation.

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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 340, 09/12/1976, p. 0026 - 0031

[4] Official Journal No L 221, 07/08/1986 p. 0037 - 0042

[5] Official Journal No L 350, 14/12/1990 p. 0071 - 0079

[6] Directives 76/895/EEC, 86/362/EEC, and 90/642/EEC were repealed by Regulation (EC) No 396/2005 of the European Parliament and of the Council of 23 February 2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC (OJ L 70, 16/03/05, p. 0001 – 0016) with effect from 2 September 2008.

[7] Official Journal No L 165, 30/04/2004. Corrected and re-published in OJ L 191, 28/05/2004 p. 0001 – 0052).

[8] Official Journal No L 187, 16/07/2002 p. 0030 - 0043

[9] Official Journal No L 019, 24/01/2006, p. 0023 – 0029

Article 7 of Council Directive 86/362/EEC and Article 4 of Council Directive 90/642/EEC 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 common format for the reports on the Community programme was agreed in document SANCO/10216/2006. The Commission is required to compile and collate the information, annually.

Commission Regulation (EC) No 645/2000[10] provides for detailed implementing rules for the monitoring provisions of Directives 86/362/EEC and 90/642/EEC.

3. MAXIMUM RESIDUE LEVELS (MRL), ACCEPTABLE DAILY INTAKES (ADI) AND ACUTE REFERENCE DOSES (ARFD)

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

- minimise the exposure of consumers to the harmful 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 within the EU of products treated with pesticides as long as they comply with the harmonised MRLs.

A Maximum Residue Level (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. Foods derived from commodities that comply with the respective MRLs are intended to be toxicologically acceptable. Exceeded MRLs are indicators of violations of GAP. If MRLs are exceeded, comparison of the exposure with Acceptable Daily Intake (ADI) and/or Acute Reference Dose (ARfD) 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, 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 (long-term) toxicity.

The Acute Reference Dose (ARfD) 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 (short-term) toxicity. At present, Acute Reference Doses have been fixed for a number of pesticides.

[10] Official Journal No L 78, 29/03/2000, p. 0007 - 0009

4. NATIONAL MONITORING PROGRAMMES

4.1. Monitoring results for 2006

4.1.1. Overview

Table 1: Results of the national (incl. EU co-ordinated) monitoring programmes for pesticide residues

	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 residues above EC-MRLs	%
Fruit and veg., *surveillance*	54747	27652	51	24508	45	2587	4.7	1528	2.8
Fruit and veg., *enforcement*	1823	628	34	956	52	239	13.1	164	9.0
Cereals, *surveillance*	3645	2652	73	968	27	25	0.7	23	0.6
Processed products (excl. babyfood), *surveillance*	3920	2987	76	897	23	36	0.9	19	0.5
Babyfood, *surveillance*	1395	1345	96	47	3.4	3	0.2	3	0.2
Cereals, processed products incl. babyfood,	280	230	82	48	17	2	0.7	0	0.0
TOTAL (excl. processed)	60477	31147	52	26477	44	2853	4.7	1715	2.8
TOTAL (incl. processed)	65810	35494	54	27424	42	2892	4.4	1737	2.6

For the EU and EEA as a whole, the results of analysis of 65,810 samples of fruit and vegetables, cereals, and processed products including baby food are reported.

Surveillance and follow-up enforcement samples are 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.

Surveillance 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 States where problems were found previously.

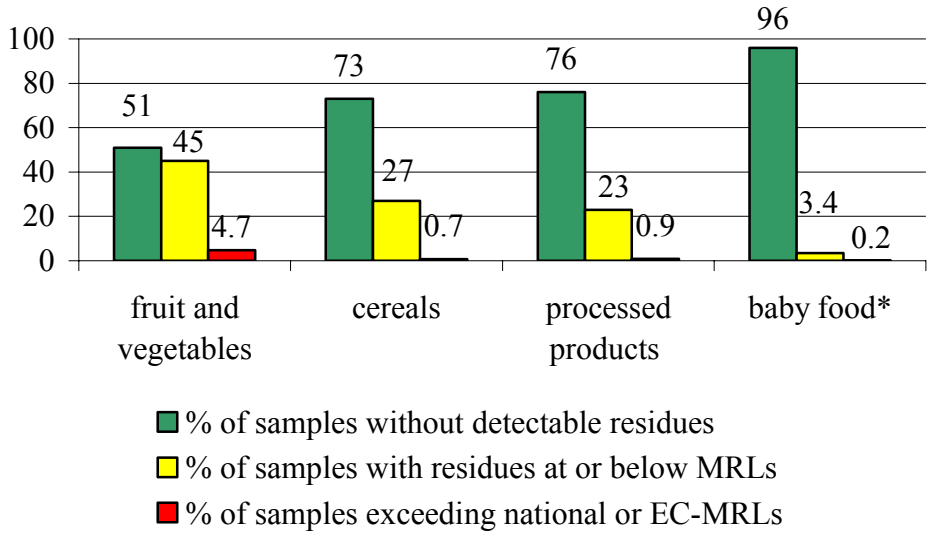
Follow-up enforcement samples are taken in case of suspicion, as a follow-up for violations found previously. Follow-up enforcement sampling is directed to a specific grower/producer or to a specific consignment.

In total, 769 different pesticide residues were sought in the surveillance samples of fruit and vegetables. The number of substances analysed in the individual States ranged from 45 to 683. A list of the substances, which were sought and detected, respectively, is provided in Annex 1, Table A. The participating States reported a total of 8,929,360 analyses for the 54,747 surveillance samples of fruit and vegetables, and on average 163 substances were sought in these samples. In total, 354 different pesticides and metabolites were detected.

The overall results of the national monitoring programmes are shown in Table 1.

In 54 % of all samples, no pesticide residues were detected. Residues at or below the MRL were detected in 42 % of the samples. In 4.4 % of the samples, the residues exceeded MRLs (both national and EC-MRLs). There were exceedances of EC-MRLs in 2.6 % of all samples (sum of fresh, frozen and processed products). Figure 1 illustrates the breakdown of the data for fruit and vegetables, cereals, processed products and baby food.

Figure 1: Monitoring results for fruit/vegetables, cereals, processed products (excl. babyfood) and baby food, surveillance samples only



*: different legislation on MRLs applies for baby food (see chapter 4.1.5)

A breakdown of the results of the different national programmes is provided in Annex 1, Tables B. It is noted that the results from the different States vary significantly. However, differences between the national monitoring programmes are very likely to account for an important part of the variation.

Several factors can cause these differences in the national monitoring programmes, such as:

- The choice of pesticides investigated in different commodities;
- Sampling, e.g. more random or more targeted and the proportion of domestic and imported foodstuffs;

- Methods used, e.g. the use of single methods to detect specific, often problematic pesticides;
- Analytical capabilities of the laboratories (differences in reporting levels);
- Differences in national MRLs, leading to differences in exceeded levels reported.

4.1.2. Results for fruit and vegetables surveillance samples

For fruit and vegetables, 54,747 surveillance samples were analysed (see Table 1). No residues were detected in 51 % of the samples, the percentage of samples with residues at or below the MRL was 45 %, and the percentage of samples exceeding the MRL (national or EC) was 4.7 %. EC-MRLs were exceeded in 2.8 % of the samples. A breakdown of the results of the different national programmes is provided in Annex 1, Table C.

4.1.3. Results for cereals surveillance samples

For cereals, 3645 surveillance samples were analysed (see Table 1). No residues were detected in 73 % of the samples. The percentage of samples with residues at or below the MRL and exceeding the MRL (national or EC-MRL) was lower in cereals at 27 % and 0.7 %, respectively, compared to fruit and vegetables. A breakdown of the results of the different national programmes is provided in Annex 1, Table D.

4.1.4. Results for follow-up enforcement samples

In 2006, 97 % of the samples (63,707) were surveillance samples and 3 % (2,103) were follow-up enforcement samples. The more targeted nature of follow-up enforcement sampling leads to a higher percentage of MRL exceedances (national or EC-MRL) for these samples (13.1 % of fruit and vegetable samples compared to 4.7 % in the surveillance sampling, see Table 1). A breakdown of the results of the different national programmes is provided in Annex 1, Table E.

4.1.5. Results for processed products

As in previous years, 8 % of the samples (5,333) taken in the EU and the EEA States were processed products. Sampling and analyses of processed products were reported by 25 States.

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 in processed products than in fresh products (see Table 1). Residues at or below the MRL were found in 23 % of the samples, and residues exceeding the MRL were found in 0.9 % of the samples. The percentage of samples with no residues detected was 76 %. A breakdown of the results of the different national programmes is provided in Annex 1, Table F.

Council Directives 86/362/EEC and 90/642/EEC contain general provisions for dried, processed and composite products, and 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. Specific MRLs for processed products may, or may not, have been set at the national level and the general provisions of Directives 86/362/EEC and 90/642/EEC are applied differently by Member States.

4.1.6. Results for baby food

Maximum levels for pesticide residues in baby food have been set by Commission Directive 91/321/EEC of 14 May 1991 on infant formulae and follow-on formulae[11] and Commission Directive 96/5/EC of 16 February 1996 on processed cereal-based foods and baby foods for infants and young children[12], as amended. An overall MRL has been set at 0.01 mg/kg, and for certain specified substances, specific MRLs (lower than 0.01 mg/kg) apply. This means that MRLs for pesticides in baby food are generally lower than MRLs specified in Council Directives 76/895/EEC, 86/362/EEC and 90/642/EEC.

In 2006, 23 States reported data on analyses of baby food. Overall, 1,395 samples were analysed (see Table 1). No residues were found in 1,345 of the surveillance samples (96 %), residues at or below the MRLs were found in 47 samples (3.4 %), and exceedances of the MRLs specified in Directives 91/321/EEC and 96/5/EC, as amended, were found in 3 samples (0.2 %).

4.1.7. Origin of samples exceeding EC-MRLs

The participating States also report information on the origin of samples that exceeded MRLs. The data show that EC-MRLs are exceeded more often in samples of produce imported from Third Countries than in EU produce. Thus, 6.4 exceedances of EC-MRLs were reported per 100 samples of imported fruit, vegetables and cereals, compared to only 2.2 exceedances per 100 samples of produce from the EU (see Table 2 and Figure 2). Many of the MRL exceedances notified for imported food relate to commodity/pesticide combinations, where the MRL was set at the Limit of Determination (LOD)[13].

Table 2: Exceedances of EC- MRLs in relation to the origin of samples (surveillance samples of fruit, vegetables and cereals)

Origin	**No of samples**	**Exceedances of EC-MRLs**	**Exceedances/100 samples**
EU	46,327	1,000	2.2
Imported	10,973	707	6.4
Unknown	1,092	158	14.5
Total	58,392	1,865 *(in 1,551 samples[14])*	3.2 *(in 2.7 % of the samples)*

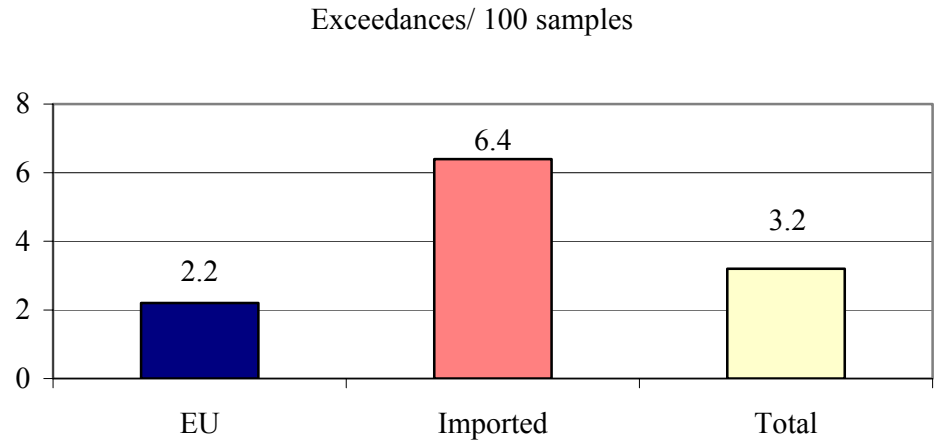
[11] Official Journal L 175, 04/07/1991, p. 0035 – 0049. Repealed by Commission Directive 2006/141/EC of 22 December 2006 on infant formulae and follow-on formulae and amending Directive 1999/21/EC, Official Journal L 401, 30.12.2006, p. 01-33.

[12] Official Journal L 49, 28/02/1996, p. 0017 – 0028. Repealed by Commission Directive 2006/125/EC of 5 December 2006 on processed cereal-based foods and baby foods for infants and young children, Official Journal L 339, 6.12.2006, p. 16–35.

[13] LOD (limit of determination), also known as limit of quantification (LOQ). It means the validated lowest residue concentration which can be quantified and reported by routine monitoring with validated control methods. The term LOQ is more widely used than LOD because it avoids possible confusion with "limit of detection". However, in legislation MRLs that are set at the limit of quantification/determination are referred to as "LOD MRLs", not "LOQ MRLs".

[14] In some samples, more than one MRL exceedance was found.

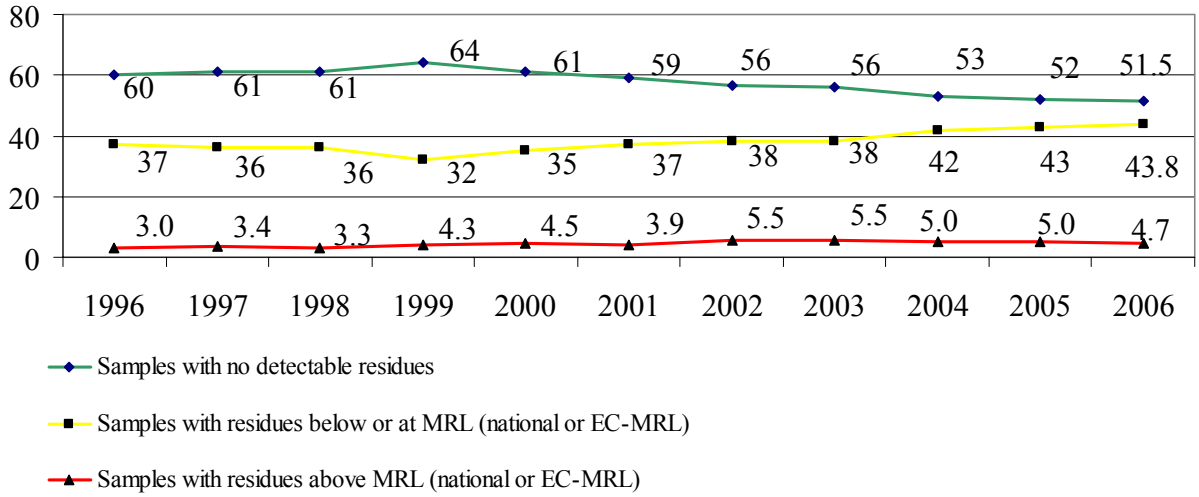
Figure 2: Exceedances of EC- MRLs in relation to the origin of samples (surveillance samples of fruit, vegetables and cereals)



4.2.Results of the 2006 national monitoring programmes compared to the previous years

Figure 3 provides an overview of the overall trend in the data on presence of pesticide residues in or on fruit, vegetables and cereals. The percentage of samples with no residues detected has steadily decreased from 64 % in 1999 to 51.5 % in 2006. Similarly, the percentage of samples with residues detected below or at the MRL (national or EC-MRL) has increased from 32 % in 1999 to 43.8 % in 2006. The percentage of samples with residues above the MRL increased from 3.0 % in 1996 to 5.5 % in 2002/2003. Since 2003, it has decreased to 4.7 % in 2006.

Figure 3: National monitoring results 1996 – 2006 for fruit, vegetables and cereals: percentage of samples with no residues detected, with residues below and above MRLs (national or EC-MRL)



A number of factors may have contributed to the findings shown in Figure 3:

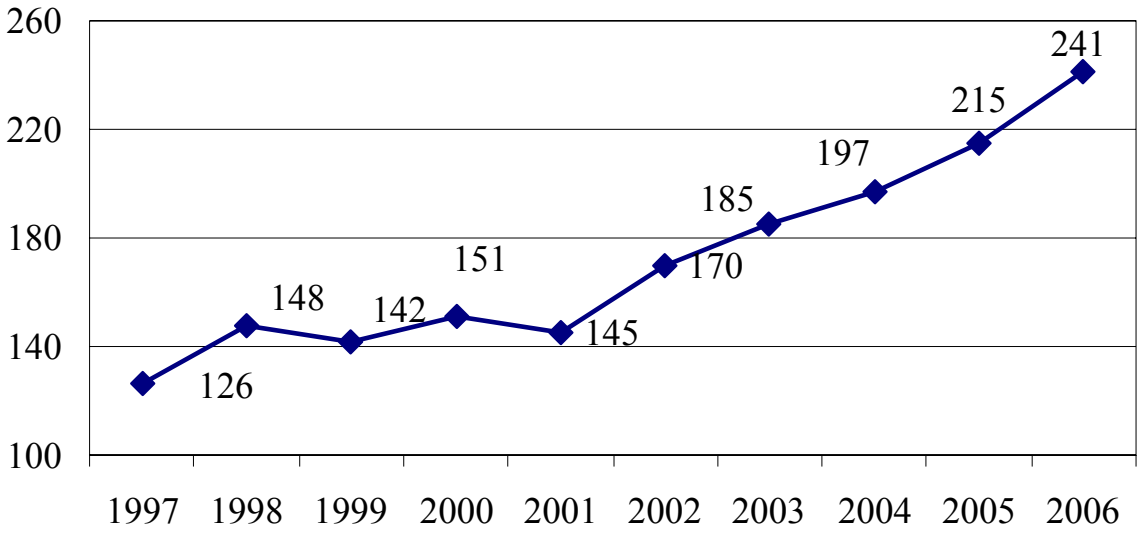
In particular, the analytical laboratories are constantly moving towards lower reporting levels, and towards enhanced capability to analyse more substances. The development is shown in Figure 4. In 1997, the analytical capabilities of laboratories varied between the participating States from 66 to 281 detectable pesticides, and an average of 126 pesticides and metabolites were analysed by the different States[15]. In 2006, the average was 209 (ranging from 45 to 683 detectable pesticides, see Table C of Annex 1). If only the EU 15 and EEA States are taken into account, an average of 241 substances was analysed by the different States in 2006.

One possible reason for the slight decrease in MRL exceedances could be that farmers increasingly vary the pesticides to control pests, weeds and diseases. The variation of pesticides can lead to a reduction of the total amounts used for each pesticide and thus avoid MRL exceedances. This could also explain the increasing percentage of samples with multiple residues (see next chapter).

As outlined in chapter 4.1.1, the national monitoring programmes differ considerably from year to year.

Finally, the comparability of the data is limited by the fact that the number of States included in the reports has increased from 16 in 1996 to 28 in 2006.

Figure 4: Average number of pesticides analysed for in the participating States from 1997 to 2006 (EU 15 and EEA States), surveillance samples of fruit and vegetables



4.3. Samples with multiple residues

Residues of two or more pesticides were found in 27.7 % of the analysed samples. In most of these cases (10.5 %, see Table 3), residues of two pesticides were found, while 6.6 % of samples contained residues of three pesticides. The percentage of samples with four or more

[15] Value is not identical to the average number of pesticides sought per sample, which was 163 in 2006.

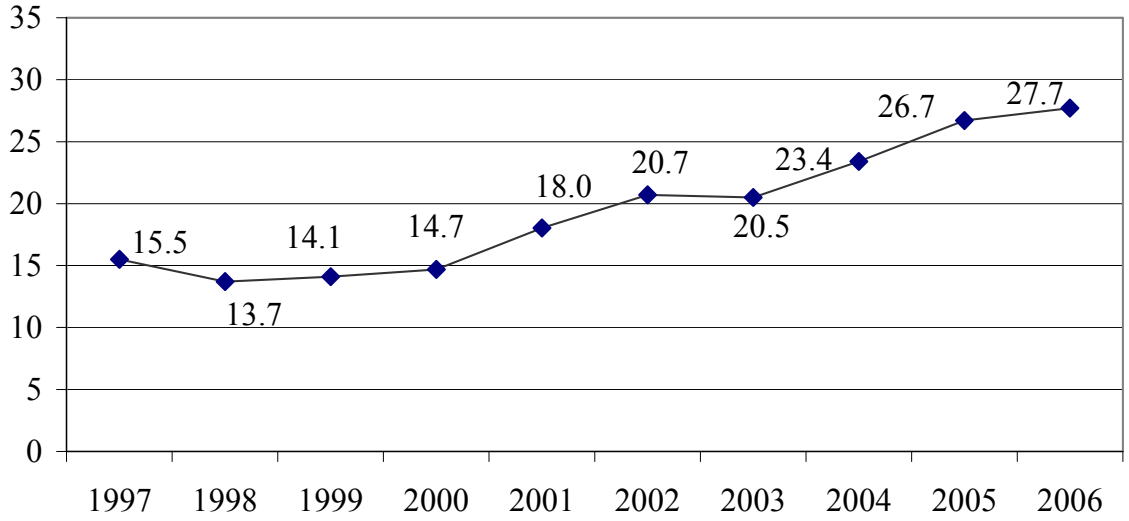
residues (10.6 %) is higher than in previous years (2 % in 1998, 2.8 % in 2000, 5.4 % in 2002, and 7.3 % in 2004). A breakdown for the results of the different national programmes is provided in Annex 1, Table G.

Table 3: Samples with residues of more than one pesticide in fresh (incl. frozen) fruit, vegetables and cereals

	Samples analysed	**Samples with 2 or more pesticides**	2 pesti-cides	3 pesti-cides	4 pesti-cides	5 pesti-cides	6 pesti-cides	7 pesti-cides	8 or more pesticides
No.	60477	**16782**	6338	4011	2400	1455	932	561	1085
%		**27.7**	10.5	6.6	4.0	2.41	1.54	0.93	1.79

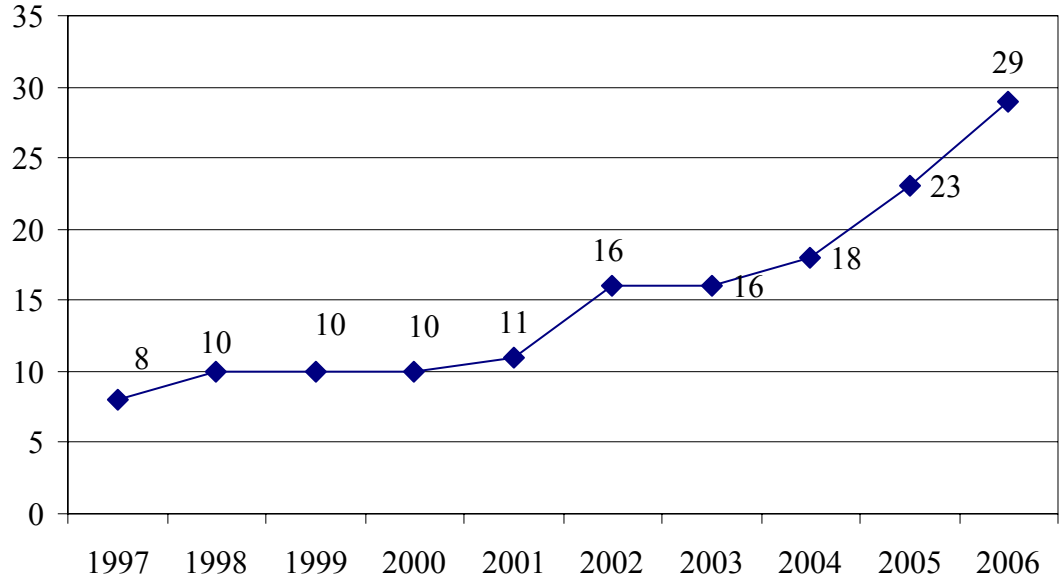
Figure 5 a gives an overview of the percentage of samples with multiple residues in the years from 1997 to 2006 (fresh fruit, vegetables and cereals). The chart shows that the proportion of samples with multiple residues has increased since 1998. While in 1997 only 0.009 % of the samples contained 8 or more pesticides, there were 1.79 % of the samples in 2006 found to contain 8 and more pesticides.

Figure 5 a: Percentage of samples with multiple residues from 1997 to 2006, fruit, vegetables and cereals



Similarly, the highest reported number of different pesticides detected in a sample has increased (Figure 5 b). While in 1997 up to 8 different pesticides were found in a sample, up to 29 different pesticides were detected in samples in 2006. The highest numbers of different pesticides per sample were detected in pepper (*piper nigrum*).

Figure 5 b: Highest reported number of different pesticides in a sample from 1997 to 2006, fruit, vegetables and cereals



When evaluating these data, the factors outlined in chapter 4.2 are relevant. The presence of multiple residues is not necessarily an indication of excessive or inappropriate use. The adequate control of pests, weeds and diseases may require the use of more than one type of pesticide, which can give more effective control and reduce the total amounts used. Methods to assess any cumulative and synergistic effects of multiple residues on consumer health are currently developed by EFSA.

4.4. Most frequently found pesticides

The participating States 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 each pesticide in relation to the total number of samples analysed for this specific pesticide. There were 17 participating States, who provided a breakdown of the data for multi-residue and single-residue methods. The results from these States were combined and are summarised in Table 4, ranked in decreasing order. A breakdown of the results from each State is provided in Annex 1, Table H.

The Table shows that the most frequently found pesticides on fruit and vegetables were mainly fungicides. On cereals, the pesticides found were mainly insecticides. In both cases, this is in line with the findings of previous years.

Of the 769 pesticides analysed for (see Table A in Annex 1), a total of 354 substances (46 %) were detected. 117 of these substances were only detected in 1 to 4 samples, and 248 pesticides and metabolites were detected in 5 or more samples. The percentage of detected pesticides in 2006 (46 %) is similar to the percentage in 2004 (48 %), when 324 of 677 pesticides were detected. While the number of pesticides analysed for has increased significantly, the percentage of detected pesticides has not changed much.

Table 4: Pesticides found most often in the national (incl. co-ordinated) monitoring programmes in the European Union, Norway, Iceland and Liechtenstein for **a) fruit and vegetables** and **b) cereals**, as reported

Fruit and vegetables	**Cereals**
Multi-residue method: Imazalil, Thiabendazole, Procymidone, Benomyl group, Chlorpyrifos, Iprodione, Cyprodinil, Chlorpyrifos-methyl, Imidacloprid, Maneb group.	Multi-residue method: Pirimiphos-methyl, Chlorpyrifos-methyl, Deltamethrin, Malathion, Dichlorvos, Chlormequat, Piperonyl-butoxide, Chlorpyrifos, Permethrin.
Single-residue method: Maneb Group, Chlormequat, Bromide, Ortho-phenylphenol, Propamocarb, Benomyl Group, Thiabendazole, 2,4-D, Maleic hydrazide, Diquat.	Single-residue method: Chlormequat, Hydrogen phosphide, Mepiquat, Glyphosate (incl. AMPA), Bromide, Benomyl Group, Spiroxamine, Maneb Group, Trinexapac-ethyl, Phosphine. (This is the complete list of those found)

5. THE EU CO-ORDINATED MONITORING PROGRAMME

As an EU co-ordinated monitoring programme, the Commission recommended in 2006 via Commission Recommendation 2006/26/EC that eight commodities should be tested (aubergines, bananas, cauliflower, grapes, orange juice, peas (fresh/frozen, without pod), peppers (sweet), wheat). The list of pesticides analysed for in 2006 includes 55 substances, the same as in 2005. For chlormequat, only results for wheat, peppers and aubergines were requested. For diphenylamine, no results were requested in 2006 (results for diphenylamine are only requested for apples and pears, which did not form part of the EU programme in 2006). Although not required, Member States submitted results for this pesticide.

The list of pesticides has been extended substantially over the previous years. In 1996, only analyses of nine pesticides had been reported.

The benomyl-group comprises three different compounds (benomyl, carbendazim, thiophanate-methyl), which are analysed with the same analytical method and determined as sum of residues expressed as carbendazim. The maneb-group, by legal definition, comprises five different dithiocarbamates, which are also determined as a sum, expressed as CS_2.

All 25 Member States and the three EEA States participated in the EU co-ordinated programme. Overall, 10,906 samples were analysed. A total of 178 laboratories were involved in the analyses.

Table 5 shows the numbers of samples taken for each commodity. A breakdown for the different participating States is provided in Table I of Annex 1. Table K of Annex 1 provides a breakdown of the results for the participating States.

Table 5: Numbers of samples taken for each commodity

Aubergines	Bananas	Cauliflower	Grapes	Orange juice	Peas	Peppers	Wheat
960	1137	1014	2479	684	853	2248	1531

5.1. Sampling design applied in the 2006 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.

The sampling design of the co-ordinated programme is based on a statistical method proposed by Codex Alimentarius[16]. Based on a binomial probability distribution, it can be calculated that examination of 613 samples gives a confidence of more than 99 % detecting one sample containing pesticide residues above the Limit of Quantification (LOQ), where less than 1 % of products of plant origin contain residues above the LOQ.

The minimum numbers of samples to be taken of each commodity were fixed at a different level for each State, according to their population and consumer numbers, since adjusting the sample size to the size of the national markets improves the precision of the sampling design. As specified by Commission Recommendation 2006/26/EC, the required number of samples varied from 12 to 93, resulting in a recommended total of 613 samples for all Member States and 649 samples for all participating States (i.e. incl. EEA States). As in previous years, more samples were analysed from all commodities than recommended.

5.1.2. Statistical evaluation of the results of the co-ordinated programme

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 pesticides.

The values for 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 the attached figures. 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 captan in the food items. In total for all food items 8413 samples have been analysed for captan, and 119 of them showed residues below or at the MRL. The number of 8413 samples represents only a part of the whole European market, therefore the calculated fraction of samples with residues below or at the MRL (119 /8413 = 1.41 %) 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 the above mentioned figures. For the example of captan this means that the true value of the number of samples with residues at or

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

below the MRL would vary between 99 and 142 samples which corresponds to a range of 1.2 % to 1.7 %, estimated at a 95 % confidence level.

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 aldicarb was found in the co-ordinated monitoring exercise, but the upper limit of the error range (95 % confidence level) is 0.05 %, which means that still 0.05 % of the specific commodities in the whole population (European market) could have exceeding MRLs for aldicab. This upper limit of the error range for the other pesticides, for which no residues exceeding the MRL have been found (aldicarb, azinphos-methyl, captan, chlorothalonil, chlorpropham, dichlofluanid, diphenylamine, captan + folpet, iprodione, kresoxim-methyl, lambda-cyhalothrin, malathion, methidathion, myclobutanil, oxydemeton-methyl, phosalone, spiroxamine, tolcloflos-methyl, triademefon + triadimenol) varied from 0.04 % to 0.06 %. The exact value depended on the number of samples included.

The indicated error range of all pesticides was considered as very low. This ensures sufficient precision of the results and allows for subsequent risk analysis calculations to be carried out.

In the following figures the percentage of samples with residues at or below MRL (national or EC-MRL) and exceeding the MRL (national or EC-MRL) for a specific pesticide with the corresponding error bars are shown.

Figure 6a: Statistical evaluation of results from the EU co-ordinated programme (I)

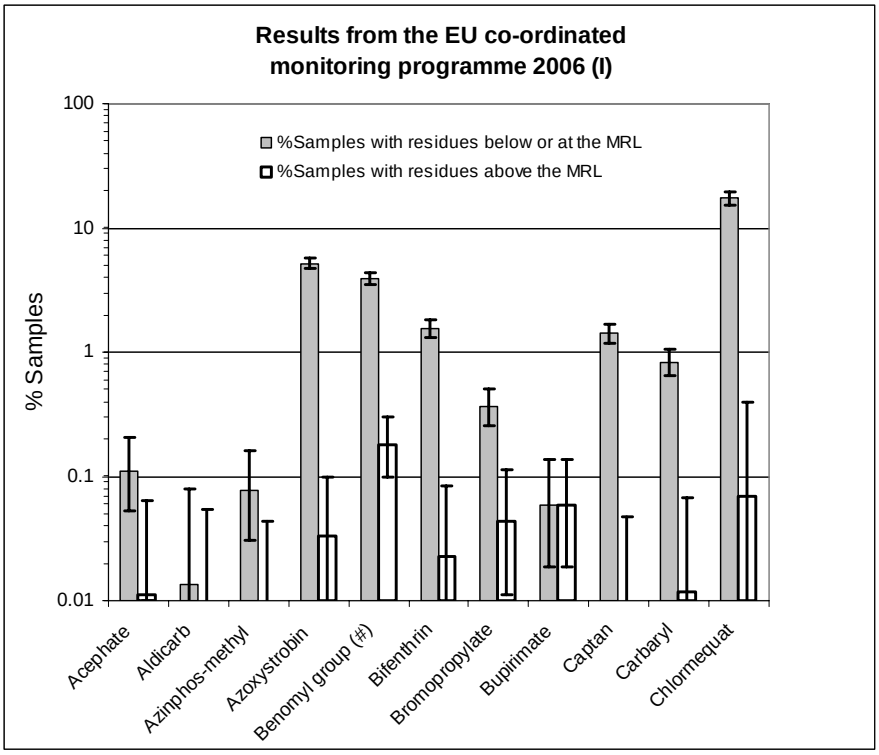


Figure 6b: Statistical evaluation of results from the EU co-ordinated programme (II)

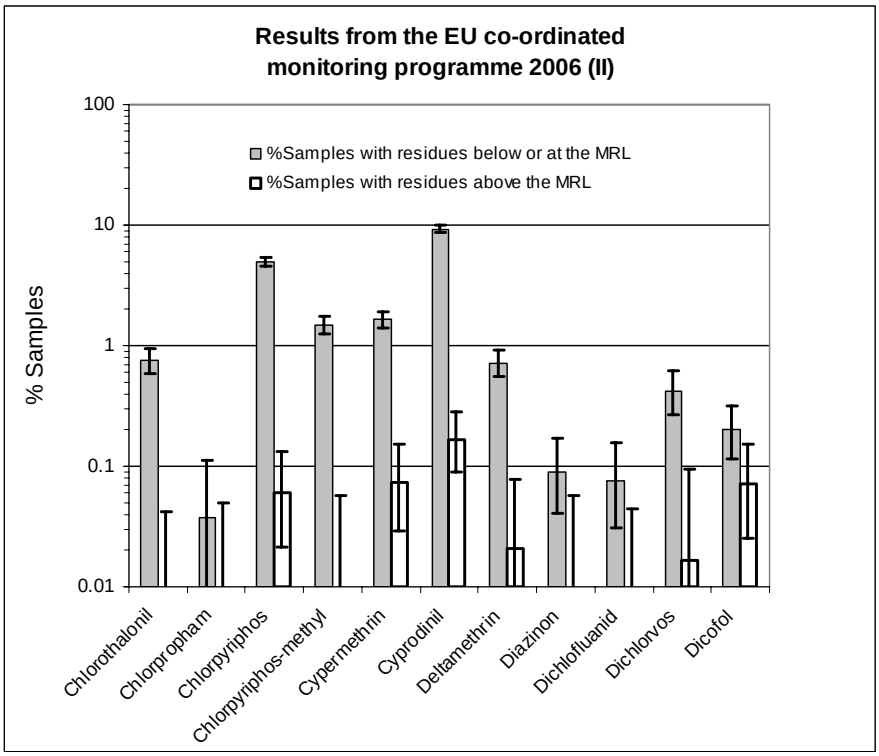


Figure 6c: Statistical evaluation of results from the EU co-ordinated programme (III)

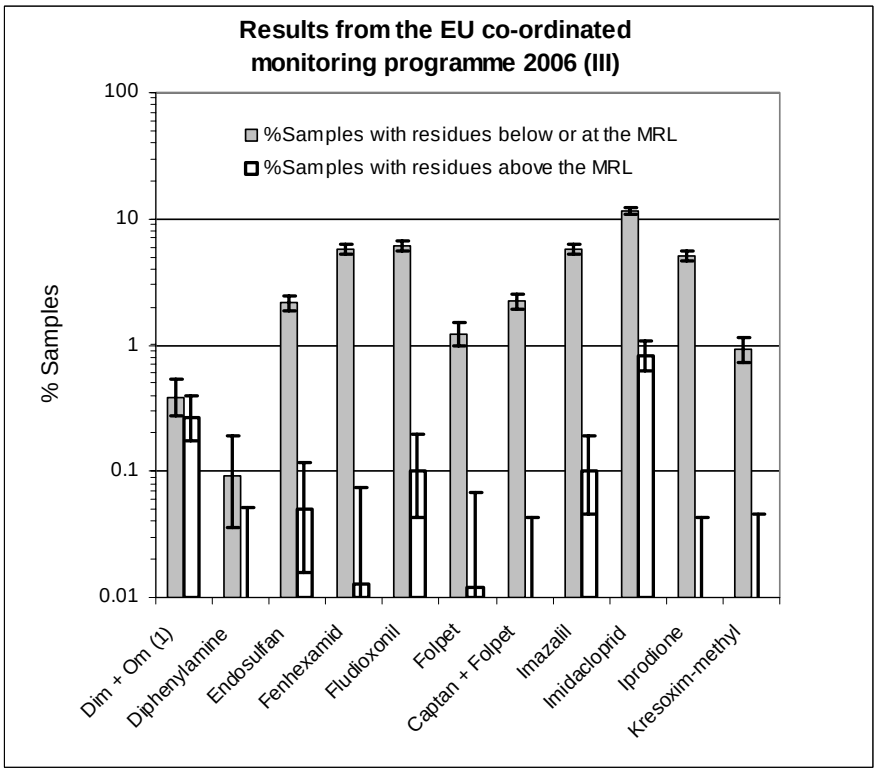


Figure 6d: Statistical evaluation of results from the EU co-ordinated programme (IV)

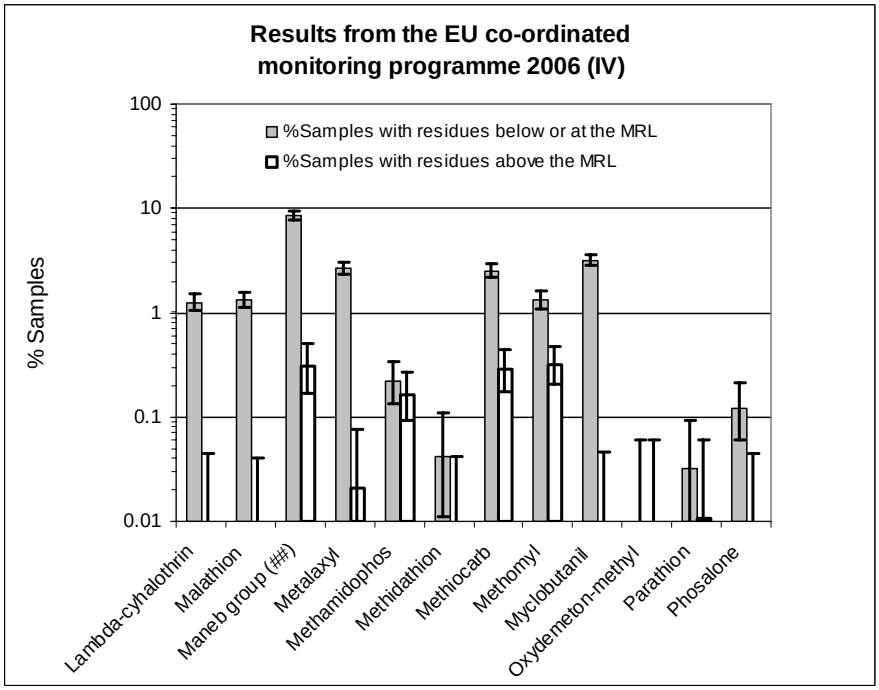
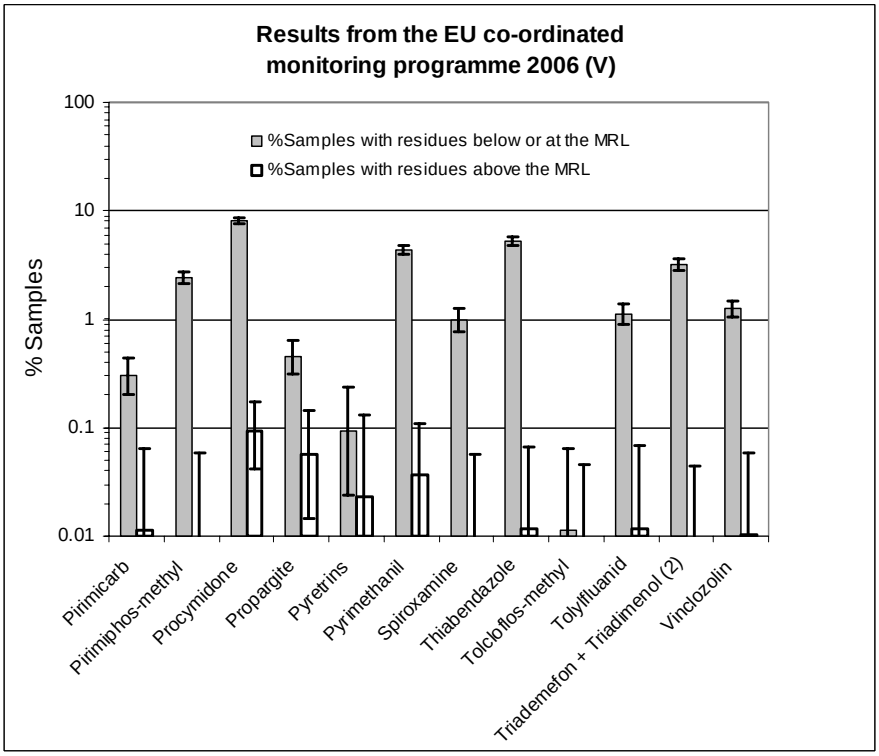


Figure 6e: Statistical evaluation of results from the EU co-ordinated programme (V)

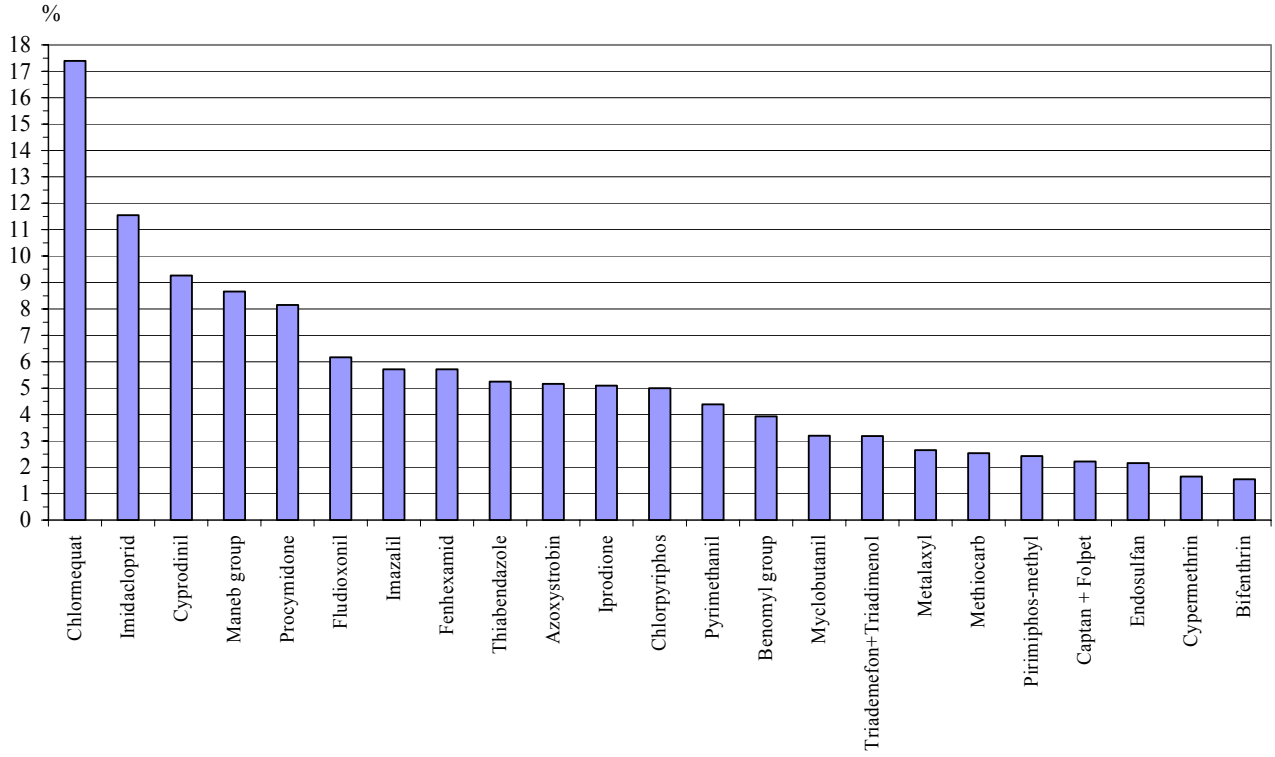


5.2. Evaluation by pesticide

Figures 7 and 8 show the most significant pesticide detections at or below the MRL and exceedances of MRLs. More details can be found in Table L of Annex 1, and in Annex 3, where the complete results for all reporting States and all commodities are given.

The commodities analysed and reported in the EU co-ordinated programme rotate in a three year cycle. As different pesticides are used on the different commodities, the percentages and identities of the detected pesticides vary between the years. In addition, results for chlormequat were requested for only three commodities this year, i.e. wheat, peppers and aubergines. This should be considered when comparing the results for chlormequat to those for other pesticides.

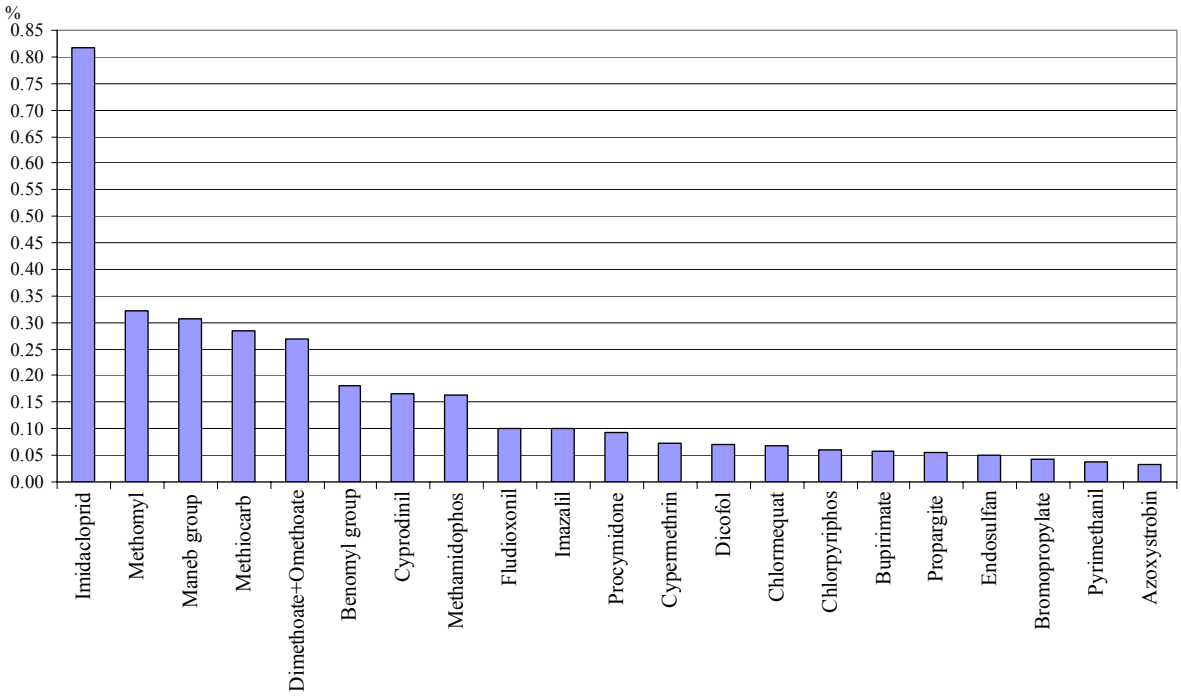
Figure 7: Percentage of samples with residues at or below MRL (national or EC-MRL); results by pesticide (31 pesticides where less than 1.5 % of samples had residues at or below the MRL are not included in the chart; one of the listed pesticides was not found)



Residues at or below the MRL were found most frequently of chlormequat (17.4 % of the samples analysed for the substance), followed by imidacloprid (11.6 % of the samples analysed for this substance), cyprodinil (9.3 %), the maneb group (8.7 %), procymidone (8.2 %), fenhexamid (6.2 %), thiabendazole (5.7 %), azoxystrobin (5.7 %), iprodione (5.3 %), and chlorpyrifos (5.0 %). For 31 of the pesticides, the frequency of samples with residues corresponded to less than 1.5 %. Parathion and methidathion were only detected in four of the samples, aldicarb and tolclofos-methyl were detected in one of the samples, and oxydemeton-methyl was not detected in any sample.

The frequencies of MRL exceedances for single pesticide detections are all below 1 %. The highest frequency was found for imidacloprid, where 0.82 % of all samples exceeded MRLs. The main other exceedances, in decreasing order, are methomyl (0.32 %), the maneb group (0.31 %), methiocarb (0.28 %) , dimethoate (0.27 %), the benomyl group (0.18 %) and methamidophos (0.17 %). For 18 substances no exceedance has been reported.

Figure 8: Percentage of samples with residues exceeding the MRL (national or EC-MRL); results by pesticide (16 pesticides where less than 0.03 % of samples had residues above the MRL are not included)



5.3. Evaluation by commodity

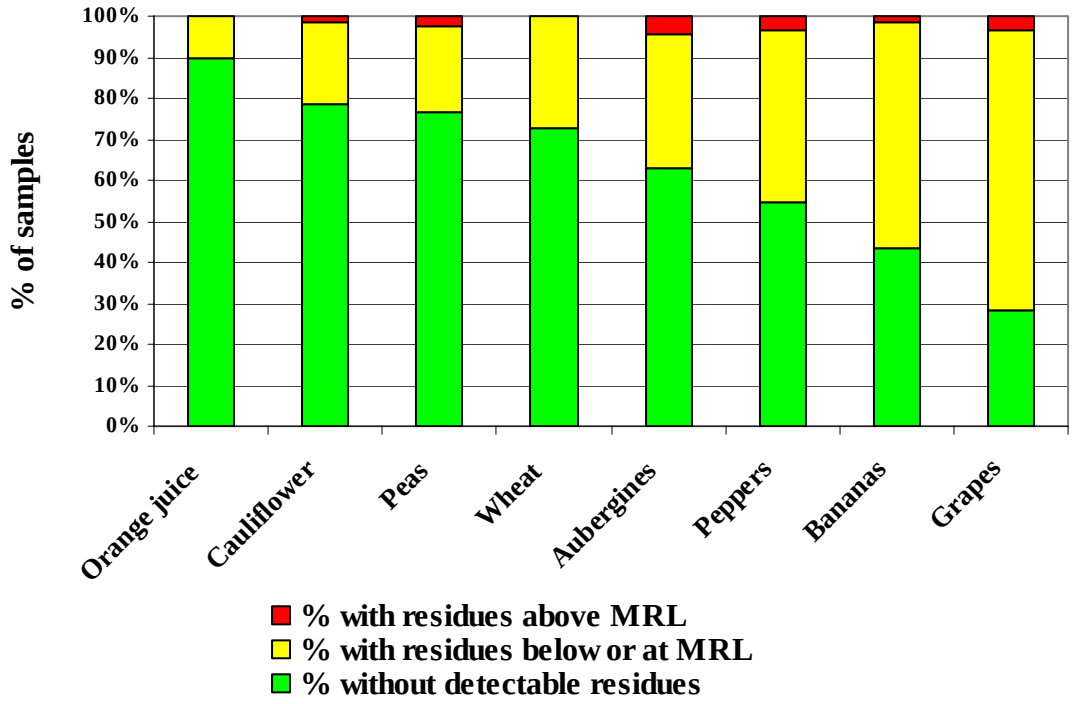
Table 6 gives an overview of the findings in the different commodities. With regard to all eight commodities investigated, no residues were detected in 56.9 % of the samples, 40.8 % of the samples contained residues of pesticides at or below the MRL (national or EC-MRL), and 2.3 % above the MRL. However, these percentages vary significantly between the analysed commodities, as the illustrated data in Figure 9 show.

Table 6: Residues found in the nine 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)	%
Aubergines	960	603	63	316	33	41	4.3
Bananas	1137	496	44	625	55	16	1.4
Cauliflower	1014	794	78	204	20	16	1.6
Grapes	2479	701	28	1698	68	80	3.2
Orange juice	684	614	90	69	10	1	0.1
Peas	853	654	77	179	21	20	2.3
Peppers	2248	1231	55	939	42	78	3.5
Wheat	1531	1112	73	417	27	2	0.1
SUM	10906	6205	56.9	4447	40.8	254	2.3

Grapes had the highest percentage of samples with pesticide residues (68 %) below or at MRLs, 55 % of the banana samples and 42 % of the pepper samples contained residues at or below the MRL. Samples of aubergines, wheat, peas and cauliflower contained residues at or below the MRL less frequently (33 %, 27 %, 21 % and 20 %, respectively). Orange juice had the lowest percentage of samples containing residues (10 %).

Figure 9: Residues found in the eight commodities analysed in the EU co-ordinated monitoring programme



Most of the samples did not exceed the MRLs. The highest percentage of MRL exceedances was found in aubergines (4.3 %), followed by peppers (3.5 %), grapes (3.2 %) and peas (2.3 %). It is noted that for aubergines, the relatively high percentage of exceedances is mainly caused by infringements of national MRLs for imidacloprid. The new temporary EC-MRL for imidacloprid of 2008 would have been exceeded in only one sample (see next chapter 5.4).

In these results, no differentiation is made with regard to findings of several pesticides in the same sample. This means that a sample where two different pesticides were found would be counted as just one finding with detectable residues. To provide a complementary picture, Table 7 shows the residues found in individual determinations, which 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 evaluation, residues of a specific pesticide at or below the MRL (national or EC-MRL) were found most often in grapes, followed by peppers and bananas. These are the same commodities as in Table 6, but now pepper shows a higher percentage than banana. Regarding MRL exceedance, the highest frequency was found in aubergines, followed by peppers and grapes. This is consistent with the results in Table 6.

It can be concluded that grapes, peppers and bananas were the commodities on which pesticide residues were most often detected, whereas MRLs (national or EC-MRLs) were most often exceeded in aubergines, peppers and grapes.

Table 7: Residues found in individual determinations (ind. det.) in the eight 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)**	**%**
Aubergines	41,149	40,543	565	1.4	41	0.10
Bananas	50,942	49,876	1047	2.1	19	0.04
Cauliflower	46,697	46,480	201	0.4	16	0.03
Grapes	115,952	110,589	5276	4.6	87	0.08
Orange juice	30,067	29,996	69	0.2	2	0.01
Peas	39,727	39,438	269	0.7	20	0.05
Peppers	103,462	100,781	2594	2.5	87	0.08
Wheat	53,479	52,942	535	1.0	2	0.00
TOTAL	481,475	470,645	10556	2.2	274	0.06

5.4. Evaluation by pesticide-commodity combinations

The main pesticide-commodity combination where detectable residues were found most frequently (including those at or below the MRL and exceeding the MRL) was imazalil/bananas, and residues of imazalil were detected in 45.51 % of banana samples (Table 8). This is followed by thiabendazole/bananas (40.96%), chlormequat/wheat (36.41 %), imidacloprid/aubergines (35.00 %), and imidacloprid/peppers (33.86 %).

Table 8: Most frequent detections of particular pesticide/commodity combinations (results over 5 % only)

Commodity	**Pesticide and % samples with detectable residues**
Aubergines	Imidacloprid (35.00), Cyprodinil (7.96), Procymidone (7.47), Maneb group (6.76), Chlormequat group (6.52)
Bananas	Imazalil (45.51), Thiabendazole (40.96), Chlorpyrifos (9.48)
Cauliflower	Maneb group (29.52)
Grapes	Cyprodinil (29.34), Fenhexamid (20.85), Fludioxonil (18.11), Procymidone (16.59), Iprodione (15.62), Chlorpyrifos (15.01), Maneb group (13.27), Azoxystrobin (12.35), Pyrimethanil (11.50), Myclobutanil (10.88), Benomyl group (10.33), Captan + Folpet (8.94),Metalaxyl (8.25), Triademefon + Triadimenol (6.80)
Orange juice	-
Peas	Vinclozolin (12.88), Procymidone (8.36)
Peppers	Imidacloprid (33.86), Procymidone (14.02), Methiocarb (9.72), Endosulfan (9.19), Maneb group (9.18), Azoxystrobin (7.06), Fludioxonil (5.12)
Wheat	Chlormequat (36.41), Pirimiphos-methyl (10.27)

Table M of Annex 1 gives a more detailed overview of the most important pesticide-commodity combinations for all pesticides included in the EU co-ordinated programme. It also lists the maximum concentrations found for each of the pesticides.

There were four combinations with MRL exceedances above 1 % (see Table 9). The highest percentages were found for imidacloprid, which exceeded MRLs most often in aubergines (4.14 % of all samples), followed by the maneb group in cauliflower (1.81 % of all samples), procymidone in peas (1.21 % of all samples) and imidacloprid in peppers (1.20 %). It is noted that, due to the residue definition of the maneb group (CS_2), the analysis for these substances in cauliflower may lead to false positive results. Imidacloprid was also in grapes the pesticide, which exceeded MRLs most often (0.68 %). However, the exceeded levels were

national MRLs, as temporary EC-MRLs were only established in 2008 by Regulation (EC) No 149/2008[17]. The new EC-MRLs would have been exceeded in only one case.

Table 9: Most frequent MRL exceedances of pesticide/commodity combinations (results over 0.2 % only)

Commodity	**Pesticide and % MRL exceedances**
Aubergines	Imidacloprid (4.14)[18], Propargite (0.49), Endosulfan (0.47), Dimethoate and Omethoate (0.35), Methiocarb (0.35), Chlormequat (0.31), Pyrimethanil (0.29)
Bananas	Dimethoate and Omethoate (0.74), Maneb group (0.35)
Cauliflower	Maneb group (1.81)[19]
Grapes	Imidacloprid (0.68), Methomyl (0.62), Cyprodinil (0.59), Dimethoate and Omethoate (0.42), Benomyl group (0.38), Imazalil (0.36)
Orange juice	-
Peas	Procymidone (1.21), Maneb group (0.61), Azoxystrobin (0.40)
Peppers	Imidacloprid (1.20), Methiocarb (0.87), Methamidophos (0.66), Methomyl (0.63), Benomyl group (0.35), Dimethoate and Omethoate (0.24), Dicofol (0.23)
Wheat	Pyrethrins (0.27)

[17] Commission Regulation (EC) No 149/2008 of 29 January 2008 amending Regulation (EC) No 396/2005 of the European Parliament and of the Council by establishing Annexes II, III and IV setting maximum residue levels for products covered by Annex I thereto, Official Journal L 58, 1/3/2008, 1-398.

[18] The exceeded levels for imidacloprid in aubergines, grapes and peppers were national MRLs, as temporary EC-MRLs were only established in 2008. The new EC-MRLs would have been exceeded in only one case.

[19] Due to the residue definition of the maneb group (CS_2), the analysis for these substances in cauliflower may lead to false positive results.

5.5. Indicative Exposure Assessment

5.5.1. Chronic risk

To estimate the chronic risk to the consumer for the commodities investigated in the EU co-ordinated programme, an indicative chronic risk assessment was carried out with the revised EFSA model for calculating the acute and chronic consumer exposure (revision 2)[20], which is based on data on consumption of individual commodities from different EU Member States. It should be noted that this model was not developed for the risk assessment of monitoring data, but for the risk assessment of proposed temporary MRLs according to Article 24 of Regulation (EC) No 396/2005. The model is a first screening tool based on conservative assumptions[21]. The model was used for this EU monitoring report, because it is the only available model which contains data on food consumption from different EU Member States. As in previous EU monitoring reports, the assessment of the chronic risk was carried out, to consider worst case conditions, on the basis of the 90th percentile. 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 samples with no detectable residues[22].

For 44 of the 55 pesticides of the co-ordinated programme the 90th percentile was below 0.01 mg/kg. For these pesticides, only insignificant intakes are expected. For 11 pesticides the 90th percentile was above 0.01 mg/kg. The intake of the pesticide was calculated with the EFSA model for those commodities, in which the highest residues were found, and compared with the acceptable daily intake (ADI). The contribution from residues in other commodities was not calculated, except for procymidone, where the 90th percentile was above 0.01 mg/kg for both peppers and grapes.

Bananas are normally peeled before consumption. The German Federal Institute for Risk Assessment (BfR) published a collection of processing factors to take account of the reduction of pesticide residues by peeling, cooking or other reasons[23]. When these processing factors are taken into account for imazalil and thiabendazole in bananas, the calculated exposure is significantly lower.

As shown by the results in Table 11, the intake of pesticide residues remains clearly below the ADI in every case. The estimated exposure ranges from 0.1 % of the ADI for azoxystrobin and fenhexamid on grapes, to 9 % of the ADI for chlormequat on wheat.

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[20] http://www.efsa.europa.eu/EFSA/DocumentSet/EFSA_acute_chronic_RA_model_rev2_0,0.xls

[21] For a full description of the model and the underlying assumptions please consult the following document: reasoned opinion on the potential chronic and acute risks to consumers' health arising from proposed temporary EC-MRLs, 15 March 2007, http://www.efsa.europa.eu/de/science/praper/maximum_residue_levels/mrl_opinion.html

[22] Example: the 90th percentile for the content of residues of azoxystrobin in grapes is to be determined: 2,268 samples were analysed in total, out of which 1,988 samples contained no detectable residues. 280 samples showed different residue contents, categorised in 8 categories (from “up to 0.01 mg/kg” to “1.1-2 mg/kg”). 90 % of all values would comprise 1,988 x 0.9= 2,042.2 samples. The 2,042/2,043rd sample falls within the samples of the category “0.021-0.05 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 ≤ 0.05 mg/kg

[23] http://www.bfr.bund.de/cm/218/bfr_programm_zu_verarbeitungsfaktoren_von_pflanzenschutzmittel_rueckstaenden.zip

Table 11: Indicative exposure assessment for **chronic** risk for those 11 of the 55 pesticides, where the 90th percentile was above 0.01 mg/kg

Compound	**Commodity**	**90th percentile (mg pesticide / kg commodity)**	**ADI (mg pesticide / kg body weight/day)** [24]	**Highest calculated TMDI in % of the ADI**	**Highest intake**
Azoxystrobin	Grapes	≤ 0.05	0.1	0.1	German child
Chlormequat	Wheat	≤ 0.5	0.05	9	WHO cluster diet B
Chlorpyrifos	Grapes	≤ 0.02	0.01	0.3	German child
Cyprodinil	Grapes	≤ 0.5	0.03	2	German child
Fenhexamid	Grapes	≤ 0.2	0.2	0.1	German child
Imazalil	Bananas	≤ 0.5	0.05	0.9 [25]	Sweden general population
Iprodione	Grapes	≤ 0.2	0.06	0.4	German child
Maneb group (Propineb)	Grapes	≤ 0.05	0.007[26]	0.9	German child
Procymidone	Grapes Peppers	≤ 0.05 ≤ 0.02	0.025	0.3	German child
Thiabendazole	Bananas	≤ 0.5	0.1	0.9[27]	Sweden general population
Vinclozolin	Peas	≤ 0.05	0.01	0.3	UK infant

[24] JMPR Evaluation reports – EU Regulatory Decisions

[25] Processing factor of 0.52

[26] Since these pesticides have the same residue definition, it can not be determined, from which of the pesticides the residues result, and a mixture of residues from the different pesticides of the group is likely. In this case, the intake was calculated for propineb as a worst case.

[27] Processing factor of 0.31

5.5.2. Acute risk

There is no generally accepted model for evaluating risks from acute exposure for monitoring data in the EU. As an example, the acute risk can be evaluated by using the EFSA model, which is based on IESTI (international estimated short term intake) equations. The joint FAO/WHO meeting on pesticide residues (JMPR) stated in their report of 2006[28] that the adequacy of applying the IESTI equations to assess the safety of food containing residues at levels found in monitoring and/or enforcement programs needs to be discussed further. As stated in chapter 5.5.1, the EFSA model was developed as a first screening tool, based on conservative assumptions. The calculation of the acute consumer exposure with this model implied that a person from a vulnerable group with an extraordinary appetite (the maximum of figures for high food intake reported in the EU), consumes food from the lot with the highest identified residue in the EU. The likelihood of this possibility was not evaluated. For children, the highest available consumption figures for cauliflowers relate to Dutch children, for bananas they relate to UK infants, for wheat and aubergines to 4-6 year old UK children, and for orange juice, peppers and grapes to German children.

The evaluation of the acute risk was carried out for each of those 34 of the 55 pesticides of the EU co-ordinated programme, for which acute Reference Doses (ARfDs) have been set by the European Commission, EFSA or the JMPR[29], and residues detected. Many of the ARfD for these pesticides were only established or revised in 2006 or 2007. The highest residue found for each pesticide was used in this calculation. To consider worst case conditions default variability factors, taking into account unit-to-unit variability of single units, were used. A variability factor of 5 was used for grapes, cauliflowers and aubergines, and a variability factor of 7 was used for peppers and bananas. In practice this means that the intake is calculated with a value 5 or 7 times higher that the residue level actually found in monitoring. Where appropriate and available[30], processing factors were used to take account of the reduction of pesticide residues by peeling or cooking. The estimated intake of the specific pesticide via a specific commodity was compared with the ARfD, as established by EU Regulatory Decisions, the EFSA or the JMPR.

For 15 of the 34 pesticides the indicative intakes for the highest detected residue concentrations in a composite sample have been assessed above the ARfD: aldicarb, azinphos-methyl, benomyl group (carbendazim), captan, carbaryl, dimethoate, endosulfan, folpet, lambda-cyhalothrin, maneb group (propineb), methamidophos, methiocarb, methomyl, parathion, procymidone. For these 15 pesticides further intake assessments were performed on results below the maximum detected concentration to identify any further samples exceeding the ARfD[31].

For 7 of the 34 pesticides, intakes above the ARfD were calculated for children, but not for adults. For 8 of the 34 pesticides, intakes above the ARfD were calculated also for adults:

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[28] http://www.fao.org/ag/AGP/AGPP/Pesticid/JMPR/DOWNLOAD/2006_rep/report2006jmpr.pdf

[29] http://www.efsa.eu.int/EFSA/efsa_locale-1178620753812_MRLteam.htm. Where available, ARfD values of EU Regulatory Decisons or EFSA were used, and in the absence of these, values from JMPR were applied.

[30] Database of BfR, see chapter 5.5.1 and footnote 22

[31] The exact concentrations of the residues below the maximum concentration were not available, but the results had been grouped into categories, according to the concentration of the residues. The intake assessment was carried out with the lowest concentration in these groups and the maximum reported concentration. Example: There were 2 cases of residues of captan in grapes with concentrations between 2.01 and 2.1 mg/kg. The intake assessment was carried for the concentrations of 2.01 and 2.1 mg/kg.

benomyl group (carbendazim), carbaryl, dimethoate, endosulfan, maneb goup (procymidone), methiocarb, methomyl and procymidone.

Table 12: Indicative exposure assessment for **acute** risk for those 34 of the 55 pesticides, for which ARfDs have been set, and residues detected

Pesticide	Food item	ARfD in mg/kg (source)	Max. Residue/ Range[32] in mg/kg	Pro-cessing factor	Indicative intake in % of the ARfD		No. of samples > ARfD
					Adult	Child	
Acephate	cauli-flower	0.1 (JMPR 2005)	0.05	-	2	3	
Aldicarb	orange juice	0.003 (JMPR 1995)	0.11	-	37	182	1
Azinphos-methyl	grapes	0.01 (EU peer review[33])	0.31	-	98	203	1
Benomyl group (carbendazim)	grapes	0.02 (COM 2007)	0.51-2.38	-	81-378	167-779	13
Captan	grapes	0.1 (EFSA 2006)	2.01-2.1	-	64-67	132-138	2
Carbaryl	grapes	0.01 (EFSA 2006)	0.21-1.46	-	67-464	138-956	15
Chlormequat	wheat	0.05 (JMPR 1999)	1.3	-	20	38	
Chlorothalonil	grapes	0.6 (COM 2006[34])	0.73	-	4	8	
Chlorpropham	peppers	0.5 (COM 2003)	0.13	-	0.4	2	
Chlorpyrifos	grapes	0.1 (COM 2005)	0.89	-	28	58	
Chlorpyrifos-methyl	grapes	0.1 (COM 2005)	0.6	-	19	39	
Cypermethrin	grapes	0.2 (COM 2005)	0.9	-	14	30	
Deltamethrin	wheat	0.01 (COM 2002)	0.7	0.91[35]	50	92	
Diazinon	peppers	0.025 (EFSA 2006)	0.25	-	16	63	
Dimethoate	auber-gines	0.01 (EFSA 2006)	0.63	*[36]	157	158	1
Dimethoate	bananas	0.01	0.21-0.6	*	29-82	176-502	3
Dimethoate	grapes	0.01	0.21-0.63	-	67-200	138-413	3

[32] The highest value in this column represents the highest concentration found.

[33] "Status of active substances under EU review", http://ec.europa.eu/food/plant/protection/evaluation/index_en.htm

[34] http://ec.europa.eu/food/plant/protection/evaluation/existactive/list_chlorothalonil.pdf

[35] wholemeal flour

[36] *: no processing factors available to account for any different residue levels after peeling (banana) or cooking (aubergine/cauliflower).

Pesticide	Food item	ARfD in mg/kg (source)	Max. Residue/ Range[32] in mg/kg	Pro-cessing factor	Indicative intake in % of the ARfD		No. of samples > ARfD
					Adult	Child	
Endosulfan	auber-gines	0.02 (JMPR 1998)	1.7	*	212	213	1
Endosulfan	peppers	0.02	0.37	-	30	117	1
Folpet	grapes	0.1 (EFSA 2006)	2.01-3.1	-	64-98	132-203	5
Imazalil	bananas	0.1 (EFSA 2007[37])	1.6	0.52	11	67	
Imidacloprid	grapes	0.4 (JMPR 2001)	0.89	-	7	15	
Lambda-cyhalothrin	grapes	0.0075 (COM 2001)	0.2	-	85	175	1
Malathion	wheat	0.3 (EFSA 2006)	2.4	-	6	12	
Maneb-group (propineb)	cauli-flower	0.1 (COM 2003)	2.01-3.5	*	64-111	133-213	5
Maneb-group (propineb)	grapes	0.1	3.3	-	105	216	1
Methamidophos	cauli-flower	0.03 (COM 2007)	0.72	*	76	159	1
Methidathion	grapes	0.01 (JMPR 1997)	0.02		6	13	
Methiocarb	auber-gines	0.013 (EFSA 2006)	0.53	*	101	102	1
Methiocarb	peppers	0.013	0.21-3.25	-	26-409	102-1,575	20
Methomyl	grapes	0.0025 (EFSA 2006)	0.06-0.3	-	76-381	156-786	12
Methomyl	peppers	0.0025	0.06-0.8	-	39-523	151-2,015	14
Methomyl	bananas	0.0025	0.12	*	66	401	1
Parathion	bananas	0.01 (JMPR 1995)	0.16	*	22	134	1
Phosalone	grapes	0.1 (EFSA 2006)	0.98	-	31	64	
Pirimicarb	peppers	0.1 (EFSA 2006)	0.20	-	3	13	
Pirimiphos-methyl	wheat	0.15 (EFSA 2005)	4.42	-	23	43	
Procymidone	grapes	0.035 (COM 2007)	1.01-4.9	-	92-444	189-917	20
Procymidone	peppers	0.035	1.3	-	61	234	1
Pyrethrins	wheat	0.2 (JMPR 2003)	1.2	-	5	9	

[37] ARfD of 0.1 mg/kg relates to general population. ARfD of 0.05 mg/kg for pregnant and nursing women results in calculated intake of 22% of ARfD

Pesticide	Food item	ARfD in mg/kg (source)	Max. Residue/ Range[32] in mg/kg	Pro-cessing factor	Indicative intake in % of the ARfD		No. of samples > ARfD
					Adult	Child	
Tolylfluanid	grapes	0.25 (EFSA 2005)	2.38	-	30	62	
Triadimefon + Triadimenol	grapes	0.08 (JMPR 2004)	0.55	-	22	45	

For carbaryl, 15 exceedances of the ARfD were calculated in grapes. The indicative intake was up to 464 % of the ARfD for adults, and up to 956 % for children. The MRL for carbaryl in grapes was reduced to 0.05 mg/kg (LOD) by Commission Directive 2006/59/EC[38]. Furthermore, Commission Directive 2007/355/EC[39] stipulates that in the EU all authorisations of plant protection products containing carbaryl must be withdrawn by 21 November 2007.

For methiocarb, 20 exceedances of the ARfD were calculated in peppers, and 1 in aubergines. The indicative intake in peppers was up to 409 % of the ARfD for adults, and up to 1,575 % for children. A temporary EC-MRL of 0.2 mg/kg in peppers and 0.1 mg/kg in aubergines was established by Commission Regulation (EC) No 149/2008[40].

For methomyl, 14 exceedances of the ARfD were calculated in peppers, and 12 in grapes. The indicative intake in peppers was up to 523 % of the ARfD for adults, and up to 2,015 % for children. The EC-MRL for methomyl was set to 0.05 mg/kg in grapes, and to 0.2 mg/kg in peppers, by Commission Directive 2007/07/EC[41]. Eleven of the exceedances were calculated for concentrations between 0.06 and 0.2 mg/kg in peppers. EC-MRLs are currently being reviewed and set at lower levels, following the evaluation of methomyl by EFSA and the review of the ARfD. Furthermore, Commission Directive 2007/628/EC[42] stipulates that in the EU all authorisations of plant protection products containing methomyl must be withdrawn by 19 March 2008.

For procymidone, 20 exceedances of the ARfD were calculated in grapes, and one in peppers. The indicative intake in grapes was up to 444 % of the ARfD for adults, and up to 917 % for children. The exceedances were calculated for concentrations of procymidone within the legal EU limits. For this substance Member States had to withdraw authorisations by 30 June 2008. The EC-MRLs are being reviewed to take into account new lower toxicological endpoints and the need to withdraw authorisations.

The benomyl-group comprises three different compounds (benomyl, carbendazim, thiophanate-methyl), and it is impossible to determine to which pesticide the residue relates. Calculations were made with the ARfD for carbendazim, and 13 exceedances of the ARfD were calculated in grapes. The indicative intake in grapes was up to 378 % of the ARfD for

[38] Official Journal L 175, 29.6.2006, p. 61–76

[39] Official Journal L 133, 25.5.2007, p. 40–41

[40] Official Journal L 58, 1.3.2008, p. 1–398

[41] Official Journal L 175, 29.6.2006, p. 61–76

42 Official Journal L 133, 25.5.2007, p. 40–41

adults, and up to 779 % for children. The MRL for carbendazim in grapes was reduced to 0.3 mg/kg by Commission Directive 2008/17/EC[43].

For captan, 2 exceedances, and for folpet 5 exceedances of the ARfD were calculated in grapes. The indicative intake was up to 98 % of the ARfD for adults, and up to 203 % for children. The EC-MRL for captan and folpet was reduced to 0.02 mg/kg (LOD) in (table) grapes by Commission Directive 2006/92/EC[44].

For dimethoate, three exceedances of the ARfD were found in grapes, another three in bananas, and one in aubergines. The indicative intake in grapes was up to 200 % of the ARfD for adults, and up to 413 % for children. All cases were infringements of EC-MRLs. EC-MRLs are currently being reviewed and set at lower levels, following the evaluation of dimethoate by EFSA and the review of the ARfD.

For endosulfan, one exceedance of the ARfD was found each for aubergines and peppers. Commission Directive 2005/864/EC[45] stipulates that in the EU all uses of plant protection products containing endosulfan must be phased out at the latest by 31 December 2007. EC-MRLs are consequently being reviewed and lowered.

The maneb-group included by legal definition the dithiocarbamates metiram and zineb, with a relatively low acute toxicity (for this reason no ARfD was established), as well as maneb, mancozeb and propineb, each with different values for acute toxicity. It is not possible to determine, whether the detected residues relate to metiram or zineb (with no ARfD), to mancozeb, maneb or to propineb (for which an indicative intake of up to 213 % of the ARfD was calculated for children). New EC-MRLs have been established for these substances by Commission Directive 2007/57/EC[46], allowing to distinguish residues of propineb and the additional dithiocarbamates thiram and ziram.

For 5 of the pesticides, the calculated exceedances of the ARfD were singular cases: aldicarb, azinphos-methyl, methamidophos, lambda-cyhalothrin, and parathion.

In summary, the indicative assessment of acute exposure, performed with a first screening model based on worst-case scenarios, shows exceedances of the ARfD for residues of 15 pesticides. A number of exceedances of the ARfD were estimated for residues of carbaryl, carbendazim and methomyl in grapes, and of methiocarb, methomyl and procymidone in peppers. The ARfD values for these pesticides were established or revised in 2006 and 2007, and EC-MRLs have been established or revised since, or are in the process of review.

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[43] Official Journal L 50, 23.2.2008, p. 17–50

[44] Official Journal L 311, 10.11.2006, p. 31–45

45 Official Journal L 317, 3.12.2005, p. 25-28

[46] Official Journal L 243, 18.09.2007, p. 61-70

6. SAMPLING

Commission Directive 2002/63/EC established sampling methods for the official control of pesticide residues in and on products of plant and animal origin. Annex 2 contains the information on sampling given in the summaries of the national monitoring reports of the Member States and EEA States. In most cases, sampling followed annual national plans that were usually established taking into consideration consumption, production, share of imported and exported products as well as risks (e.g. results from previous years).

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

The share of domestic and imported samples should reflect the situation in the respective national market. In total, about 79.3 % of samples were taken from EU produce, and approximately 18.5 % of samples were taken from imported produce. For 2.2 % of samples the origin was unknown.

On average, 14.04 samples were taken per 100,000 inhabitants of the EU and EEA States. The value varies significantly between the States. Within the EU it ranges from 4 samples/100,000 inhabitants to up to 70 samples/100.000 inhabitants. The three EEA States (with a relatively small population size) took up to 100 samples/100,000 inhabitants.

More information about the numbers and origin of the samples taken by the participating States is given in Table N of Annex 1.

7. QUALITY ASSURANCE

Regulation (EC) No 882/2004 requires accreditation of all testing laboratories to ISO 17025. A derogation specified in Regulation (EC) No 2076/2005[47] allows the designation of non-accredited laboratories until 31 December 2009, provided that the laboratories have initiated the accreditation procedures, and that quality control schemes for the analyses they conduct for the purpose of official controls are in place. The quality control system of those laboratories availing of the derogation should be based on the requirements described in the EU Quality Control Procedures for Pesticide Residue Analyses[48].

Commission Recommendation 2006/26/EC lays down that Member States should provide information about the details of accreditation of the laboratories which carry out the analyses for the monitoring programme, about the application of the EU Quality Control Procedures for Pesticide Residue Analyses and about their participation in proficiency and ring tests. It also requires the States contributing to the monitoring to provide the accreditation certificates. Workshops on Analytical Quality Control are regularly held in order to review the Quality Control Procedures. Proficiency tests, supported by the European Commission, are also regularly organised (until 2006, eight proficiency tests have been organised).

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[47] Official Journal L 338 22/12/2005. p. 0083 - 0088

[48] last revision by Document N° SANCO/2007/3131 of 31 October 2007, http://ec.europa.eu/food/plant/protection/resources/qualcontrol_en.pdf

The European Commission's Monitoring Regulation No. 645/2000 (cf. chapter 2) ensured the financial contribution of the European Commission to the organisation of proficiency tests and Analytical Quality Control workshops.

Figure 10 gives an overview of the development since 1998 regarding accreditation of monitoring laboratories. The overall situation of the laboratories has continuously improved since 1998. In 2006, all participating States use at least partly accredited laboratories, while 22 out of 28 States use only accredited laboratories (79 %).

Figure 10: **Status of laboratory accreditation**. Number of States with accreditation of all, of some or of none of the monitoring laboratories in 2006 compared to previous years

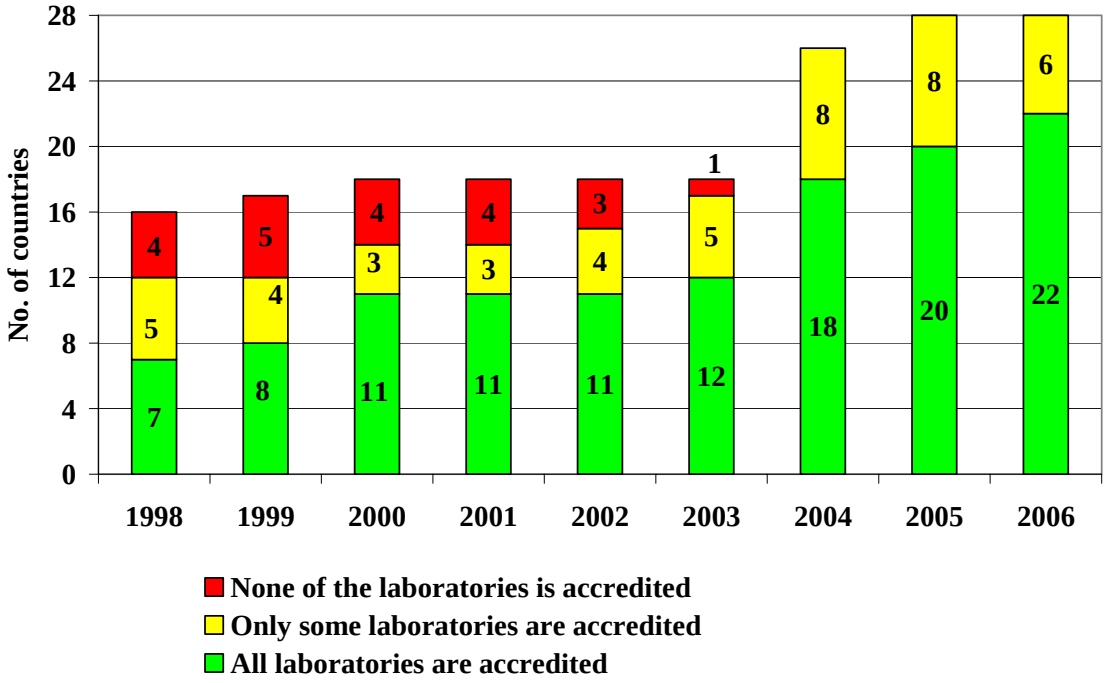
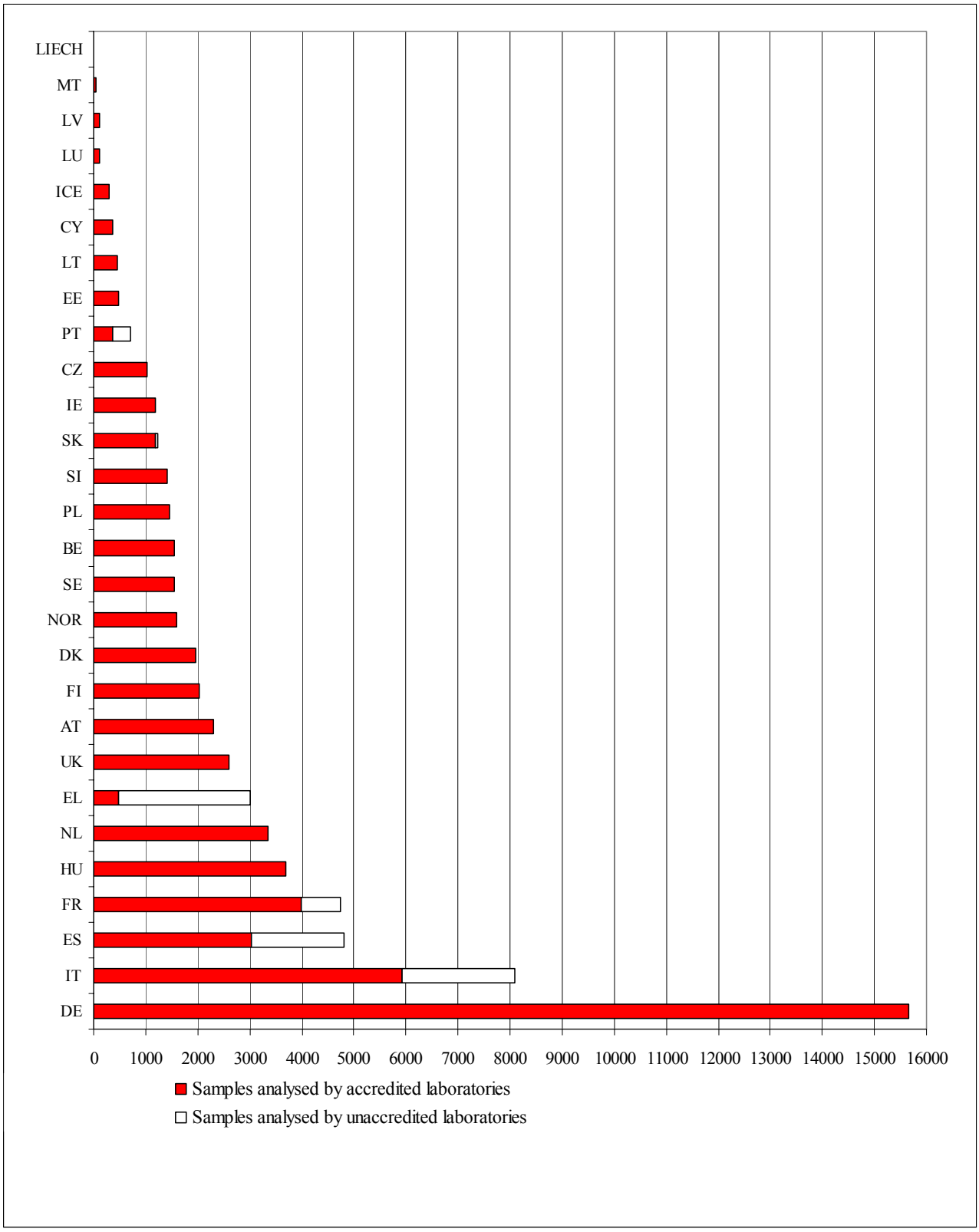


Figure 11 gives information about the number of samples analysed by accredited laboratories or by non accredited laboratories as submitted by the different participating States. In the Mediterranean countries Greece, France, Italy, Spain and Portugal, the number of samples from non-accredited laboratories was significant (between 16 % and 84 %), and there was no considerable change since 2004. In addition, there was a small number of samples from non-accredited laboratories in Slovakia (4 %).

Out of the total of 65,810 analysed samples (sum of fresh and processed products), 88.4 % were analysed by accredited laboratories. This percentage is similar to 2004, when 87.5 % of the samples had been analysed by accredited laboratories.

Figure 11: Numbers of samples analysed by accredited laboratories or by non accredited laboratories by State in the year 2006



In addition to the information on accreditation of laboratories, Figure 12 gives an overview on the implementation of the EU Guidelines on Quality control procedures for pesticide residues analysis. According to Article 4, second indent, of Regulation (EC) 645/2000, Member States "shall make every effort to implement the quality control procedures for pesticide residue analysis provided for […]." The EU Guidelines contain requirements for laboratories in the following ten chapters:

1 Accreditation
2 Sampling, transport, processing and storage of samples
3 Pesticide standards, calibration, solutions, etc.
4 Extraction and concentration
5 Contamination and interference
6 Analytical calibration, representative analytes, matrix effects and chromatographic integration
7 Analytical methods and analytical performance
8 Proficiency testing and analysis of reference materials
9 Confirmation of results
10 Reporting of results

Figure 12: Percentage of laboratories, which have fully, partially, or not, implemented the different chapters of the EU Quality Control Guidelines

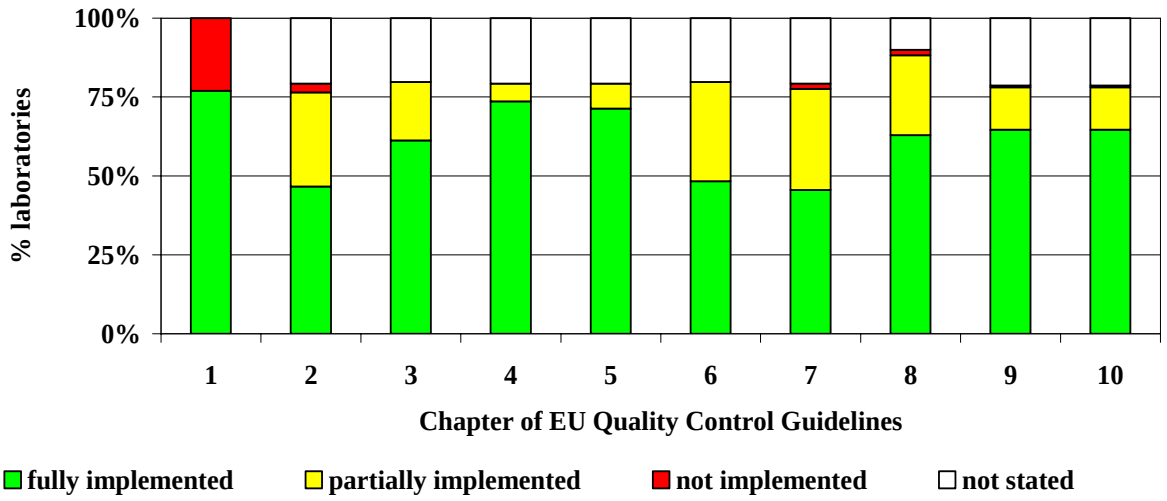


Figure 12 shows the percentage of laboratories, which have fully, partially, or not, implemented the different chapters of the EU Quality Control Guidelines (the information was not available for all 178 laboratories). The level of implementation varies between the different chapters: Chapters 1, 3, 4, 5, 8, 9 and 10 have been fully implemented by the majority of laboratories (61 - 76 %). Chapters 2, 6 and 7 are the least frequently implemented chapters, and have been fully implemented by less than half (46 % - 48 %) of the laboratories. However, only 2 % - 3 % of the laboratories stated that they did not implement chapters 2, 7 and 8 in their laboratories.

Member States reported the participation of 156 of the 178 laboratories (88 %) in proficiency tests. Laboratories from all 28 States participated in the EU proficiency test (EU PT 8).

Another often-used proficiency test scheme was FAPAS[49]. Some laboratories also took part in other nationally or internationally organised proficiency tests.

A summary of the information provided by all participating States about accreditation, participation in proficiency tests and implementation of the EU Quality Control Procedures is provided in Table O of Annex 1.

8. RAPID ALERT SYSTEM

The Rapid Alert System for Food and Feed (RASFF) was established by Council Directive 92/59/EEC[50] on General Product Safety. In February 2002, new provisions entered into force as laid down in Regulation (EC) No 178/2002[51] of the European Parliament and of the Council.

Member States shall immediately notify the European Commission under the RASFF whenever they have any information relating to the existence of a serious direct or indirect risk to human health deriving from food and feed. Such notifications are classified as Alert notifications. Subsequently, the Commission forwards the Alert to the contact points in all Member States. Member States are required to take appropriate action and inform the Commission Services of any measure adopted. Notifications which do not fulfil the above requirements 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). A draft Guidance Document on Notification criteria for pesticide residue findings to the Rapid Alert System for Food and Feed (RASFF), SANCO/3346/2001 rev 7[52], has been published by the European Commission.

The dissemination of information via the RASFF can play an important role in the Member States' planning of monitoring programmes. It allows the identification of specific problems at an early stage and possible adaptation of the sampling programmes accordingly, if considered necessary.

In 2006, a total of 85 notifications regarding pesticide residues in food of plant origin were distributed within the RASFF. Eleven of the notifications were sent as Alerts. The majority of notifications (70) related to fruit and vegetables, in particular to beans (13), lettuce including rocket (8), grapes (6), citrus (6), peppers (4), and apples (4) of different origins. Nine notifications related to herbs and spices.

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

[50] Official Journal No. L 228, 11/08/1992 p. 0024 – 0032; repealed by Directive 2001/95/EC of the European Parliament and of the Council, Official Journal L 011 , 15/01/2002 p. 0004 – 0017.

[51] Official Journal No. L 31, 01/02/2002 p. 0001 - 0024

[52] http://ec.europa.eu/food/plant/protection/resources/rasff_pest_res_en.pdf

9. SUMMARY

9.1. National Monitoring programmes

This report covers the situation with regard to pesticide residues monitoring for the 2006 calendar year in the 25 participating Member States of the EU and the three EEA States Norway, Iceland and Liechtenstein.

A total of 65,810 samples were analysed. About 92 % of the samples analysed were fresh (incl. frozen) fruit, vegetables and cereals, while about 8 % were processed products. In total, 769 different pesticides were sought. The analytical capabilities of laboratories in the participating States ranged from 45 to 683. On average 163 substances were sought in the surveillance samples of fruit and vegetables samples. Of all pesticides analysed for, 354 substances (46 %) were detected.

Overall, no residues were detected in 54 % of the samples, while a further 42 % of the samples contained residues that were below or equal to the maximum residue limits (MRL) laid down at EU or national level. In 4.4 % of all samples, residues above the MRL (national or EC-MRL) were found. When only fresh products are considered, the percentage of samples with no residues detected is 51 %, the percentage of samples with residues at or below the MRLs is 45 % and the percentage of MRL exceedances is 4.7 %. For processed food, no residues were found in 76 % of the samples, residues at or below the MRLs were detected in 23 %, and exceedances of the MRLs in 0.9 % of the samples. For baby food, no residues were found in 96 % of the samples, residues at or below the MRLs were found in 3.4 %, and exceedances of the MRLs in 0.2 % of the samples (specific, lower, MRLs apply for baby food).

The number of exceedances of EC-MRLs is higher in produce imported from Third Countries (6.4 exceedances/100 samples) than in produce from the EU (2.2 exceedances/ 100 samples).

Compared to previous years, the percentage of samples with detected residues at or below the MRL shows an increase to a current level of 43.8 % (in fresh products and cereals). The frequency of samples exceeding MRLs has slightly decreased from 5.5 % in 2003 to 4.7 % in 2006. The frequency of samples with detected multiple residues in fresh fruit, vegetables and cereals shows an increasing tendency, rising to 27.7 % in 2006.

The increased rates of pesticide detections can be partly explained by the enhanced analytical capabilities of the laboratories. This development is reflected by the continuously increasing numbers of pesticides sought in the analytical screens since 1997.

9.2. EU co-ordinated monitoring programme

In the EU co-ordinated programme, eight commodities (aubergines, bananas, cauliflower, grapes, orange juice, peas, sweet peppers, wheat) were analysed for 55 pesticides. Overall, 10,906 samples were analysed in this programme.

The most frequently detected pesticides were chlormequat (analysed in wheat, peppers and aubergines only), imidacloprid, cyprodinil, the maneb group, procymidone, fenhexamid, thiabendazole, azoxystrobin, iprodione, and chlorpyrifos. The highest frequency of MRL exceedances were found for imidacloprid, methomyl, the maneb group, methiocarb,

dimethoate, the benomyl group and methamidophos. For 18 pesticides no exceedance has been reported.

Grapes had the highest percentage of samples with pesticide residues (68 %) below or at MRLs, 55 % of the banana samples and 42 % of the pepper samples contained residues at or below the MRL. Samples of aubergines, wheat, peas and cauliflower contained residues less frequently (33 %, 27 %, 21 % and 20 %, respectively). Orange juice had the lowest percentage of samples containing residues (10 %). Most of the samples did not exceed the MRLs. The highest percentage of MRL exceedances was found in aubergines (4.3 %), followed by peppers (3.5 %) and grapes (3.2 %). For aubergines, the exceedances are mainly caused by infringements of the different national MRLs for imidacloprid. The new EC-MRL for imidacloprid of 2008 would have been exceeded in one sample only.

The pesticide-commodity combination where detectable residues were found most frequently was imazalil/bananas, and residues of imazalil were detected in 45.5 % of banana samples. This is followed by thiabendazole/bananas (41 %), chlormequat/wheat (36.4 %), imidacloprid/aubergines (35.0 %), and imidacloprid/peppers (33.9 %).

There were four combinations with MRL exceedances above 1 %. The highest percentages were found for imidacloprid, which exceeded MRLs most often in aubergines (4.1 % of all samples), followed by the maneb group in cauliflower (1.8 % of all samples), procymidone in peas (1.2 % of all samples) and imidacloprid in peppers (1.2 %). It is noted that, due to the residue definition of the maneb group (CS_2), the analysis for these substances in cauliflower may lead to false positive results. Imidacloprid was also in grapes the pesticide, which exceeded MRLs most often (0.7 %). However, the exceeded levels were national MRLs, as EC-MRLs were only established in 2008 (see above).

Indicative chronic (long-term) exposure assessments demonstrate that the intake of pesticides remains clearly below the ADI[53] and there is no concern of chronic toxicity. The data from an indicative assessment of acute (short-term) exposure, based on worst-case scenarios using the highest levels of residues detected, combined with high food consumption data, show exceedances of the ARfD[54] in some of the samples. In particular, exceedances of the ARfD were estimated for residues of carbaryl, carbendazim and methomyl in grapes, and of methiocarb, methomyl and procymidone in peppers. The ARfD values for these pesticides were established or revised in 2006 and 2007, and EC-MRLs have been established or revised since, or are in the process of review.

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 States, taking into consideration e.g. consumption data; production figures import/export relation and risks (e.g. results from previous years).

All participating States used at least some accredited laboratories, while 22 out of 28 States (79 %) use only accredited laboratories. Overall, 88 % of the monitoring samples were analysed by accredited laboratories.

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[53] Acceptable Daily Intake

[54] Acute Reference Dose

The participating States reported the participation of 156 of the 178 laboratories (88 %) in the EU proficiency tests. The majority of laboratories have, at least partly, implemented the EU Guidelines on Quality control procedures for pesticide residues analysis, although the level of implementation varies for the different chapters of the Guidelines.