



Federal Office of
Consumer Protection
and Food Safety



“Pesticide residues in food”

National reporting 2020 Federal Republic of Germany –
condensed version



Summary

The report presents the results of the analysis of food for pesticide residues. In accordance with Regulation (EC) No 396/2005, the compliance with current legislation was checked and analyses to assess consumer exposure were carried out.

In 20 official laboratories of 16 federal states, 18,921 food samples were analysed for the presence of pesticide residues. 6,602 of these samples were taken at random in the framework of the monitoring programme, in order to be able to make representative statements about consumer exposure. However, with regard to the selection of the other 12,319 samples, foodstuffs known for presenting higher risks were preferred. For this reason, the results do not allow to draw conclusions on the contamination level of the entirety of all foodstuffs available on the market.

For reporting to the European Food Safety Authority (EFSA) and the European Commission, the samples are divided in "surveillance" and "follow-up enforcement" samples. The routine and monitoring samples are denominated as "surveillance" samples, while suspect samples, complaint samples and persecution samples are summarised as "follow-up enforcement" samples.

In the reporting year, a total of 18,503 samples fall under the category "surveillance" and 418 samples under the category "follow-up enforcement".

In 2020, 1,757 samples were analysed in the framework of the coordinated multi-annual Community control programme. These samples were part of the 18,921 samples analysed in total.

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1 Information about maximum residue levels

“Maximum Residue Level” (MRL) means the upper legal level of a concentration for a pesticide residue in or on food. For setting MRLs, data on the toxicology of the substance and on the intake quantity of the respective foodstuff as well as data from field studies carried out in accordance with good agricultural practice are taken into consideration.

The report distinguishes between the exceedance of a MRL and the objection (non-compliance) of samples. Not all samples with MRL exceedances are objected (non-compliant) by the respective responsible authority, as for an objection (non-compliance) further arguments like the analytical measurement uncertainty have to be taken into account.

When it is established that a consumer risk through pesticide residues in a foodstuff cannot be excluded, the European Rapid Alert System for Food and Feed (RASFF) is notified, so that all responsible authorities in the EU are informed accordingly.

In 2020, Germany issued 94 notifications due to pesticide residues; 61 of these were alerts.

2 Food-related view on the results

(only “surveillance” samples without substances which are proven to (mainly) not stem from pesticide use: chlorate and the quaternary ammonium compounds (QAC) didecyl-dimethylammonium chloride (DDAC) and benzalkonium chloride (BAC))

In total 236 different foodstuffs were analysed. As every year, the majority were fruit and vegetables.

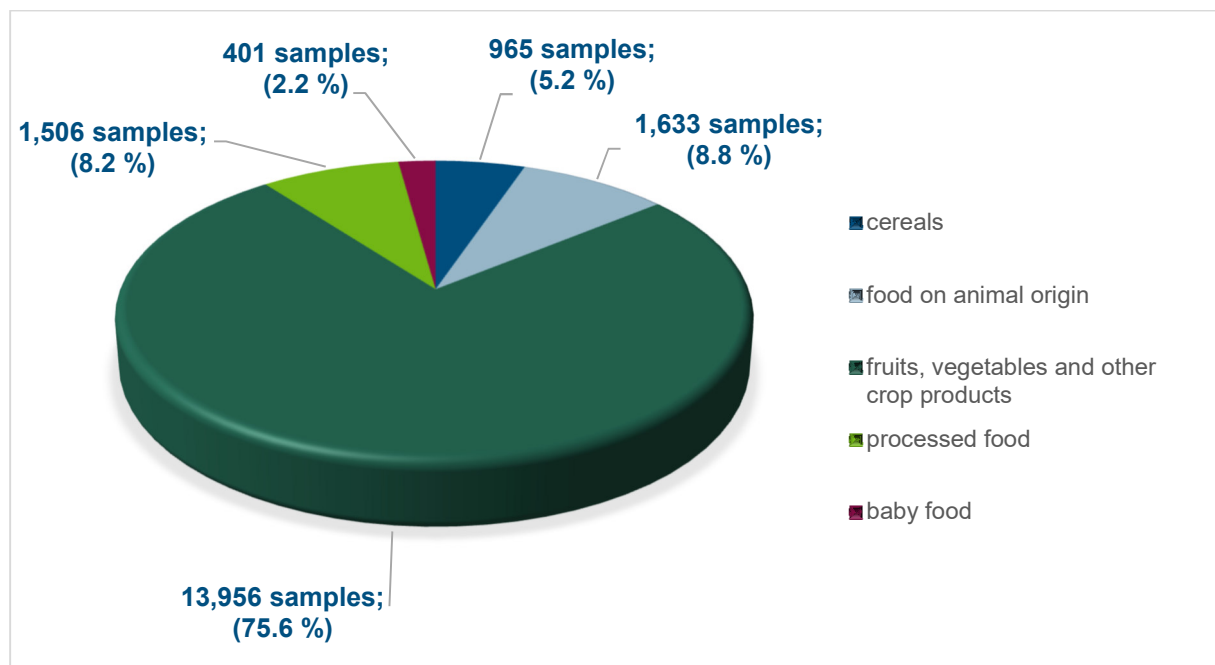


Figure 1: Distribution of sample numbers between food groups in 2020

Potatoes (671 samples), apples (554 samples), strawberries (537 samples), lettuces (482 samples), carrots (459 samples), tea (black and green; 434 samples) and bovine milk and milk products (410 samples) were analysed the most frequently.

Table 1: Residues in food groups in 2020

Food group	Number of samples				
	total	with residues < LOQ (limit of quantification)	with residues < MRL	> MRL not objected	> MRL objected
Cereals	965	297 (30.8 %)	668 (69.2 %)	19 (2.0 %)	5 (0.5 %)
Food of animal origin	1,633	1,089 (66.7 %)	544 (33.3 %)	27 (1.7 %)	3 (0.2 %)
Fruit, vegetables and other products of plant origin	13,956	4,778 (34.2 %)	9,178 (65.8 %)	460 (3.3 %)	257 (1.8 %)
Processed food	1,506	406 (27.0 %)	1,100 (73.0 %)	46 (3.1 %)	23 (1.5 %)
Food for infants and young children	401	272 (67.8 %)	129 (32.2 %)	18 (4.5 %)	5 (1.2 %)
Total	18,461	6,842 (37.1 %)	11,691 (62.9 %)	570 (3.1 %)	293 (1.6 %)

In the category food for infants and young children, 4.5 % of the samples contained residues above the MRL. Five of 18 samples were objected. These five samples (four of them were processed fruit and one processed vegetables for infants and young children) were objected due to the residue definition for the fungicide fosetyl (sum).

Residue definition of fosetyl includes the lead compound fosetyl as well as the metabolite phosphonic acid and their salts. It should be noted that phosphonic acid can be present as a degradation product of the fungicide fosetyl but can also originate from other sources such as authorised fertiliser. In general, predominantly phosphonic acid was detected in all food groups. Fosetyl was actually only detected in approx. 2,5 % of the samples.

For fruit and vegetable, the range of pesticide contaminations was particularly large, spanning from foodstuffs in which no residues were quantified, to products with objection rates of 40.0 % (cumin). However, the foodstuffs with objection rates of 6.0 % and more were fresh herbs, pomegranates, frozen blackberries and beans with pods.

Fortunately, many foodstuffs with particularly high intake like apples, bananas, carrots or potatoes only had few MRL exceedances and objections.

Table 2 summarises the fruit and vegetable products without any objections or less than 1.0 % objections in at least 100 analysed samples.

Table 2: Fruit and vegetables with objections less than 1.0 % in 2020 (≥ 100 samples)

Food	Number of analysed samples	Objections (%)
Apples	542	0
Bananas	117	0
Peas (dried)	115	0
Strawberries	529	0
Hazelnuts	158	0
Cultivated fungi	259	0
Limes	120	0
Radishes	142	0
Brussels sprouts	106	0
Asparagus	256	0
Onions	274	0
Lettuce	480	0.2
Carrots	456	0.2
Potatoes	671	0.3
Kohlrabies	299	0.3
Table grapes	256	0.4
Tomatoes	378	0.5
Lemons	191	0.5
Peaches	270	0.7
Cucumbers	385	0.8
Pears	328	0.9
Cauliflowers	226	0.9
Head cabbages	106	0.9

The ten foodstuffs with the highest objection rates are presented in Table 3 (at least 100 samples).

Table 3: Fruit and vegetables with the highest number of objections in 2020 (≥ 100 samples)

Food	Number of analysed samples	Objections (%)
Fresh herbs	120	12.5
Pomegranates	118	11.0
Blackberries (frozen)	101	8.9
Beans (with pods)	199	6.0
Beans (dried)	118	4.2
Sweet peppers, chilis	295	4.1
Grapefruits, pomelos, sweeties	150	3.3
Tea (black and green)	328	2.7
Lamb's lettuce	198	2.0
Oranges	297	2.0

Also in 2020, organic products were controlled for residues. The contamination of these samples was much lower than that of conventionally produced samples. Only 33.8 % of the products stemming from organic farming contained residues, which could be quantified analytically – compared to 67.4 % of other products.

3 View with regard to origin

(“surveillance” samples and “follow-up enforcement” samples without chlorate and QAC)

18,868 samples (surveillance sampling“- and „follow-up enforcement sampling) were controlled, 45.7 % thereof from Germany, 23.9 % from other EU-Member States and 16.9 % from Third Countries. 13.5 % of the samples were of unknown origin.

Nearly two thirds of the samples were purchased from retail food traders and about less than one fifths from wholesalers. The rest was bought from growers, manufacturers and packers as well as from service providers, e.g. restaurants or delivery services.

Big differences can be observed in the contamination level of foods with pesticide residues depending on their origin. In 2020 maximum residue levels were exceeded in 2.0 % of the analysed products (only “surveillance sampling“) from Germany (2019: 1.0 %) and in 1.3 % of the analysed products from other EU-Member States (2019: 1.3 %). With regard to products from Third Countries, this was the case in 7.8 % of the samples (2019: 6.5 %). Nevertheless, the percentage of samples without any quantifiable pesticide residues is still the highest in German foodstuffs.

4 Substance-related view on the results

(“surveillance sampling“ and “follow-up enforcement sampling“)

The range of pesticide substances tested for in 2020 comprised 1,036 different substances (including the legal residue definitions of sums, their metabolites and isomers). In the years before 2017, the number of active substances according to their legal residue definition was counted without metabolites and isomers. Since 2017 in addition to definitions of sums, their metabolites and isomers are included. This change became necessary due to an increasing number of complex residue definitions and varying residue definitions depending on the foodstuff. Only in this way was it possible to disclose all data without losses.

Obviously, no sample was analysed for all substances. On average, each food sample was analysed for 374 different substances.

602 of the 1,036 substances were not found in quantifiable quantities in any sample. On the other hand, for 201 substances residues above the valid maximum residue levels were detected.

The most noticeable substances among the 649 stated MRL exceedances were ethylene oxide, dithiocarbamates, nicotine and lambda-cyhalothrin.

The use of **ethylene oxide** as a pesticide has been banned in Germany since 1981 and in the EU since 1991. In 2020, high levels of ethylene oxide residues in sesame seeds originating from India were the subject of various warnings in the RASFF rapid alert system. It is presumed that sesame seeds are treated inadmissibly with the gas ethylene oxide for the protection against salmonella and

other microbiological contamination. Since the entry into force of the Implementing Regulation (EU) 2020/1540 on 26th October 2020, increased import controls by the competent monitoring authorities are required for Indian sesame seeds for ethylene oxide.

The determination of **dithiocarbamates** (Maneb, Mancozeb, Metiram, Propineb, Thiram, Ziram) occurs nonspecific as carbon disulfide (CS₂). Therefore, it cannot be concluded analytically which dithiocarbamates were used. Only contents of Propineb and Thiram can be determined separately from that of CS₂. Besides even natural sources of CS₂ as certain plants with natural sulfur or carbon disulfide compounds (for example Brassicaceae such as cabbage and rapeseed or allium species) influence analysis. This can lead to false positive results.

Since 2010 **nicotine** is banned for pesticide use in the EU due to its high toxicity. Natural causes of some plant species (nightshade family), contamination of nearby tobacco fields or tobacco processing plants and the contact of nicotine-contaminated hands of smokers are discussed as causes for the occasionally striking nicotine contents in fruit and vegetable products.

Lambda-Cyhalothrin is an insecticide that is used in agriculture, forestry and vegetable cultivation. With regulation (EU) 2018/960 the previous residue definition "Lambda-Cyhalothrin" was changed into the residue definition "Lambda-Cyhalothrin (including gamma-Cyhalothrin) (sum of the R, S- and S, R-isomers)" and among others the maximum residue levels for grape leaves, kale and tea were reduced to the standard value of 0.01* mg/kg due to a lack of information (effective since 26th January 2019). In accordance with Regulation (EC) No. 396/2005 maximum residue levels set for kale also have to be used for the assessment of kohlrabi leaves.

5 Findings of multiple residues

(“surveillance sampling“ and “follow-up enforcement sampling”)

In 34.5 % of all samples, more than one substance was detected in quantifiable quantities. The percentage distribution of the number of quantified residues is presented in the following figure:

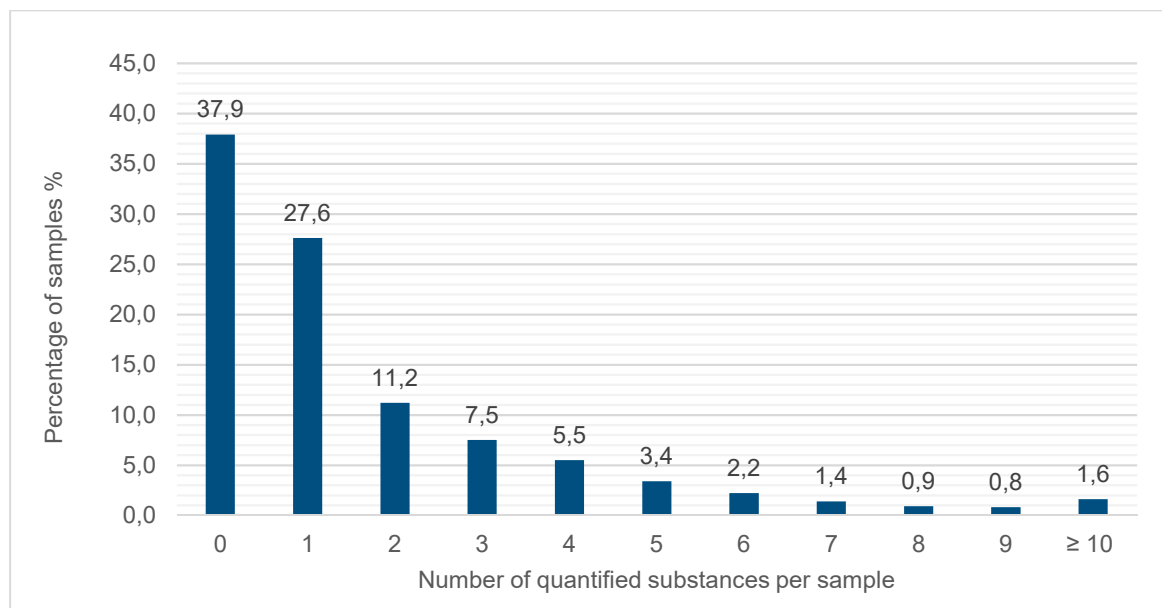


Figure 1: Percentage of samples without any residues or with residues of 0 to ≥ 10 substances.

Multiple residues above 75.0 % were found particularly in cherries, table grapes, currants, strawberries, peaches, mandarins and frozen blackberries.

6 Substances which are proven to (mainly) not stem from pesticide use

Some substances are legally regulated as pesticides, but their residues mainly originate from other sources than pesticide treatments. In order not to distort the overall picture of pesticide contamination, the quaternary ammonium compounds didecyltrimethylammonium chloride (DDAC) and benzalkonium chloride (BAC) as well as chlorate are treated separately in the report.

Residues of **chlorate** can enter the food during processing, e. g. through washing and disinfection steps.

With Regulation (EU) 2020/749 specific maximum residue levels were set for chlorate. It should be expressly pointed out that the specifically established maximum residue levels have only come into force since 28th June 2020. However the present analysis was based on the new maximum residue levels for the entire year 2020 and therefore does not take into account the legal situation applicable before this date.

In 2020, chlorate was quantified in 10.2 % of the 4,732 samples tested for it. In 0.3 % of the samples, residues were exceeding the MRL. Chlorate was objected in 0.1 % of the samples.

4,182 samples of 'Fruit, vegetables and other products of plant origin' were examined, seven of them lay over the maximum residue levels and two (0.05 %) were objected. In only one sample (1.4 %) of 'Food of animal origin' (69 samples in total) chlorate residues exceeded the maximum residue levels without being objected. In the case of 'Processed food' (162 samples in total) the objection rate was 0.6 %. 'Cereals' (222 samples in total) showed the highest objection rate (0.9 %). No sample of the category 'food for infants and young children' (97 samples in total) lay over the maximum residue levels.

In 9.0 % of a total of 703 samples of products from organic farming chlorate residues were detected. Only 0.3 % of samples of organic origin exceeded the maximum residue levels of chlorate and were objected.

Quaternary ammonium compounds are used for example to disinfect milking plants and tanks. For this reason, they are often detected in dairy products. In 2020, residues of DDAC and/or BAC above the maximum level were analysed in 5.7 % of foodstuffs of animal origin. Overall, the maximum levels for DDAC or BAC were exceeded in 0.2 % of the samples examined.

In products from organic farming, the residue situation with regard to DDAC and BAC is also better than in conventional products. Only in 0.5 % of samples of organic origin, residues of DDAC or BAC were detected, one sample (0.1 %) contained residues above the MRL.