Pesticides

Food monitoring, 1998-2003. Part 2.

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Food monitoring, 1998-2003,
consists of four sub-reports:

Part 1: Chemical contaminants
Part 2: Pesticides
Part 3: Food additives
Part 4: Microbial contaminants

MINISTRY OF FAMILY
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Food monitoring, 1998-2003. Part 2.

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Danish Veterinary and Food Administration is part of the Ministry of Family and Consumer Affairs. Danish Veterinary and Food Administration is responsible for the administration and control within food and veterinary areas "from farm to fork", as well as practical matters relating to animal protection (otherwise under the Ministry of Justice).

Making of regulations, co-ordination and development, take place in the Administrations center in Moerkhoej. The 10 Regional Authorities handle the practical inspection of food and veterinary matters, including import/export etc.

The central administration of Danish Veterinary and Food Administration employ a staff of approx. 250 full-time employees, whilst the 10 regional authorities employ a further approx.1500 full-time employee.

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1 Preface

The monitoring programme for foods was established in 1983. Results are reported for periods of five or six years; thus, the present report covers the fourth period, 1998-2003.

The fourth period report of the monitoring programme consists of the following sub-reports:

Part 1: Chemical contaminants
Part 2: Pesticides
Part 3: Food additives
Part 4: Microbial contaminants

The Danish Veterinary and Food Administration coordinates the studies in collaboration with the Danish Institute for Food and Veterinary Research. The regional laboratories in Copenhagen, Odense (until 1999) and Aalborg (until 2000) carried out the analyses for pesticide residues. The samples were taken by the regional veterinary and food control authorities.

April 2005

2 Sammenfatning og konklusion

Nærværende rapport præsenterer resultaterne fra overvågningsperioden 1998-2003 af det fortløbende overvågningsprogram for pesticidrester i frugt, grønsager, korn og kød. Programmet ledes af Fødevarestyrelsen. Danmark har siden begyndelsen af 1960' overvåget pesticidrester i frugt og grønt. Der er to formål med det danske pesticidovervågningsprogram. Dels skal programmet kontrollere, at såvel EU som danske maksimalgrænseværdier bliver overholdt, og dels skal projektet overvåge restindholdet i fødevarer, så det er muligt at vurdere eksponeringen af pesticider til den danske befolkning. Prøveudtagningen blev foretaget som stikprøvekontrol af uddannet personale fra fødevareregionerne. De fleste prøver var frugt og grønt (80%), men der blev også udtaget korn (5%) og prøver af animalsk oprindelse (9%). Yderligere blev der udtaget 5% økologiske prøver. I alt blev der udtaget og analyseret 14.563 prøver. En tredjedel af frugt og grønt prøverne og to tredjedele af kornprøverne var produceret i Danmark. For kød prøverne udgjorde de dansk producerede prøver over 90%. Frugt og grønt blev analyseret for 132-153 forskellige pesticider. Korn blev analyseret for op til 81 pesticider og kød for op til 31.

Den gennemsnitlige hyppighed af prøver med restindhold var 40% for frugt og grønt, 31% for korn, 19% for vin og øl, 5% for økologisk dyrkede produkter og mindre end 1% i babymad. I kød, mælk og honning blev der ikke fundet pesticidrester overhovedet.

Seksten afgrøder var ansvarlig for ca. 96% af det daglige indtag af pesticider beregnet i µg/person/dag. For konventionelt dyrket frugt og grønt, er det undersøgt om det er muligt at afgøre om afgrøder dyrket i ét land havde lavere hyppighed af prøver med restindhold, end de samme afgrøder dyrket i et andet land. De afgrøder, der er undersøgt er appelsiner, æbler, mandariner, pærer, bananer, citroner, vindruer, meloner, ferskner, kiwifrugter, gulerødder, agurker, peberfrugter og salat. Hovedkonklusionen er, at frugt og grønt produceret i Danmark har lavere hyppighed af pesticidrester sammenlignet med afgrøder dyrket i udlandet. Desuden blev der fundet færre forskellige pesticidrester i de danske afgrøder. For de fleste afgrøder var det ikke muligt af se forskelle mellem lande (udenfor Danmark) med hensyn til hyppigheden af pesticidrester, selvom nogle afgrøder fra Holland (tomat, peberfrugt og agurker) havde signifikant lavere hyppighed end tilsvarende prøver fra andre lande. Det er derfor ikke muligt at rådgive forbrugerne om at købe produkter fra ét land frem for et andet, hvis formålet er at undgå pesticidrester. Dog vil forbrugere, der altid vælger danske producerede produkter, når dette er muligt, generelt få flere varer uden pesticidrester end, hvis de køber tilsvarende udenlandske produkter.

I frugt og grønt blev der fundet følgende pesticider i mere end 5% af de udenlandsk producerede prøver: chlormequat, imazalil, 2-phenylphenol, dithiocarbamater, chlorpyrifos, procymidone and endosulfan. I dansk produceret frugt og grønt var det kun chlormequat, der blev fundet i mere end 5% af prøverne. Både i dansk og udenlandsk producerede pærer blev chlormequat fundet i ca. 40% af prøverne.

Det er desuden undersøgt, om der har været ændring af hyppigheden af prøver med indhold af pesticidrester fra år til år. Resultaterne udviste ingen trends.

Analyserne af korn dækkede byggryn, bygkerner , bulgur, majsmel, majsflager, majskerner, havreklid, havregryn, havremel, havrekerner, rismel, brune ris, hvide ris, vilde ris, hvedekim, rugbrød, hvedebrød, hvedekerner, rugkerner, hvedemel, hvedeklid, rugmel, sigtemel og pastaprodukter. I alt blev 791 prøver udtaget og analyseret, nemlig 273 dansk producerede og 518 udenlandsk producerede prøver. Der blev fundet pesticidrester i 31% af prøverne. Chlormequat var det pesticid, der hyppigst blev fundet i både danske og udenlandske prøver (>50%). Glyphosat blev fundet i mere end en tredjedel af de danske prøver og i mere end 10% af de udenlandsk producerede prøver.

Ved en indtagsberegning bliver konsumet af en afgrøde ganget med indholdet af stoffet i afgrøden. Der eksisterer ingen international vedtaget procedure for, hvordan man beregner det gennemsnitlige konsum. Derfor er indtagsberegningerne udført med forskellige modeller.

Vurderingen af exponeringen i forhold til de toksikologiske data er udført ved en såkaldt Hazard Quotient (HQ), som er beregnet ved at dividere indtaget af et pesticid med den relevante Acceptabel Daglige Indtag, ADI. Derefter er alle kvotienterne (HQ'erne) summeret op (ΣHQ) til en form for hazard index eller toksikologisk indeks. Er de toksikologiske effekter, herunder målorganet, ens for alle summerede stoffer, ville ΣHQ være lig med Hazard Index. Hvis summen af HQ har en værdi større end 1.0 (eller 100%) kan dette indikere, at indtagelsen af den aktuelle afgrøde kan være sundhedsmæssig betænkelig, idet beskyttelsesniveauet er nedsat. Når HQ'er for stoffer med forskellige toksikologiske effekter summeres, vil ΣHQ kunne give en indikation af hvilke afgrøder og stoffer, der bidrager mest til risikoen. Dermed får man også en indikation af, hvilke pesticider og hvilke afgrøder, der vil være mest relevant at regulere, for at få sænket indtaget pesticider. Det skal bemærkes, at ikke alle de målte pesticider har en fastsat ADI, og disse pesticider er derfor ikke inkluderet i risikovurderingen.

Der er benyttet forskellige modeller til at estimere det totale gennemsnitlige indtag i µg/dag/person for hele befolkningen. I den ene model beregnes indtaget baseret på resultater over rapporteringsgrænserne. I næste model korrigeres mulige resultater under rapporteringsgrænsen til 50% af denne grænse. Da denne korrektion for nogle afgrøder med relativt få fund af pesticider over rapporteringsgrænsen giver en uforholdsmæssigt stor korrektion, er der benyttet en tredje model. I denne model er korrektionen begrænset til højst at være en faktor 25. Skrælning af fx. citrus frugter, bananer og meloner vil reducere indtaget yderligere, og korrektion for dette er også udført. Det er herefter estimeret, at det totale gennemsnitlige indtag er på 124 µg/dag/person. På samme måde er det estimeret, at ΣHQ er på 24%.

Indtaget for mænd, kvinder og børn (mellem 4 og 14 år) er også beregnet. Kvinder havde det højeste indtag på 137 µg/dag sammenlignet med mænds på 124 µg/dag og børns på 103 µg/dag. Sidstnævnte resulterer i en ΣHQ for børn på 35 %.

Omkring 90 forskellige varetyper eller grupper af varetyper med pesticidrester er blevet inkluderet i beregningen af ΣHQ. De 20 varetyper der bidrog mest til ΣHQ udgjorde omkring 96% af ΣHQ. Det var følgende varetyper: æbler, gulerødder, kartofler, tomater, vindruer, rødvin, pærer, appelsiner, ferskner, salat, kiwifrugt, hvedebrød, mandariner, agurker, peberfrugter, rugbrød, appelsinjuice, citroner, meloner og tropisk frugt. På samme måde er det beregnet hvilke 20 pesticider, der bidrager mest til ΣHQ. Det var følgende pesticider: dieldrin, demeton-S-methyl, dicofol, propargit, prothiofos, dithiocarbameter, chlorfenvinphos, mevinphos, vinclozolin, parathion, dimethoat+omethoat, heptachlor, chlormequat, imazalil, benomyl gruppen, methidathion, carbaryl, phosmet, fenitrothion og endosulfan. Disse pesticider bidrog med 88% af ΣHQ. I alt indgik 107 pesticider i beregningen af ΣHQ.

Nogle afgrøder, som fx. appelsiner, dyrkes kun i udlandet, mens andre, fx. æbler, også dyrkes i Danmark. Hvis afgrøder produceret i Danmark altid bliver valgt, når det er muligt, vil det totale indtag blive reduceret fra 126 µg/dag til 79 µg/dag og ΣHQ ændres fra 24% til 16%.

De danske myndigheder anbefaler at alle over 10 år spiser 600 g frugt og grønt om dagen (plus kartofler). Som ventet vil indtaget for personer, der følger anbefalingerne, øges sammenlignet med den gennemsnitlige forbruger. Forøgelsen er på ca. en faktor 2 både for indtag og ΣHQ, og dette betyder, at ΣHQ for kvinder øges til 59%.

Indtaget af pesticider er signifikant forøget fra sidste overvågningsperiode (1993-1997) til denne periode. Selv når beregningerne er begrænset til at omfatte de samme pesticider og varetyper, som var inkluderet i 1993-1997 rapporten er forøgelsen på 50%-70%. Sammenlignes ΣHQ er forøgelsen endda større. Resultaterne fra denne overvågningsperiode viser, at forholdsvis få, ca. 20, varetyper bidrager væsentligt til indtaget og ΣHQ. Hvis færre varetyper udtages, ville det være muligt at analysere flere prøver fra disse varetyper, hvilket ville reducere usikkerheden på indtagsberegningerne.

Forskellene mellem de to overvågningsperioder (1993-1997 og 1998-2003) viser, at antallet af pesticider, der er analyseret for, har en signifikant indflydelse på det estimerede indtag. Nogle pesticider som for nyligt er inkluderet i programmet, som fx, propargit, imazalil og chlormequat, havde stor indflydelse på det estimerede totale indtag. Dette understreger, at der er et kontinuerligt behov for at inkludere stadig flere pesticider i analyseprogrammet for at forbedre estimatet af forbrugernes pesticideksponering.

3 Summary and conclusion

The present study reports the results from the 1998-2003 period of the on-going fruit, vegetable, cereals and meat, monitoring programme conducted by The Danish Veterinary and Food Administration. Denmark has since the beginning of the 1960's monitored fruit and vegetables for pesticides residues. The Danish pesticide monitoring programme has two objectives. Firstly the programme had to check compliance with the maximum residue levels laid down by the EU and by national authorities, and secondly to monitor the residue levels in foods to enable an evaluation of the exposure of the Danish population to pesticides. Authorised personnel from local food control units performed the sampling randomly within each commodity. Most of the samples were fruits and vegetables (80%), but also cereals (5%) and samples of animal origin (9%) were collected. In addition 5 % samples of organically grown crops (fresh, frozen, processed) were collected. In total 14,563 samples were analysed. One third of the fruit and vegetable samples and two third of the cereals samples were of Danish origin. For meat more than 90 % of the samples were Danish produced. Fruits and vegetables were analysed for 132-153 pesticides. Cereals were analysed for up to 81 pesticides and meat up to 31 pesticides.

The average frequencies of samples with residues were 40% for fruit and vegetables, 31% for cereals, 19% for wine and beer, 5% for organically grown products and below 1% in baby food. Meat, milk and honey were without any pesticide residues.

Sixteen commodities are responsible for about 96% of the daily pesticide intake calculated in µg/day. For conventionally grown fruits and vegetables it has been estimated whether samples grown in one country have lower frequencies of pesticide residues than samples grown in another country. The commodities included are oranges, apples, mandarins and clementines, pears, bananas, lemon, grapes, melons, peaches, kiwis, carrots, cucumbers, sweet peppers and lettuces. The overall conclusion is that Danish produced fruit and vegetables have lower frequencies of samples with pesticide residues compared to products of foreign origin. Also smaller ranges of different pesticides were found in the Danish products. For most of the commodities produced outside of Denmark, there were no major differences between the countries in relation to frequencies of samples with pesticide residues, although some of the commodities from Holland (tomato, sweet pepper and cucumbers) had significantly lower frequencies than other foreign countries. It is therefore not possible to advise consumers to buy products from one country rather than another in order to avoid pesticide residues. However, if consumers choose to buy fruit and vegetables from Denmark whenever possible, they will generally be more likely to get commodities without detectable pesticide residues than if they bought foreign commodities.

In fruit and vegetables the following pesticides were found in more then 5% of the samples of foreign origin: chlormequat, imazalil, 2-phenylphenol, maneb-group, chlorpyrifos, procymidone and endosulfan. In Danish produced fruit and vegetables only chlormequat was found in more than 5 % of the samples analysed. In both Danish and foreign produced pears chlormequat was found in 40% if the samples.

The findings have been investigated to see whether there were any changes in the frequencies of pesticides from one year to another. The data did not show any overall trends.

The analyses of cereals cover barley grouts, barley grain, bulgur, maize flour, maize grits, maize kernels, oats (bran), rolled oats, oat flour, oat grains, rice flour, brown rice, white rice, wild rice, wheat germ, rye bread, wheat bread, wheat grains, rye grains, wheat flour, wheat bran, rye flour, bolted rye flour and pasta products. In all, 791 samples were analysed, 273 Danish produced and 518 imported samples. Pesticide residues were found in 31 % of the samples. Chlormequat was the pesticide residue most often found in both the Danish and foreign samples. Glyphosate was found in more than one third of the Danish and 10 % of the foreign produces samples.

In an intake calculation the consumption of a commodity is multiplied with the content of a substance in that commodity. There is no worldwide agreement on how to find the average consumption. Therefore, the intake for the population is calculated with different models.

The assessments of the exposure in relation to the toxicological data are performed by calculation of the so-called Hazard Quotient (HQ), which is found by dividing the intake of a pesticide with the relevant Acceptable Daily Intake, ADI. The HQs are summed up (ΣHQ) to give a form of hazard index. If the toxicological endpoint were the same for all the summed substances, ΣHQ would be equivalent to the Hazard Index. For both HQ and ΣHQ a value above 1.0 (or 100%) indicates an unacceptable risk. However, summing HQs for substances with different toxicological effects into ΣHQ gives an indication of, which commodities contribute most to the hazard. Together with the HQ's for the individual pesticides, an indication is thereby given as to which pesticides and/or commodities are the most appropriate to adjust in order to reduce the intake of pesticides. However, not all pesticides monitored have an ADI, and these pesticides are therefore not included in the risk assessment.

Different models estimate the total average intake in µg/day/person for the total population. One model calculates the intake based on results over the reporting limit. The next model corrects possible results under the reporting limits to 50% of the reporting limit. Because this correction gives a disproportionately big correction for commodities with relatively few findings of pesticides residues over the reporting limit, a third model is introduced. In this model corrections higher than a factor of 25 are adjusted down to 25. Peeling e.g. citrus fruits, bananas and melon will reduce the intake further, and corrections have also been made for this process. The total average intake is subsequently estimated to be 124 µg/day/person. In the same manner as the intake in percentage of the ADI, the ΣHQ is estimated to be 24%.

In addition, intake and ΣHQ for men, women and children (between 4 and 14 years) have been estimated. Women had the highest intake at 137 µg/day compared to men, who have an intake of 124 µg/day, and children, with an intake of 103 µg/day. This resulted in a ΣHQ for children of 35 %.

About 90 different commodities or commodity groups with detected residues were included in the calculation of the ΣHQ. The 20 commodities that contributed most to the ΣHQ make up about 96% of the ΣHQ. These commodities were apples, carrots, potatoes, tomatoes, table grapes, red wine, pears, oranges, peaches, lettuce, kiwi, wheat bread, mandarins, cucumbers, sweet peppers, rye bread, orange juice, lemons, melons and exotic fruit. Likewise it was determined which 20 pesticides contributed the most to the ΣHQ. These were dieldrin, demeton-S-methyl, dicofol, propargite, prothiofos, maneb-group, chlorfenvinphos, mevinphos, vinclozolin, parathion, dimethoate+omethoate, heptachlor, chlormequat, imazalil, benomyl group, methidathion, carbaryl, phosmet, fenitrothion and endosulfan. These pesticides contributed to % of the ΣHQ. A total of 107 pesticides were included in the calculation of the ΣHQ.

Some commodities e.g. oranges originate only from foreign countries, while some commodities e.g. apples are produced both in Denmark and foreign countries. If commodities produced in Denmark are chosen whenever possible, the total intake is reduced from 126 µg/day to 79 µg/day and the ΣHQ changes from 24% to 16%.

In Denmark the authorities recommend that all persons above 10 years of age eat 600 g of fruit and vegetables (not including potatoes). As expected intake increases for these consumers compared to average consumers. The increase is about a factor 2 for both the intake and ΣHQ, which gives a ΣHQ of 59% for women.

The intake of pesticide residues has increased significantly between the period 1993-1997 and this period. When the calculation is restricted to the same pesticides and commodities included in the 1993-1997 report, the increase is calculated to be 50%-70%. Comparing the ΣHQ an even greater increase is found. The results from this period show that only quite a few, approximately 20, commodities contributed to the intake and ΣHQ. If fewer commodities are sampled, more samples of each commodity can be analysed, which will lower the uncertainty of the estimated intake.

From the differences between the monitoring programmes in the period 1993-1997 and the 1998-2003 period, it can be seen, that the number of pesticides included in the programmes has a significant effect on the estimated intake. Some newly included pesticides (i.e. propargite, imazalil, chlormequat) had an impact on the estimated total intake. This underlines the need for a continued effort to include more pesticides in the programmes in order to get an even more complete estimate of the consumer pesticide exposure.

4 Monitoring programme for foods

The subjects of the monitoring programme have changed over time. For the first two periods (1983-1992) the monitoring programme covered nutrients and chemical contaminants, while in the third period (1993-1997) new subjects were included under the monitoring concept: Pesticides, veterinary drugs, food additives and microbial contaminants.

The monitoring programme for nutrients has been reduced during the fourth period, and purpose of the analyses of veterinary drugs is food control rather than monitoring. Thus these two subjects are not reported for the fourth period. However, dioxin, dioxin-like PCB and selenium are included in the present monitoring period.

While each of the first two monitoring periods (1983-1987 and 1988-1992) was reported as a whole [1, 2], the reporting of the third period was divided into sub-reports according to subject [3, 4, 5, 6, 7]. The fourth period is reported in four sub-reports covering, chemical contaminants, pesticides, food additives and microbial contaminants.

The objectives of the monitoring programme are, by means of systematic studies of foods and the dietary habits of the Danish population,

- to ascertain whether our foods are subject to any long-term changes in terms of the contents of desirable and undesirable substances and/or microorganisms,
- to assess the health significance of any such changes in relation to major changes in dietary habits,
- to disclose potential problems within the area and to provide background material as well as a basis for decisions to remedy any problems which might have arisen.

The material provided may also serve as a documentation of the health quality of Danish foods, and be used for updating the Danish food composition databank. Monitoring results are used also in other connections; e.g., microbiological results are reported to the Danish Zoonosis Centre, and results concerning residues of pesticides are reported to the EU.

Work with the monitoring programme consists of the following:

- to monitor, by means of analyses, the contents of desirable and undesirable substances/ micro-organisms in specific foods,
- to investigate the dietary habits of the Danish population,
- to carry out intake estimates (wherever relevant) by combining contents in foods and data on the population's diet.

Subsequently, a nutritional and/or toxicological assessment can be made. Such an assessment will be particularly important whenever changes are found.

Since changes in the contents of foods and changes in our dietary habits usually develop slowly, the studies cover a considerable number of years. Every five or six years, the results are reviewed, and the analytical results for the foods are compared with the dietary habits over the period. This permits an assessment of whether the intake of desirable substances is adequate, and whether the intake of undesirable substances or microorganisms is acceptably low.

Content findings and intake estimates are compared with earlier results, thus permitting an assessment of the development of contents and intakes over time.

Results are evaluated continuously during the monitoring period, enabling reactions to violations of existing limits or other noteworthy observations.

The monitoring programme gives information on the immediate situation concerning Danish foods, the health significance for Danish consumers, and the direction in which matters are likely to develop. In this respect, the monitoring programme can provide background material and a basis for decisions on actions in the form of national or international regulations.

5 Pesticide residues and exposure

Present study reports the results from the 1998-2003 period of an on-going fruit, vegetable, cereals and meat monitoring programme conducted by The Danish Veterinary and Food Administration. Denmark has since the beginning of the 1960' monitored fruit and vegetables for pesticides residues. In 1961, 300-400 samples of raspberry, lettuce, strawberry, cucumber and apples were analyses for DDT and parathion [8]. Later on potatoes and carrots were included in the programme and were analysed for aldrin, dieldrin, lindane and quintozene. The number of pesticides analysed has increased ever since and was in 2003 153 pesticides. The number of samples and commodities analysed have increased until 2001. In 2002 and 2003 a slight decrease was been seen. Results about violations of the Maximum Residue Limits have been continuous published each year [9, 10, 11, 12, 13 and 14].

5.1 Monitoring programme

Design of sampling plan

There are two objectives for the Danish pesticide monitoring projects. Firstly the programme had to check compliance with the maximum residue levels laid down by the EU and by national authorities, and secondly it had to monitor the residue levels in foods to enable an evaluation of the exposure of the Danish population to pesticides (Danish Veterinary and Food Administration 2000).

For fruit and vegetables this was reflected in the design of the sampling plans, since samples were taken among crops with known possibilities for high frequencies of residues or crops with high consumption. Approximately 60 % of the samples were chosen based on findings in samples from the previous five years. The contribution of each commodity was calculated proportionally to the frequency of findings, although the samples were taken randomly within the commodities. The remaining 40 % of the samples reflected the pattern of consumption in Denmark. For each commodity the maximum number of samples per year was limited to 100 samples per year (e.g. oranges, apples and potatoes), and the minimum number of samples was set to 10. Some manual corrections were made to the calculated programme: The number of samples was reduced for some commodities with low estimates of consumption where, few the high frequencies of previous findings otherwise would result in unreasonably high number of samples (e.g. chilli, pomelo, gooseberry, some exotic fruits). For commodities with low estimated consumption and low frequency of findings, a rolling program is maintained in such a way that all groups are covered during a five-year period [15]

Sampling

Authorised personnel from regional food control units performed the sampling randomly within each commodity. The sampling procedure conformed to the EU directive on sampling for official control of pesticide residues [16]. A total of 14,563 samples of fruit and vegetables were taken primarily at wholesalers, importers and at food processing companies. Most of the samples were fruits and vegetables (80%), but also cereals (5%) and samples of animal origin (9%) were collected. In addition 5 % samples of organically grown crops (fresh, frozen, processed) were collected (See **Table 1**). One third of the fruit and vegetable samples and two third of the cereals samples were of Danish origin. For meat more than 90 % of the samples were Danish produced. Sampling of meat and other products of animal origin are regulated by EU-directive 96/23. The aim of this directive is to ensure that the member states monitor there own production of commodities of animal origin. The directive instructs member states to monitor for e.g. pesticide residues in own production and in import from third countries. The number of samples taken are a between 0.03-0.15 %, depending on species, on the production and on import. This kind of regulation does not exist for fruit, vegetables and cereals. The aim here has been to monitor the commodities on the Danish marked. Therefore more samples produced in EU member states and third countries have been collected

***Table 1**. Number of samples analysed, Danish respectively foreign origin.*

Foodstuff	Danish	Foreign	Total
Fruit and vegetables (fresh, frozen, processed)	3733	8001	11734
Cereals (including processed)	518	273	791
Wine and beer	33	44	77
Meat	1058	94	1152
Milk and honey	27	2	29
Baby food	59	57	116
Organically grown fruit, vegetables and cereals (fresh, frozen, processed)	274	390	664
Total	5702	8861	14563

Laboratories

Samples were mainly analysed at the Regional Food Laboratories. However, some of the samples were analysed at Danish Institute of Food and Veterinary Reasearch, DFVF. All the laboratories involved in the monitoring were accredited for pesticide analysis in accordance to EN45001 or, later, ISO17045 by the Danish body of accreditation, DANAK.

In cases where Maximum Residue Limits, MRL or regulations for the use of pesticides in Denmark are violated, frozen samples were sent to the DFVF for confirmatory determination.

Analytical Programme

Analytical methods were developed and documented at the DFVF (former Institute of Food Chemistry and Nutrition at the Danish Veterinary and Food Administration).

Fruits and vegetables were analysed by up to five different analytical methods covering 132-153 pesticides (see **Table 2**) [17]. Cereals were analysed by three different methods and meat, with one method. The number of analytical methods used for other commodities differs depending on the matrices.

Table 2. *Number of pesticides analysed from 1998-2003 in different types of commodities*

Foodstuff	1998	1999	2000	2001	2002	2003
Fruit and vegetables	126	126	129	130	134	148
Cereals	23	26	26	79	81	81
Meat	12	12	12	15	16	31
Other commodities			138	135	140	153

The pesticide profile for the methods is shown in appendix 8.2 and 8.3

5.2 Residues

The average frequencies of samples are seen in **Table 3**. However, some commodity groups have much higher frequencies. For the citrus group 89% of the samples contained residues, pome fruits 58% and berries 57%. Consequently, the intake of pesticides differs from commodity to commodity. This is described in part 5.3 The frequencies have to be considered as the lowest possible frequency, as the pesticide profile in the analytical methods did not cover all pesticides used in Denmark and the countries where Denmark imports foods from. Furthermore, there will be residues below the detection limits.

Table 3. *Frequency of samples with residues*

Foodstuff	Frequency of samples with residues	Frequency of samples above MRL
Fruit and vegetables (fresh, frozen, processed)	40%	3%
Cereals (including processed)	31%	0.1%
Wine and beer	19%	0%
Meat	0%	0%
Milk and honey	0%	0%
Baby food	1%	0%
Organically grown fruit, vegetables and cereals	5%	0%
Total	34%	3%

Since a high number of different types of fruit and vegetables has been analysed, it has not been possible to report all the results in the present report. Consequently, 10 types of fruit and six types of vegetable have been chosen for which more specific results will be given below. These 16 commodity types are responsible for 96% of the daily intake of pesticides calculated in µg/day. More detailed information about the all the results are given in [9, 10, 11, 12, 13 14].

Although pesticide residues seldom exceed the maximum residue limits, consumer awareness on health issues due to food contaminants is high. Many consumers are interested in avoiding fruit and vegetables with high contents of pesticide residues. To give the best guidance to consumers, the frequencies of samples with pesticide residues for each year have been calculated for the main producing countries. Samples from Denmark are included for the commodities where Denmark contributes significantly to the market. For some commodities there are only one or two significant export countries represented on the Danish market. For that reason only frequencies for these countries are given. If possible, the remaining samples represented a range of other countries have been pooled, and the frequency for these countries has been calculated. However, the data will only reveal major differences, because the data set is quite small and the samples were colleted for other purposes.

The results below only include samples of conventionally grown fruits and vegetables. The figures give a general idea of the differences between countries and but not between years as the number of samples analysed for each years for each commodity and each country is small. At the same time, the analytical programme e.g. number of pesticides analysed for and detection limits, has changed during the period. The figures do therefore not necessarily reflect a time trend.

Fruit and vegetables

Oranges

The average daily consumption of oranges (excluding orange juice) was 10 g/person (see appendix 8.5). The main exporters to the Danish marked were Spain, Greece, South Africa and Morocco. In all 494 orange samples were collected and analysed in the period 1998-2003. Most of them, 421, were produced in these four countries. In total 89% of the samples contained pesticide residues and 46 different pesticide residues were found.

No major difference was seen between the four countries or between the different years (see **Figure 1**). Most of the frequencies were between 75-100%. The remaining 73 samples not included in **Figure 1** had a slightly lower frequency at 79%. However, this result is based on few data.

Apples

The average daily consumption of apples was 56 g/person (see appendix 8.5). Apples are grown in Denmark and from the collected samples it is estimated that approximately 40% of the marked in the period 1998-2003 was covered by Danish apples. The main exporters to Denmark were France and Holland. In all 653 apple samples were collected and analysed. Approximately one third were produced in Denmark, one third in France and Holland and one third in 13 other countries (Argentina, Belgium, Brazil, Chile, China, Germany, Italy, New Zealand, Poland, Spain, South Africa, Uruguay and USA).

The Danish produced apples had residues of 14 different pesticides in 29% of the samples. The foreign produced apples had residues of 44 different pesticides in 72% of the samples. A major difference was seen between Danish and imported apples in respect to the number of pesticides found and the frequency of samples with residues. The frequencies for the Danish apples the different years were between 19-41%. No major differences were seen between the apples produced in France, Holland or the other countries (see **Figure 2**). Most of the frequencies in foreign produced apples were between 65-85%.

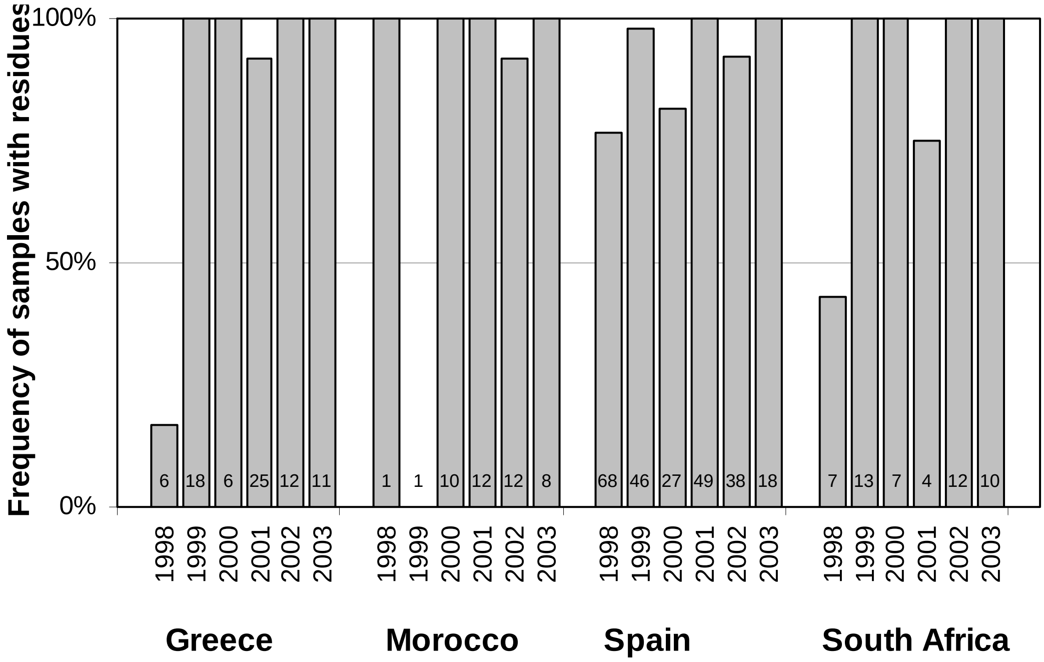

Figure 1. *Frequencies of samples with residues for oranges. Numbers in the bars are the number of samples analysed for the year and country.*

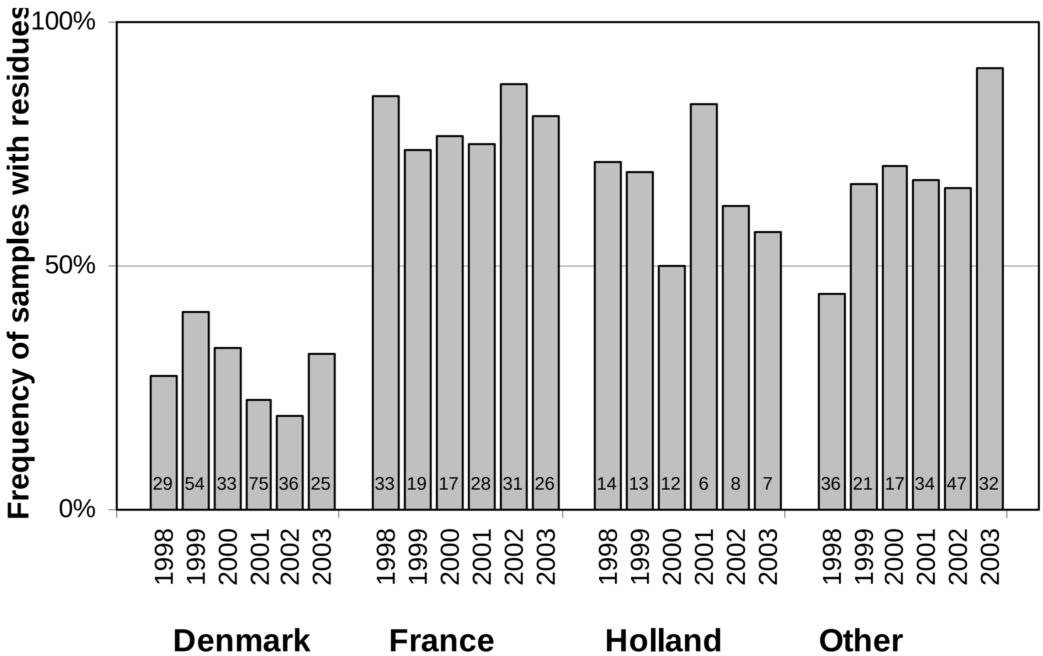

Figure 2. *Frequencies of samples with residues for apples. Numbers in the bars are the number of samples analysed for the year and country.*

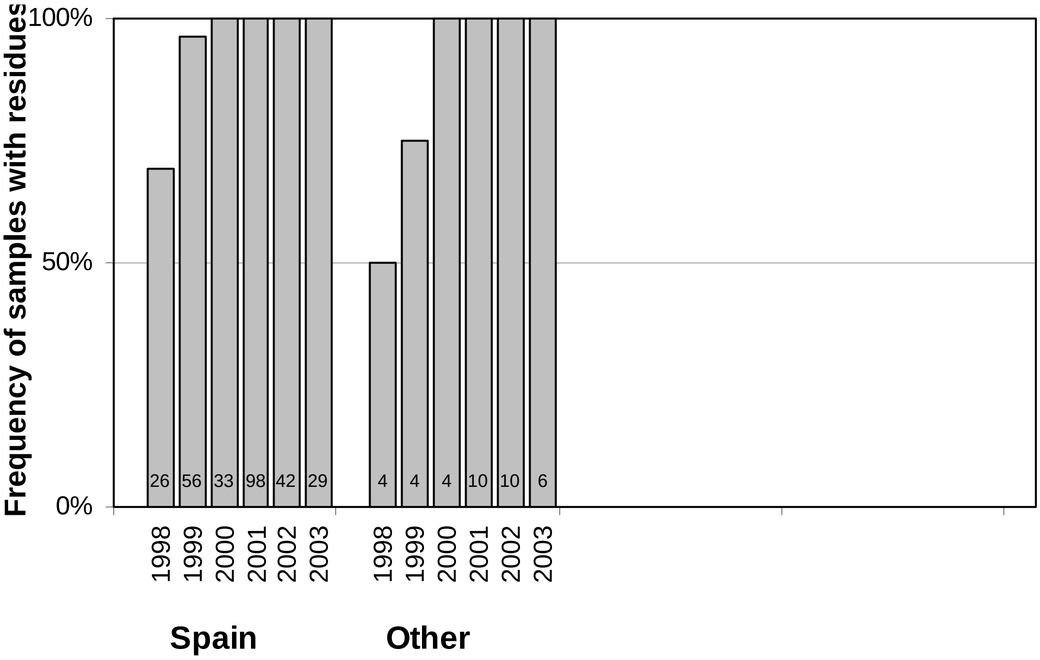

__Figure 3__ Frequencies of samples with residues for mandarins and clementines. Numbers in the bars are the number of samples analysed for the year and country.

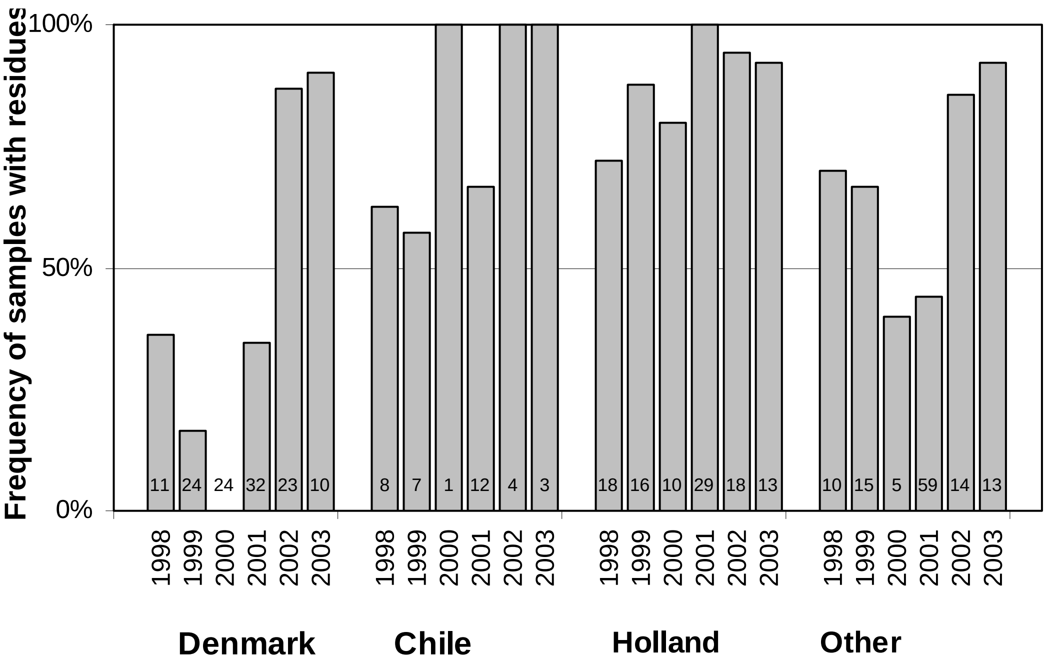

__Figure 4.__ Frequencies of samples with residues for pears. Numbers in the bars are the number of samples analysed for the year and country.

Mandarins and clementines

The average daily consumption of mandarins and clementines was 5.6g/person (see appendix 8.5). The overall main exporter to the Danish marked was Spain. In all 322 mandarin and clementine samples were collected and analysed in the period 1998-2003. Most of them, 284 (90%), were exported from Spain. The rest of the samples, 38, were produced in 11 different countries (Argentina, Cyprus, Greece, Israel, Italy, Jamaica, Morocco, South Africa, Turkey, Uruguay). I total 96% of the samples contained pesticide residues and 35 different were found.

No major difference was seen between the Spanish samples and the samples from the other countries or between the different years (see Figure 3). Almost all the samples had residues.

Pears

The average daily consumption of pears was 15 g/person (see appendix 8.5). Pears are grown in Denmark, and from the collected samples it is estimated that approximately 30% of the marked in the period 1998-2003 was covered by Danish pears. The main exporters to Denmark were Chile and Holland. In all 379 pear samples were collected and analysed. One third were produced in Denmark, one third in Chile and Holland and one-third in 10 other countries (Belgium, China, France, Germany, Italy, New Zealand, Poland, Spain, South Africa and Turkey).

The Danish produced pears had residues of seven different pesticides in 39% of the samples. The imported had residues of 40 different pesticides in 73% of the samples (see Figure 4). However, there was an important difference in the pesticide profile befor 2001, where only imported pear samples were analysed for chlormequat. Therefore the frequency of samples with residues for Danish samples is too low compared to the imported. Consequently, it is not possible to state whether there were major differences between Danish and imported pears in respect to the frequency of samples with residues. However, in respect to the number of different pesticides found, there are significant differences with almost six times as many different pesticides found in imported pears.

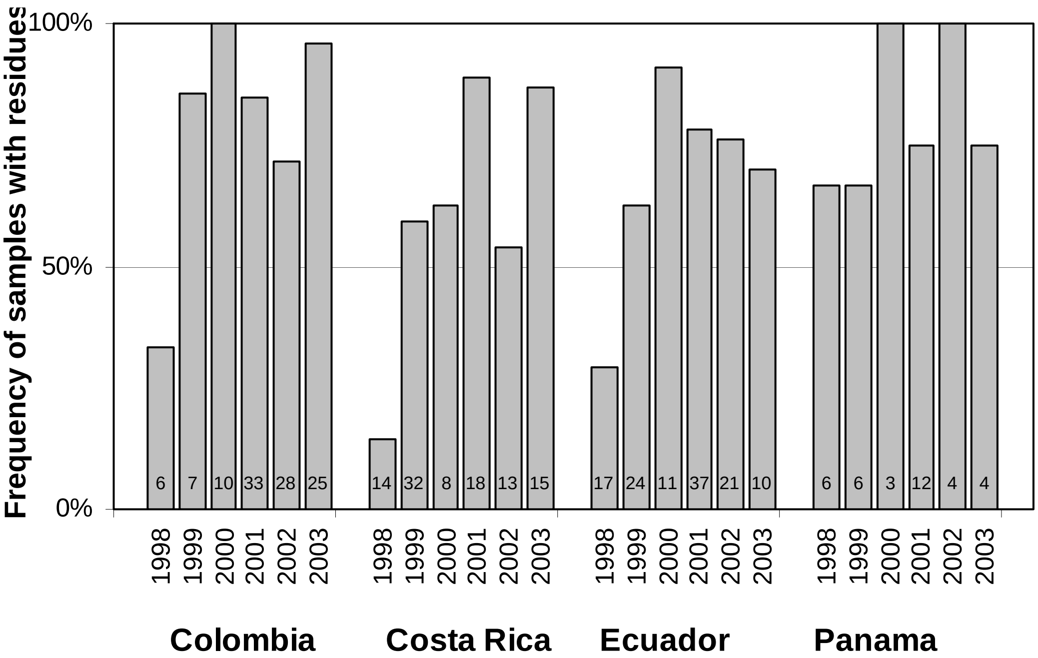

Figure 5. Frequencies of samples with residues for bananas. Numbers in the bars are the number of samples analysed for the year and country.

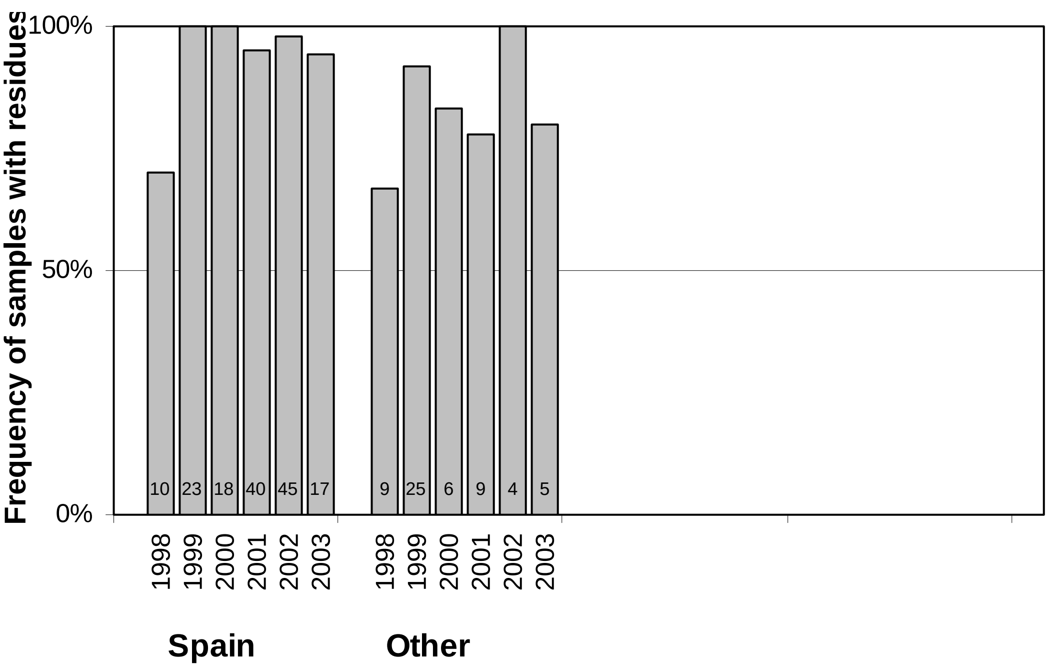

***Figure 6** Frequencies of samples with residues for lemons. Numbers in the bars are the number of samples analysed for the year and country.*

Bananas
The average daily consumption of bananas was 26 g/person (see appendix 8.5). The main exporters to the Danish marked were Columbia, Costa Rica, Ecuador and Panama. In all 423 banana samples were collected and analysed in the period 1998-2003. Most of them, 364, were exported from these four countries. The rest were imported from 15 different countries (Brazil, Cameroon, Central African Republic, Dominica Republic, Cost of Ivory, Ghana, Guatemala, Honduras, Italy, Martinique, Mexico, Peru, South Africa, USA and Venezuela). In total 70% of the samples contained 12 different pesticide residues.

No major difference was seen between the four countries or between the different years (see Figure 5). Most of the frequencies were 60-90%. The remaining 53 samples, which are not included in Figure 5 had a slightly lower frequency at 57%. However, this result is based on few data.

Lemon
The average daily consumption of lemons was 2.5 g/person (see appendix 8.5). The overall main exporter to the Danish marked was Spain. In all 211 lemon samples were collected and analysed in the period 1998-2003. Most of them, 153 (72%), were exported from Spain. The rest of the samples, 38, were imported from 10 other countries (Argentina, Cyprus, France, Greece, Israel, Italy, Morocco, South Africa, Turkey and Uruguay). I total 92% of the samples contained pesticide residues, and 36 different residues were found.

No major difference was seen between the Spanish samples and the samples from the other countries or between the different years (see Figure 6). Most of the frequencies were 70-100%.

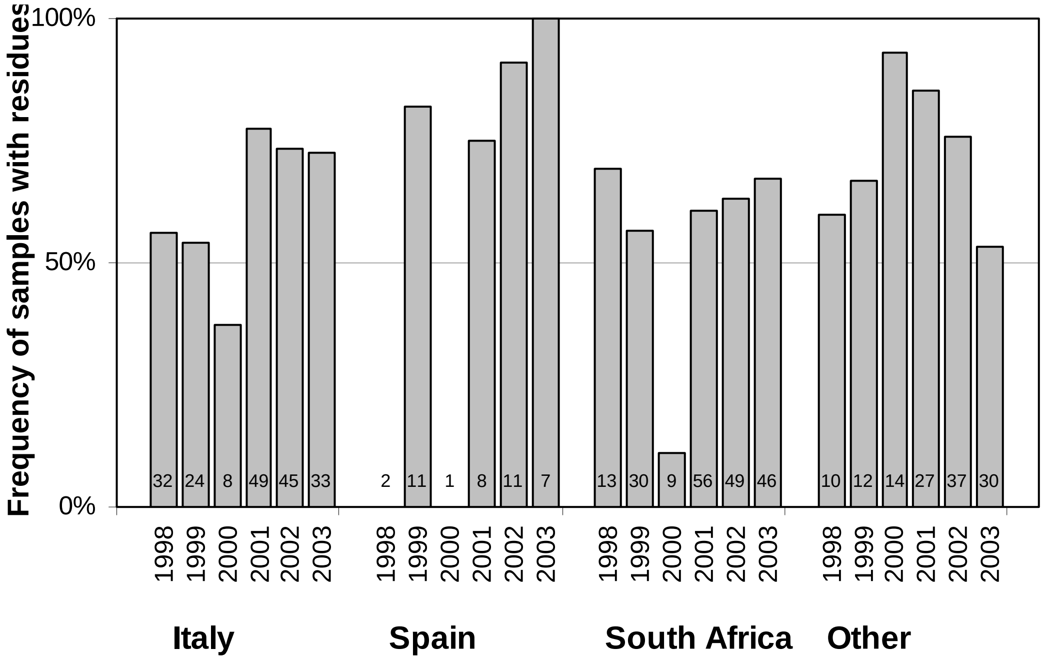

Figure 7. *Frequencies of samples with residues for grapes. Numbers in the bars are the number of samples analysed for the year and country.*

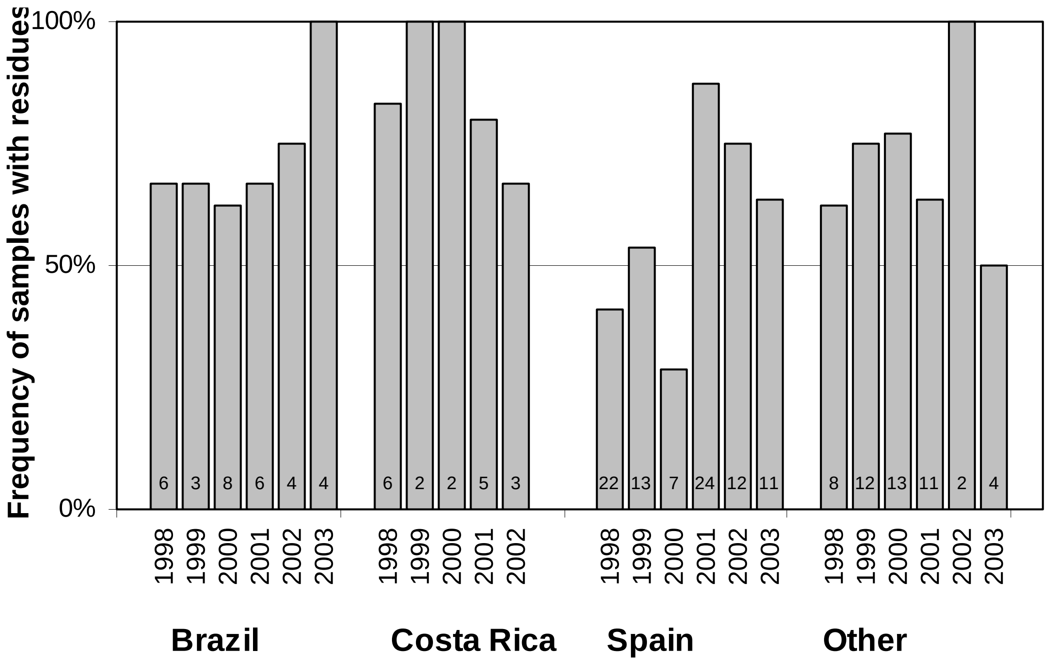

Figure 8. *Frequencies of samples with residues for melons. Numbers in the bars are the number of samples analysed for the year and country.*

Grapes
The average daily consumption of grapes was 5.2 g/person (see appendix 8.5). The main exporters to the Danish marked were South Africa and Italy. In all 564 grape samples were collected and analysed in the period 1998-2003. Most of them, 394 (70%), were exported from these two countries, and 7% of the samples were produced in Spain. The rest were produced in 14 other countries (Argentina, Australian, Brazil, Chile, Cyprus, Egypt, France, Greece, India, Israel, Morocco, Namibia, Turkey and USA). In total 67% of the samples contained pesticide residues, and 50 different pesticide residues were found.

No major difference was seen between the countries or between the different years (see Figure 7). Most of the frequencies were 60-80%.

Melons
The average daily consumption of melons was 5.2 g/person (see appendix 8.5). The main exporters to the Danish marked were Spain, Brazil and Costa Rica. In all 188 melon samples were collected and analysed in the period 1998-2003. Most of them, 138 (77%), were produced in these three countries. The rest were imported from 14 other countries (Ecuador, France, Guatemala, Guinea, Honduras, Kenya, Israel, Italy, Morocco, Nicaragua, Panama, Peru and Turkey). In total 68% of the imported samples contained pesticide residues and 25 different pesticide residues were found. Two samples grown in Denmark had no residues.

No major difference was seen between the countries or between different years (see Figure 8). Most of the frequencies were 60-100%.

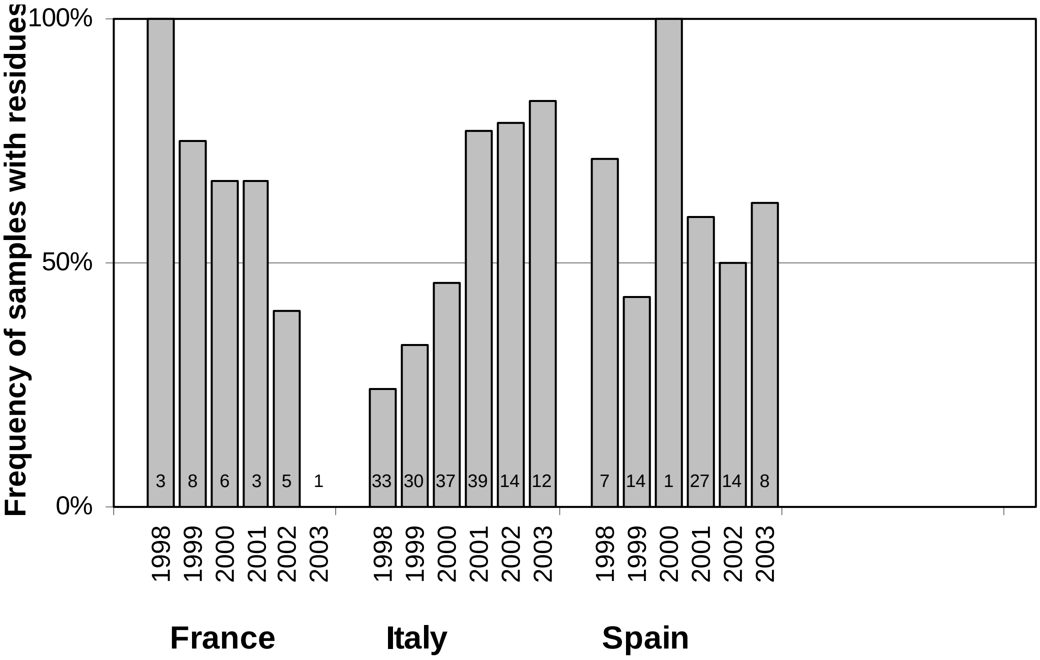

__Figure 9.__ Frequencies of samples with residues for peaches and nectarines. Numbers in the bars are the number of samples analysed for the year and country.

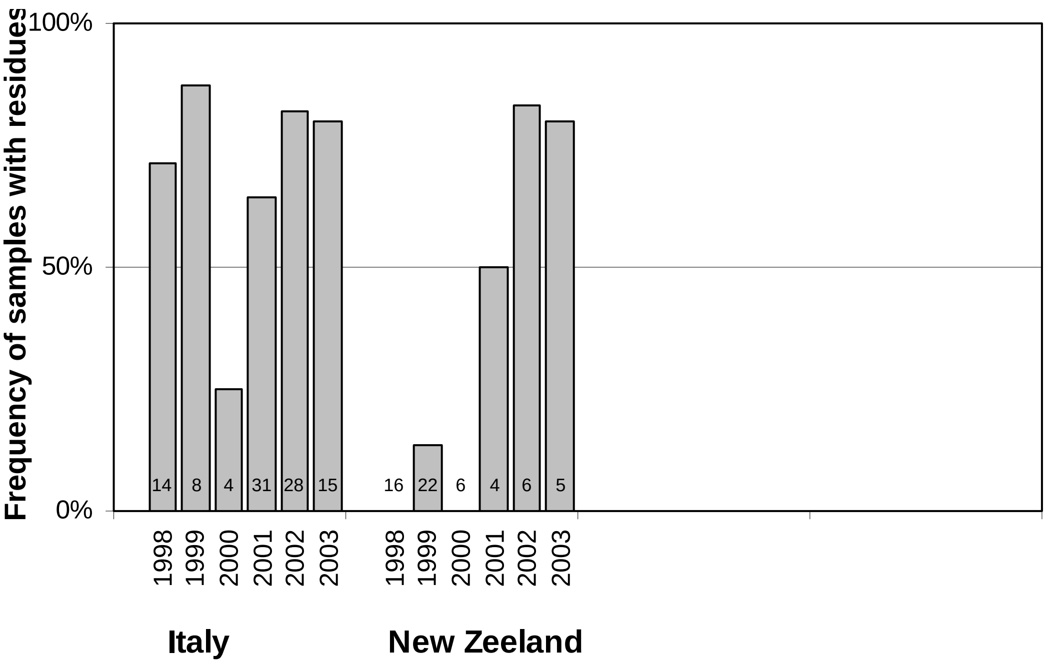

__Figure 10.__ Frequencies of samples with residues for kiwis. Numbers in the bars are the number of samples analysed for the year and country.

Peaches
The average daily consumption of peaches and nectarines was 7 g/person (see appendix 8.5). The main exporters to the Danish market were Spain, Brazil and Costa Rica. In all 281 peaches and nectarine samples were collected and analysed in the period 1998-2003. Most of them, 262, were produced in these three countries. The rest, 19 samples, were produced in seven other countries (Chile, Greece, Egypt, Martinique, South Africa, Turkey and Zimbabwe). I total 55% of the samples contained pesticide residues, and 37 different pesticide residues were found.

No major difference was seen between the three countries or between the different years (see Figure 9). Most of the frequencies were 45-85%. The remaining 19 samples, which are not included in Figure 9had a quite higher frequency at 84%. However, these results are based on few data.

Kiwis
The average daily consumption of kiwis was 2.1 g/person (see appendix 8.5). The main exporters to the Danish marked were Italy and New Zealand. In all 172 kiwi samples were collected and analysed in the period 1998-2003. Most of them, 160, were produced in these two countries. The rest, 12 samples, were produced in five different other (Chile, Costa Rica, Greece, Portugal and Spain). In total 53% of the samples contained pesticide residues, and 17 different pesticide residues were found.

No major difference was seen between the three countries or between the different years (see Figure 10). Most of the frequencies were 50-90%. The remaining 12, which are samples not included in Figure 10, had a slightly lower frequency at 42%. However, these results are based on few data.

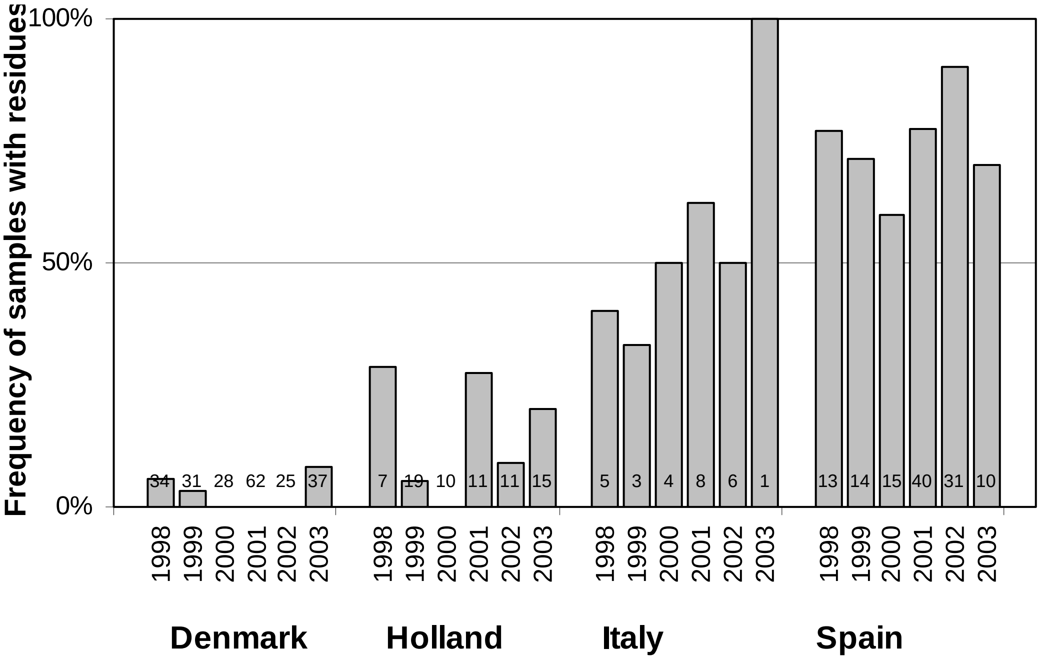

Figure 11. *Frequencies of samples with residues for tomatoes. Numbers in the bars are the number of samples analysed for the year and country.*

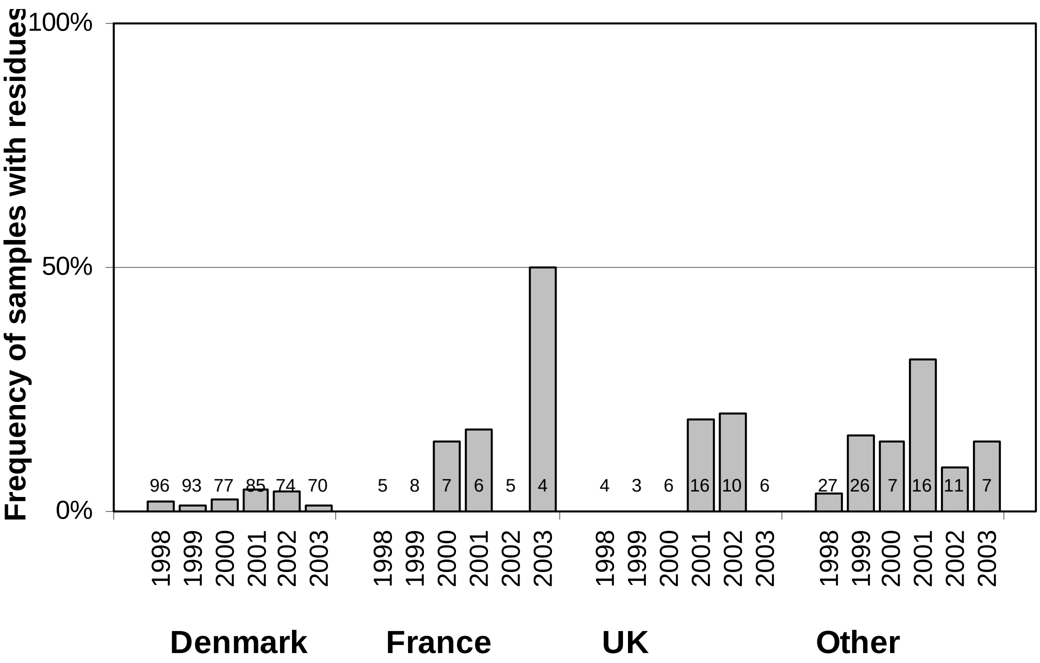

Figure 12. *Frequencies of samples with residues for potatoes. Numbers in the bars are the number of samples analysed for the year and country.*

Tomatoes
The average daily consumption of tomato was 29 g/person (see appendix 8.5). Tomatoes are grown in Denmark, and from the collected samples it is estimated that approximately 45% of the market in the period 1998-2003 was covered by Danish tomatoes. The main exporter to Denmark were Spain, Holland and Italy. In all 485 tomato samples were collected and analysed. Almost 45% were produced in Denmark, 45% in Spain, Holland and Italy and 10% in 8 other countries (Belgium, France, Island, Israel, Morocco, Poland, Senegal, Thailand and Turkey).

The Danish produced tomatoes had residues of five different pesticides in only 3% of the samples, where as the imported tomatoes had residues of 37 different pesticides in 50% of the samples. A major difference was seen between Danish and imported tomatoes in respect to the number of pesticides found and the frequency of samples with residues. However, samples from Holland have also had low frequencies of samples with residues (14%). Tomato samples from Spain had the highest frequency at 77% (see Figure 11).

Potatoes
The average daily consumption of potato was 100 g/person (see appendix 8.5). Potatoes are grown in Denmark, and from the collected samples it is estimated that approximately 75% of the market in the period 1998-2003 was covered by Danish potatoes. The main exporters to Denmark were UK and France. In all 669 potato samples were collected and analysed. Almost 75% were produced in Denmark, 10% in UK and France and 15% in 4 other countries (Cyprus, Holland, Italy and Morocco).

The Danish produced potatoes had residues of 7 different pesticides in only 3% of the samples. Four of the pesticides are pollutants from earlier use. The foreign produced samples had residues of 8 different pesticides in 13% of the samples. A difference was seen between Danish and imported potatoes in respect to the number of pesticides found and the frequency of samples with residues (see Figure 12).

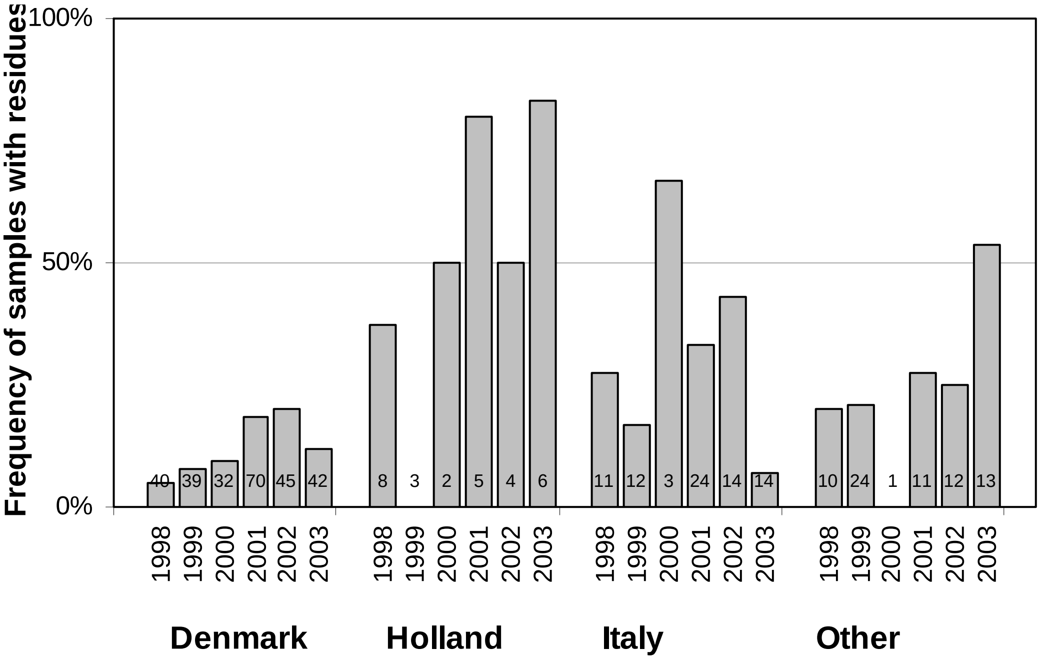

Figure 13. *Frequencies of samples with residues for carrots. Numbers in the bars are the number of samples analysed for the year and country.*

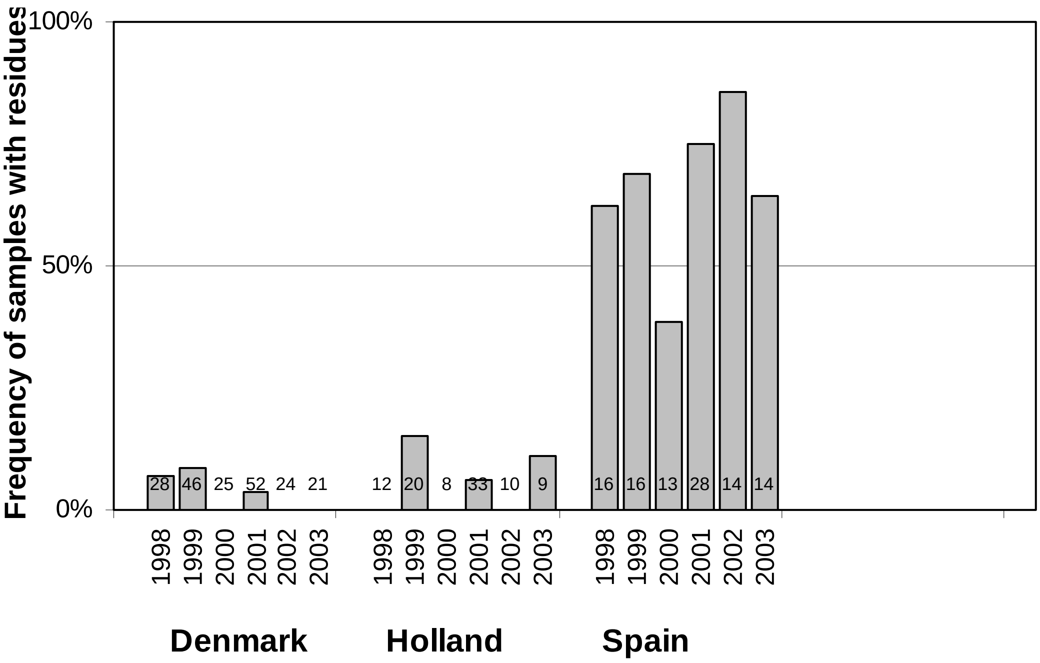

Figure 14. *Frequencies of samples with residues for cucumbers. Numbers in the bars are the number of samples analysed for the year and country.*

Carrots

The average daily consumption of carrot was 32 g/person (see appendix 8.5). Carrots are grown in Denmark, and from the collected samples it is estimated that approximately 60% of the marked in the period 1998-2003 was covered by Danish carrots. The main exporters to Denmark were Italy and Holland. In all 445 carrot samples were collected and analysed. Almost 60% were produced in Denmark, 25% in UK and France and 5% in 8 other countries (Belgium, France, Germany, Island, Poland, Spain, Sweden and South Africa).

The Danish produced carrots had residues of 8 different pesticides in 13% of the samples. Two of the pesticides are pollutants from earlier use. The imported samples had residues of 27 different pesticides in 32% of the samples. Differences were seen between Danish and imported carrots in respect to thefrequency of samples with residues (see *Figure 13*).

Cucumbers

The average daily consumption of cucumber was 22 g/person (see appendix 8.5). Cucumbers are grown in Denmark, and from the collected samples it is estimated that approximately 50% of the market in the period 1998-2003 was covered by Danish cucumbers. The main exporters to Denmark were Holland and Spain. In all 399 cucumber samples were collected and analysed. Almost 50% were produced in Denmark, 25% in Holland and Spain. An additional 10 samples came from Sweden and Turkey.

The Danish produced cucumbers had residues of 6 different pesticides in 4% of the samples. The imported samples had residues of 21 different pesticides in 38% of the samples. A mayor difference was seen between Danish and Spanish cucumber in respect to the frequency of samples with residues. However the Dutch cucumbers were very much alike the Danish (7% samples with residues)(see Figure 14).

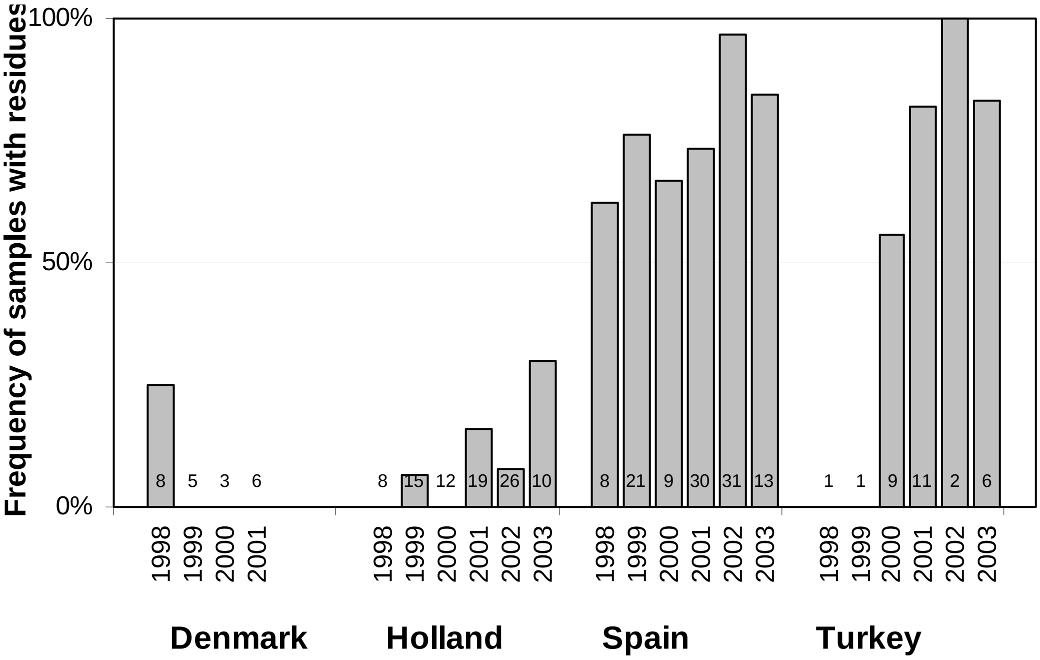

Figure 15*. Frequencies of samples with residues for sweet peppers. Numbers in the bars are the number of samples analysed for the year and country.*

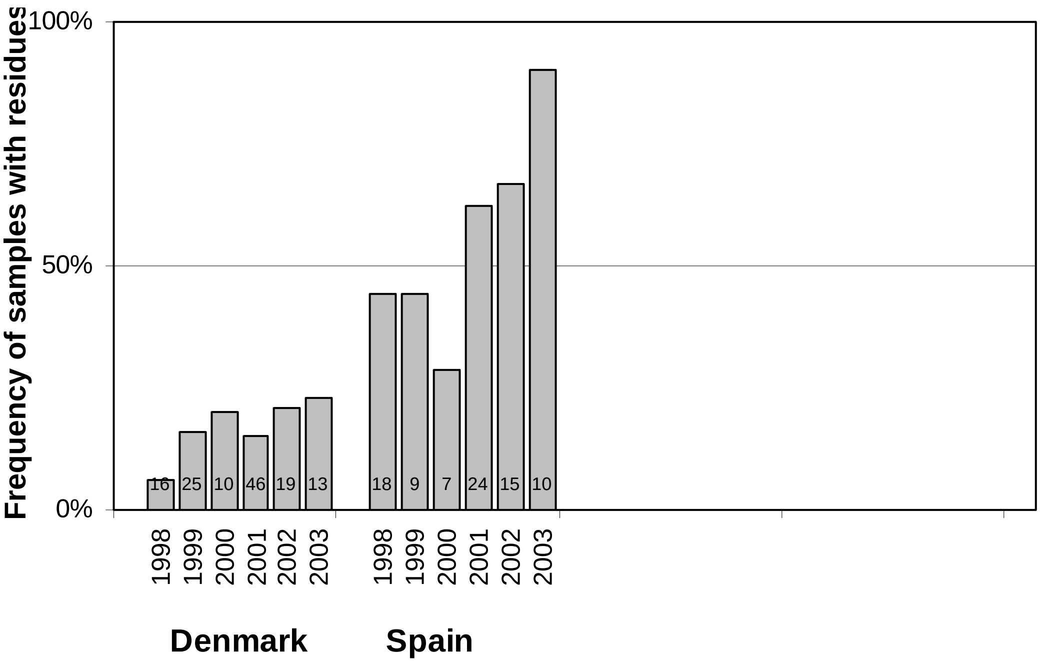

Figure 16*. Frequencies of samples with residues for lettuces. Numbers in the bars are the number of samples analysed for the year and country.*

Sweet peppers

The average daily consumption of sweet pepper was 7.4 g/person (see appendix 8.5). Sweet peppers were grown in Denmark at the beginning of the period, and from the collected samples it is estimated that approximately 10% of the marked in the period 1998-2001 was covered by Danish sweet peppers. The main exporters to Denmark were Holland, Spain and Turkey. In all 285 sweet pepper samples were collected and analysed. Less than 10% were produced in Denmark, one third in Holland and Spain respectively, 10% in Turkey and 5% in 5 other countries (France, Israel, Italy, Kenya, Morocco).

The Danish produced sweet peppers had residues of one pesticide in 9% of the samples. The imported samples had residues of 31 different pesticides in 52% of the samples. A major difference was seen between Danish and Spanish and Turkish sweet peppers in respect to the number of pesticides found and to the frequency of samples with residues. However Dutch sweet peppers were very much alike the Danish (10% samples with residues)(see Figure 15).

Lettuces

The average daily consumption of lettuce was 8.8 g/person (see appendix 8.5). Lettuces are grown in Denmark, and from the collected samples it is estimated that approximately 50% of the marked in the period 1998-2003 was covered by Danish lettuces. The overall main exporter to Denmark was Spain. In all, 252 lettuce samples were collected and analysed. Almost 50% were produced in Denmark, one third in Spain and 15% in 5 other countries (France, Holland, Italy, Poland, Thailand, Germany).

The Danish produced lettuces had residues of 12 different pesticides in 16% of the samples. The imported samples had residues of 23 different pesticides in 58% of the samples. A major difference was seen between Danish and Spanish lettuce in respect to the frequency of samples with residues. No difference was seen between Spanish samples and other imported samples (see Figure 16).

Conclusion on residues in fruit and vegetables

The overall conclusion on residues in the fruit and vegetables responsible for about 96% of the intake of pesticides (in µg/day) is that Danish produced fruit and vegetables had lower frequencies of samples with pesticide residues compared to products of foreign origin. Also a smaller range of different pesticides were found in the Danish products. For most of the commodities produced abroad there were no major differences between the countries in relation to frequencies of samples with pesticide residues, although some of the commodities from Holland (tomato, sweet pepper and cucumbers) had significantly lower frequencies than other foreing countries. It is therefore not possible to advise consumers to buy products from one country rather than another in order to avoid pesticide residues. However, if consumers choose to buy fruit and vegetables from Denmark whenever possible, they will be more likely to get commodities without detectable pesticide residues than if they bought foreign commodities.

Pesticides found in fruit and vegetables

As described in part 5.1 fruit and vegetables were analyses for up to 148 different pesticides. Some pesticides residues definitions cover more than one compound so in total up to 192 compounds were analysed.

The calculations and discussion in this report do only concern the pesticides that have been analysed throughout the entire period, with minor exceptions. Imazalil and chlormequat have been detected so frequently and contributes significantly to the daily intake, that these pesticides are included proportional to the number of samples analysed for imazalil and chlormequat. Other pesticides that were seldom detected are not included, because the uncertainty would be too high.

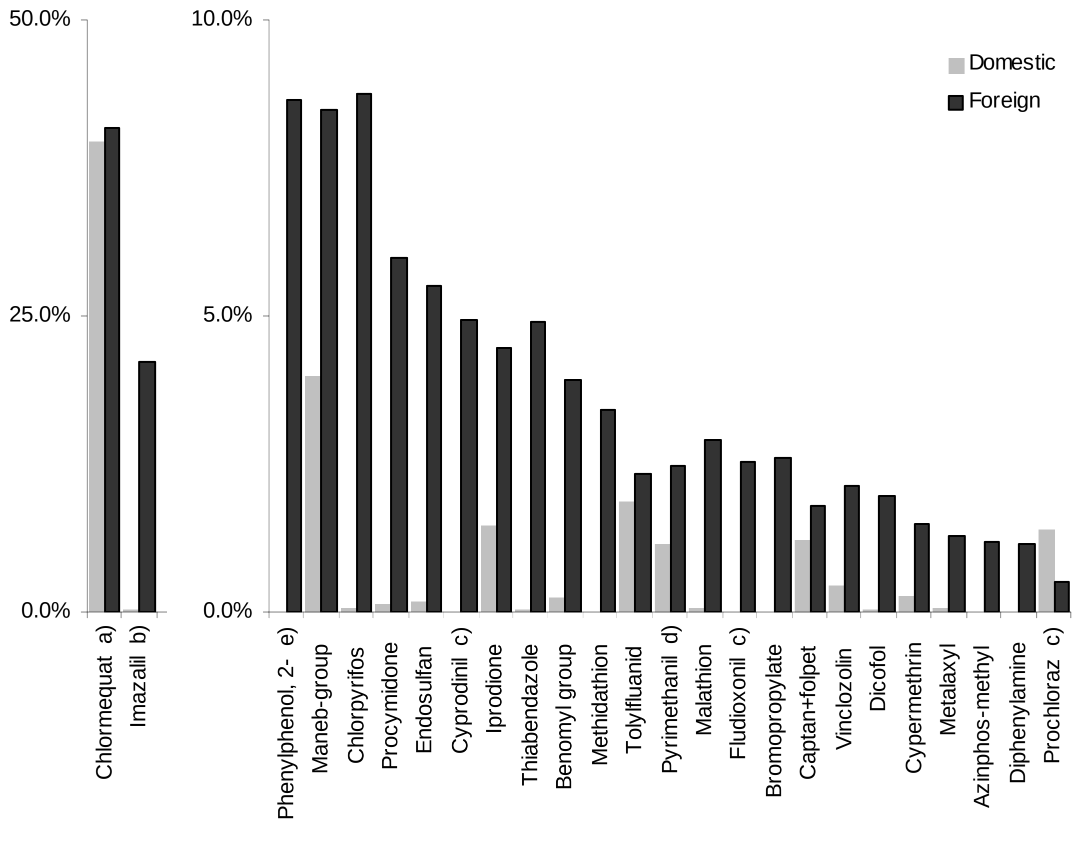

Figure 17. *Frequencies of pesticides found in fruit and vegetables higher that 1% in conventionally grown domestic, foreign or total samples. The pesticides were sought in approximately 12,000 samples), except for the following: a) chlormequat: pears in 2001-2003, carrots, mushrooms and tomatoes all in 2003, approximately 180 from 2001-2003. b) imazalil, 50 samples analysed in 1998, sought in selected sample groups from 1999-2003, approximately 7800 samples analysed in 1998-2003. c) cyprodinil, fludioxonil and prochloraz approximately 1400 samples analysed in 2003. d) pyrimethanil approximately 3200 samples from 2002-2003. e) 2-phenylphenol, citrus samples only, approximately 1400 samples analysed.*

Figure 17 shows that chlormequat was the pesticide most frequently found. However, only pears are analysed for chlormequat. Pear trees were treated with the chlormequat and it was discovered that the chlormequat had accumulated in the trees more than expected, so residues could be found years after treatment, and these findings are expected. Imazalil has been analysed in more than 7500 samples and the frequency of 21% in foreign commodities is calculated with high certainty. Apart from chlormequat and imazalil, ortho-phenylphenol, maneb-group (dithiocarbamates), chlorpyrifos, procymidone, endosulfan were found in more then 5 % of the foreign samples. In Danish samples maneb-group (dithiocarbamates), tolylfluanid, iproion, prochloraz, pyrimethanil and the sum of captan and folpet were found in more than 1% of the samples.

The pesticides, detection frequencies, and reporting limits are shown in Appendix 8.2

The findings have been investigated to see whether there were any changes in the frequencies of pesticides from one year to another. The data did not show any overall trends (see **Figure 18**).

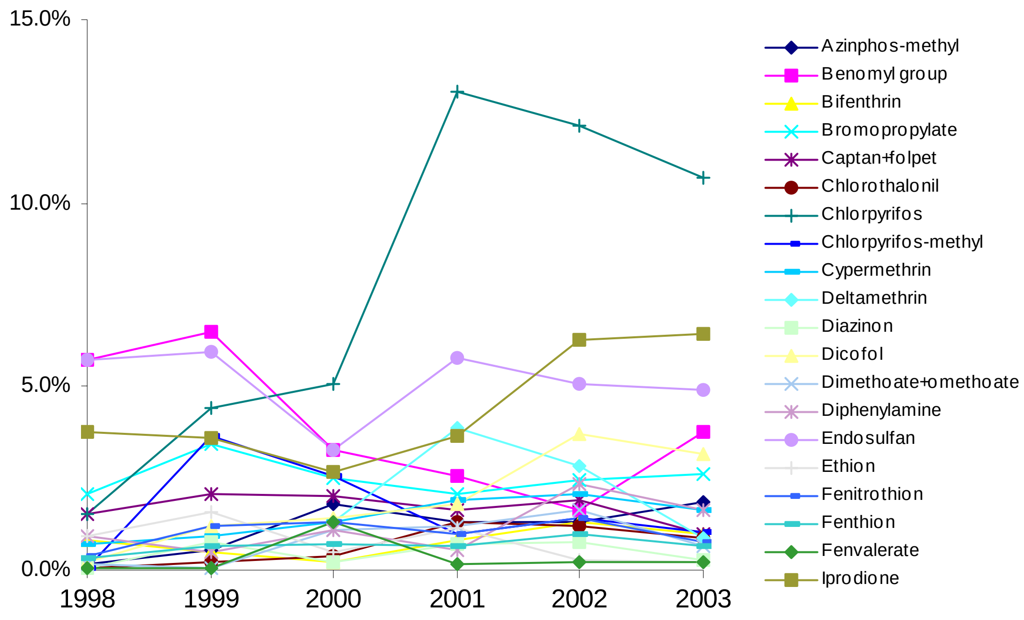

Figure 18. *Examples of frequencies of different pesticides found from 1998-2003.*

Appendix 8.4 shows in which commodities the different pesticides were detected.

Cereals

The analyses of cereals covers barley groats, barley grain, bulgur, maize flour, maize grits, maize kernels, oats (bran), rolled oats, oat flour, oat grains, rice flour, brown rice, white rice, wild rice, wheat germ, rye bread, wheat bread, wheat grains, rye grains, wheat flour, wheat bran, rye flour, bolted rye flour and pasta products. In all, 791 samples were analysed, 273 Danish produced and 518 imported samples. Pesticide residues were found in 31 % of the samples.

Chlormequat was the pesticide residue most often found in both Danish and foreign samples. However glyposate was found in more the one third of the Danish samples (see Figure 19)

The pesticides, detection frequencies, and reporting limits are shown in Appendix 8.3

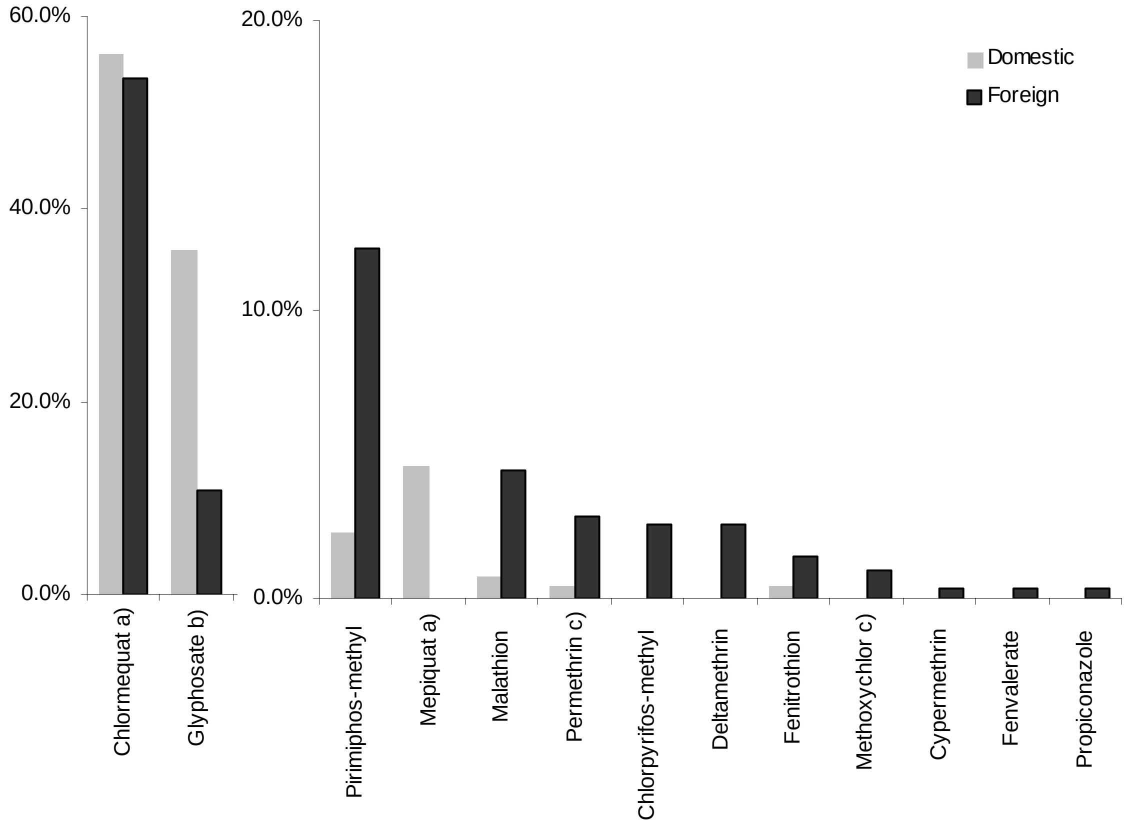

Figure 19. *Frequencies of pesticides found in conventionally grown domestic and foreign cereal. The pesticides were sought in approximately 800 samples, except for the following: a) chlormequat and mepiquat, only sought in wheat, rye, oat and barley, 50 samples analysed each year from 1999-2002, from 2002-2003 all samples analysed, in total approximately 250 analysed. b) glyphosate, only sought in wheat, rye, oat and barley, 50 samples analysed each year from 1998-2002, from 2002-2003 all samples analysed, in total approximately 270 analysed. c) permethrin and methoxychlor, approximately 350 samples analysed in 2001-2003.*

Products with low frequency of samples with residues

In addition to the monitoring of fruit, vegetables and cereals, several commodities with few residues have been analysed. These are meat, organic grown products, baby food, wine and beer (see Table 1). No pesticide residues were found in any of the meat samples or other samples of animal origin. In the organic grown products, residues were found in 5% of the samples (See appendix 8.1). For baby food, 116 samples were analysed, and residues were found in few samples (<1%). In wine 39% of the samples contained residues. However, the concentrations were very low, probably due to the fermentation process as well as the dilution of pesticides, since different batches of grapes might be pooled to one single wine product. In beer, residues were found in 7% of the samples. Only the plant growth regulators, chlormequat and mepiquat, were found in beer. The results have been published in [9, 10, 11,12, 13 and 14].

5.3 Exposure

Intake and risk assessment

The intake of pesticides has been calculated to determine if it is a potential problem for the Danish population. Intake calculations were also compared with the intake from the last monitoring period, so that the development in the pesticide intake could be followed.

In an intake calculation the consumption of a commodity is multiplied with the content of a substance in that commodity. However, it can be difficult both to find the correct consumption as well as the correct content. In a chronic intake calculation it is the average consumption that is multiplied with the average content. However, there is no worldwide agreement on how to find these average values and thereby on how to perform an intake calculation. Consequently there is not one correct way to perform such a calculation. Therefore, in this report the average intake for the total population is calculated with several models. The different models are discussed, and the most suitable model is chosen and used in further calculations. With the chosen model the contribution from the individual pesticides and commodities are also calculated, and risk assessments based on pesticide and commodity, respectively, are performed for the total population.

The consumption data used are from the national survey of dietary habits 2000-2002 [18]. The consumption data used for the intake calculations for different consumer groups are shown in appendix 8.5. It is not possible from the consumption data to distinguish between consumption of commodities of Danish and foreign origin. Therefore the distribution between domestic and foreign food commodities has been estimated from the distribution of samples in the monitoring programmes.

The assessments of the exposures compared to the toxicological data are performed by first calculating the so-called Hazard Quotient (HQ), which is found by dividing the intake with the relevant ADI (in this report called risk assessment). Then the HQs are summed up (ΣHQ) to give a kind of hazard index. If ΣHQ exceeds a value of 1.0 equal to 100%, this could indicate an unacceptable risk. Originally the hazard index [19] is the sum of the hazard quotients of pesticides within a common mechanism group; i.e., it is the sum of the exposures to each of the pesticides in the group expressed as a fraction of their respective ADIs. It is in accordance with the definition of HQ to sum quotients for the same pesticide in different commodities. However, it is not strictly correct to sum HQs for different pesticides that do not have a common mechanism. On the other hand, this method gives an indication of which commodities that contribute most to the hazard. Together with the HQ for the individual pesticides, an indication is thereby given as to which pesticides and commodities it would be the most appropriate to do something about in order to reduce the intake of pesticides. It must be stressed that the calculations should to be used with extreme care.

Not all the monitored pesticides have an ADI and these pesticides are therefore not included in the risk assessment. In appendix 8.6, the ADIs for the pesticides used in the risk assessment as well as the pesticides with no ADIs are shown.

All the models and considerations concerning the food consumption data, intake calculations and risk assessments are closely described in annex 7.2

The total intake of pesticides

In **Table 4** the average intake in µg/day/person for the total population, otherwise referred to as "All", is shown using different models for calculation. The total intake means that all commodities are included, e.g. fruit, vegetables, cereals, wine and beer. In

Table 5 the ΣHQ for "All" is shown. The consumption data for this group are shown in appendix 8.5 and includes data from about 4000 persons. The different models are shortly summarised below.

In many circumstances no detectable amount of pesticides is found but this does not necessarily mean that the content is zero. The content may just be too low for detection with the available methods, or in other words below the reporting limit (RL). Therefore a calculation has been performed where all the undetected residues were "0" and another where they have been set at ½ RL. However, if no detectable results were found for a specific pesticide ½RL was not used in the calculation and all the undetectable residues were calculated as "0".

In some cases it has been found that correcting samples without detected residues leads to a very high correction. This is especially the case when many samples have been analysed, but only a few samples with residues were detected. Therefore a model was chosen where the difference between the intake with and without correction is not allowed to be more than a factor 25. This means that if the correction is more than a factor 25 it is adjusted down to 25. The background for the correction factor of 25 is described in annex 7.2.

For many pesticides most of the applied amount remains in the outer part of the commodity, e.g. the peel. Citrus fruits, bananas and melon contribute considerably to the total intake. As these commodities to a very high extent are consumed after peeling, a calculation has been performed which includes corrections for this process. The correction, called processing factor, used for thiabendazole and the benomyl group was that 25% of the residue remains in the edible part, while a correction of 10% was used for all the other pesticides (see appendix 8.7).

As mentioned earlier there is no standard or agreed method to calculate the intake of pesticides. From the figures in **Table 4**, it is expected that the correct intake of the total population is somewhere between 59 µg/day/person (correction for processing, no correction for undetectable) and 244 µg/day/person (no correction for processing, all undetectables = ½RL). From **Table 5** it can be seen that ΣHQ is somewhere between 5% and 51%, but under all circumstances below 100%. Using zero instead of ½RL has a very important impact on the intake as well as ΣHQ and a more profound impact than processing does.

***Table 4** . Average intake (µg/day) for the consumer group "All" using different models*

	Intake (µg/kg)		
	No correction for undetected residues	Correction for undetected residues; correction factor limited to 25	Correction for undetected residues: 50% of RL
No correction for processing factors	99	189	244
Correction for processing factors	59	126	150

***Table 5**. ΣHQ (%) for the consumer group "All" using different models*

	ΣHQ (%)		
	No correction for undetected residues	Correction for undetected residues; correction factor limited to 25	Correction for undetected residues: 50% of RL
No correction for processing factors	9	35	51
Correction for processing factors	5	24	38

It has been evaluated that the most suitable model is the model where corrections for undetected residues are limited to a factor of 25 and where corrections for peeling are included. In this model it is taken into consideration that residues below the RL could have content different from "0". At the same time it is also taken into consideration that a few positives will not influence on the intake in an exaggerated way; e.g. that 2-3 residue above the RL out of maybe 400 samples cause that 397-398 results are calculated as having contents of ½RL. At last in this model it is also taken into consideration that some commodities are commonly eaten peeled and that only a minor part the pesticides are found in the pulp.

In **Table 6** the average intake in µg/day/person and ΣHQ are shown for the consumer groups, children, men and women using the chosen intake model. The children represent all the participants in the dietary habit survey that are between 4 and 14 year of ages, while the adults, 15-75 years of aged, are divided by gender. The consumption data used are shown in appendix 8.5. As can be seen from **Table 6**, women have the highest intake (137 µg/day) in comparison to men who have an intake of 124 µg/day and children with an intake of 103 µg/day. This is due to the fact that women eat more fruit and vegetables than men (see appendix 8.5). Children have the highest ΣHQ (35%), but it is still well below 100%.

***Table 6**. Average intake for men, women and children with the chosen intake model in mg/day/person and ΣHQ*

	Intake (g/day/person)	ΣHQ (%)
Men, 15-75 years	124	19
Women, 15-75 years	137	26
Children, 4-14 years	103	35

Intake and risk assessment based on commodities

For the group “All” the contribution of each commodity to the intake as well as the ΣHQs with the chosen model have been calculated. In appendix 8.8 the calculation for each commodity is shown with as well as without processing included. In **Table 7**, the intake (in µg/day/person) and the ΣHQs are shown for the 20 commodities that contribute most to the **total** ΣHQ. The results are sorted by ΣHQ. The sum of HQs from the 20 commodities make up about 96% of the total ΣHQ and about 90% of the average intake.

Table 7. *Intake and ΣHQ for the group "All" for the 20 commodities that contribute most to theΣHQ*

Commodity	Intake µg/day/person	ΣHQ (%)
Apples	35	7.91%
Carrots	3.1	3.79%
Potatoes	5.9	2.40%
Tomatoes	8.2	1.30%
Table grapes	3.7	1.30%
Wine, red	4.6	1.20%
Pears	9.6	1.17%
Oranges	4.0	0.53%
Peaches and nectarines	2.6	0.53%
Lettuce	2.6	0.43%
Kiwi	2.4	0.38%
Wheat bread	16	0.34%
Mandarins/clementines	2.6	0.34%
Cucumbers	3.6	0.28%
Sweet peppers	3.0	0.23%
Rye bread	5.2	0.20%
Orange juice	1.4	0.15%
Lemons	0.62	0.15%
Melons	0.36	0.14%
Exotic fruit	0.4	0.11%
Sum	**115**	**23%**
Total	**126**	**24%**
% of total	**91**	**96**

In **Figure 20** the 5 commodities that contribute most to the intake are shown together with the contribution from the rest of the commodities called "others". In **Figure 21** the same is shown for the HQs. As it can be seen in these figures it is not entirely the same commodities that contribute most to the intake and to the ΣHQ as only apples, potatoes and tomatoes are mentioned in both cases. In any case, apples contribute much more than any other commodity to both intake and ΣHQ.

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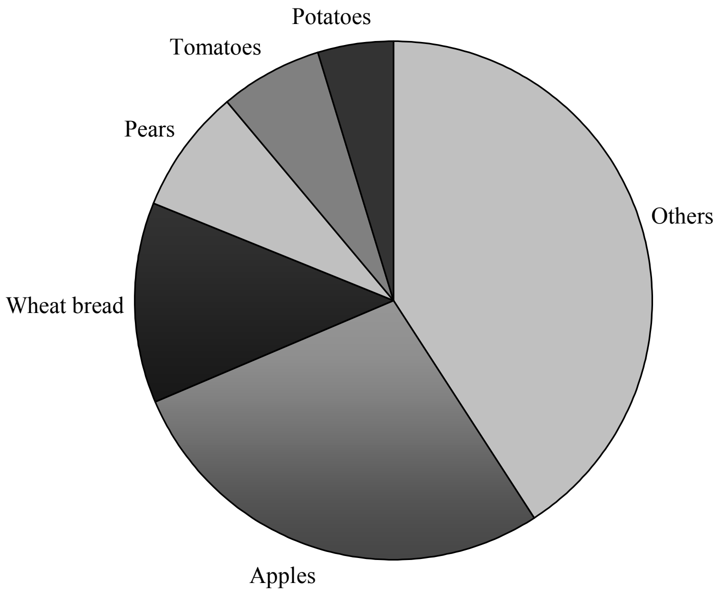

***Figure 20**. The commodities that contribute most to the intake (μg/day/person)*

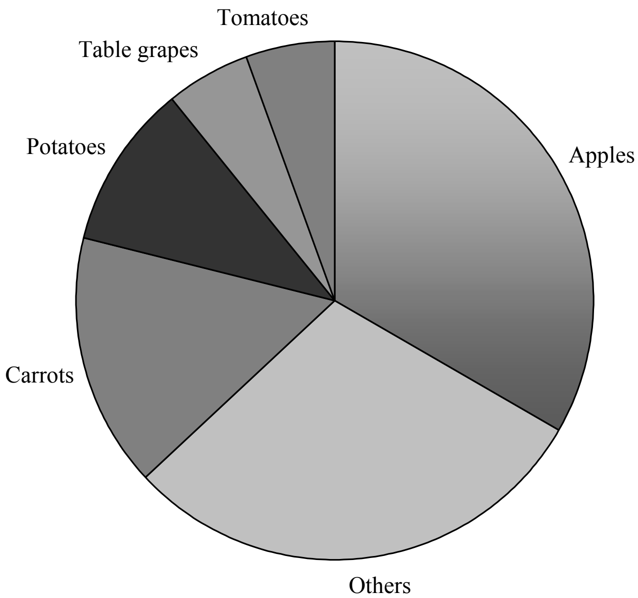

***Figure 21.** The commodities that contribute most to the ΣHQ*

Intake and risk assessment based on pesticide

For the group "All", the contributions of each pesticide in the monitoring programme to the intake as well as the HQs have been calculated. In appendix **8.9** the calculation is shown for each pesticide with and without processing. In **Table 8** the intake (in µg/day/person) and the HQs are shown for the 20 pesticides that contribute most to the ΣHQ using the chosen model. The results are sorted by HQ. The intake from the shown commodities constitutes about 88% of the total ΣHQ and about 55% of the total intake. As can be seen from the table, there is a big difference in ordering the pesticides according to intake and HQ, which is due to differences in their ADIs; e.g. chlormequat contributes most to the intake while dieldrin has the highest HQ. The intake of some pesticides is higher than the intakes shown in **Table 8**, but the HQ is so low that this pesticide is not among the 20 highest values; e.g. the intake of glyphosate is 8.5 µg/day/person but the HQ is only 0.04%.

Table 8. *Intake (µg/day/person) and HQ for the 20 pesticides that contribute most to the ΣHQ*

Pesticide name	Intake (µg/day/person)	HQ (%)
Dieldrin	0.27	4.07%
Demeton-S-methyl	0.70	3.49%
Dicofol	3.6	2.72%
Propargite	9.0	1.36%
Prothiofos	0.08	1.23%
Maneb-group	13	1.20%
Chlorfenvinphos	0.39	1.16%
Mevinphos	0.39	0.73%
Vinclozolin	3.8	0.57%
Parathion	0.22	0.56%
Dimethoate+omethoate	0.65	0.49%
Heptachlor	0.03	0.49%
Chlormequat	16	0.48%
Imazalil	9	0.45%
Benomyl group	7.3	0.37%
Methidathion	0.20	0.30%
Carbaryl	1.2	0.23%
Phosmet	1.4	0.20%
Fenitrothion	0.68	0.20%
Endosulfan	0.79	0.20%
Sum	**69**	**21%**
Total	**124**	**24%**
% of total	**55**	**88**

In **Figure 22** the 5 pesticides that contribute most to the intake are shown together with the contribution from the rest of the commodities called "others", and in **Figure 23** the same is shown for HQ. Propargite is the only pesticide that is among the 5 most important contributors in both instances.

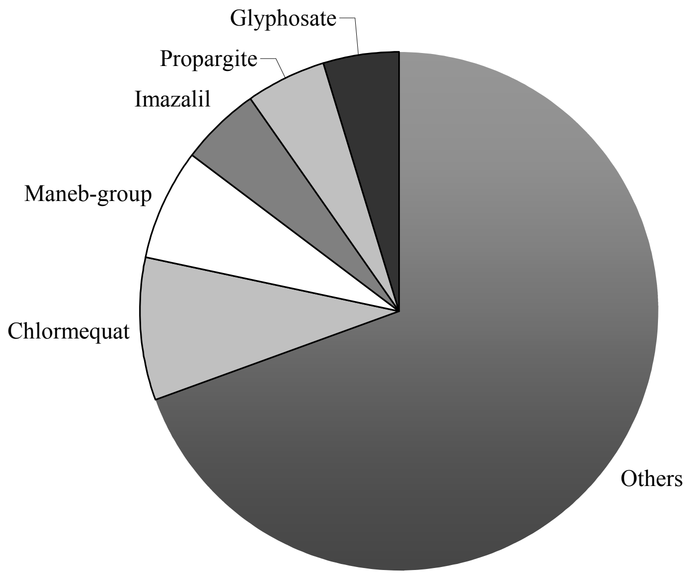

Figure 22. *The pesticides that contribute most to the intake (µg/day/person)*

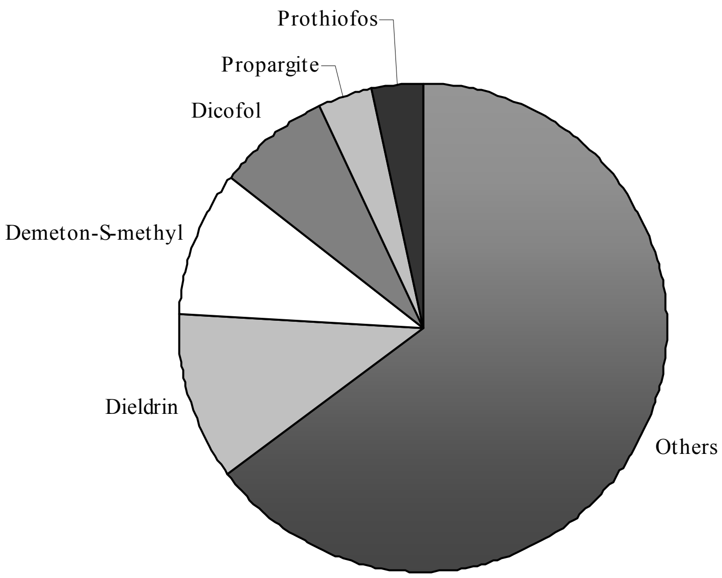

Figure 23*. The pesticides that contribute most to ΣHQ (%)*

Choosing fruits and vegetables from Denmark versus from other countries

Some commodities originate only from foreign countries e.g. oranges, while some commodities e.g. apples are produced both in Denmark and foreign countries. As can be seen for the group “All” in appendix 8.8 samples of foreign origin contribute most to the intake for fruits and vegetables, while Danish samples contribute most to the intake for cereals. Therefore the origin of the commodities can have an effect on the intake in µg/day as well the ΣHQ.

This effect has been calculated as the average intake was calculated for consumers who eat commodities of Danish origin whenever possible, e.g. only Danish apples and pears. The intake and ΣHQ are shown in **Table 9**. As seen in the table the average intake changes from 126 µg/day to 79 µg/day if Danish commodities are always chosen, while ΣHQ changes from 24% to 16%. The real difference is not known. But as Danish commodities in general have lower contents and lower frequencies of pesticide residues than commodities of foreign origin, the average intake will always be lower if Danish commodities are eaten whenever possible.

Table 9. *The intake (µg/person/day) and ΣHQ for high and normal consumers as well as if Danish samples are chosen whenever possible*

Consumer group	Total intake (µg/day/person)	ΣHQ (%)
All, average consumption	126	24%
All, domestic if possible	79	16%
All, foreign if possible	164	29%
Men, average consumption	124	19%
Men, high consumption	281	46%
Women, average consumption	137	26%
Women, high consumption	279	59%

High consumption of fruits and vegetables

In Denmark the authorities recommend that everyone above 10 years of age eat 600 g of fruit and vegetables. It is often asked what effect such a high consumption will have on the intake of pesticides. Calculations have therefore been performed to investigate what effect a high consumption of fruits and vegetables has on the intake of pesticides for “All”. The calculation was performed by taking all the participants in the food dietary survey, who have eaten more than 550 gram of fruits and vegetables and then calculating the intake for these persons. The average intake for high consumers is shown in appendix 8.1 and in **Table 9** the intake and the ΣHQ for high and normal consumers are shown for the chosen model. As expected the intake is higher for high consumers as compared to average consumers. As can be seen from **Table 9**, the increase is about a factor 2 for both the intake and ΣHQ. The ΣHQ rises to 59% for women but is still below 100%.

Comparison of exposure from the period 1998-2003 with 1993-1997

Intake of pesticides in the Danish diet was also calculated in the report from the monitoring programme 1993-1997 [20]. It is not possible to directly compare the results from the 1993-

1997 report with results from the present study (1998-2003) as different calculation models were used. Three models were used to calculate intake from fruit and vegetables in the period 1995-1997. In order to compare results from the two periods, two of the models used in the 1993-1997 report have been used on the results from 1998-2003. In table

Table 10 and **Table 11** the intake and the ΣHQ are shown for model 1 and 2 from the report 1993-1997 along with data from the two periods concerning consumption, pesticides, commodities and ADIs. More details about the different models are described in 7.2 and briefly described below.

Model 1 (1993-1997): Undetected residues were estimated to 50% of either the reporting limit or the lowest residue level found for that substance (whichever was lowest). No differentiation between domestic or foreign origin was made.

Model 2 (1993-1997): As model 1 (93-97) except that different percentages of either the reporting limit or the lowest residue level found were used depending on the percentage of detected residues in the samples analysed for that pesticide (per commodity).

Apart from calculation models, the number of pesticides, reporting limits, commodities with consumer data and ADIs were not quite the same for the two periods:

- *Pesticide profile*: The present study included and detected a higher number of pesticides. Calculations have been performed both with the 1995-1997 profile and with the 1998-2003 profile.
- *Reporting limits*: Reporting limits from the present study were used, as the actual limits used in the 1993-1997 report, were not directly available. In general the reporting limits from the present study were lower that those used for the 1993-1997 calculations.
- *Commodities with consumption data*: The present study included a higher number of commodities. Some minor differences exist in the grouping of commodities. Calculations have been performed both with all commodities from the 1998-2003 study, and restricted to commodities included in the 1993-1997 study. In this study consumption data from the 1995 diet survey was used while now the data from the survey 2000-2002 are used.
- *ADIs*: The 1993-1997 report calculated Hazard Quotients using the ADIs that were accepted for that period. Several of these have changed since then. Calculations have been performed with both the 1995-1997 values as well as with the 1998-2003 values.

For both models, a significant increase in pesticide intake was found from the period 1993-1997 to 1998-2003. With model 1 the intake increased 96%, from 124 to 243 µg/day/person; with model 2 the increase was 74%, from 93 to 162 µg/day/person. These increases could be the result of changes in the number of pesticides sought. Restricting the calculations to either the same pesticides or the same pesticides and commodities as in the period 1993-1997 reduces the change between the two periods in the same magnitude; e.g. from 124 µg/day/person to 212 µg/day/person or 71% for model 1, while the change is 53% namely from 93 µg/day/person to 142 µg/day/person for model 2. It can therefore be concluded that the impact from using same commodities as in the 1993-1997 report is very minor.

Table 10. *Intake(μg/person/day) with two of the models from the 1993-1997 report and with different data for consumption, pesticides, commodities and ADIs*

	Intake μg/day/person	
	Model 1 (1993-1997)	Model 2 (1993-1997)
1993-1997 data	124	93
1998-2005 data	243	162
1998-2005 data; pesticide profile 1993-1997	215	144
1998-2005 data; pesticide profile and commodities 1993-1997	212	142
1998-2005 data; pesticide profile, commodities and pesticide with ADIs 1993-1997	212	142

Table 11. *ΣHQ with two of the models from the 1993-1997 report and with different data for consumption, pesticides, commodities and ADIs*

	Sum of Hazard Quotients (%)			
	2005 ADIs		1997 ADIs	
	Model 1 (1993-1997)	Model 2 (1993-1997)	Model 1 (1993-1997)	Model 2 (1993-1997)
1993-1997 data			10.7	7.5
1998-2005 data	58.1	33.3		
1998-2005 data; pesticide profile 1993-1997	54.2	31.1		
1998-2005 data; pesticide profile and commodities 1993-1997	53.7	30.8		
1998-2005 data; pesticide profile, commodities and pesticide with ADIs 1993-1997	30.7	18.7	28.1	17.3

The sum of HQs increases even more from the former to the present period, 5 times, from 11% to 58% (model 1) or 4 times, from 8% to 33% (model 2). A major part of the increase is caused by changes in the number of pesticides with ADIs. Restricting the calculations to the same pesticides, commodities and ADIs changed the increase to 2.6 times (model 1) and 2.3 times (model 2). The ΣHQ only change about 1% if the both the pesticide profile and commodities from 1993-1997 are used compared to the only using the pesticide profile. Altogether it can be concluded that the commodities contributing significantly to the intake and ΣHQ were included in the calculations from both periods.

Conclusion for exposure

The average intake of pesticides for the group "All" is calculated to be 126 µg/day/person with the chosen model. This model takes into consideration both processing and that undetected residues could have contents above zero, and the effect of peeling on the pesticide residues is also included. Women have the highest average intake (137 µg/day/person) compared to men and children (124 µg/day/person and 103 µg/day/person, respectively), as they eat more fruit and vegetables. High consumers (eat more than 550 g of fruit and vegetables per day) have an intake about twice the average intake, namely 281 µg/day/person rather than 124 µg/day/person for men and 279 µg/day/person rather than 137 µg/day/person for women. However, if Danish commodities are chosen whenever possible, the intake decreases from 126 µg/day/person to 79 µg/day/person.

The risk assessment was performed by calculating the HQs, and then summing these into a kind of hazard index, (ΣHQ). The ΣHQ for the group "All" is 24% with the chosen model. For ΣHQ, children have the highest exposure (35%) compared to women (26%) and men (19%). For high consumers there is a huge difference between women and men when comparing the average consumption of the two groups. For men the ΣHQ increases from 19% to 26%, while for women the ΣHQ increases from 26% to 59%. Eating Danish commodities whenever possible, reduces the ΣHQ from 24% to 16% for the average consumer. As can be seen all the calculations show that the ΣHQ is below 100%. As mentioned at the beginning, it is not strictly accurate to sum HQs for different pesticides, but this method gives a good indication of the commodities and pesticides that contribute most to the hazard.

As can be seen, relatively few commodities contribute in a great extent to the intake and ΣHQ. For pesticides, on the other hand, the intake and ΣHQ are distributed between many substances.

The intake of pesticides has increased significantly between this period and the period from 1993-1997. When the calculation is restricted to the same pesticides and commodities included in the 1993-1997 report, the increase is calculated to be 50%-70%. When comparing the ΣHQ, an even greater increase is found.

When comparing the two periods it is obvious that the differences in the number of commodities do not have any significant effect on the intake. The commodities that contribute most are included in both periods. At the same time, it is also clear that expanding the number of pesticides in the monitoring programme has had a great effect on the intake. The Danish pesticide profile includes far from all pesticides that possibly could be found in commodities on the Danish market. Some pesticides, which have not been included in the monitoring programme in the whole period e.g. chlormeqaut, imazalil and propargite have an impact on the intake, and propargite contributed also in a great extent to the ΣHQ.

The results on intake and ΣHQ show that there is no immediate reason to be concerned about pesticide exposure even for consumers who eat more 600 g of fruit and vegetables each day. On the other hand, the pesticide exposure is not ignorable and at the same time it has increased from the last monitoring period. Therefore it is still necessary and important to survey pesticide exposure.

To improve the exposure calculations and get an even more reliable picture of the Danish populations exposure to pesticides it would therefore be preferable:

1) To expand the number of pesticides in the monitoring programme

2) To take a greater number of samples of the most important commodities, so as to get more information about the residues in these commodities

3) To lower the RLs in order to minimize the numbers of undetectable residues

6 References

1. National Food Agency of Denmark, Food monitoring in Denmark. Nutrients and contaminants 1983 – 1987. Publication No. 195 (September 1990).
2. National Food Agency of Denmark, Food monitoring 1988 – 1992. Publication No. 232 (December 1995).
3. Danish Veterinary and Food Administration, Nurients, Food monitoring, 1993-1997, Part 1. Fødevarerapport 2001:17 (October 2001).
4. Danish Veterinary and Food Administration, Chemical Contaminants, Food monitoring, 1993-1997, Part 2. Fødevarerapport 2001:18 (October 2001).
5. Danish Veterinary and Food Administration, Production aids (pesticides and veterinary drugs), Food monitoring, 1993-1997, Part 3. Fødevarerapport 2001:19 (October 2001). (e-publication).
6. Danish Veterinary and Food Administration, Food additives, Food monitoring, 1993-1997, Part 4. Fødevarerapport 2001:20 (October 2001). (e-publication).
7. Danish Veterinary and Food Administration, Microbial contaminants, Food monitoring, 1993-1997, Part 5. Fødevarerapport 2001:21 (October 2001). (e-publication)
8. Forureningsrådet [Council for Pollution], Pesticider [Pesticides], publication No. 17, Copenhagen, Denmark (1971) [In Danish].
9. J.H. Andersen, K. Jonassen, M.E. Poulsen and O. Meyer, Pesticidrester i fødevarer 2003 – resultater fra den danske pesticidkontrol [Pesticide Residues in foodstuffs 2003 – Results from the Danish Pesticide Monitoring], Fødevare Rapport 2004:16 (September 2004).

10 J.H. Andersen, M.E. Poulsen, R. Bille and O. Meyer, Pesticidrester i fødevarer 2002 – resultater fra den danske pesticidkontrol [Pesticide Residues in foodstuffs 2002 – Results from the Danish Pesticide Monitoring], Fødevare Rapport 2003:16 (Oktober 2003)

11 J.H. Andersen, M.E. Poulsen, K. Granby, H.B. Christensen and O. Meyer, Pesticidrester i fødevarer 2001 – resultater fra den danske pesticidkontrol, [Pesticide Residues in foodstuffs 2001– Results from the Danish Pesticide Monitoring]. Fødevare Rapport 2002:25 (November 2002).

12. J.H. Andersen, M.E. Poulsen, K. Granby and H.B. Christensen, Pesticidrester i fødevarer 2000 – resultater fra den danske pesticidkontrol [Pesticide Residues in foodstuffs 2000 – Results from the Danish Pesticide Monitoring], Fødevare Rapport 2001:22 (November 2001).

13 M.E. Poulsen, J.H. Andersen, K. Granby and H.B. Christensen, Pesticidrester i fødevarer 1999 – resultater fra den danske pesticidkontrol [Pesticide Residues in foodstuffs 1999 – Results from the Danish Pesticide Monitoring], Fødevare Rapport 2000:29 (November 2000).

14 M.E. Poulsen, J.H. Andersen, K. Granby and H.B. Christensen, Pesticidrester i fødevarer 1998 – resultater fra den danske pesticidkontrol. [Pesticide Residues in foodstuffs 1998 – Results from the Danish Pesticide Monitoring], Fødevaredirektoratet (December 1999).

15 J.H. Andersen and M.E. Poulsen, Results from the Monitoring of Pesticide Residues in Fruit and Vegetables on the Danish Market 1998-99. Food Additives and Contaminants, 18, 10 p906-931 (2001).

16 European Communities, Commission directive 79/700/EEC of 24 July 1979 establishing Community methods of sampling for the official control of pesticide residues in and on fruit and vegetables. *Official Journal of the European Communities*, L207, 26-28. (1979)

17 M.E. Poulsen and J.H. Andersen, Results from the Monitoring of Pesticide Residues in Fruit and Vegetables on the Danish Market 2000-01. Food Additives and Contaminants, 20, 8 p742-757 (2003).

18 Danish Veterinary and Food Administration, Om kostundersøgelsen [Concerning the Dietary Survey], Fødevarerapport 2002:2 (February 2002) (only in Danish),

19. C.F. Wilkinson, C.G. Christoph, E. Julien, M. Kelly, J. KronenbergJ. McCarthy & R. Reiss, Assessing the Risks of Exposures to Multiple Chemicals with a Common Mechanism of Toxicity: How to Cumulate?, *Regulatory Toxicology and Pharmacology* **31**, 30-43 (2000)

20. Danish Veterinary and Food Administration, Production aids, Monitoring system for foods, 1993-1997. Part 3. FødevareRapport 2000:03 (January 2000).

7 Annexes

7.1 Intake calculations

Intake of pesticide residues from food has been calculated from an estimate of the average content of pesticides included in the monitoring programmes, combined with the estimated consumption of Danish consumer groups.

As previously explained, most pesticides and all significant food items in the monitoring programmes have been included all six years (1998-2003). All pesticides included in the monitoring programmes were usedin the intake calculations, but the available data for recently included pesticides does not cover all six years.

The monitoring programmes primarily include fresh fruit and vegetables. For some commodities, a smaller part of the samples were sampled as frozen food. Results from these samples have been included in the results for fresh items.

In general, samples were analysed with their peels (to conform with the definitions of maximum residue levels), thus the measured content might include parts that are not normally consumed. In a few important cases, corrections have been made for the reduction of pesticide contents due to peeling.

Calculation of the average content of pesticides

For each combination of pesticide and food item, an average content has been calculated.

Origin: As previously shown, the residue levels sometimes differ considerably between countries. Therefore calculations were performed separately for samples of domestic and foreign origin.

Undetected residues: Not all pesticides are detected in all samples. Due to technical and economical limitations in the monitoring programme, some samples will contain residues not detected by the analytical procedures, either because the pesticides were not included in the programme or because the residue content was lower that the reporting limit used.

Different models have been proposed to compensate for undetected residues from pesticides included in the programmes.

The average content ($C_{p,f}$) of pesticide p in food item f has been calculated from the average content ($C_{avg,pos,p,f}$) in the $n_{pos,p,f}$ samples with detected residues, the reporting limit (RL_p) for the pesticide and the number ($N_{p,f}$) of food items analysed for the pesticide:

(1) Average content ($C_{p,f}$) = ($C_{avg,pos,p,f}$ * $n_{pos,p,f}$ + 50% * RL_p * ($N_{p,f}$ - $n_{pos,p,f}$) / $N_{p,f}$

This model (50%RL-model) may overestimate the average content to some extent, especially for those combinations of pesticide and food items where the frequency of detection was low or where the reporting limit was high.

In some cases the calculated result without compensation for undetected residues has been discussed. This content has been calculated from:

(2) Average content ($C_{0,p,f}$) = $C_{avg,pos,p,f}$ * $N_{pos,p,f}$ / $N_{p,f}$

This model will underestimate the average content.

A third model that restricts the compensation for undetected residues has been proposed in order to avoid excesive compensation. The background for this model is discussed in Annex 7.2.

When compensating for undetected residues, different approaches as to which samples should be included have been discussed. If a pesticide has been detected in a domestic sample of apples, should the compensation include domestically grown apples only or also foreign grown? Or could the same residues be expected in all samples of the same type (i.e. all pomes fruits)?

Processing factors: Detailed information on the actual processing performed by consumers as well as the effect on the residue levels is limited. On the other hand, intake from citrus fruits, bananas and melons contributes significantly to the total intake of pesticides. As these food items mostly are consumed after peeling only, corrections have been made for this process. Data has shown, that approximately 90% of residues in these food items are found in the peel, and only 10% remains in the edible part - except for thiabendazole and pesticides from the benomyl group (carbendazim, thiophanat-methyl and benomyl), where about 25% remains in the edible parts (Appendix 8.3).

Thus, corrections for loss of residues during peeling were calculated for citrus fruits, bananas and melons as:

(3) Reduced average content ($C_{R,p,f}$) = $C_{p,f}$ * $PF_{p,f}$

where the processing factor ($PF_{p,f}$) describes the fraction of residue from pesticide *p* left after processing food item *f*. (25% for thiabendazole and the benomyl group, 10% for other pesticides).

Calculation of consumption data

Consumption data were supplied by the Department of Nutrition, Danish Institute for Food and Veterinary Research, and are mainly based on data from the national survey of dietary habits 2000-2002. A description of the survey has been published[1]. The survey is based on a combination of personal interviews about e.g. physical activities and a 7-day diary record. The consumption data were given for each individual as an average of the 7 days for each eaten food item together with information about gender, age and body weight. In total about 4000 persons from four to 75 years of age participated in the survey. The survey provides information about the consumption of individuals and consumption patterns in different groups of age and gender.

In some cases, a food item in the survey did not match any of the food items in the monitoring programmes. Some of these discrepancies have been handled by combining data from the consumption survey with data from sales and/or recipes. This was the case for the citrus fruits, some of which contribute significantly to the intake of residues: The survey generated data on the consumption of citrus fruits as a group, while the monitoring programme showed separate results for lemons, oranges, mandarins and clementines, pomelos, minneolas and limes. Most other cases concerned food items that did not contribute significantly to the intake. Some food items without much effect on the average intake were combined into groups (nuts, other small fruits and berries, exotic fruits or vegetables, cabbages and others).

A special case has been cereals and cereal products. Bread is an important food item, but the monitoring programmes mainly include grain and flour. In order to use the analytical results

[1] *Danish Veterinary and Food Administration, Om kostundersøgelsen (only in Danish), Fødevarerapport 2002:2 (February 2002)*

for grain and flour to estimate the pesticide intake from bread, the analytical results for grain and flour of wheat and rye were converted to estimates of residues in bread by multiplying the analytical results for wheat by 0.77 and by 0.65 for rye (these figures were estimated from the content of dry matter, protein and carbohydrates in bread, flour and grain from wheat and rye, respectively).

The consumption data does not provide an estimate for the distribution of consumed food items between the countries of origin or between domestic and foreign origin.

Calculation of intake

The contribution to intake of pesticide residues for each combination of pesticide *p* and food item *f* was calculated from the average content ($C_{p,f}$) of that pesticide and the estimated average consumption ($K_{f,g}$) of that food item within the target group *g*:

(4) Contribution to intake ($I_{p,f,g}$) = $C_{p,f} * K_{f,g}$

For each group of consumers, the individual contributions to intake has been summed for food items, pesticides, origin and for all combinations of pesticide, food items and origins.

Effects of models and analysis of robustness

Calculated results for the intake of pesticides are subject to some uncertainty partly caused by differences between the real world and the calculating models used, and partly because the data used in the modelling is sampled with some statistical uncertainty.

While the uncertainty of the residue contents in the single samples are well described, as determinations were performed by accredited methods (normally an analytical reproducibility of 15-25% would be expected), the bias of the average content is not known due to the unknown contribution of undetected residues.

Average content: Calculations with different models for the compensation of undetected residues reveals that differences can be quit high for some pesticides, while in other cases the compensation seems very reasonable.

In some studies[1], no differentiation between organically grown and conventionally grown food items was made when calculating the intake. In the present study, approx. 11700 samples of conventionally grown fruit and vegetables have been analysed for the same pesticide residues as the approx. 450 organically grown samples (4%). If these samples are included, the average intake for the consumer group “All” is reduced by approx. 6% (no compensation for undetected residues, 2% with compensation). Although this difference is small, the organically grown food items have been excluded for our calculations of intake, as the consumption of the two types are expected to be very unevenly distributed between consumers.

Consumption: The distribution of residues between samples of different origin could be expected to vary according to the pattern of pesticides used under different growing conditions and legislation. This expectation seems to be confirmed by the present study.

As previously mentioned, the food consumption study did not provide information on the origin of the consumed food. The sample plans from the monitoring programmes normally target

[1] *Monitoring of Pesticide Residues in Products of Plant Origin in the European Union, Norway, Iceland and Liechtenstein - Report 2002 (http://europa.eu.int/comm/food/fs/inspections/fnaoi/reports/annual_eu/monrep_2002_en.pdf)*

samples to the expected distribution between consumption of domestic and foreign grown items, but the actual distribution might differ from this estimate.

Models used in the report

Origin: In this report, the average content of pesticide residues (including compensation for undetected residues) has been calculated separately for samples of domestic and foreign origin, using estimates calculated from the distribution of samples in the monitoring programmes..

Organically grown samples are not included.

Processing factors: Corrections for the reduction of pesticide residues by peeling of citrus fruits, bananas and melon were calculated.

Undetected residues: Results are given, using a “best estimate”, calculated by compensating for undetected residues using the 50%RL-model, but limiting the compensation factor to 25.

7.2 Correction for samples with undetectable residues

Best estimate – model corrections

The distribution of residues for substances that extensively add to the total intake and/or the total ”Hazard Index” has been scrutinized. In some cases it was found that a very low incidence of positive samples has an excessive impact on the result from the model, when the pesticide content in samples without detected residues is estimated to be 50% of the reporting limit (RL).

For this reason, there is a need to modify the model in order to minimize an over-correction for undetected residues.

This is of special significance for biphenyl, dieldrin (in potatoes and domestic carrots) and demeton-S-methyl (in apples) as shown below for the consumer group ”All”. Over-compensation could be the case for many other pesticide/crop combinations when using an unmodified 50%RL-correction, although the individual contributions from these cases are less significant.

Biphenyl: Found in 1 of 494 samples of oranges and in 1 of 85 samples of pomelo. The low frequency of detection in combination with a very high reporting limit (7 mg/kg) results in an intake of 37 µg/day (HQ=0.44%), which makes biphenyl the second highest contributor to the total intake[1]. Without a correction for residues in samples, the intake calculates to 0.3 µg/day (HQ=0.004%). I.e. the correction factor[2] is 120, and the reciprocal frequency of detection[3] is 290.

Demeton-S-methyl: Found in 11 commodities (approx. 2300 samples, 15 with residues) the Hazard Quotient calculates to 12%, making demeton-S-methyl the highest contributor to the total sum of Hazard Quotients[4]. Demeton-S-methyl was detected in 5 out of 653 apples (reciprocal frequency of detection = 130; correction factor = 63; HQ = 7.0%).

Dieldrin: Found in 8 commodities (approx. 1800 samples, 22 with residues) the Hazard Quotient calculates to 5.6%, making dieldrin the second highest contributor to the total sum of Hazard Quotients[4]. Dieldrin was detected in 2 out of 494 potatoes (from the same grower) (reciprocal frequency of detection = 250; correction factor = 41; HQ = 3.2%).
In contrast, pesticide/commodities combinations with a higher frequency of detected residues seem to calculate to a lower degree of correction:

Imazalil: Found in 20 commodities (approx. 4000 samples, 1200 with residues). Reciprocal frequency of detection = 3.3; Correction factor = 1.2.

Maneb-group: Found in 34 commodities (approx. 5400 samples, 470 with residues). Reciprocal frequency of detection = 11; Correction factor = 2.6.

From the examples above, it seems that the frequency of detection could be used as guidance for when to limit the correction factor.

Figure 24 illustrates that a higher reciprocal frequency of detection (i.e. where only few residues are found) corresponds with a high variation in correction factor.

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[1] *244 µg/day (Fruit, vegetables, cereals, wine and beer; consumer group ”All”)*
[2] *Correction factor: (Intake with correction) / (Intake without correction)*
[3] *Reciprocal frequency of detection : (Number of samples analyzed) / (Number of samples with residues)*
[4] *51% (Fruit, vegetables, cereals, wine and beer; consumer group ”All”)*

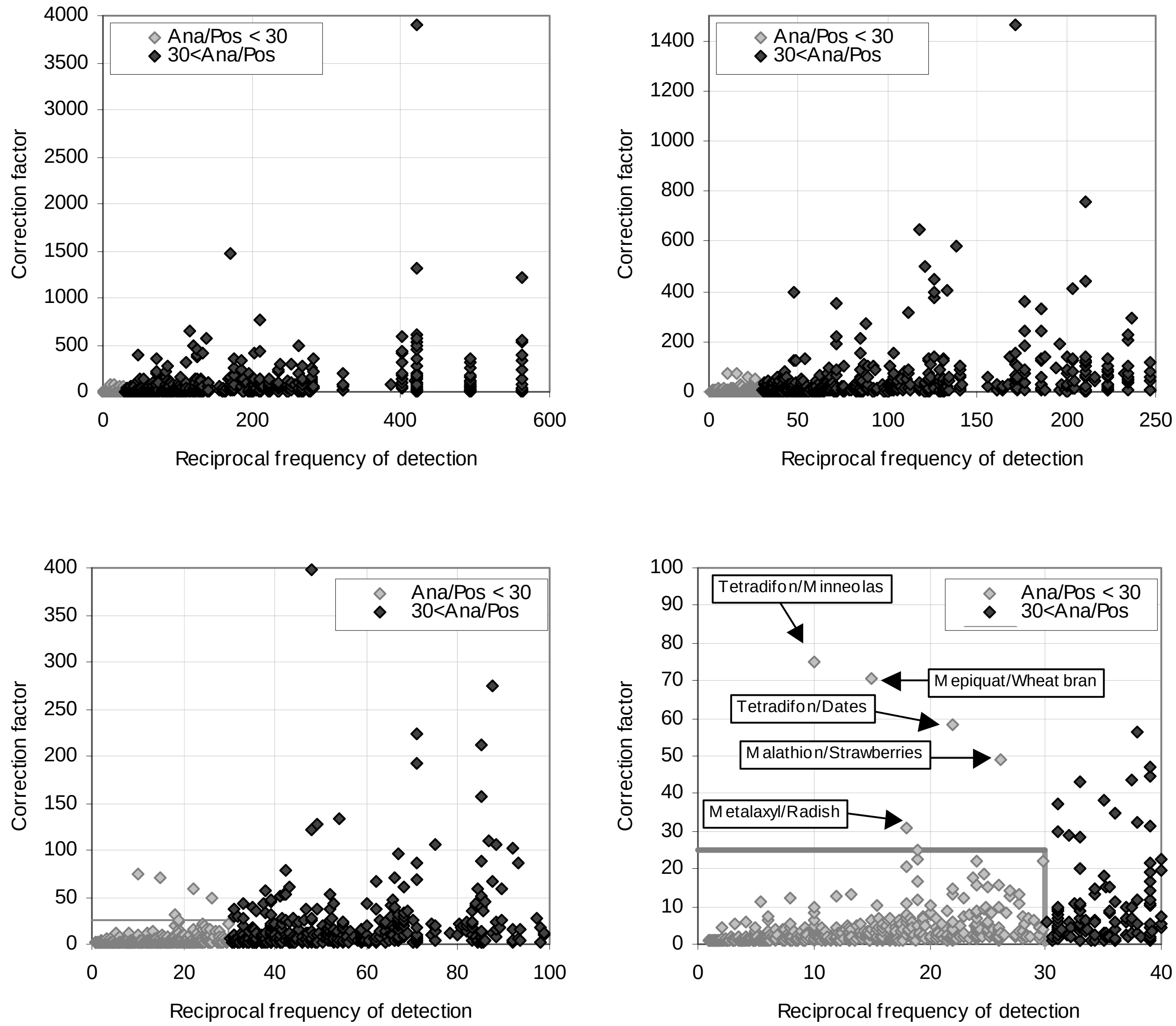

***Figure 24**. Plots of corresponding values for the (reciprocal) frequency of detection and the resulting correction factor for all pesticide/commodity-combinations from the uncompensated model is shown above. The figures show the same data with different scaling*

All combinations with a reciprocal frequency of detection lower than 30 (i.e. where residues were found in at least 3.3% of the samples) had correction factors less than 25, except for five combinations. In Figure 25 it can be seen that approx. 75% of all the pesticide/commodity combinations with detected residues had correction factors below 25.

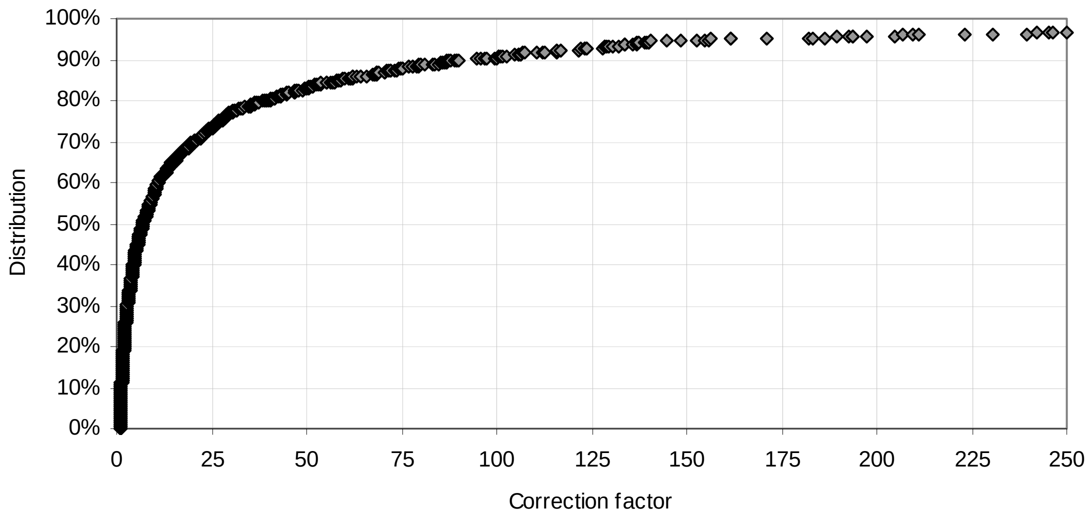

Figure 25. Distribution of correction factors for individual pesticide/commodity/origin combinations

From **Table 12** it can be seen that limiting the correction factor to 25 for biphenyl, dieldrin in potatoes and demeton-S-methyl in apples, alone reduces the calculated intake (compensated with 50%RL) by 30 µg/day. Limiting the correction factor for all combinations of pesticide/commodity/origin will reduce the calculated intake by a further 35 µg/day to 189 µg/day – about twice the amount calculated without compensation for undetected residues.

Although arguments for using a higher or a lower cut-off level could be found, a maximum correction factor of 25 has been chosen as a ”best estimate”, eliminating an over-correction of the calculated residue content in samples without detected residues.

***Table 12**. Effect of limiting the correction factor on total intake (for all commodity groups and consumer group ”All”)*

	Intake	Sum of Hazard Quotients
No correction for undetected residues:	99 µg/day	9%
Correction for undetected residues (50%RL):	244 µg/day	51%
Correction for undetected residues (50%RL), limiting the correction factor to 25 for biphenyl, dieldrin in potatoes, demeton-S-methyl in apples:	214 µg/day	46%
Correction for undetected residues (50%RL), limiting the correction factor to 25:	189 µg/day	34%

7.3 Comparison of intake and ΣHQ for the period 1993-1997 with the period 1998-2003

Intake of pesticides in the Danish diet was calculated in the report from the 1993-1997 monitoring periode[1]. Direct comparison of results from the 1993-1997 report with results from the present study (1998-2003) is not possible, as different calculation models were used.

Three models were used to calculate the intake of pesticide residues from fruit and vegetables in the period 95-97. Two of these models have been reconstructed here and used on data from the present study in order to enable a comparison with results from the previous study.

Model 1 (93-97): Undetected residues were estimated to be 50% of either the reporting limit or the lowest residue level found for that substance (whichever was lowest). No differentiation between domestic and foreign origin was made.

Model 2 (93-97): As model 1 (93-97) except that 25%, 30%, 40% or 50% of either the reporting limit or the lowest residue level found were used where residues were detected in less than 20%, 20-30%, 30-40% or more than 40% of the samples analysed for that pesticide (per commodity).

Apart from calculation models, the number of pesticides, reporting limits, commodities with consumer data, and ADIs were not quite the same for the two periods:

Pesticides: The present study included and detected a higher number of pesticides. Calculations have been performed with both the 1995-1997 pesticide profile[2] and the 1998-2003 profile.

Reporting limits: Reporting limits from the present study were used, as the actual limits used in the 93-97 report were not directly available[3]. In general, the reporting limits from the present study were lower than those used for the 93-97 calculations. This might underestimate the calculated intake for the 98-03 period.

Commodities with consumer data: The present study included a higher number of commodities. Some minor differences exist in the grouping of commodities. Calculations have been performed with all the commodities from the 1998-2003 study and restricted to commodities included in the 95-97 study[4].

ADIs: The 1993-1997 report calculated Hazard Quotients using the ADIs that were accepted for that period. Several of these have changed since then. Calculations have been performed with both the 1995-1997 values[5] as well as the 1998-2003 values.

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[1] *Danish Veterinary and Food Administration, Production aids, Monitoring system for foods, 1993-1997. Part 3. FødevareRapport 2000:03 (January 2000). (In Danish)*

[2] *Table 1 in the 93-97 report.*

[3] *Detection limits are given in table 1; the lowest residues found for each pesticide/commodity were given in appendix 17 of the 93-97 report.*

[4] *Table 9 in the 93-97 report.*

[5] *Table 12 in the 93-97 report.*

Pesticides included in the 1993-1997 report for fruit and vegetables:

Acephate
Aldrin
Atrazine
Azinphos-ethyl
Azinphos-methyl
Benfuracarb
Bifenthrin
Bromophos
Bromophos-ethyl
Bromopropylate
Captafol
Captan+folpet
Carbaryl
Benomyl group
Carbofuran
Carbophenothion
Carbosulfan
Chlorobenzilate
Chlorfenson
Chlorfenvinphos
Chlormephos
Chlormequat
Chlorothalonil
Chlorpropham
Chloropropylate
Chlorpyrifos
Chlorpyrifos-methyl
Cyfluthrin
Cyhalothrin, lambda-
Cypermethrin
DDT
Deltamethrin
Demeton-S-methyl
Dialifos
Diazinon
Dichlofluanid
Dicloran
Dichlorvos
Dicofol
Dieldrin
Dimethoate
Dioxathion
Biphenyl
Diphenylamine
Ditalimfos
Maneb-group
Endosulfan
Endrin
Ethion
Etrimfos
Fenarimol
Fenchlorphos
Fenitrothion
Fenpropathrin
Fenson
Fenthion
Fenvalerate
Formothion
Furathiocarb
HCH
Heptachlor
Heptenophos
Hexachlorobenzene
Imazalil
Iprodione
Isofenphos
Lindane
Malathion
Mecarbam
Metalaxyl
Methamidophos
Methidathion
Methoxychlor
Mevinphos
Monocrotophos
Omethoate
Parathion
Parathion-methyl
Pentachloroanisole
Pentachlorobenzene
Pentachlorophenol
Permethrin
Phenkapton
Phenthoate
Phenylphenol, 2-
Phorate
Phosalone
Phosmet
Phosphamidon
Phoxim
Pirimicarb
Pirimiphos-ethyl
Pirimiphos-methyl
Procymidone
Profenofos
Propham
Propiconazole
Propyzamide
Prothiofos
Pyrazophos
Quinalphos
Quintozene
Simazine
Sulfotep
Tecnazene
TEPP
Tetrachlorvinphos
Tetradifon
Tetrasul
Thiabendazole
Thiometon
Tolclofos-methyl
Tolylfluanid
Triadimefon
Triadimenol
Triazophos
Trichlorfon
Trichloronate
Vamidothion
Vinclozolin

Commodities equivalent to those included in the 1993-1997 report:

Apple juice
Apples
Apricots
Bananas
Beans with pods
Beetroot
Broccoli
Brussels sprouts
Canned pineapples
Carrots
Cauliflowers
Celeriac
Celery
Cherries
Chinese cabbage
Courgettes
Cucumbers
Currants
Exotic fruits
Grapefruits
Head cabbages
Kiwi
Lemons
Lettuce
Mandarins and clementines
Melons
Orange juice
Oranges
Other small fruits and berries
Peaches and nectarines
Pears
Peas with pods
Peas without pods
Pineapples
Plums
Potatoes
Raspberries
Spinach
Spring onions
Strawberries
Sweet peppers
Table grapes
Tomatoes

Table 13. *ADI's with changed values*

	ADI, 1997, mg/kg bw	ADI 2005, mg/kg bw		ADI, 1997, mg/kg bw	ADI 2005, mg/kg bw
Increased:			***Decreased***:		
Lindane	0.001	0.005	Azinphos-methyl	0.05	0.005
Metalaxyl	0.03	0.08	Biphenyl	0.13	0.125
Phenylphenol, 2-	0.02	0.4	Carbaryl	0.03	0.008
			DDT	0.02	0.01
Withdrawn:			Endosulfan	0.01	0.006
Captafol	0.1		Fenitrothion	0.01	0.005
			Fenthion	0.01	0.007
			Mevinphos	0.001	0.0008
			Monocrotophos	0.001	0.0006
			Parathion	0.004	0.0006
			Tolylfluanid	0.1	0.08

Table 14. *Comparison of intake and sum of Hazard Quotients using different models*

	Intake, mg/kg bw		Sum of Hazard Quotients			
			1997 ADI's		2005 ADI's	
	Model 1[a] (93-97)	Model 2[b] (93-97)	Model 1 (93-97)	Model 2 (93-97)	Model 1 (93-97)	Model 2 (93-97)
1993-1997 Report	124	93	10.7	7.5		
1998-2005 data	243	162			58.1	33.3
1998-2005 data, 93-97 pesticides	215	144			54.2	31.1
1998-2005 data, 93-97 pesticides and commodities	212	142			53.7	30.8
1998-2005 data, 93-97 pesticides and commodities, ADI's restricted[c]	212	142	28.1	17.3	30.7	18.7
1993-1997 Report, excluding dicofol and dieldrin			10.3	7.3		
1998-2005 data, 93-97 pesticides and commodities, ADI's restricted[a] excluding dicofol and dieldrin			16.0	10.6		

[a] Undetected residues were estimated to be 50% of either the reporting limit or the lowest residue level found for that substance.

[b] As model 1 except that 25%, 30%, 40% or 50% of either the reporting limit or the lowest residue level found were used where residues were detected in less than 20%, 20-30%, 30-40% or more than 40% of the samples analysed for that pesticide (per commodity).

[c] Includes only those substances that were listed with an ADI in the 93-97 report.

Using either model, a significant increase in pesticide intake was found. With model 1 the intake increased 96%, from 124 to 243 mg/kg bw; while with model 2 the increase was 74%, from 93 to 162 mg/kg bw. Most of the increase was caused by the change in the number of pesticides included in the monitoring programmes.

Restricting the calculations to the same pesticides and commodities reduced the change to 71% (model 1) and 53% (model 2).

The sum of Hazard Quotients increased even more, 5 times, from 11 to 58 (model 1) or 4 times, from 8 to 33 (model 2). Most of the increase was caused by the change in the number of pesticides with ADI's.

Restricting the calculations to the same pesticides, commodities and ADI's reduced the change to 2.6 times (model 1) and 2.3 times (model 2).

Residues of dicofol and dieldrin contribute significantly to this increase. Excluding these two substances reduces the increase to 50% (no change in ADI's).

Conclusions

Intake of pesticides increased significantly between the two periods reported (1995-1997 and 1998-2005). When restricting the calculation to the same pesticides and commodities included in the 93-97 report, the increase calculates to 50%-70%.

Changes in the pesticide-monitoring programme between the two periods have resulted in a more complete basis for estimating the intake of pesticide residues, mainly caused by an increase in the number of pesticides included.

An even greater increase in the pesticide impact was found when comparing the sum of Hazard Quotients.

Although this increase is reduced to about 50% when dicofol and dieldrin are excluded from the calculations, intake from these two substances cannot be ignored: Dicofol was detected in 158 samples (1%), dieldrin in 22 samples (0.2%).

The increase in the number of pesticides with official ADI's resulted in a more complete basis for evaluating the pesticide intake.

8 Appendices

8.1 Commodity groups with few residues

Commodity	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Pesticide	Number of samples analysed	Number of samples with residues	General limit of quatifikation (mg/kg)	Avg. content (in samples with residues) (mg/kg)
Organically grown samples									
Grapefruits	F	1	1						
Lemons	F	42	41	1	Parathion	42	1	0.037	0.0470
Mandarins and clementines	F	9	9						
Oranges	F	48	47	1	Dicofol	48	1	0.10	0.345
Nuts and similar	F	1	1						
Apples	DK	12	12						
Apples	F	41	38	3	Chlorpyrifos	41	1	0.017	0.0060
	F				Diphenylamine	41	1	0.012	0.0500
	F				Phosalone	41	1	0.036	0.135
	F				Pyrimethanil	20	1	0.007	0.0080
	F				Tolylfluanid	41	1	0.024	0.0340
	F				Trifloxystrobin	20	1	0.009	0.0260
Pears	DK	1	1						
Pears	F	9	9						
Cherries	F	1	1						
Currants	DK	6	6						
Currants	F	1	1						
Other small fruits and berries	DK	2	2						
Other small fruits and berries	F	1	1						
Raspberries	F	4	4						
Strawberries	F	6	6						
Table grapes	F	14	12	2	Procymidone	14	2	0.006	0.0115
Bananas	F	24	23	1	Imazalil	24	1	0.050	0.117
Kiwi	F	1	1						
Beetroot	DK	8	8						
Carrots	DK	52	49	3	Hexachlorobenzene	52	2	0.006	0.0095
	DK				Quintozene	52	3	0.003	0.0083
Carrots	F	6	6						
Parsnips	DK	4	3	1	Quintozene	4	1	0.003	0.0900
Onions	DK	7	7						
Onions	F	3	3						
Spring onions	DK	2	2						
Courgettes	DK	2	2						
Lettuces	DK	5	5						
Lettuces	F	5	5						
Sweet peppers	DK	2	2						
Potatoes	DK	5	5						
Potatoes	F	3	3						
Watermelons	F	1		1	Dieldrin	1	1	0.006	0.0060
Broccoli	DK	1	1						
Broccoli	F	1	1						

Commodity	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Pesticide	Number of samples analysed	Number of samples with residues	General limit of quatifikation (mg/kg)	Avg. content (in samples with residues) (mg/kg)
Head brassicas	DK	5	5						
Kale	DK	2	2						
Kale	F	1	1						
Lettuce	DK	4	4						
Spinach	DK	4	4						
Spinach	F	1	1						
Peas without pods	F	2	2						
Celery	DK	2	2						
Leeks	DK	3	3						
Mushrooms	F	2	2						
Pulses	F	2	2						
Oil seeds	F	2	2						
Potatoes	DK	48	48						
Potatoes	F	3	3						
Tea leaves	F	2	2						
Spices	F	3	3						
Barley grains	DK	1	1						
Bulgur	F	1	1						
Cornflour	F	12	11	1	Pirimiphos-methyl	12	1	0.009	0.342
Oatmeal	DK	1	1						
Rice, other	F	9	9						
Rice, white	F	9	9						
Rolled oats	DK	11	11						
Rolled oats	F	7	4	3	Etrimfos	7	2	0.037	0.0150
	F				Pirimiphos-methyl	7	3	0.009	0.0697
Jam and similars	DK	6	5	1	Procymidone	6	1	0.006	0.0400
Jam and similars	F	5	5						
Apple juice	DK	2	2						
Fruitjuice, others	DK	7	7						
Fruitjuice, others	F	3	3						
Orange juice	F	4	4						
Dates	F	1	1						
Raisins	F	1	1						
Other processes fruit and veg.	F	1	1						
Herbal tea	DK	1	1						
Herbal tea	F	3	3						
Rye bread	DK	26	22	4	Chlormequat	12	2	0.010	0.0007
	DK				Chlorpyrifos	26	1	0.018	0.0065
	DK				Glyphosate	9	1	0.10	0.0566
	DK				Pirimiphos-methyl	26	1	0.009	0.0091
Rye bread	F	18	13	5	Chlormequat	9	3	0.010	0.0917
	F				Malathion	18	1	0.032	0.0117
	F				Pirimiphos-methyl	18	1	0.009	0.0098
Wheat bread	DK	32	31	1	Chlorpyrifos	32	1	0.018	0.0223
Wheat bread	F	19	17	2	Chlormequat	7	2	0.010	0.0119
	F				Glyphosate	7	1	0.10	0.0716
Beer	DK	2	2						
Baby food, fruit puree, canned	DK	2	2						
Baby food, fruit puree, canned	F	24	24						

Commodity	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Pesticide	Number of samples analysed	Number of samples with residues	General limit of quatifikation (mg/kg)	Avg. content (in samples with residues) (mg/kg)
Fruit drink for children, canned	F	1	1						
Baby food, vegetable puree, canned	F	15	15						
Baby food, cerealbased	F	5	5						
Baby food, cerealbased, canned	DK	2	2						
Baby food, cerealbased, powder	DK	4	4						
Baby food, cerealbased, powder	F	12	12						
Baby food, conventionally grown									
Baby food, fruit puree, canned	DK	14	14						
Baby food, fruit puree, canned	F	29	29						
Fruit drink for children, canned	F	1	1						
Baby food, vegetable puree, canned	DK	1	1						
Baby food, vegetable puree, canned	F	6	6						
Baby food, cerealbased	F	5	5						
Baby food, cerealbased, canned	F	1	1						
Baby food, cerealbased, powder	DK	44	44						
Baby food, cerealbased, powder	F	15	14	1	Chlormequat	4	1	0.010	0.0250
	F				Mepiquat	4	1	0.010	0.0190
Wine and beer, conventionally grown samples									
Wine, red	F	31	19	12	Carbaryl	31	1	0.014	0.0540
	F				Benomyl group	31	5	0.050	0.0808
	F				Dichlorvos	31	1	0.006	0.0130
	F				Etrimfos	31	2	0.012	0.0095
	F				Iprodione	31	5	0.006	0.0480
	F				Mevinphos	31	1	0.010	0.0310
	F				Permethrin	31	1	0.006	0.0170
	F				Procymidone	31	1	0.006	0.0030
Beer	DK	33	33						
Beer	F	13	10	3	Chlormequat	13	2	0.010	0.0165
	F				Mepiquat	13	1	0.010	0.0250
Meat									
Beef	DK	206	206						
Beef	F	46	46						
Chicken meat	DK	46	46						
Chicken meat	F	9	9						
Deer fat	DK	16	16						
Duck meat	DK	1	1						
Duck meat	F	3	3						
Goat meat	DK	1	1						
Lamb	DK	16	16						
Lamb	F	36	36						
Mutton	DK	30	30						
Ostrich meat	DK	1	1						
Pork	DK	730	730						
Turkey meat	DK	5	5						
Veal	DK	6	6						
Other animal products									
Raw milk	DK	2	2						
Honey	DK	25	25						
Honey	F	2	2						

8.2 Pesticides sought in grown fruit and vegetables in 1998-2003 and their frequency of detection in conventionally grown crops.

Pesticide	Number of samples analysed	Number of samples with detected residues	Reporting limit
Acephate	11 683	6(0.1%)	0.012
Aclonifen 4)	1 356	0(0.0%)	0.006
Aldrin	11 683	1(0.0%)	0.006
Atrazine	11 683	0(0.0%)	0.006
Azinphos-ethyl	11 683	3(0.0%)	0.006
Azinphos-methyl	11 683	93(0.8%)	0.017
Azoxystrobin 3)	3 184	7(0.2%)	0.006
Benfuracarb	11 683	1(0.0%)	0.012
Benomyl group	11 625	318(2.7%)	0.050
Bifenthrin	11 683	66(0.6%)	0.023
Binapacryl	11 683	9(0.1%)	0.013
Biphenyl	11 625	2(0.0%)	7.0
Bitertanol	11 683	7(0.1%)	0.036
Bromophos	11 683	0(0.0%)	0.006
Bromophos-ethyl	11 683	0(0.0%)	0.006
Bromopropylate	11 683	206(1.8%)	0.037
Bupirimate	11 683	2(0.0%)	0.024
Buprofezin 4)	1 356	4(0.3%)	0.030
Captafol	11 683	2(0.0%)	0.010
Captan+folpet	11 683	187(1.6%)	0.005
Carbaryl	11 683	37(0.3%)	0.014
Carbofuran	11 683	12(0.1%)	0.010
Carbophenothion	11 683	0(0.0%)	0.008
Carbosulfan	11 683	0(0.0%)	0.007
Chinomethionat	11 683	1(0.0%)	0.012
Chlorfenson	11 683	0(0.0%)	0.006
Chlorfenvinphos	11 683	15(0.1%)	0.023
Chlormephos	11 683	0(0.0%)	0.03
Chlormequat	244	99(40.6%)	0.006
Chlorobenzilate	11 683	2(0.0%)	0.017
Chloropropylate	11 683	1(0.0%)	0.017
Chlorothalonil	11 683	78(0.7%)	0.012
Chlorpropham	11 683	12(0.1%)	0.029
Chlorpyrifos	11 683	697(6.0%)	0.017
Chlorpyrifos-methyl	11 683	62(0.5%)	0.012
Clofentezine 4)	1 356	0(0.0%)	0.009
Cyfluthrin	11 683	18(0.2%)	0.006
Cyhalothrin, lambda- 2)	7 618	9(0.1%)	0.006
Cypermethrin	11 683	127(1.1%)	0.006
Cyprodinil 4)	1 356	49(3.6%)	0.006
DDT	11 683	15(0.1%)	0.004
Deltamethrin	11 683	50(0.4%)	0.006
Demeton-S-methyl	11 683	15(0.1%)	0.050
Dialifos	11 683	0(0.0%)	0.017
Diazinon	11 683	47(0.4%)	0.019

1) not used for analyses of all commodities
2) analysed from 2000-2003
3) analysed from 2002-2003
4) analysed in 2003

Pesticide	Number of samples analysed	Number of samples with detected residues	Reporting limit
Dichlofluanid	11 683	36(0.3%)	0.024
Dichlorvos	11 683	4(0.0%)	0.006
Dicloran	11 683	11(0.1%)	0.006
Dicofol	11 683	158(1.4%)	0.10
Dieldrin	11 683	22(0.2%)	0.006
Difenoconazole 4)	1 356	4(0.3%)	0.029
Diflufenican 4)	1 356	0(0.0%)	0.013
Dimethoate+omethoate	11 683	86(0.7%)	0.012
Dioxathion	11 683	1(0.0%)	0.031
Diphenylamine	11 683	91(0.8%)	0.012
Disulfoton 4)	1 356	0(0.0%)	0.06
Ditalimfos	11 683	0(0.0%)	0.03
Endosulfan	11 683	444(3.8%)	0.003
Endrin	11 683	0(0.0%)	0.006
Esfenvalerate	11 683	20(0.2%)	0.006
Ethion	11 683	70(0.6%)	0.017
Etrimfos	11 683	0(0.0%)	0.012
Fenarimol	11 683	10(0.1%)	0.029
Fenchlorphos	11 683	0(0.0%)	0.03
Fenitrothion	11 683	35(0.3%)	0.029
Fenoxaprop-P-ethyl 4)	1 356	0(0.0%)	0.04
Fenpropathrin	11 683	25(0.2%)	0.050
Fenpropidin 4)	1 356	0(0.0%)	0.14
Fenpropimorph 2)	7 618	8(0.1%)	0.023
Fenson	11 683	4(0.0%)	0.006
Fenthion	11 683	55(0.5%)	0.007
Fenvalerate	11 683	18(0.2%)	0.008
Flucythrinate	11 683	2(0.0%)	0.006
Fludioxonil 4)	1 356	25(1.8%)	0.057
Fluvalinate, tau- 4)	1 356	1(0.1%)	0.006
Formothion	11 683	0(0.0%)	0.002
Furathiocarb	11 683	2(0.0%)	0.006
HCH	11 683	8(0.1%)	0.007
Heptachlor	11 683	6(0.1%)	0.005
Heptenophos	11 683	0(0.0%)	0.006
Hexachlorobenzene	11 683	12(0.1%)	0.006
Imazalil 1)	7 770	1 199(15.4%)	0.050
Iodofenphos 2)	7 618	0(0.0%)	0.006
Iprodione	11 683	409(3.5%)	0.006
Isofenphos	11 683	2(0.0%)	0.032
Kresoxim-methyl 3)	3 184	7(0.2%)	0.007
Lindane	11 683	22(0.2%)	0.006
Malathion	11 683	233(2.0%)	0.095
Maneb-group	6 956	497(7.1%)	0.10
Mecarbam	11 683	15(0.1%)	0.024
Metalaxyl	11 683	103(0.9%)	0.023
Methamidophos	11 683	14(0.1%)	0.006
Methidathion	11 683	272(2.3%)	0.088
Methoxychlor	11 683	6(0.1%)	0.006
Mevinphos	11 683	2(0.0%)	0.010
Monocrotophos	11 683	1(0.0%)	0.006
Myclobutanil	11 683	29(0.2%)	0.006

1) not used for analyses of all commodities
2) analysed from 2000-2003
3) analysed from 2002-2003
4) analysed in 2003

Pesticide	Number of samples analysed	Number of samples with detected residues	Reporting limit
Nuarimol	11 683	4(0.0%)	0.021
Parathion	11 683	12(0.1%)	0.037
Parathion-methyl	11 683	25(0.2%)	0.10
Penconazole	11 683	14(0.1%)	0.015
Pentachloroanisole	11 683	11(0.1%)	0.006
Pentachlorobenzene	11 683	10(0.1%)	0.006
Pentachlorophenol	11 683	7(0.1%)	0.019
Permethrin	11 683	39(0.3%)	0.006
Phenkapton	11 683	0(0.0%)	0.03
Phenthoate	11 683	4(0.0%)	0.012
Phenylphenol, 2-	11 625	123(1.1%)	0.029
Phorate	11 683	2(0.0%)	0.15
Phosalone	11 683	45(0.4%)	0.036
Phosmet	11 683	43(0.4%)	0.050
Phosphamidon	11 683	0(0.0%)	0.03
Phoxim	11 683	2(0.0%)	0.017
Pirimicarb	11 683	26(0.2%)	0.012
Pirimiphos-ethyl	11 683	0(0.0%)	0.03
Pirimiphos-methyl	11 683	51(0.4%)	0.007
Prochloraz 4)	1 356	10(0.7%)	0.057
Procymidone	11 683	481(4.1%)	0.006
Profenofos	11 683	9(0.1%)	0.029
Propargite 4)	1 356	8(0.6%)	0.29
Propham	11 683	0(0.0%)	0.03
Propiconazole	11 683	1(0.0%)	0.029
Propyzamide	11 683	0(0.0%)	0.007
Prothiofos	11 683	29(0.2%)	0.018
Pyrazophos	11 683	10(0.1%)	0.006
Pyrethrines 4)	1 356	1(0.1%)	0.029
Pyrimethanil 3)	3 184	67(2.1%)	0.007
Quinalphos	11 683	11(0.1%)	0.018
Quintozene	11 683	33(0.3%)	0.003
Simazine	11 683	2(0.0%)	0.011
Sulfotep	11 683	0(0.0%)	0.06
Tebuconazole	11 683	46(0.4%)	0.018
Tecnazene	11 683	3(0.0%)	0.037
TEPP	11 683	0(0.0%)	0.06
Tetrachlorvinphos	11 683	0(0.0%)	0.006
Tetradifon	11 683	74(0.6%)	0.082
Tetrasul	11 683	0(0.0%)	0.012
Thiabendazole	11 625	389(3.3%)	0.050
Thiometon	11 683	0(0.0%)	0.03
Tolclofos-methyl	11 683	15(0.1%)	0.006
Tolylfluanid	11 683	255(2.2%)	0.024
Triadimefon+triadimenol	11 683	55(0.5%)	0.016
Triazophos	11 683	5(0.0%)	0.006
Trichlorfon	11 683	4(0.0%)	0.030
Trichloronate	11 683	0(0.0%)	0.03
Trifloxystrobin 3)	3 184	6(0.2%)	0.009
Vamidothion	11 683	0(0.0%)	0.06
Vinclozolin	11 683	186(1.6%)	0.036

1) not used for analyses of all commodities
2) analysed from 2000-2003
3) analysed from 2002-2003
4) analysed in 2003

8.3 Pesticides sought in grown cereals and cereal products in 1998-2003 and their frequency of detection in conventionally grown crops.

Pesticide	Number of samples analysed	Number of samples with detected residues		Reporting limit
Acephate	426	0	(0.0%)	0.008
Aldrin	426	0	(0.0%)	0.008
Azoxystrobin	541	0	(0.0%)	0.009
Bifenthrin	426	0	(0.0%)	0.043
Bromophos-ethyl	426	0	(0.0%)	0.040
Bromopropylate	426	0	(0.0%)	0.29
Captafol	426	0	(0.0%)	0.049
Captan+folpet	310	0	(0.0%)	0.030
Carbaryl	669	0	(0.0%)	0.035
Carbofuran	426	0	(0.0%)	0.032
Carbophenothion	426	0	(0.0%)	0.43
Chlorobenzilate	426	0	(0.0%)	0.043
Chlordane	238	0	(0.0%)	0.010
Chlorfenvinphos	426	0	(0.0%)	0.032
Chlormephos	426	0	(0.0%)	0.008
Chlorothalonil	426	0	(0.0%)	0.008
Chloropropylate	426	0	(0.0%)	0.043
Chlorpyrifos	791	0	(0.0%)	0.018
Chlorpyrifos-methyl	791	7	(0.9%)	0.007
Cyfluthrin	791	0	(0.0%)	0.019
Cyhalothrin, lambda-	365	0	(0.0%)	0.010
Cypermethrin	791	1	(0.1%)	0.012
DDT	426	0	(0.0%)	0.010
Deltamethrin	791	7	(0.9%)	0.015
Demeton-S-methyl	250	0	(0.0%)	0.030
Diazinon	791	0	(0.0%)	0.021
Dichlofluanid	426	0	(0.0%)	0.053
Dicloran	426	0	(0.0%)	0.008
Dichlorvos	365	0	(0.0%)	0.010
Dieldrin	426	0	(0.0%)	0.008
Dimethoate	669	0	(0.0%)	0.011
Endosulfan	426	0	(0.0%)	0.010
Endrin	426	0	(0.0%)	0.008
Esfenvalerate	116	0	(0.0%)	0.007
Ethion	426	0	(0.0%)	0.043
Etrimfos	791	0	(0.0%)	0.037
Fenarimol	426	0	(0.0%)	0.019
Fenchlorphos	426	0	(0.0%)	0.019
Fenitrothion	791	6	(0.8%)	0.020
Fenpropathrin	426	0	(0.0%)	0.43
Fenson	426	0	(0.0%)	0.008
Fenvalerate	791	1	(0.1%)	0.009
Flucythrinate	426	0	(0.0%)	0.008
HCH	426	0	(0.0%)	0.010
Heptachlor	426	0	(0.0%)	0.043
Heptenophos	426	0	(0.0%)	0.008

Pesticide	Number of samples analysed	Number of samples with detected residues		Reporting limit
Hexachlorobenzene	426	0	(0.0%)	0.008
Iprodione	426	0	(0.0%)	0.008
Isofenphos	426	0	(0.0%)	0.43
Kresoxim-methyl	238	0	(0.0%)	0.009
Lindane	791	0	(0.0%)	0.008
Malathion	791	16	(2.0%)	0.032
Mecarbam	426	0	(0.0%)	0.008
Metalaxyl	426	0	(0.0%)	0.053
Methacrifos	487	0	(0.0%)	0.030
Methidathion	122	0	(0.0%)	0.50
Methoxychlor	426	0	(0.0%)	0.008
Parathion	426	0	(0.0%)	0.043
Parathion-methyl	426	0	(0.0%)	0.070
Pentachlorophenol	426	0	(0.0%)	0.008
Permethrin	426	0	(0.0%)	0.040
Phenthoate	426	0	(0.0%)	0.043
Phosalone	426	0	(0.0%)	0.31
Phosmet	426	0	(0.0%)	0.20
Phosphamidon	365	0	(0.0%)	0.017
Pirimicarb	791	0	(0.0%)	0.016
Pirimiphos-methyl	791	45	(5.7%)	0.009
Pirimiphos-ethyl	426	0	(0.0%)	0.019
Procymidone	791	0	(0.0%)	0.016
Profenofos	426	0	(0.0%)	0.043
Propham	426	0	(0.0%)	0.48
Propiconazole	791	1	(0.1%)	0.030
Prothiofos	426	0	(0.0%)	0.021
Pyrazophos	426	0	(0.0%)	0.008
Quinalphos	426	0	(0.0%)	0.043
Quintozene	426	0	(0.0%)	0.010
Sulfotep	426	0	(0.0%)	0.021
Tebuconazole	304	0	(0.0%)	0.007
Tecnazene	426	0	(0.0%)	0.19
Tetrachlorvinphos	426	0	(0.0%)	0.043
Tetradifon	426	0	(0.0%)	0.008
Tetrasul	426	0	(0.0%)	0.032
Tolylfluanid	426	0	(0.0%)	0.18
Trichloronate	426	0	(0.0%)	0.032
Trifloxystrobin	238	0	(0.0%)	0.009
Vinclozolin	791	0	(0.0%)	0.033
Methoxychlor	342	1	(0.3%)	0.008
Permethrin	345	4	(1.2%)	0.040
Glyphosate	263	87	(33.1%)	0.10
Chlormequat	246	137	(55.7%)	0.010
Mepiquat	246	10	(4.1%)	0.010

8.4 Pesticides and commodities analysed.

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Acephate	F	8321	8315	6	Peaches and nectarines	281	1
					Plums	75	1
					Lettuce	123	3
					Beans with pods	85	1
Aldrin	F	8321	8320	1	Courgettes	103	1
Azinphos-ethyl	F	8321	8318	3	Peaches and nectarines	281	1
					Spring onions	44	1
					Figs	59	1
Azinphos-methyl	F	8321	8228	93	Grapefruits	235	1
					Lemons	211	2
					Mandarins and clementines	322	10
					Oranges	494	1
					Apples	401	22
					Pears	223	15
					Peaches and nectarines	281	36
					Plums	75	2
					Other small fruits and berries	92	2
					Exotic fruits	421	1
					Cucumbers	203	1
Azoxystrobin	DK	927	925	2	Tomatoes	62	2
Azoxystrobin	F	2438	2433	5	Strawberries	28	1
					Table grapes	258	3
					Carrots	63	1
Benfuracarb	F	8321	8320	1	Garlics	27	1
Benomyl group	DK	3938	3929	9	Apples	252	1
					Strawberries	142	2
					Cucumbers	196	2
					Mushrooms	102	4
Benomyl group	F	8261	7947	314	Grapefruits	234	9
					Lemons	211	8
					Limes	52	2
					Mandarins and clementines	322	15
					Oranges	494	36
					Pomelos	85	4
					Apples	401	51
					Other pome fruits	3	1
					Pears	223	44
					Apricots	67	12
					Cherries	43	4
					Peaches and nectarines	281	36
					Plums	75	1
					Currants	71	1
					Other small fruits and berries	92	1
					Raspberries	66	2
					Strawberries	131	7
					Table grapes	564	16
(cont.)					Exotic fruits	419	16

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of sam-ples analysed	Without detected residues	With detected residues	Commodity	Number of sam-ples analysed	Number of sam-ples with residues
Benomyl group (cont.)					Kiwi	171	2
					Pineapples	101	2
					Exotic vegetables	33	1
					Onions	126	1
					Spring onions	44	2
					Courgettes	103	3
					Cucumbers	203	9
					Melons	186	6
					Sweet peppers	263	4
					Tomatoes	268	1
					Lettuce	123	1
					Parsley	39	1
					Beans with pods	85	1
					Peas with pods	31	1
					Celery	52	5
					Mushrooms	62	3
					Wine, red	31	5
Bifenthrin	F	8321	8255	66	Oranges	494	1
					Apples	401	10
					Cherries	43	1
					Peaches and nectarines	281	2
					Currants	71	1
					Raspberries	66	3
					Table grapes	564	10
					Avocados	71	1
					Exotic fruits	421	6
					Cucumbers	203	1
					Melons	186	1
					Sweet peppers	263	16
					Tomatoes	268	9
					Watermelons	39	1
					Chinese cabbage	39	1
					Beans with pods	85	1
					Pulses	121	1
Binapacryl	F	8321	8312	9	Apricots	67	1
					Kiwi	171	1
					Carrots	177	1
					Aubergines	103	1
					Courgettes	103	3
					Cucumbers	203	1
					Potatoes	173	1
Biphenyl	F	8261	8259	2	Oranges	494	1
					Pomelos	85	1
Bitertanol	DK	3965	3961	4	Apples	252	4
Bitertanol	F	8321	8318	3	Pears	223	1
					Exotic fruits	421	1
					Carrots	177	1
Bromopropylate (cont.)	F	8321	8115	206	Grapefruits	235	54

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Bromopropylate (cont.)					Lemons	211	20
					Mandarins and clementines	322	1
					Minneolas	10	4
					Oranges	494	19
					Pomelos	85	18
					Apples	401	22
					Pears	223	17
					Cherries	43	1
					Peaches and nectarines	281	1
					Other small fruits and berries	92	2
					Strawberries	131	2
					Table grapes	564	25
					Bananas	422	1
					Exotic fruits	421	7
					Radish	36	1
					Sweet corn	62	1
					Tomatoes	268	5
					Beans with pods	85	1
					Pulses	121	1
					Tea leaves	24	1
					Jam and similars	6	1
					Raisins	24	1
Bupirimate	F	8321	8319	2	Strawberries	131	1
					Tomatoes	268	1
Buprofezin	F	1041	1037	4	Melons	19	1
					Sweet peppers	35	2
					Tomatoes	38	1
Captafol	F	8321	8319	2	Lemons	211	1
					Melons	186	1
Captan+folpet	DK	3965	3920	45	Apples	252	24
					Pears	124	6
					Cherries	43	2
					Plums	58	1
					Currants	83	8
					Strawberries	142	3
					Herbs (fresh)	36	1
Captan+folpet	F	8321	8179	142	Lemons	211	5
					Apples	401	47
					Pears	223	26
					Apricots	67	3
					Peaches and nectarines	281	4
					Plums	75	1
					Currants	71	4
					Other small fruits and berries	92	3
					Raspberries	66	3
					Strawberries	131	10
					Table grapes	564	30
					Kiwi	171	2
(cont.)					Aubergines	103	1

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Captan+folpet (cont.)					Broccoli	83	1
					Dill	12	1
					Asparagus	59	1
Carbaryl	DK	3965	3964	1	Apples	252	1
Carbaryl	F	8321	8284	37	Grapefruits	235	6
					Mandarins and clementines	322	1
					Oranges	494	2
					Apples	401	4
					Pears	223	4
					Peaches and nectarines	281	2
					Plums	75	1
					Raspberries	66	3
					Table grapes	564	1
					Exotic fruits	421	1
					Pineapples	101	4
					Melons	186	2
					Globe artichokes	48	1
					Raisins	24	4
					Wine, red	31	1
Carbofuran	DK	3965	3964	1	Jam and similars	22	1
Carbofuran	F	8321	8310	11	Grapefruits	235	3
					Mandarins and clementines	322	1
					Minneolas	10	2
					Oranges	494	1
					Table grapes	564	1
					Spring onions	44	1
					Aubergines	103	1
					Lettuce	123	1
Chinomethionat	F	8321	8320	1	Globe artichokes	48	1
Chlorfenvinphos	DK	3965	3959	6	Carrots	268	6
Chlorfenvinphos	F	8321	8312	9	Lemons	211	6
					Carrots	177	3
Chlormequat	DK	296	172	124	Barley grains	9	2
					Rolled oats	21	13
					Wheat bran	15	15
					Rye bread	59	33
					Rye bread, organic	12	2
					Wheat bread	112	59
Chlormequat	F	69	46	23	Wheat bran	1	1
					Rye bread	4	1
					Rye bread, organic	9	3
					Wheat bread	22	13
					Wheat bread, organic	7	2
					Beer	13	2
					Baby food, cerealbased, powder	4	1
Chlormequat	DK	65	40	25	Pears	33	23
					Mushrooms	10	2
Chlormequat	F	202	128	74	Pears	162	74

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Chlorobenzilate	F	8321	8319	2	Exotic fruits	421	1
					Globe artichokes	48	1
Chloropropylate	F	8321	8320	1	Oranges	494	1
Chlorothalonil	DK	3965	3949	16	Currants	83	5
					Strawberries	142	5
					Other Vegetables	29	3
					Cucumbers	196	1
					Peas with pods	43	2
Chlorothalonil	F	8321	8259	62	Peaches and nectarines	281	1
					Currants	71	1
					Other small fruits and berries	92	2
					Raspberries	66	2
					Strawberries	131	3
					Bananas	422	1
					Exotic fruits	421	8
					Carrots	177	2
					Aubergines	103	2
					Cucumbers	203	8
					Melons	186	6
					Sweet peppers	263	3
					Tomatoes	268	11
					Watermelons	39	1
					Broccoli	83	1
					Peas with pods	31	2
					Celery	52	6
					Leeks	55	1
					Mushrooms	62	1
Chlorpropham	DK	3965	3964	1	Potatoes	494	1
Chlorpropham	F	8321	8310	11	Potatoes	173	11
Chlorpyrifos	DK	667	665	2	Rye bread, organic	26	1
					Wheat bread, organic	32	1
					Radish	32	2
Chlorpyrifos	F	8321	7625	696	Grapefruits	235	76
					Lemons	211	38
					Mandarins and clementines	322	189
					Minneolas	10	3
					Oranges	494	148
					Pomelos	85	5
					Apples	401	33
					Apples, organic	41	1
					Pears	223	9
					Peaches and nectarines	281	16
					Plums	75	1
					Strawberries	131	3
					Table grapes	564	39
					Avocados	71	1
					Bananas	422	63
					Exotic fruits	421	34
(cont.)					Kiwi	171	2

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Chlorpyrifos (cont.)					Carrots	177	7
					Spring onions	44	2
					Melons	186	3
					Sweet peppers	263	4
					Tomatoes	268	5
					Watermelons	39	1
					Broccoli	83	2
					Parsley	39	1
					Spinach	68	1
					Beans with pods	85	2
					Celery	52	3
					Globe artichokes	48	1
					Tea leaves	24	1
					Spices	8	1
					Herbal tea	16	1
Chlorpyrifos-methyl	F	399	392	7	Cornflour	56	5
					Pasta product	31	2
					Grapefruits	235	1
					Lemons	211	1
					Mandarins and clementines	322	5
					Oranges	494	3
					Pears	223	1
					Peaches and nectarines	281	12
					Strawberries	131	1
					Table grapes	564	33
					Kiwi	171	1
					Tomatoes	268	1
					Parsley	39	2
					Celery	52	1
Cyfluthrin	F	8321	8303	18	Apples	401	1
					Pears	223	1
					Table grapes	564	13
					Sweet peppers	263	1
					Tomatoes	268	1
					Asparagus	59	1
Cyhalothrin, lambda-	DK	2513	2512	1	Currants	38	1
Cyhalothrin, lambda-	F	5608	5600	8	Mandarins and clementines	232	1
					Apricots	37	2
					Plums	54	1
					Sweet peppers	201	2
					Tomatoes	197	1
					Raisins	24	1
Cypermethrin	F	399	398	1	Pasta product	31	1
Cypermethrin	DK	3965	3955	10	Currants	83	3
					Raspberries	25	1
					Kale	41	1
					Lettuce	129	1
(cont.)					Celery	53	4

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Cypermethrin	F	8321	8204	117	Oranges	494	1
					Apples	401	3
					Pears	223	1
					Apricots	67	2
					Cherries	43	1
					Peaches and nectarines	281	5
					Plums	75	2
					Currants	71	1
					Strawberries	131	1
					Table grapes	564	22
					Exotic fruits	421	20
					Exotic vegetables	33	2
					Aubergines	103	5
					Courgettes	103	1
					Sweet peppers	263	11
					Tomatoes	268	9
					Broccoli	83	5
					Head cabbages	28	1
					Herbs (fresh)	8	1
					Lettuce	123	3
					Spinach	68	1
					Beans with pods	85	6
					Asparagus	59	1
					Celery	52	7
					Tea leaves	24	1
					Apricot, dried	3	2
					Raisins	24	1
					Dill, dried	2	1
Cyprodinil	F	1041	992	49	Apples	65	2
					Pears	33	1
					Apricots	9	1
					Peaches and nectarines	22	3
					Raspberries	10	1
					Strawberries	6	4
					Table grapes	116	22
					Avocados	20	1
					Exotic fruits	45	1
					Aubergines	21	1
					Cucumbers	25	2
					Sweet peppers	35	7
					Tomatoes	38	1
					Cauliflowers	10	1
					Beans with pods	11	1
DDT	DK	3965	3961	4	Courgettes	49	1
					Kale	41	1
					Potatoes	494	2
DDT	F	8321	8310	11	Grapefruits	235	2
					Lemons	211	2
(cont.)					Oranges	494	1

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
DDT (cont.)					Carrots	177	1
					Tomatoes	268	1
					Watermelons	39	1
					Oil seeds	31	1
					Potatoes	173	1
					Figs	59	1
Deltamethrin	F	399	392	7	Cornflour	56	4
					Rice, white	80	3
Deltamethrin	DK	3965	3964	1	Lettuce	129	1
Deltamethrin	F	8321	8272	49	Apples	401	3
					Pears	223	1
					Apricots	67	2
					Peaches and nectarines	281	1
					Currants	71	3
					Table grapes	564	7
					Avocados	71	1
					Carrots	177	1
					Aubergines	103	2
					Cucumbers	203	2
					Sweet peppers	263	12
					Tomatoes	268	8
					Chinese cabbage	39	1
					Lettuce	123	2
					Spinach	68	3
Demeton-S-methyl	DK	3965	3963	2	Apples	252	2
Demeton-S-methyl	F	8321	8308	13	Lemons	211	1
					Limes	52	1
					Oranges	494	1
					Apples	401	3
					Pears	223	2
					Kiwi	171	1
					Pineapples	101	1
					Aubergines	103	1
					Melons	186	1
					Lettuce	123	1
Diazinon	DK	3965	3961	4	Carrots	268	2
					Lettuce	129	1
					Celery	53	1
Diazinon	F	8321	8278	43	Grapefruits	235	2
					Lemons	211	2
					Mandarins and clementines	322	6
					Oranges	494	10
					Apples	401	1
					Pears	223	1
					Cherries	43	4
					Table grapes	564	2
					Kiwi	171	6
(cont.)					Carrots	177	1

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Diazinon (cont.)					Cucumbers	203	1
					Melons	186	4
					Celery	52	2
					Dates	22	1
Dichlofluanid	DK	3965	3964	1	Apples	252	1
Dichlofluanid	F	8321	8286	35	Apples	401	9
					Pears	223	3
					Peaches and nectarines	281	2
					Raspberries	66	3
					Strawberries	131	9
					Table grapes	564	4
					Aubergines	103	1
					Sweet peppers	263	1
					Tomatoes	268	1
					Broccoli	83	1
					Celery	52	1
Dichlorvos	F	8321	8316	5	Apples	401	2
					Pears	223	1
					Leeks	55	1
					Wine, red	31	1
Dicloran	F	8321	8310	11	Mandarins and clementines	322	1
					Pears	223	1
					Peaches and nectarines	281	1
					Carrots	177	4
					Aubergines	103	1
					Melons	186	1
					Tomatoes	268	1
					Lettuce	123	1
Dicofol	DK	3965	3964	1	Apples	252	1
Dicofol	F	8321	8163	158	Grapefruits	235	7
					Lemons	211	48
					Mandarins and clementines	322	55
					Oranges	494	23
					Oranges, organic	48	1
					Apples	401	2
					Pears	223	2
					Table grapes	564	5
					Exotic fruits	421	7
					Tomatoes	268	3
					Pulses	121	1
					Tea leaves	24	4
Dieldrin	DK	3965	3960	5	Beetroot	66	2
					Carrots	268	1
					Potatoes	494	2
Dieldrin	F	8321	8303	18	Grapefruits	235	2
					Peaches and nectarines	281	1
					Carrots	177	6
					Courgettes	103	7
(cont.)					Melons	186	1

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Dieldrin (cont.)					Watermelons, organic	1	1
Difenoconazole	F	1041	1037	4	Pears	33	1
					Carrots	33	1
					Tomatoes	38	1
					Parsley	8	1
Dimethoate+omethoate	DK	3965	3949	16	Apples	252	3
					Pears	124	1
					Currants	83	1
					Celeriac	49	1
					Broccoli	37	1
					Chinese cabbage	47	3
					Lettuce	129	5
					Mushrooms	102	1
Dimethoate+omethoate	F	8321	8251	70	Lemons	211	1
					Mandarins and clementines	322	3
					Oranges	494	11
					Apples	401	7
					Pears	223	1
					Cherries	43	1
					Other small fruits and berries	92	2
					Raspberries	66	1
					Table grapes	564	20
					Exotic fruits	421	3
					Exotic vegetables	33	1
					Spring onions	44	3
					Courgettes	103	1
					Sweet peppers	263	2
					Broccoli	83	2
					Cauliflowers	64	1
					Lettuce	123	6
					Parsley	39	1
					Celery	52	2
					Raisins	24	1
Dioxathion	F	8321	8320	1	Bananas	422	1
Diphenylamine	F	8321	8229	92	Apples	401	90
					Apples, organic	41	1
					Pears	223	1
Endosulfan	DK	3965	3959	6	Currants	83	2
					Cucumbers	196	1
					Tomatoes	216	1
					Broccoli	37	1
					Rhubarbs	35	1
Endosulfan	F	8321	7883	438	Grapefruits	235	1
					Lemons	211	9
					Mandarins and clementines	322	7
					Oranges	494	9
					Apples	401	14
(cont.)					Pears	223	14

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Endosulfan (cont.)					Apricots	67	1
					Cherries	43	2
					Peaches and nectarines	281	13
					Plums	75	1
					Currants	71	9
					Other small fruits and berries	92	3
					Raspberries	66	2
					Strawberries	131	10
					Table grapes	564	5
					Avocados	71	1
					Bananas	422	2
					Exotic fruits	421	20
					Kiwi	171	1
					Pineapples	101	2
					Carrots	177	3
					Exotic vegetables	33	1
					Other Vegetables	13	1
					Aubergines	103	6
					Courgettes	103	38
					Cucumbers	203	24
					Melons	186	98
					Sweet peppers	263	53
					Tomatoes	268	33
					Watermelons	39	5
					Broccoli	83	4
					Dill	12	2
					Lettuce	123	20
					Beans with pods	85	5
					Peas with pods	31	3
					Asparagus	59	2
					Celery	52	2
					Mushrooms	62	1
					Pulses	121	2
					Potatoes	173	1
					Tea leaves	24	2
					Spices	8	1
					Canned pineapples	8	1
					Figs	59	2
					Other processes fruit and veg.	14	1
					Herbal tea	16	1
Esfenvalerate	DK	3965	3955	10	Other small fruits and berries	25	1
					Broccoli	37	1
					Head cabbages	205	1
					Lettuce	129	1
					Peas with pods	43	3
					Celery	53	3
Esfenvalerate	F	8321	8311	10	Oranges	494	1
					Apples	401	2
(cont.)					Currants	71	2

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Esfenvalerate (cont.)					Table grapes	564	2
					Exotic fruits	421	1
					Sweet peppers	263	1
					Beans with pods	85	1
Ethion	F	8321	8251	70	Grapefruits	235	31
					Lemons	211	7
					Mandarins and clementines	322	14
					Oranges	494	8
					Pears	223	2
					Exotic fruits	421	2
					Beans with pods	85	3
					Globe artichokes	48	1
					Tea leaves	24	1
					Figs	59	1
Etrimfos	F	399	397	2	Rolled oats, organic	7	2
					Wine, red	31	2
Fenarimol	DK	3965	3962	3	Currants	83	3
Fenarimol	F	8321	8314	7	Lemons	211	1
					Apricots	67	1
					Other small fruits and berries	92	1
					Table grapes	564	3
					Carrots	177	1
Fenitrothion	DK	667	665	2	Wheat bran	29	1
					Rye bread	156	1
Fenitrothion	F	399	395	4	Cornflour	56	3
					Wheat bread	66	1
Fenitrothion	DK	3965	3964	1	Jam and similars	22	1
Fenitrothion	F	8321	8287	34	Mandarins and clementines	322	1
					Oranges	494	5
					Pomelos	85	1
					Apples	401	1
					Peaches and nectarines	281	6
					Currants	71	3
					Table grapes	564	13
					Parsley	39	1
					Beans with pods	85	1
					Celery	52	1
					Globe artichokes	48	1
Fenpropathrin	DK	3965	3953	12	Apples	252	1
					Currants	83	9
					Carrots	268	1
					Kale	41	1
Fenpropathrin	F	8321	8308	13	Grapefruits	235	1
					Mandarins and clementines	322	3
					Oranges	494	2
					Cherries	43	1
					Currants	71	2
(cont.)					Exotic fruits	421	1

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Fenpropathrin (cont.)					Melons	186	2
					Sweet peppers	263	1
Fenpropimorph	DK	2513	2511	2	Beetroot	36	1
					Chives	14	1
Fenpropimorph	F	5608	5602	6	Spring onions	40	1
					Cauliflowers	43	1
					Lettuce	85	2
					Beans with pods	60	1
					Leeks	40	1
Fenson	F	8321	8317	4	Mandarins and clementines	322	1
					Table grapes	564	1
					Tomatoes	268	1
					Celery	52	1
Fenthion	F	8321	8266	55	Mandarins and clementines	322	22
					Oranges	494	18
					Apples	401	1
					Other pome fruits	3	1
					Pears	223	1
					Apricots	67	1
					Cherries	43	1
					Peaches and nectarines	281	3
					Plums	75	1
					Table grapes	564	1
					Exotic fruits	421	5
Fenvalerate	F	399	398	1	Rye bread	13	1
Fenvalerate	DK	3965	3960	5	Raspberries	25	1
					Chinese cabbage	47	1
					Head cabbages	205	1
					Kale	41	1
					Lettuce	129	1
Fenvalerate	F	8321	8308	13	Apples	401	1
					Pears	223	3
					Peaches and nectarines	281	3
					Strawberries	131	1
					Table grapes	564	1
					Exotic fruits	421	1
					Melons	186	1
					Watermelons	39	1
					Tea leaves	24	1
Flucythrinate	F	8321	8319	2	Table grapes	564	1
					Watermelons	39	1
Fludioxonil	F	1041	1016	25	Oranges	53	1
					Strawberries	6	1
					Table grapes	116	15
					Cucumbers	25	1
					Sweet peppers	35	6
					Beans with pods	11	1
Fluvalinate, tau-	F	1041	1040	1	Apples	65	1
Furathiocarb (cont.)	F	8321	8319	2	Oranges	494	1

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Furathiocarb (cont.)					Apricots	67	1
Glyphosate	DK	263	178	85	Barley grains	14	6
					Barley groats	2	2
					Rolled oats	25	6
					Wheat bran	20	16
					Rye bread	62	15
					Rye bread, organic	9	1
					Wheat bread	112	39
Glyphosate	F	50	46	4	Wheat bread	22	3
					Wheat bread, organic	7	1
HCH	F	8321	8313	8	Exotic fruits	421	1
					Exotic vegetables	33	3
					Pulses	121	2
					Oil seeds	31	2
Heptachlor	F	8321	8315	6	Grapefruits	235	1
					Pomelos	85	1
					Carrots	177	2
					Exotic vegetables	33	1
					Herbs (fresh)	8	1
Hexachlorobenzene	DK	3965	3957	8	Carrots	268	5
					Carrots, organic	52	2
					Parsley	55	1
Hexachlorobenzene	F	8321	8315	6	Carrots	177	4
					Radish	36	1
					Broccoli	83	1
Imazalil	DK	2214	2210	4	Courgettes	42	1
					Cucumbers	168	1
					Potatoes	399	2
Imazalil	F	5984	4788	1196	Grapefruits	201	141
					Lemons	192	139
					Limes	41	16
					Mandarins and clementines	292	252
					Minneolas	10	9
					Oranges	416	317
					Pomelos	58	36
					Apples	265	4
					Pears	146	3
					Avocados	60	3
					Bananas	373	249
					Bananas, organic	24	1
					Exotic fruits	344	7
					Kiwi	138	1
					Pineapples	89	1
					Cucumbers	172	1
					Melons	144	6
					Tomatoes	237	1
					Cauliflowers	54	1
(cont.)					Potatoes	138	6

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Imazalil (cont.)					Orange juice	15	2
Iprodione	DK	3965	3911	54	Currants	83	9
					Raspberries	25	5
					Strawberries	142	3
					Carrots	268	14
					Celeriac	49	1
					Parsnips	59	2
					Radish	32	1
					Cucumbers	196	2
					Sweet peppers	22	2
					Tomatoes	216	2
					Brussels sprouts	82	3
					Head cabbages	205	4
					Kale	41	1
					Herbs (fresh)	36	1
					Lettuce	129	4
Iprodione	F	8321	7961	360	Limes	52	1
					Minneolas	10	1
					Apples	401	4
					Pears	223	7
					Apricots	67	8
					Cherries	43	9
					Peaches and nectarines	281	19
					Plums	75	24
					Currants	71	17
					Other small fruits and berries	92	10
					Raspberries	66	5
					Strawberries	131	6
					Table grapes	564	118
					Bananas	422	1
					Exotic fruits	421	2
					Kiwi	171	16
					Carrots	177	13
					Exotic vegetables	33	1
					Mixed vegetables	24	1
					Radish	36	1
					Aubergines	103	2
					Courgettes	103	3
					Cucumbers	203	11
					Melons	186	3
					Sweet peppers	263	29
					Tomatoes	268	16
					Watermelons	39	1
					Cauliflowers	64	1
					Chinese cabbage	39	1
					Head cabbages	28	1
					Lettuce	123	10
					Spinach	68	2
(cont.)					Beans with pods	85	5

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Iprodione (cont.)					Fennel	40	1
					Other canned vegetables	43	2
					Raisins	24	2
					Dill, dried	2	1
					Wine, red	31	5
Isofenphos	F	8321	8319	2	Broccoli	83	2
Kresoxim-methyl	DK	927	923	4	Currants	7	2
					Strawberries	36	2
Kresoxim-methyl	F	2438	2435	3	Grapefruits	69	1
					Currants	23	1
					Table grapes	258	1
Lindane	F	8321	8299	22	Lemons	211	1
					Mandarins and clementines	322	2
					Oranges	494	1
					Nuts and similar	57	1
					Apples	401	1
					Pears	223	2
					Peaches and nectarines	281	1
					Exotic fruits	421	1
					Kiwi	171	1
					Carrots	177	2
					Exotic vegetables	33	3
					Broccoli	83	1
					Brussels sprouts	14	1
					Spinach	68	1
					Pulses	121	2
					Oil seeds	31	1
Malathion	DK	667	663	4	Rye bread	156	1
					Wheat bread	265	3
Malathion	F	399	386	13	Cornflour	56	7
					Rice, other	18	1
					Rice, white	80	2
					Wheat germ	1	1
					Rye bread, organic	18	1
					Wheat bread	66	1
Malathion	DK	3965	3963	2	Kale	41	1
					Lettuce	129	1
Malathion	F	8321	8090	231	Grapefruits	235	15
					Mandarins and clementines	322	136
					Oranges	494	26
					Pomelos	85	2
					Pears	223	1
					Peaches and nectarines	281	2
					Strawberries	131	5
					Avocados	71	1
					Exotic fruits	421	32
					Aubergines	103	1
(cont.)					Sweet peppers	263	5

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Malathion (cont.)					Lettuce	123	1
					Celery	52	2
					Pulses	121	1
					Herbal tea	16	1
Maneb-group	DK	2186	2103	83	Apples	248	29
					Pears	124	24
					Cherries	20	4
					Plums	51	4
					Currants	32	4
					Raspberries	10	1
					Strawberries	111	1
					Beetroot	62	1
					Cucumbers	194	2
					Tomatoes	194	1
					Dill	8	1
					Herbs (fresh)	16	1
					Lettuce	124	6
					Parsley	41	1
					Spinach	23	2
					Celery	53	1
Maneb-group	F	4978	4564	414	Apples	373	46
					Pears	220	47
					Apricots	65	18
					Cherries	35	1
					Peaches and nectarines	268	35
					Plums	73	4
					Currants	32	2
					Other small fruits and berries	53	1
					Raspberries	25	2
					Strawberries	75	2
					Table grapes	547	67
					Bananas	386	1
					Exotic fruits	389	49
					Carrots	167	1
					Exotic vegetables	30	2
					Spring onions	2	1
					Aubergines	97	5
					Courgettes	103	5
					Cucumbers	202	33
					Melons	170	12
					Sweet peppers	245	20
					Tomatoes	256	16
					Watermelons	31	1
					Dill	12	1
					Lettuce	122	10
					Parsley	30	4
					Spinach	47	7
					Beans with pods	64	4
(cont.)					Peas with pods	30	4

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Maneb-group (cont.)					Celery	52	3
					Leeks	51	9
					Figs	37	1
Mecarbam	F	8321	8306	15	Lemons	211	11
					Mandarins and clementines	322	1
					Oranges	494	3
Mepiquat	DK	296	286	10	Wheat bran	15	1
					Rye bread	59	9
Mepiquat	F	69	67	2	Beer	13	1
					Baby food, cerealbased, powder	4	1
Metalaxyl	DK	3965	3963	2	Lettuce	129	1
					Spinach	33	1
Metalaxyl	F	8321	8220	101	Grapefruits	235	4
					Lemons	211	2
					Mandarins and clementines	322	2
					Oranges	494	2
					Pomelos	85	1
					Peaches and nectarines	281	2
					Raspberries	66	4
					Strawberries	131	1
					Table grapes	564	37
					Radish	36	2
					Spring onions	44	3
					Cucumbers	203	11
					Melons	186	1
					Sweet peppers	263	3
					Tomatoes	268	3
					Broccoli	83	2
					Lettuce	123	18
					Spinach	68	1
					Potatoes	173	2
Methamidophos	F	8321	8307	14	Oranges	494	3
					Peaches and nectarines	281	2
					Mixed vegetables	24	1
					Cucumbers	203	2
					Sweet peppers	263	1
					Cauliflowers	64	1
					Lettuce	123	1
					Beans with pods	85	3
Methidathion	F	8321	8049	272	Grapefruits	235	18
					Lemons	211	64
					Mandarins and clementines	322	106
					Minneolas	10	1
					Oranges	494	77
					Pomelos	85	2
					Exotic fruits	421	3
					Fennel	40	1
Methoxychlor (cont.)	F	8321	8315	6	Lemons	211	1

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Methoxychlor (cont.)					Oranges	494	1
					Pomelos	85	1
					Apples	401	2
					Tomatoes	268	1
					Cornflour	18	1
Mevinphos	DK	3965	3964	1	Lettuce	129	1
Mevinphos	F	8321	8319	2	Apricots	67	1
					Wine, red	31	1
Monocrotophos	F	8321	8320	1	Table grapes	564	1
Myclobutanil	F	8321	8292	29	Peaches and nectarines	281	1
					Strawberries	131	2
					Table grapes	564	18
					Exotic fruits	421	1
					Kiwi	171	1
					Cucumbers	203	1
					Melons	186	1
					Sweet peppers	263	4
Nuarimol	F	8321	8317	4	Sweet peppers	263	2
					Tomatoes	268	2
Parathion	F	8321	8308	13	Grapefruits	235	1
					Lemons, organic	42	1
					Oranges	494	2
					Apples	401	2
					Peaches and nectarines	281	1
					Table grapes	564	2
					Exotic fruits	421	1
					Parsley	39	3
Parathion-methyl	F	8321	8296	25	Grapefruits	235	4
					Lemons	211	1
					Limes	52	2
					Mandarins and clementines	322	2
					Minneolas	10	1
					Oranges	494	9
					Pomelos	85	1
					Apples	401	3
					Currants	71	1
					Exotic fruits	421	1
Penconazole	F	8321	8307	14	Strawberries	131	2
					Table grapes	564	11
					Sweet peppers	263	1
Pentachloroanisole	DK	3965	3964	1	Mushrooms	102	1
Pentachloroanisole	F	8321	8311	10	Grapefruits	235	1
					Limes	52	1
					Apples	401	5
					Carrots	177	1
					Courgettes	103	1
					Celery	52	1
Pentachlorobenzene	DK	3965	3961	4	Currants	83	1
(cont.)					Onions	277	1

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Pentachlorobenzene (cont.)					Brussels sprouts	82	1
					Potatoes	494	1
Pentachlorobenzene	F	8321	8315	6	Exotic fruits	421	1
					Carrots	177	3
					Cauliflowers	64	1
					Pulses	121	1
Pentachlorophenol	DK	3965	3964	1	Peas with pods	43	1
Pentachlorophenol	F	8321	8315	6	Apples	401	1
					Tomatoes	268	2
					Cauliflowers	64	1
					Spinach	68	1
					Globe artichokes	48	1
Permethrin	DK	3965	3961	4	Kale	41	1
					Beans with pods	18	1
					Rhubarbs	35	1
					Mushrooms	102	1
Permethrin	F	8321	8285	36	Lemons	211	2
					Limes	52	1
					Other small fruits and berries	92	1
					Table grapes	564	3
					Exotic fruits	421	5
					Kiwi	171	5
					Cucumbers	203	1
					Melons	186	3
					Tomatoes	268	5
					Watermelons	39	1
					Broccoli	83	1
					Lettuce	123	3
					Celery	52	2
					Figs	59	1
					Raisins	24	1
					Wine, red	31	1
Permethrin	DK	352	351	1	Rye bread	81	1
Permethrin	F	187	184	3	Pasta product	3	3
Phenthoate	F	8321	8317	4	Oranges	494	1
					Avocados	71	2
					Exotic vegetables	33	1
Phenylphenol, 2-	F	8321	8250	71	Grapefruits	235	12
					Lemons	211	3
					Mandarins and clementines	322	19
					Oranges	494	18
					Pomelos	85	1
					Apples	401	1
					Canned pineapples	8	1
					Canned tomatoes	25	8
					Other canned vegetables	43	8
					Grapefruits	234	28
(cont.)					Lemons	211	13

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Phenylphenol, 2- (cont.)					Mandarins and clementines	322	21
					Minneolas	10	2
					Oranges	494	53
					Pomelos	85	5
					Exotic fruits	419	1
Phorate	F	8321	8319	2	Grapefruits	235	2
Phosalone	DK	3965	3962	3	Apples	252	3
Phosalone	F	8321	8278	43	Apples	401	24
					Apples, organic	41	1
					Pears	223	1
					Apricots	67	1
					Peaches and nectarines	281	7
					Strawberries	131	1
					Table grapes	564	4
					Exotic fruits	421	1
					Onions	126	1
					Spring onions	44	1
					Brussels sprouts	14	1
Phosmet	F	8321	8278	43	Lemons	211	1
					Mandarins and clementines	322	3
					Apples	401	10
					Pears	223	21
					Peaches and nectarines	281	1
					Plums	75	2
					Table grapes	564	2
					Onions	126	1
					Spring onions	44	1
					Pulses	121	1
Phoxim	F	8321	8319	2	Strawberries	131	1
					Spring onions	44	1
Pirimicarb	DK	3965	3948	17	Apples	252	3
					Pears	124	5
					Cucumbers	196	1
					Brussels sprouts	82	1
					Dill	11	1
					Herbs (fresh)	36	1
					Lettuce	129	3
					Parsley	55	1
					Celery	53	1
Pirimicarb	F	8321	8312	9	Limes	52	1
					Apples	401	1
					Other small fruits and berries	92	1
					Table grapes	564	1
					Carrots	177	1
					Sweet peppers	263	2
					Lettuce	123	1
					Celery	52	1
Pirimiphos-methyl	DK	667	654	13	Wheat bran	29	5
(cont.)					Rye bread	156	5

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Pirimiphos-methyl (cont.)					Rye bread, organic	26	1
					Wheat bread	265	2
Pirimiphos-methyl	F	399	361	38	Cornflour	56	15
					Cornflour, organic	12	1
					Rice, other	18	1
					Rice, white	80	1
					Rolled oats	1	1
					Rolled oats, organic	7	3
					Wheat germ	1	1
					Pasta product	31	4
					Rye bread	13	3
					Rye bread, organic	18	1
					Wheat bread	66	7
Pirimiphos-methyl	DK	3965	3964	1	Onions	277	1
Pirimiphos-methyl	F	8321	8271	50	Grapefruits	235	2
					Lemons	211	2
					Mandarins and clementines	322	8
					Oranges	494	14
					Pomelos	85	2
					Mixed vegetables	24	1
					Sweet peppers	263	21
Prochloraz	DK	410	405	5	Mushrooms	22	5
Prochloraz	F	1041	1036	5	Grapefruits	24	1
					Mandarins and clementines	35	1
					Exotic fruits	45	3
Procymidone	DK	3965	3959	6	Strawberries	142	2
					Dill	11	1
					Jam and similars	22	1
					Jam and similars, organic	6	1
					Raspberry, dried	1	1
Procymidone	F	8321	7842	479	Grapefruits	235	2
					Lemons	211	2
					Mandarins and clementines	322	1
					Oranges	494	3
					Apples	401	1
					Pears	223	6
					Cherries	43	1
					Peaches and nectarines	281	14
					Plums	75	2
					Currants	71	2
					Raspberries	66	12
					Strawberries	131	21
					Table grapes	564	118
					Table grapes, organic	14	2
					Exotic fruits	421	2
					Kiwi	171	5
					Carrots	177	10
(cont.)					Mixed vegetables	24	2

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Procymidone (cont.)					Aubergines	103	11
					Courgettes	103	24
					Cucumbers	203	27
					Melons	186	25
					Sweet peppers	263	68
					Tomatoes	268	73
					Watermelons	39	1
					Chinese cabbage	39	2
					Lettuce	123	21
					Spinach	68	1
					Beans with pods	85	4
					Celery	52	2
					Fennel	40	2
					Potatoes	173	1
					Canned tomatoes	25	5
					Figs	59	3
					Raisins	24	2
					Wine, red	31	1
Profenofos	F	8321	8312	9	Oranges	494	2
					Table grapes	564	1
					Exotic fruits	421	1
					Exotic vegetables	33	1
					Spring onions	44	3
					Herbal tea	16	1
Propargite	F	1041	1033	8	Apples	65	6
					Exotic fruits	45	1
					Tomatoes	38	1
Propiconazole	F	399	398	1	Rice, other	18	1
					Lemons	211	1
Prothiofos	F	8321	8292	29	Grapefruits	235	1
					Lemons	211	6
					Mandarins and clementines	322	2
					Minneolas	10	1
					Oranges	494	9
					Apricots	67	1
					Peaches and nectarines	281	1
					Table grapes	564	5
					Exotic fruits	421	3
Pyrazophos	DK	3965	3964	1	Strawberries	142	1
Pyrazophos	F	8321	8312	9	Apricots	67	1
					Strawberries	131	1
					Table grapes	564	1
					Melons	186	6
Pyrethrines	F	1041	1040	1	Pineapples	20	1
Pyrimethanil	DK	927	917	10	Pears	33	2
					Strawberries	36	8
Pyrimethanil	F	2438	2380	58	Apples	151	6
					Apples, organic	20	1
(cont.)					Pears	69	6

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Pyrimethanil (cont.)					Other small fruits and berries	12	1
					Raspberries	18	2
					Strawberries	28	1
					Table grapes	258	15
					Avocados	30	3
					Bananas	135	3
					Exotic fruits	110	1
					Pineapples	41	2
					Aubergines	38	2
					Sweet peppers	97	2
					Tomatoes	89	6
					Cauliflowers	23	1
					Lettuce	31	2
					Tea leaves	10	1
					Canned pineapples	8	1
					Apple juice	2	1
					Other processes fruit and veg.	11	1
Quinalphos	F	8321	8310	11	Lemons	211	4
					Oranges	494	1
					Apples	401	1
					Peaches and nectarines	281	1
					Kiwi	171	4
Quintozene	DK	3965	3943	22	Carrots	268	7
					Carrots, organic	52	3
					Parsnips, organic	4	1
					Radish	32	1
					Brussels sprouts	82	1
					Parsley	55	1
					Spinach	33	3
					Potatoes	494	5
Quintozene	F	8321	8306	15	Oranges	494	1
					Carrots	177	12
					Sweet peppers	263	1
					Pulses	121	1
Simazine	F	8321	8319	2	Lemons	211	1
					Garlics	27	1
Tebuconazole	DK	3965	3964	1	Celeriac	49	1
Tebuconazole	F	8321	8276	45	Lemons	211	1
					Peaches and nectarines	281	6
					Table grapes	564	11
					Spring onions	44	4
					Courgettes	103	1
					Cucumbers	203	1
					Sweet peppers	263	11
					Tomatoes	268	5
					Leeks	55	4
					Raisins	24	1
Tecnazene (cont.)	DK	3965	3964	1	Courgettes	49	1

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Tecnazene	F	8321	8319	2	Bananas	422	1
					Potatoes	173	1
Tetradifon	F	8321	8247	74	Grapefruits	235	1
					Lemons	211	16
					Mandarins and clementines	322	17
					Minneolas	10	1
					Oranges	494	20
					Pears	223	1
					Currants	71	1
					Strawberries	131	2
					Table grapes	564	1
					Exotic fruits	421	5
					Sweet peppers	263	3
					Tomatoes	268	4
					Globe artichokes	48	1
					Dates	22	1
Tetrasul	F	8321	8320	1	Radish	36	1
Thiabendazole	DK	3938	3937	1	Head cabbages	205	1
Thiabendazole	F	8261	7873	388	Grapefruits	234	35
					Lemons	211	4
					Limes	52	3
					Mandarins and clementines	322	83
					Minneolas	10	1
					Oranges	494	100
					Pomelos	85	22
					Apples	401	45
					Pears	223	4
					Raspberries	66	1
					Bananas	423	68
					Exotic fruits	419	7
					Kiwi	171	1
					Melons	186	12
					Head cabbages	28	2
Tolclofos-methyl	DK	3965	3964	1	Potatoes	494	1
Tolclofos-methyl	F	8321	8307	14	Peaches and nectarines	281	1
					Carrots	177	5
					Radish	36	1
					Spring onions	44	1
					Lettuce	123	5
					Spinach	68	1
Tolylfluanid	DK	3965	3896	69	Apples	252	5
					Pears	124	1
					Currants	83	7
					Raspberries	25	1
					Strawberries	142	55
Tolylfluanid	F	8321	8134	187	Apples	401	45
					Apples, organic	41	1
					Pears	223	75
(cont.)					Currants	71	24

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Tolylfluanid (cont.)					Other small fruits and berries	92	17
					Raspberries	66	9
					Strawberries	131	11
					Bananas	422	1
					Sweet peppers	263	1
					Tomatoes	268	1
					Lettuce	123	1
					Leeks	55	1
Triadimefon+triadimenol	F	8321	8266	55	Mandarins and clementines	322	1
					Other small fruits and berries	92	1
					Strawberries	131	1
					Table grapes	564	11
					Exotic fruits	421	1
					Pineapples	101	29
					Melons	186	1
					Sweet peppers	263	4
					Tomatoes	268	4
					Lettuce	123	1
					Herbal tea	16	1
Triazophos	DK	3965	3964	1	Herbal tea	3	1
Triazophos	F	8321	8317	4	Oranges	494	1
					Pears	223	1
					Table grapes	564	1
					Beans with pods	85	1
Trichlorfon	F	8321	8317	4	Minneolas	10	1
					Table grapes	564	1
					Sweet peppers	263	1
					Tomatoes	268	1
Trifloxystrobin	F	2438	2431	7	Grapefruits	69	1
					Apples, organic	20	1
					Table grapes	258	3
					Exotic fruits	110	1
					Carrots	63	1
Vinclozolin	DK	3965	3948	17	Raspberries	25	1
					Strawberries	142	11
					Carrots	268	1
					Radish	32	1
					Tomatoes	216	1
					Herbs (fresh)	36	1
					Peas without pods	19	1
Vinclozolin	F	8321	8152	169	Minneolas	10	1
					Apples	401	2
					Pears	223	1
					Peaches and nectarines	281	6
					Other small fruits and berries	92	2
					Raspberries	66	7
					Strawberries	131	14
(cont.)					Table grapes	564	12

Pesticide	Origin of samples (DK=Domestic; F=Foreign)	Number of samples analysed	Without detected residues	With detected residues	Commodity	Number of samples analysed	Number of samples with residues
Vinclozolin (cont.)					Kiwi	171	66
					Carrots	177	1
					Mixed vegetables	24	2
					Onions	126	1
					Spring onions	44	1
					Aubergines	103	1
					Courgettes	103	3
					Cucumbers	203	1
					Melons	186	1
					Sweet peppers	263	2
					Tomatoes	268	4
					Broccoli	83	3
					Chinese cabbage	39	2
					Dill	12	2
					Lettuce	123	8
					Parsley	39	1
					Spinach	68	1
					Beans with pods	85	17
					Peas with pods	31	1
					Peas without pods	25	5
					Pulses	121	1

8.5 Consumption used for intake calculations

Consumer group	All	Male	Female	Children	Male High F&V [1)]	Female High F&V [1)]	Assumed domestic consumption in % of total
Age (years)	4-75	15-75	15-75	4-14	15-75	15-75	
Avg. weight (kg)	66,4	82,4	67,3	35,1	82,4	66,9	
No. of individuals in group	4063	1520	1739	804	135	234	
	Average consumption (g/day/person)						
Apricots	0.18	0.11	0.25	0.14	0.56	0.84	0%
Cucumbers	22	18	22	29	37	43	49%
Pineapples	0.35	0.25	0.47	0.28	0.29	1.1	0%
Canned pineapples	0.75	0.54	1.0	0.59	0.61	2.3	0%
Other small fruits and berries	0.24	0.21	0.26	0.24	0.51	0.54	21%
Oranges	10	7.5	13	11	21	29	0%
Orange juice	48	45	46	58	56	55	0%
Globe artichokes	0.034	0.039	0.034	0.026	0.056	0.052	0%
Asparagus	0.087	0.098	0.11	0.015	0.17	0.31	9%
Canned asparagus	0.51	0.58	0.65	0.087	0.98	1.8	0%
Aubergines	0.43	0.48	0.52	0.12	1.1	0.96	0%
Avocados	0.64	0.48	0.96	0.26	1.2	1.5	0%
Bananas	26	24	31	20	69	73	0%
Celery	0.50	0.34	0.81	0.16	0.59	2.6	50%
Cauliflowers	2.3	2.9	2.5	0.86	6.6	4.5	54%
Plums	1.4	0.87	2.1	0.92	3.2	6.7	44%
Broccoli	1.6	1.8	1.9	0.68	4.3	2.9	31%
Beans with pods	1.1	1.1	1.2	0.73	2.4	2.3	17%
Mushrooms	3.1	3.5	3.4	1.9	4.1	5.3	62%
Lemons	2.5	2.2	2.7	2.5	5.4	5.7	0%
Courgettes	0.80	0.87	1.0	0.23	2.7	1.7	32%
Dates	0.13	0.10	0.22	0.003	0.31	0.69	0%
Dill	0.024	0.018	0.034	0.012	0.043	0.074	48%
Oil seeds	0.42	0.37	0.46	0.42	0.91	0.97	0%
Fennel	0.047	0.053	0.046	0.036	0.077	0.071	5%
Peaches and nectarines	7.0	4.4	10.0	5.5	21	25	0%
Figs	0.21	0.14	0.36	0.018	0.23	1.6	0%
Spring onions	0.088	0.10	0.11	0.026	0.22	0.16	25%
Exotic fruits	0.47	0.31	0.67	0.33	1.5	1.2	0%
Fruitjuice, others	18	18	13	30	17	12	62%
Grapefruits	0.37	0.27	0.46	0.38	0.75	1.1	0%
Kale	0.48	0.53	0.50	0.37	1.2	0.69	93%
Mixed vegetables	2.5	2.8	2.4	1.9	4.1	3.8	11%
Exotic vegetables	0.23	0.26	0.23	0.18	0.38	0.35	0%
Carrots	32	28	37	29	69	82	60%
Rolled oats	8.6	10	6.8	9.0	22	9.3	98%
Raspberries	0.17	0.14	0.22	0.14	0.31	0.43	27%
Head cabbages	4.0	4.3	4.8	1.8	10	10	88%
Wheat bread	103	113	96	101	128	95	80%
Wheat bran	0.24	0.27	0.27	0.14	0.44	0.41	85%
Garlics	0.069	0.049	0.10	0.034	0.071	0.22	0%
Strawberries	3.2	2.3	4.0	3.3	7.6	7.9	52%
Potatoes	100	133	86	66	143	103	74%
Chinese cabbage	0.98	1.1	1.1	0.45	2.6	1.9	55%
Cherries	0.32	0.20	0.40	0.35	0.39	0.35	50%

Consumer group	All	Male	Female	Children	Male High F&V [1)]	Female High F&V [1)]	Assumed domestic consumption in % of total
Age (years)	4-75	15-75	15-75	4-14	15-75	15-75	
Avg. weight (kg)	66,4	82,4	67,3	35,1	82,4	66,9	
No. of individuals in group	4063	1520	1739	804	135	234	
	Average consumption (g/day/person)						
Kiwi	2.1	0.87	3.1	2.4	4.3	10	0%
Celeriac	1.4	1.7	1.5	1.0	3.1	2.1	89%
Herbs (fresh)	0.020	0.022	0.020	0.015	0.032	0.030	82%
Limes	0.029	0.021	0.036	0.030	0.058	0.083	0%
Onions	11	14	11	8.3	19	13	69%
Sweet corn	1.3	1.5	1.3	1.0	2.2	2.0	28%
Cornflour	0.002	0.0	0.006	0.0	0.0	0.0	0%
Mandarins and clementines	5.6	4.1	6.9	5.8	11	16	0%
Jam and similars	2.4	2.1	2.6	2.4	5.1	5.4	79%
Melons	7.2	4.2	9.2	8.4	21	31	1%
Minneolas	0.050	0.044	0.055	0.050	0.11	0.12	0%
Nuts and similar	0.42	0.37	0.46	0.42	0.91	0.97	0%
Pasta product	14	16	12	16	22	11	0%
Parsnips	0.043	0.043	0.063	0.0	0.0	0.093	97%
Sweet peppers	7.4	7.4	8.4	5.4	11	14	8%
Parsley	0.043	0.035	0.059	0.025	0.085	0.11	59%
Pomelos	0.050	0.044	0.055	0.050	0.11	0.12	0%
Leeks	2.1	2.3	2.5	1.1	3.8	3.5	56%
Chives	0.055	0.050	0.069	0.033	0.083	0.11	70%
Pears	15	12	18	13	42	45	32%
Rhubarbs	0.15	0.15	0.19	0.081	0.34	0.27	95%
Radish	0.49	0.55	0.48	0.38	0.80	0.74	47%
Currants	0.031	0.027	0.034	0.031	0.068	0.072	54%
Rice, white	6.1	7.6	5.4	4.9	13	5.8	0%
Brussels sprouts	0.67	0.74	0.79	0.28	1.8	1.2	85%
Raisins	1.5	1.1	1.8	1.7	2.7	3.8	0%
Rye bread	34	42	30	27	49	35	92%
Beetroot	0.51	0.74	0.47	0.16	1.7	0.86	96%
Wine, red	63	91	67	0.005	81	73	0%
Lettuce	8.8	9.1	10	5.7	15	15	51%
Spinach	0.97	1.1	1.00	0.75	2.4	1.4	33%
Tea leaves	0.58	0.54	0.83	0.11	0.98	1.1	0%
Tomatoes	29	29	32	20	49	53	45%
Canned tomatoes	9.9	11	9.0	9.5	11	8.5	0%
Watermelons	2.0	1.2	2.6	2.4	6.1	8.8	0%
Table grapes	5.2	3.5	7.6	3.6	13	23	0%
Apples	56	54	62	45	178	153	39%
Apple juice	26	24	26	32	29	33	50%
Peas with pods	0.073	0.082	0.082	0.036	0.18	0.15	58%
Peas without pods	6.4	7.2	7.3	3.2	16	13	43%
Beer	154	325	76	3.5	280	70	72%
Fruits (total)	234	208	255	238	491	517	
Vegetables (total)	264	293	266	203	458	441	
Cereals (total)	166	189	151	158	234	156	
Other	217	416	143	3.5	362	143	
Total	882	1 106	814	603	1 545	1 256	

1) Consumers with a consumption higher that 550 g of fruits and vegetables selected from total survey

8.6 ADIs for pesticides included in the risk assessment as well as pesticides with no ADIs

The information concerning ADIs are mainly from the document "Status of active substances under EU review" from the DG Sancos homepage (http://europa.eu.int/comm/food/plant/protection/evaluation/index_en.htm)

Pesticide	ADI mg/kg bw/d	Source
Acephate	0.01	JMPR 2002
Aldrin	0.0001	JMPR 2004
Azinphos-ethyl	0.002	Australia (AUS) 1991
Azinphos-methyl	0.005	JMPR 1991
Azoxystrobin	0.1	EU 1998
Benomyl group	0.03	JMPR 1995 (carbendazim)
Bifenthrin	0.02	JMPR 1992
Binapacryl	0.0025	JMPR 1969, withdrawn in 1982 but used anyway
Biphenyl	0.125	JMPR 1967
Bitertanol	0.01	JMPR 1998
Bromopropylate	0.03	JMPR 1993
Bupirimate	0.05	AUS 1978
Buprofezin	0.01	JMPR 1999
Captan+folpet	0.1	JMPR 1995
Carbaryl	0.008	JMPR 2001
Carbofuran	0.002	JMPR 1996
Chinomethionat	0.006	JMPR 1997
Chlorfenvinphos	0.0005	JMPR 1994
Chlormequat	0.05	JMPR 1999
Chlorobenzilate	0.02	JMPR 1980
Chlorothalonil	0.03	JMPR 1994
Chlorpropham	0.03	JMPR 2000
Chlorpyrifos	0.01	JMPR 1999
Chlorpyrifos-methyl	0.01	JMPR 2001
Cyfluthrin	0.02	JECFA 1997
Cyhalothrin, lambda-	0.005	EU 2000
Cypermethrin	0.05	JECFA 1996
Cyprodinil	0.03	DFVF 1998
DDT	0.01	JMPR 2000
Deltamethrin	0.01	EU 2003
Demeton-S-methyl	0.0003	JMPR 1989
Diazinon	0.002	JMPR 2001
Dichlofluanid	0.3	JMPR 1983
Dichlorvos	0.004	JMPR 1993
Dicloran	0.01	JMPR 1998
Dicofol	0.002	JMPR 1992
Dieldrin	0.0001	JMPR 1994
Difenoconazole	0.01	AUS 1990
Dimethoate+omethoate	0.002	DFVF 2003
Dioxathion	0.0015	JMPR 1968
Diphenylamine	0.08	JMPR 1998

Pesticide	ADI mg/kg bw/d	Source
Endosulfan	0.006	JMPR 1998
Esfenvalerate	0.02	EU 2000
Ethion	0.002	JMPR 1990
Etrimfos	0.003	JMPR 1986
Fenarimol	0.01	JMPR 1995
Fenitrothion	0.005	JMPR 2000
Fenpropathrin	0.03	JMPR 1993
Fenpropimorph	0.003	JMPR 2001
Fenthion	0.007	JMPR 1997
Fenvalerate	0.02	JMPR 1986
Flucythrinate	0.02	JMPR 1985
Fludioxonil	0.33	DFVF 2004
Furathiocarb	0.035	EU 1999
Glyphosate	0.3	EU 1999
Imazalil	0.03	JMPR 2001
Iprodione	0.06	EU 2003
Isofenphos	0.001	JMPR 1986
Kresoxim-methyl	0.4	EU 1999
Lindane	0.005	JMPR 2002
Malathion	0.3	JMPR 1997
Maneb-group	0.0165	Avg. for the substances incl. in the residue definiton
Mecarbam	0.002	JMPR 1986
Mepiquat	0.15	AUS 1991
Metalaxyl and metalxyl M	0.08	JMPR 2002 and EU 2002
Methamidophos	0.004	JMPR 2002
Methidathion	0.001	JMPR 1997
Methoxychlor	0.1	JMPR 1977
Mevinphos	0.0008	JMPR 1997
Monocrotophos	0.0006	JMPR 1995
Myclobutanil	0.03	JMPR 1992
Parathion(-ethyl)	0.0006	EU 2001
Parathion-methyl	0.003	JMPR 1995
Penconazole	0.03	JMPR 1993
Permethrin	0.05	JMPR 1999
Phenthoate	0.003	JMPR 1984
Phenylphenol, 2-	0.4	JMPR 1999
Phorate	0.0005	JMPR 1996
Phosalone	0.02	JMPR 2001
Phosmet	0.01	JMPR 1998
Phoxim	0.004	JECFA 1999
Pirimicarb	0.02	JMPR 1982
Pirimiphos-methyl	0.03	JMPR 1992
Prochloraz	0.01	JMPR 2001
Procymidone	0.1	JMPR 1989
Profenofos	0.01	JMPR 1990
Propargite	0.01	JMPR 1991
Propiconazole	0.04	EU 2003
Prothiofos	0.0001	AUS 1993
Pyrazophos	0.004	JMPR 1992
Pyrethrines	0.04	JMPR 1999
Pyrimethanil	0.2	AUS 1995
Quintozene	0.01	JMPR 1995
Simazine	0.005	AUS 1990
Tebuconazole	0.03	JMPR 1994

Pesticide	ADI mg/kg bw/d	Source
Tecnazene	0.02	JMPR 1994
Thiabendazole	0.1	EU 2001
Tolclofos-methyl	0.07	JMPR 1994
Tolylfluanid	0.08	JMPR 2002
Triadimefon+triadimenol	0.03	JMPR 1985
Triazophos	0.001	JMPR 1993
Trichlorfon	0.02	JECFA 2000
Trifloxystrobin	0.1	EU 2003
Vinclozolin	0.01	JMPR 1995

The following pesticides have no official ADIs (neither in EU, JMPR or Australia) and have therefore not been included in the calculations of the intake or the HQs:

Benfuracarb
Captafol
Chloropropylate
Fenson
Fluvalinate, tau-
Hexachlorobenzene
Nuarimol
Pentachloroanisole
Pentachlorobenzene
Pentachlorophenol
Quinalphos
Tetrasul

8.7 Reduction factors

From the literature reductions factors have been found for the pesticides found in citrus fruits, melons and bananas. Reduction factors in citrus fruits from Rapport 7/98 Statens Livsmedelverk, Sweden are shown in **Table 15**.

Table 15. *Reduction factors in citrus fruits found in Sweden*

Commodity/pesticide	Content in peel/RAC (%)
Orange	
Azinfosmethyl	≥90
Bromopropylat	≥90
Dicofol	97
Dimethoate	≥90
Fenithrothion	≥95
Phosmet	≥90
Chlorfenvinphos	≥90
Chlorpyrifos	≥90
Quinalphos	≥90
Mecarbam	≥95
Methidathion	≥95
Parathion	≥95
Parathion-methyl	≥95
Tetradifon	≥90
Lemon	
Mecarbam	≥95
Grapefruit	
Ethion	≥97
Small citrus fruits	
Ethion	≥95
Chlorfenvinphos	≥90
Malathion	≥97
Methidathion	≥95

Livsmedelverket has found that for thiabendazol about 15-25% of the pesticide is in the pulp from oranges.

In **Table 16** the reduction factors found in the JMPR reports are shown.

Table 16*. Reduction factors found in JMPR reports*

Pesticide	Commodity	Reduction	Source
Thiabendazole	Oranges	<3 % in pulp; >97 % in peel	JMPR 2000
Imazalil	Melon	About 10 % in pulp; about 90 % in peel	JMPR 1994
Phenyl-phenol	Oranges	2-4 % in pulp; 96-98 % in peel	JMPR 1999
Benomyl	Oranges	From oranges to orange juice the reduction is 17-98%	JMPR 1998
Procymidon	Kiwi	In pulp about 1 %; in peel about 99 %	JMPR 1998

Conclusion
Far the most results for reduction factors are for citrus fruits. As bananas and melons also have a thick peel it is estimated that the results for citrus fruits can be transferred to these two commodities. Therefore overall a reduction factor of 90% is used for, both citrus fruits, melons and bananas except for thiabendazols and the benomyl group. For these substances a reduction of 75 % is used, as it is the lowest reduction found and the worst-case situation.

8.8 Intake and HQs for the whole population (All) based on commodity

	Intake (µg/day)		Sum of Hazard Quotients	
	No correction for processing factors	Correction for processing factors	No correction for processing factors	Correction for processing factors
Grapefruits	0.90	0.11	0.15%	0.02%
Lemons	5.9	0.62	1.50%	0.15%
Limes	0.024	0.0036	<0.01%	<0.01%
Mandarins and clementines	21	2.6	3.32%	0.34%
Minneolas	0.081	0.0086	0.02%	<0.01%
Oranges	34	4.0	5.21%	0.53%
Pomelos	0.22	0.026	0.01%	<0.01%
Nuts and similar	0.0014	0.0014	<0.01%	<0.01%
Apples	35	35	7.91%	7.91%
Pears	9.6	9.6	1.17%	1.17%
Apricots	0.074	0.074	0.03%	0.03%
Cherries	0.073	0.073	0.01%	0.01%
Peaches and nectarines	2.6	2.6	0.53%	0.53%
Plums	0.34	0.34	0.02%	0.02%
Currants	0.021	0.021	<0.01%	<0.01%
Other small fruits and berries	0.074	0.074	0.01%	0.01%
Raspberries	0.053	0.053	<0.01%	<0.01%
Strawberries	1.0	1.0	0.07%	0.07%
Table grapes	3.7	3.7	1.30%	1.30%
Avocados	0.042	0.042	0.01%	0.01%
Bananas	7.6	1.0	0.42%	0.05%
Exotic fruits	0.40	0.40	0.11%	0.11%
Kiwi	2.4	2.4	0.38%	0.38%
Pineapples	0.080	0.080	0.02%	0.02%
Beetroot	0.033	0.033	0.03%	0.03%
Carrots	3.1	3.1	3.79%	3.79%
Celeriac	0.032	0.032	<0.01%	<0.01%
Exotic vegetables	0.094	0.094	0.03%	0.03%
Mixed vegetables	0.088	0.088	0.01%	0.01%
Parsnips	0.0002	0.0002	<0.01%	<0.01%
Radish	0.030	0.030	<0.01%	<0.01%
Garlics	0.0008	0.0008	<0.01%	<0.01%
Onions	0.18	0.18	0.01%	0.01%
Spring onions	0.021	0.021	<0.01%	<0.01%
Aubergines	0.076	0.076	0.06%	0.06%
Courgettes	0.087	0.087	0.05%	0.05%
Cucumbers	3.6	3.6	0.28%	0.28%
Melons	2.7	0.36	1.40%	0.14%
Sweet corn	0.012	0.012	<0.01%	<0.01%
Sweet peppers	3.0	3.0	0.23%	0.23%
Tomatoes	8.2	8.2	1.30%	1.30%
Watermelons	0.19	0.19	0.02%	0.02%
Broccoli	0.16	0.16	0.04%	0.04%
Brussels sprouts	0.012	0.012	<0.01%	<0.01%

	Intake (µg/day)		Sum of Hazard Quotients	
	No correction for processing factors	Correction for processing factors	No correction for processing factors	Correction for processing factors
Cauliflowers	0.061	0.061	0.02%	0.02%
Chinese cabbage	0.028	0.028	0.01%	0.01%
Head cabbages	0.16	0.16	<0.01%	<0.01%
Kale	0.048	0.048	<0.01%	<0.01%
Chives	0.0005	0.0005	<0.01%	<0.01%
Dill	0.0030	0.0030	<0.01%	<0.01%
Herbs (fresh)	0.029	0.029	<0.01%	<0.01%
Lettuce	2.6	2.6	0.43%	0.43%
Parsley	0.0088	0.0088	<0.01%	<0.01%
Spinach	0.54	0.54	0.05%	0.05%
Beans with pods	0.30	0.30	0.04%	0.04%
Peas with pods	0.0068	0.0068	<0.01%	<0.01%
Peas without pods	0.13	0.13	0.02%	0.02%
Asparagus	0.0013	0.0013	<0.01%	<0.01%
Celery	0.095	0.095	0.01%	0.01%
Fennel	0.0025	0.0025	<0.01%	<0.01%
Globe artichokes	0.0025	0.0025	<0.01%	<0.01%
Leeks	0.17	0.17	0.02%	0.02%
Rhubarbs	0.0042	0.0042	<0.01%	<0.01%
Mushrooms	0.27	0.27	0.03%	0.03%
Oil seeds	0.028	0.028	0.06%	0.06%
Potatoes	5.9	5.9	2.40%	2.40%
Tea leaves	0.075	0.075	0.03%	0.03%
Canned pineapples	0.024	0.024	<0.01%	<0.01%
Canned tomatoes	0.15	0.15	<0.01%	<0.01%
Jam and similars	0.055	0.055	0.02%	0.02%
Apple juice	0.030	0.030	<0.01%	<0.01%
Orange juice	1.4	1.4	0.07%	0.07%
Dates	0.0038	0.0038	<0.01%	<0.01%
Figs	0.017	0.017	<0.01%	<0.01%
Raisins	0.16	0.16	0.02%	0.02%
Fruit and vegetables	159	95	32.69%	21.89%
Cornflour	0.0004	0.0004	<0.01%	<0.01%
Rice, white	0.21	0.21	0.01%	0.01%
Rolled oats	3.0	3.0	0.07%	0.07%
Wheat bran	0.27	0.27	0.01%	0.01%
Pasta product	0.24	0.24	0.02%	0.02%
Rye bread	5.2	5.2	0.20%	0.20%
Wheat bread	16	16	0.34%	0.34%
Cereals	25	25	0.65%	0.65%
Wine, red	4.6	4.6	1.20%	1.20%
Beer	0.58	0.58	0.01%	0.01%
Wine and beer	5.2	5.2	1.21%	1.21%
Domestic	34	34	6.13%	6.13%
Foreign	156	92	28.42%	17.62%
Total	189	126	34.55%	23.75%

8.9 Intake and HQ for the total population (All) based on pesticide

	Intake (µg/day)		Hazard Quotients	
	No correction for processing factors	Correction for processing factors	No correction for processing factors	Correction for processing factors
Acephate	0.052	0.052	0.01%	0.01%
Aldrin	0.0005	0.0005	0.01%	0.01%
Azinphos-ethyl	0.0084	0.0084	0.01%	0.01%
Azinphos-methyl	0.72	0.64	0.22%	0.19%
Azoxystrobin	0.12	0.12	<0.01%	<0.01%
Benfuracarb	0.0004	0.0004		
Benomyl group	8.2	7.3	0.41%	0.37%
Bifenthrin	0.92	0.90	0.07%	0.07%
Binapacryl	0.13	0.13	0.10%	0.10%
Biphenyl	7.5	0.75	0.09%	0.01%
Bitertanol	0.84	0.84	0.13%	0.13%
Bromopropylate	2.4	2.0	0.12%	0.10%
Bupirimate	0.20	0.20	0.01%	0.01%
Buprofezin	0.35	0.25	0.05%	0.04%
Captafol	0.0093	0.0009		
Captan+folpet	1.3	1.2	0.02%	0.02%
Carbaryl	1.4	1.2	0.26%	0.23%
Carbofuran	0.10	0.053	0.08%	0.04%
Chinomethionat	0.0002	0.0002	<0.01%	<0.01%
Chlorfenvinphos	0.42	0.39	1.27%	1.16%
Chlormequat	16	16	0.48%	0.48%
Chlorobenzilate	0.0006	0.0006	<0.01%	<0.01%
Chloropropylate	0.095	0.0095		
Chlorothalonil	0.60	0.52	0.03%	0.03%
Chlorpropham	1.9	1.9	0.10%	0.10%
Chlorpyrifos	2.0	1.1	0.30%	0.17%
Chlorpyrifos-methyl	0.40	0.31	0.06%	0.05%
Cyfluthrin	0.13	0.13	0.01%	0.01%
Cyhalothrin, lambda-	0.073	0.068	0.02%	0.02%
Cypermethrin	0.55	0.52	0.02%	0.02%
Cyprodinil	0.75	0.75	0.04%	0.04%
DDT	0.27	0.25	0.04%	0.04%
Deltamethrin	0.33	0.33	0.05%	0.05%
Demeton-S-methyl	0.87	0.70	4.35%	3.49%
Diazinon	0.47	0.25	0.36%	0.19%
Dichlofluanid	1.1	1.1	0.01%	0.01%
Dichlorvos	0.26	0.26	0.10%	0.10%
Dicloran	0.22	0.18	0.03%	0.03%
Dicofol	5.0	3.6	3.74%	2.72%
Dieldrin	0.29	0.27	4.40%	4.07%
Difenoconazole	0.51	0.51	0.08%	0.08%
Dimethoate+omethoate	0.74	0.65	0.56%	0.49%
Dioxathion	0.056	0.0056	0.06%	0.01%
Diphenylamine	4.6	4.6	0.09%	0.09%

	Intake (µg/day)		Hazard Quotients	
	No correction for processing factors	Correction for processing factors	No correction for processing factors	Correction for processing factors
Endosulfan	1.2	0.79	0.31%	0.20%
Esfenvalerate	0.10	0.091	0.01%	0.01%
Ethion	0.26	0.057	0.20%	0.04%
Etrimfos	0.39	0.39	0.20%	0.20%
Fenarimol	0.032	0.030	<0.01%	<0.01%
Fenitrothion	0.84	0.68	0.25%	0.20%
Fenpropathrin	0.50	0.34	0.02%	0.02%
Fenpropimorph	0.085	0.085	0.04%	0.04%
Fenson	0.093	0.078		
Fenthion	0.24	0.11	0.05%	0.02%
Fenvalerate	0.22	0.20	0.02%	0.02%
Flucythrinate	0.017	0.017	<0.01%	<0.01%
Fludioxonil	1.1	0.93	<0.01%	<0.01%
Fluvalinate, tau-	0.13	0.13		
Furathiocarb	0.0058	0.0010	<0.01%	<0.01%
Glyphosate	8.5	8.5	0.04%	0.04%
HCH	0.028	0.028	0.07%	0.07%
Heptachlor	0.033	0.032	0.49%	0.49%
Hexachlorobenzene	0.12	0.12		
Imazalil	36	9.0	1.81%	0.45%
Iprodione	3.0	3.0	0.08%	0.07%
Isofenphos	0.019	0.019	0.03%	0.03%
Kresoxim-methyl	0.014	0.013	<0.01%	<0.01%
Lindane	0.19	0.17	0.06%	0.05%
Malathion	2.9	2.0	0.01%	0.01%
Maneb-group	14	13	1.28%	1.20%
Mecarbam	0.22	0.022	0.17%	0.02%
Mepiquat	0.68	0.68	0.01%	0.01%
Metalaxyl	0.86	0.61	0.02%	0.01%
Methamidophos	0.16	0.13	0.06%	0.05%
Methidathion	1.8	0.20	2.72%	0.30%
Methoxychlor	0.29	0.25	<0.01%	<0.01%
Mevinphos	0.39	0.39	0.73%	0.73%
Monocrotophos	0.015	0.015	0.04%	0.04%
Myclobutanil	0.10	0.085	0.01%	<0.01%
Nuarimol	0.17	0.17		
Parathion	0.31	0.22	0.77%	0.56%
Parathion-methyl	0.95	0.19	0.48%	0.10%
Penconazole	0.061	0.061	<0.01%	<0.01%
Pentachloroanisole	0.12	0.12		
Pentachlorobenzene	0.10	0.10		
Pentachlorophenol	0.21	0.21		
Permethrin	1.1	1.1	0.03%	0.03%
Phenthoate	0.077	0.017	0.04%	0.01%
Phenylphenol, 2-	12	1.5	0.04%	0.01%
Phorate	0.0011	0.0001	<0.01%	<0.01%
Phosalone	2.0	2.0	0.15%	0.15%

	Intake (µg/day)		Hazard Quotients	
	No correction for processing factors	Correction for processing factors	No correction for processing factors	Correction for processing factors
Phosmet	1.5	1.4	0.22%	0.20%
Phoxim	0.016	0.016	0.01%	0.01%
Pirimicarb	0.35	0.35	0.03%	0.03%
Pirimiphos-methyl	1.3	1.2	0.07%	0.06%
Prochloraz	0.25	0.15	0.04%	0.02%
Procymidone	2.1	2.0	0.03%	0.03%
Profenofos	0.079	0.037	0.01%	0.01%
Propargite	9.0	9.0	1.36%	1.36%
Propiconazole	0.044	0.0044	<0.01%	<0.01%
Prothiofos	0.25	0.082	3.70%	1.23%
Pyrazophos	0.036	0.012	0.01%	<0.01%
Pyrethrines	0.0053	0.0053	<0.01%	<0.01%
Pyrimethanil	0.61	0.53	0.01%	<0.01%
Quinalphos	0.12	0.063		
Quintozene	0.30	0.30	0.05%	0.04%
Simazine	0.0030	0.0007	<0.01%	<0.01%
Tebuconazole	0.43	0.42	0.02%	0.02%
Tecnazene	0.12	0.12	0.01%	0.01%
Tetradifon	1.2	0.53	0.09%	0.04%
Tetrasul	0.0043	0.0043		
Thiabendazole	12	5.2	0.18%	0.08%
Tolclofos-methyl	0.16	0.16	<0.01%	<0.01%
Tolylfluanid	1.9	1.9	0.04%	0.04%
Triadimefon+triadimenol	0.32	0.30	0.02%	0.01%
Triazophos	0.053	0.040	0.08%	0.06%
Trichlorfon	0.051	0.050	<0.01%	<0.01%
Trifloxystrobin	0.079	0.077	<0.01%	<0.01%
Vinclozolin	3.8	3.8	0.57%	0.57%
Total	189	126	34.55%	23.75%