Residue Findings of QuPPe-Compounds in Samples of Plant Origin from the German Market Collected in 2025

Reported by: EURL-SRM
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The aim of this compilation is to give an overview as to which highly polar (QuPPe-) compounds are currently encountered in food products of plant origin. This compilation should help other institutions in deciding which QuPPe compounds are worthwhile targeting in the various types of samples and on how to reasonably plan sampling when focusing QuPPe compounds. With the knowledge communicated here the EURL-SRM ultimately aims at contributing to a more targeted and efficient use of lab resources within the EU-OfLs.

At CVUA Stuttgart, 48 QuPPe-compounds were routinely monitored in 2025 (see Table 1). Some of these compounds are not legally relevant as they are not part of the legal residue definition, but are still of interest for potential exposure and risk-assessment evaluations.

Table 1: Scope of QuPPe-compounds that were routinely monitored by the CVUA Stuttgart in 2025

Compound	Notes on legal aspects	General notes
4-Methylimidazoline	Non regulated metabolite	Marker of propylene-bis-dithiocarbamates (propineb). Limited specificity at very low concentrations (<0.005 mg/kg).
Aminocyclopyrachlor	MRLs are set at the LOQ in all products	Non-EU-approved herbicide
Amitrole	MRLs are set at the LOQ in all products	Non-EU-approved herbicide, the most important of the very few triazole pesticides with herbicidal properties. Approval expired in mid-2016.
Bromide	MRLs refer to bromide ion. Background levels are generally considered in MRLs for food of plant origin, but rather not considered in MRLs for food of animal origin. Collection of data on background levels in the latter would be useful.	Reaction product of the fumigant methylbromide. Mostly originating from soil and irrigation water. Counter ion of certain quarternary ammonium cations such as benzalkonium, didecyldimethylammonium (DDA-), diquat and paraquat.
Chlorate	New MRLs set in 2020	Formerly used as herbicide, but nowadays mainly originating from chlorinated water, that is often used to irrigate fields or for washing harvested products or the equipment that is used for processing or storage of agricultural products.
Chloridazon-desphenyl	Regulated metabolite	Metabolite of chloridazon (approval expired on 31/12/2018). Chloridazon-desphenyl is quite persistent in the environment, thus residues in succeeding crops, and in water, have been reported.
Chlormequat	MRLs refer to chlormequat chloride	EU-approved growth regulator with a wide range of applications. It has also been reported as a processing contaminant formed during the thermal degradation of choline (and its natural derivates) in presence of chloride ions. Formation has been for example reported during thermal treatment of egg powder, wheat flour, barley and coffee.
Cyanuric acid	Non-regulated metabolite	Compound originating from multiple sources, e.g.: **Triazine pesticides** (incl. the herbicides terbuthylazine, atrazine, cyanazine, the fungicide; anilazine and the insecticide cyromazine). From the above only terbuthylazine is currently in use within the EU. Cyromazine has lost EU-approval in Dec. 2019. **Cyanamide-based fertilizers.** Cyanamide contained in fertilizers may convert to melamine through trimerization, which can further hydrolyze to cyanuric acid. **Urea-based fertilizers or feed:** especially at high temperatures urea loses ammonia converting to isocyanic acid (HNCO), which trimerises to cyanuric acid. **Mono-, Di- and Trichloroisocyanurates:** Used as disinfectants, algaecides and bactericides, e.g. in sanitation liquids, bleaching agents as well as in swimming pools (pool-tabs) to retard the loss of chlorine in chlorinated water. In water, they gradually convert to cyanuric acid. **Natural formation** of cyanuric acid has also been reported (e.g. in humus).
Cyromazine	Since Aug. 2023 all MRLs in food of plant origin and for food of animal origin incl. milking sheep set at LOQ. Only for sheep tissues specific MRLs.	Non-EU-approved fungicide (EU-approval expired in Dec. 2019). Also used as an ectoparasiticide (e.g. on sheep, but not on lactating sheep) and as a biocide on manure against fly larvae.
Daminozide	MRLs are set at the LOQ in all products	Approved growth regulator

Compound	Notes on legal aspects	General notes
Difenzoquat	No specific MRLs established (0.01 mg/kg applies)	Non-EU-approved herbicide
Difluoroacetic acid	Regulated metabolite of flupyradifurone with separate MRLs	
Dimethoate-O-desmethyl	Non-regulated metabolite	Also known as metabolite X of dimethoate. Also generated during processing (e.g. brewing, baking, boiling). Concluded to be of lower toxicity compared to dimethoate.
Diquat	Specific MRLs set for products where desiccation takes place prior to harvest (e.g. potatoes, pulses, oilseeds) and for some other products, (e.g. citrus, stone fruit, tree nuts, oats, strawberries, eggs)	Non-EU-approved herbicide, formerly used for desiccation in potatoes (EU-approval expired in Dec. 2019).
Diquat dipyridone	Non-regulated metabolite	Metabolite of diquat (non-EU-approved)
Diquat monopyridone	Non-regulated metabolite	Metabolite of diquat (non-EU-approved)
Diquat Met. TOPPS	Non-regulated metabolite	Metabolite of diquat (non-EU-approved)
Ethephon		Approved growth regulator with multiple applications. Very frequent findings in pineapples where it may be used during flowering and to promote ripening. The later application leads to higher levels. Also frequently encountered in grapes, figs and mushrooms.
HEPA	Non-regulated metabolite of Ethephon having issues with natural background levels	Metabolite of ethephon. Likelihood of a natural formation by bacteria in the intestines of cattle under anaerobic conditions was reported by the EURL-SRM in 2019. Detected by the EURL-SRM in all analyzed samples of bovine liver (levels around 0.5 mg/kg). These levels are considered natural artefacts. Manure from cows, sheep and horse (collected from organic farms) and analysed by the EURL-SRM contained in all cases HEPA (highest level in cow dung 1.3 mg/kg and in sheep dung 8.7 mg/kg). Application of HEPA in fields is therefore likely to lead to HEPA residues in certain organic products. This aspect has been meanwhile also investigated by FiBL, which came to the same conclusion[1].
ETU (ethylene thiourea)	Non-regulated metabolite/degradant of DTCs	Degradant of ethylen-bis-dithiocarbamates. Reported as impurity in formulations based on EBTCs. Also formed during food processing. Marker compound for the screening of DTC-residues of products with EBTC-application history. Where EU and ETU are detected simultaneously the likelihood of relevant CS_2 levels increases. Note: Most EBDTCs lost approval within the EU (Mancozeb expired on Jan 2021 with the period of grace ending in Jan 2022; Maneb expired in Jan 2017, Metiram expired end of 2024 (period of grace till Nov. 2024), Zineb and Nabam didn't receive EU-approval).
EU (2-Imidazolidinone)	Non-regulated metabolite/degradant of DTCs	Degradant of ethylen-bis-dithiocarbamates. Degradant of ETU (see above). Marker compound for the screening of DTC-residues of products with EBTC-application history. Where EU and ETU are detected simultaneously the likelihood of relevant CS_2 levels increases. See also ETU.
Fosetyl	Non-regulated pro-pesticide (parent of phosphonic acid)	Approved fungicide (degrades to phosphonic acid, which is the active component). As fosetyl residues form only a tiny fraction of the total residue the former complex residue definition (sum of fosetyl and phosphonic acid expressed as fosetyl) was dropped. The new RD focuses on phosphonic acid only. Formation of fosetyl from phosphonic acid during the storage of wine was reported by the EURL-SRM at the EPRW 2010 in Dublin.
Phosphonic acid	Formerly regulated with its parent fosetyl in a complex residue definition. Since 11.05.2026 regulated individually	Approved fungicide, used as such and also formed as a metabolite of fosetyl. Phosphonate-based water-softening agents (e.g. ATMP. HEDP, DTPMP), that are used in cleansing agents contain some residual phosphonic acid, which may lead to small contamination of food, e.g. when in contact with surfaces that were not sufficiently rinsed after washing. Formation of phosphonic acid and derivatives thereof, such as HEPA, through the reduction of phosphates within the anaerobic environment in intestines of ruminants and other animals is likely. In dung from organically farmed sheep analyzed by the EURL-SRM phosphonic acid was found at 0.25 mg/kg. To which extend phosphonates in dung can lead to relevant residue levels in organic products needs to be investigated.
Glufosinate	Specific MRLs apply for many crops	Non-EU-approved herbicide, also used in the cultivation of glufosinate-resistant transgenic crops. EU-approval expired mid-2018. Glufosinate-P approved in several countries for use on glufosinate-tolerant crops incl. soybean, maize, rape variety canola. These crops enzymatically transform glufosinate to its inactive N-acetyl-glufosinate metabolite.
MPP (MPPA)	Included in residue definition of glufosinate	Metabolite of glufosinate formed both in plants and the environment
N-Acetyl Glufosinate	Included in residue definition of glufosinate	Metabolite of glufosinate mainly formed in through enzymatically catalyzed acetylation in genetically modified glufosinate-tolerant crops.
Glyphosate	Specific MRLs apply for many crops	Approved herbicide, also used in the cultivation of glyphosate-resistant transgenic crops. Current approval periods end in Dec 2033.
AMPA	Non-regulated metabolite.	Metabolite of glyphosate. Planned inclusion in residue definition of glyphosate.
N-Acetyl-Glyphosate	Non-regulated metabolite.	Metab. of glyphosate mainly formed through enzyme catalyzed acetylation in gen. modif. glyphosate-resistant crops. Planned inclusion in residue definition of glyphosate.

[1] https://orgprints.org/id/eprint/54058/1/schleiffer-speiser-2024-Pilotstudie_HEPA-p1-20.pdf

Compound	Notes on legal aspects	General notes
N-Acetyl-Glyphosate	Non-regulated metabolite.	Metabolite of glyphosate mainly formed when N-Acetyl-Glyphosate further degrades.
Maleic hydrazide	Plant product MRLs set at 0.2* / 0.5* except for potatoes, carrots, parsnips, onions, garlic, shallots, chicory	Approved sprouting inhibitor, mainly relevant for potatoes and onions.
Matrine	MRL of 0.01 mg/kg applies (listed in EU-pesticide database)	Natural quinolizidine alkaloid, that is considered (together with oxymatrine) as the active ingredient of biopesticides based on extracts of certain plants of the *Sophora* family. Not approved within the EU as PPP, neither in conventional nor in organic production. Registered in various countries in Asia, Africa and South America. There were cases of illegal addition of *Sophora* root extracts in fertilizers in Italy. Together with oxymatrine, often found in so-called "acacia honey" from China, which mostly originated from flowers of *Sophora* plants. *Sophora* extracts are also used in traditional Asian medicine and cosmetics. Co-harvesting of licorice and *Sophora* roots results in a considerable contamination of licorice and licorice products with matrine (and oxymatrine).
Oxymatrine	MRL of 0.01 mg/kg applies (listed in EU-pesticide database)	Quinolizidine alkaloid present in *Sophora* extracts, remarks on matrine apply
Melamine	Regulated by Reg. 1881/2006/EC as a contaminant	Metabolite of cyromazine (pesticide and vet. drug). May also originate from cyanamide fertilizers (trimerization of cyanamide) and from urea fertilizers, where it is formed through trimerisation of urea to triuret and subsequent elimination of ammonia and carbon dioxide (Note: biuret and triuret are related non-cyclic products formed from the di-and trimerisation of urea respectively). Melamine hydrolyses to cyanuric acid via ammeline and ammelide. Melamine is widely used for the synthesis of melamine-formaldehyde resins that are employed in synthetic surfaces of furniture, textiles, and kitchenware as well as in moulding and packaging materials. Also used as a fire-retardant.
Mepiquat	MRLs refer to mepiquat chloride	Approved growth regulator. Similar to chlormequat, mepiquat has been reported to be formed as a natural processing contaminant through maillard-like reactions, e.g. during roasting of coffee and barley grain with the latter being used for the production of brewery malt, which is a main ingredient of beer.
Mepiquat, 4-Hydroxy	Non-regulated metabolite	Metabolite of mepiquat, mainly relevant for food of animal origin
Morpholine	Not regulated as a pesticide	Additive of waxes. Typically used together with oleic acid to assist emulsification of wax and facilitate wax handling. In the EU, the use of morpholine in fruit coating is not permitted, but it is widely used in other parts of the world.
Nereistoxin	Non-regulated metabolite	Transformation product of various members of the nereistoxin pesticides (e.g. bensultap, sultap, cartap, thiocyclam). There are rumors that it is also illegally used as such in agriculture.
Nicotine	Specific MRLs set for rose hips, herbs, edible flowers, wild fungi, teas, herbal infusions and spices.	Non-EU-approved insecticide. Nicotine originating from tobacco may contaminate food at all stages of food production, through air, soil and human contact. Crops experiencing intensive human contact during harvest or processing are particularly affected. MRLs for certain spices (e.g. cinnamon and vanilla) were raised in 2024. For such crops MRLs will be revised when information on origin of background levels becomes available.
Paraquat	MRL at LOQ 0.02 to 0.05 mg/kg	Non-EU-approved herbicide, EU-approval expired in Dec. 2007
Perchlorate	Regulated as a contaminant, see Reg. (EC) 1881/2006/EC	Persistent and ubiquitous environmental contaminant. Mainly originating from fertilizers, may be also formed as a byproduct of disinfection of drinking water. Temporarily inhibits the intake of iodine in the thyroid gland.
Propamocarb	Current approval end on 15/06/2025	Approved fungicide, mainly relevant for vegetables, e.g. root-, bulb-, fruiting-, and leafy vegetables
Propamocarb N-desmethyl	Non regulated metabolite	Metabolite of propamocarb
Propamocarb-N-oxide	Non regulated metabolite	Metabolite of propamocarb
PTU (propylene thiourea = 4-Methyl-2-imidazolidinethione)	**Formerly** regulated in infant- and baby food Reg. EC 125/2006 and 141/2006 Nowadays not regulated	Degradant of propylen-bis-DTCs (i.e. propineb). Also, impurity in propineb-based PPPs. Also formed from propineb during food processing (heating). Useful marker for propineb-application history. Note: Propineb is not any more approved within the EU (approval expired in March 2018)
Thiram metabolite M1	Non regulated metabolite	Marker of dimethyldithiocarbamates. Specificity questionable at low levels.
Trifluoroacetic acid	Non regulated metabolite of many pesticides	A metabolite of a multitude of pesticides, veterinary and human drugs. Also metabolite of many widely used fluorochemicals, such as fluoropolymers, e.g. Teflon®, flame retardants, impregnation agents for fabrics, fluorinated refrigerants and blowing agents, such as 1,1,1-trifluoroethane and 2,3,3,3-tetrafluoropropene and 1,3,3,3-tetrafluoropropene. Very persistent in the environment and a ubiquitous contaminant with some regional hotspots including in surface waters and in groundwater. Included in the working document for MANCPs. Classified as a PFAS.
Trimesium	MRLs of dry commodities do not always take into account the amounts formed during the drying process.	Counter-ion of glyphosate, also naturally formed as an artefact during the drying process of food. Also known as trimethylsulfonium cation.

Residue Findings:

In 2025, a total of 2690 samples, mainly fruit and vegetables, but also cereals, pulses, processed goods, tea and others, were analyzed for QuPPe-amenable compounds at the CVUA Stuttgart. 2135 samples (79 %) contained quantifiable residues of one or more of the tested QuPPe compounds.

Table 2 sorts the compounds based on the frequency of findings above the reporting limit (RL). Table 3 shows a compilation of all the results concerning the above-listed highly polar compounds.

Table 2: Residue findings of QuPPe-compounds (CVUA Stuttgart 2025) by detection frequency

Frequency of findings > respective RL	Compounds (pesticides and legally relevant metabolites shown in bold)
> 10 % of samples	***Phosphonic acid***, *Cyanuric acid, TFA, Perchlorate, and* ***Chlorate***
> 1 - 10 % of samples	*Melamine,* ***Propamocarb***, ***Bromide[1)]***, ***Diquat[2)]***, *Propamocarb-N-oxide, Propamocarb-N-desmethyl,* ***Trimesium***, *Ethephon met. HEPA,* ***Ethephon, Chlormequat-chloride, Paraquat[3)], Nicotine***
0.1 -1% of samples	*Thiram met. M1,* ***Glyphosate, Chloridazon-desphenyl, Mepiquat-chloride, Glufosinate met. MPPA, Maleic hydrazide, DFA****, Dimethoate-O-desmethyl, ETU, EU,* ***Fosetyl****, 4-Methylimidazoline,* ***Amitrole,*** *Morpholine, Nereistoxin*
<0.1 - LOQ	***Cyromazine****,* ***Daminozide,*** *Matrine, Mepiquat-4-hydroxy*
Not detected above LOQ	***Aminocyclopyrachlor, Difenzoquat****, Diquat-dipyridone, Diquat met. TOPPS, Diquat-*monopyridone, ***Glufosinate,*** *Glyphosate met. AMPA, Glyphosate met. N-Acetylglyphosate,* ***N-Acetylglufosinate,*** *Oxymatrine and PTU*

[1)] ***Bromide is ubiquitous and virtually every sample is positive. The RL of 5 mg/kg represents the lowest MRL in food of plant origin.***
[2)] ***Paraquat and Diquat analysis was semi-targeted. Main focus were dry commodities such as pulses, oily seeds and cereals as well as potatoes***

Table 3: Residue findings of QuPPe-compounds (CVUA Stuttgart 2025) by compound

Compound	# samples	# pos. [1)]	% pos.	Max (mg/kg)	Mean[2)] (mg/kg)	Median[2)] (mg/kg)	# >MRL[3)]	% >MRL	RL[4)]
Fosetyl sum (Phosphonic acid)[10)]	2513	1042	41.0	122	2	0.14	4	0.2	0.02
Cyanuric acid	2556	876	34.0	1.2	0.046	0.014	Not part of RD		0.005
TFA	2513	718	29.0	4.7	0.17	0.069	Not part of RD		0.02
Perchlorate	2556	482	19.0	0.67	0.034	0.012	4[5)]	0.2	0.005
Chlorate	2556	367	14.0	2.4	0.053	0.015	9	0.4	0.005
Melamine	2690	270	10.0	4.1	0.092	0.032	0		0.01
Propamocarb	2690	117	4.3	10	0.36	0.031	1	0.04	0.005
Bromide	2556	104	4.1	210	24.2	16.0	2	0.08	5[7)]
Diquat	159	6	3.8	0.046	0.019	0.013	0		0.01
Propamocarb-N-oxide	2690	95	3.5	0.76	0.086	0.024	Not part of RD		0.005
Propamocarb-N-desmethyl	2690	71	2.6	0.3	0.034	0.014	Not part of RD		0.005
Trimesium	2690	65	2.4	1.1	0.1	0.028	11[6)]	0.4	0.005
Ethephon metabolite HEPA	2556	50	2.0	0.45	0.097	0.042	Not part of RD		0.01
Ethephon	2556	47	1.8	1.8	0.21	0.12	3	0.1	0.01
Chlormequat-chloride	2690	45	1.7	27.6	0.68	0.034	3	0.1	0.005
Paraquat	159	2	1.3	0.034	0.026	0.026	1	0.6	0.01
Nicotine	2690	29	1.1	0.32	0.084	0.040	3	0.1	0.01
Thiram M1[8)]	2682	27	1.0	0.032	0.011	0.008	Not part of RD		0.002
Glyphosate	2558	20	0.8	6.2	0.57	0.090	2	0.08	0.02
Chloridazon-desphenyl	2690	20	0.7	0.059	0.013	0.008	0		0.005
Mepiquat chloride	2690	17	0.6	0.034	0.012	0.009	0		0.005
Glufosinate metabolite MPPA	2556	16	0.6	0.074	0.038	0,038	0		0.01
Maleic hydrazide	2556	12	0.5	22.4	8.9	6.25	0		0.01
DFA[9)]	2513	9	0.4	0.91	0.20	0.13	1	0.04	0.05
Dimethoate metabolite X	2556	6	0.2	0.045	0.028	0.031	Not part of RD		0.005
ETU[8)]	2687	5	0.2	0.26	0.18	0.15	Not part of RD		0.02
EU[7)]	2686	5	0.2	0.11	0.067	0.050	Not part of RD		0.02
Fosetyl	2556	5	0.2	44.6	9	0.11	0		0.01
4-Methylimidazoline[8)]	2689	4	0.1	0.011	0.007	0.007	Not part of RD		0.004

Compound	# samples	# pos. [1]	% pos.	Max (mg/kg)	Mean[2] (mg/kg)	Median[2] (mg/kg)	# >MRL[3]	% >MRL	RL[4]
Amitrole	2690	3	0.1	0.007	0.007	0.007			0.005
Morpholine	2690	4	0.1	0.82	0.40	0.36	additive		0.02
Nereistoxin	2690	4	0.1	0.093	0.046	0.041	1	0.04	0.005
Cyromazine	2690	1	0.04	0.033			1	0.04	0.005
Daminozide	2690	1	0.04	0.016			0		0.005
Matrine	2690	1	0.04	0.019			1	0.04	0.01
Mepiquat, 4-hydroxy	2690	1	0.04	0.009			Not part of RD		0.005

[1] The number of positive samples refers to samples exceeding the RL.
[2] Mean and median of positives
[3] Numerical MRL-exceedances
[4] RL= Reporting Limit (exemplary for fruits and vegetables)
[5] Perchlorate and melamine are legally contaminants. In four cases the ML of perchlorate, as defined in Reg. (EC) No. 1881/2006, was exceeded
[6] MRL-exceedances of trimesium are in most cases likely due to the formation of trimesium during processing
[7] Bromide is ubiquitous and virtually every sample is positive. The RL of 5 mg/kg represents the lowest MRL in food of plant origin. Analytically much lower levels can be quantified
[8] Additional findings below LOQ were used for dithiocarbamate screening purposes.
[9] DFA was only found in 9 samples out of 76 positives with residues of flupyradifurone. DFA was found in eggplant (2x), strawberry, Brussels sprouts (3x), grapes (2x) and hops
[10] In the vast majority of the cases only phosphonic acid was encountered.

MRL exceedances

In 47 samples (thereof 2 organic) MRLs of different compounds were numerically exceeded. In 23 of these samples (thereof 2 organic) the MRLs were exceeded even after deducting 50% measurement uncertainty. Table 4 gives an overview of these exceedances. In 11 samples (thereof 1 organic) the MRL-exceedance concerned trimesium, which is known to be generated naturally during the drying process of plants.

Table 4: Samples with residues of QuPPe-compounds exceeding existing MRLs* (CVUA Stuttgart 2025)

Compound	Commodity	Country of Origin	Conc. (mg/kg)	>2x MRL**	Note
Bromide	Spinach	Unknown	55.3		
	Basil	Kenya	64.1		
Chlorate *(herbicide. but chlorinated water used in irrigation or sanitation is mostly responsible for levels found in food)*	Pear	Unknown	0.12	x	
	Boletus mushrooms, frozen	Unknown	1.0		
	Blueberry	Unknown	0.17	x	
	Blueberry	Unknown	0.24	x	
	Mango	Unknown	1.1	x	
	Cucumber	The Netherlands	0.35		
	Peas	Unknown	0.38		
	Pear	Portugal	0.058		
	Milk alternative, vegan	Unknown	0.14		
Chlormequat chloride	Paprika Spice	Unknown	27.6	x	
	Radish, small	Unknown	0.013		
	Broccoli	China	0.034	x	
Cyromazine	Sweet Pepper	Unknown	0.033	x	
DFA	Hops	Germany	0.91	x	
Ethephon	Grapes	Unknown	1.8		
	Blackberry	Unknown	0.53	x	
	Currant	Unknown	0.12	x	
Fosetyl, sum *(phosphonic acid was the only detected compound in most cases)*	Asparagus	Germany	3.5		
	Beans, dry	Egypt	13.2		
	Chickpeas, dry	Canada	11.3	x	
	Papaya	Brazil	3.5	x	
Glyphosate	Sweet Potato	Unknown	0.27	x	organic
	Lemons, dried	Unknown	1.1		
Matrine	Sweet Pepper	Turkey	0.019		
Nereistoxin	Cucumber	Spain	0.020		
Nicotine *(insecticide, but tobacco-related contamination mostly responsible for levels found in food)*	Borecole	Unknown	0.065	x	
	Cashew, shelled	Unknown	0.034		
	Vine leaves	Turkey	0.040	x	

Compound	Commodity	Country of Origin	Conc. (mg/kg)	>2x MRL**	Note
Paraquat	Chickpeas, dry	Canada	0.034		
Perchlorate *(contaminant in fertilizers)*	Pomegranate	Peru	0.062		
	Pineapple	Costa Rica	0.055		
	Prickly Pear	Italy	0.078		
	Exotic Fruits	Spain	0.054		
Propamocarb	Raisin and Sultana	Turkey	0.17	x	
Trimesium *(Counter ion of glyphosate but also natural formation during drying process of crops)*	Tea	Unknown	0.060		
	Green Tea	Unknown	0.11	x	organic
	Chamomile Flower Tea	Unknown	0.20	x	
	Dill Tips, dried	Unknown	1.1	x	
	Dill Tips, dried	Unknown	0.95	x	
	Dill Tips, dried	Unknown	0.84	x	
	Black Tea	Sri Lanka	0.060	x	
	Black Tea	Sri Lanka	0.082		
	Green Tea	Thailand	0.17		
	Black Tea	Turkey	0.065	x	
	Tea	Unknown	0.060		

* >1xMLR

** >2xMRL means that the sample exceeded MRL even after deducting measurement uncertainty of 50%

Table 5: Top 15 residue levels of the most-frequently found QuPPe-compounds (with > 50 findings in total)

Compound	Commodity	Country of origin	Residue level (mg/kg)
Phosphonic acid *(Metabolite of Fosetyl but also used as such. Shows high persistence in plants. and residues in crops of perennial plants may originate from previous seasons)*	Hops	Germany	121.5
	Hops, pellets	Germany	106.2
	Hops	Germany	70
	Pear	Unknown	37.4
	Pear	Belgium	34.6
	Sultanas	Australia	29.0
	Strawberry	Germany	28.5
	Blackberry	Germany	28.5
	Blackberry	Germany	25
	Pear	Unknown	23.7
	Strawberry	Germany	21
	Hops	Germany	20.7
	Pear	Unknown	19.4
	Onion	Unknown	19.2
	Pear	Unknown	18.9
Cyanuric acid *(non-regulated pesticide metabolite and contaminant in fertilizers)*	Pineapple	Costa Rica	1.2
	Avocado	Israel	1.0
	Pineapple	Costa Rica	1.0
	Pineapple	Costa Rica	0.98
	Cherry	Unknown	0.84
	Pineapple	Costa Rica	0.81
	Pineapple	Costa Rica	0.79
	Paprika Spice	Unknown	0.70
	Pineapple	Costa Rica	0.69
	Pineapple	Costa Rica	0.58
	Pineapple	Unknown	0.57
	Melon	Unknown	0.56
	Mushroom Product, Wild Mushroom	Unknown	0.55
	Pineapple	Costa Rica	0.51
	Marjoram, dried	Unknown	0.48
Perchlorate *(Regulated as contaminant)*	Food Supplement	Sri Lanka	0.67
	Marjoram, dried	Germany	0.56
	Green Tea	Japan	0.49
	Oregano, dried	Unknown	0.43
	Oregano, dried	Unknown	0.29
	Dill Leaves	Unknown	0.28
	Parsley, dried	Unknown	0.26
	Parsley, dried	Unknown	0.26
	Thyme, dried	Unknown	0.26
	Green Tea	China	0.23

Compound	Commodity	Country of origin	Residue level (mg/kg)
	Spinach	Unknown	0.22
	Cumin	Unknown	0.21
	Dill Tips, dried	Unknown	0.20
	Spinach	Spain	0.20
	Dill Leaves	Spain	0.18
Trifluoroacetic acid	Head Lettuce	Germany	4.7
	Hops, pellets	Germany	4.5
	Oregano, dried	Unknown	2.4
	Oregano, dried	Unknown	2.3
	Dill Tips, dried	Unknown	2.2
	Food Supplement	Sri Lanka	2.1
	Hops	Germany	1.9
	Marjoram, dried	Germany	1.7
	Green Tea	China	1.6
	Thyme	Kenya	1.6
	Lentils	Unknown	1.4
	Parsley, dried	Unknown	1.4
	Parsley	Germany	1.3
	Cumin	Unknown	1.3
	Mushroom Product, Wild Mushroom	Unknown	1.2
Chlorate *(herbicide, but chlorinated water used in irrigation or sanitation mostly responsible for levels found in food)*	Paprika Spice	Unknown	2.4
	Mango	Unknown	1.1
	Boletus mushrooms	Unknown	1.0
	Paprika Spice	Unknown	1.0
	Paprika Spice	Unknown	0.66
	Button Mushroom	Poland	0.57
	Milk alternative, vegan	Spain	0.46
	Paprika Spice	Unknown	0.40
	Peas	Unknown	0.38
	Cucumber	fehlt	0.35
	Paprika Spice	Unknown	0.33
	Paprika Spice	Unknown	0.30
	Paprika Spice	Unknown	0.25
	Avocado	Unknown	0.24
	Blueberry	Unknown	0.24
Melamine *(Metabolite of cyromazine, but also contaminant originating from multiple sources; regulated as contaminant)*	Parsley, dried	Unknown	4.1
	Parsley	Spain	0.74
	Potato	Germany	0.63
	Chives	Germany	0.57
	Parsley	Spain	0.57
	Parsley	Unknown	0.53
	Parsley	Unknown	0.49
	Coriander	Unknown	0.48
	Potato	Unknown	0.45
	Hops	Germany	0.45
	Potato	Germany	0.43
	Potato	Germany	0.41
	Potato	Unknown	0.40
	King Oyster Mushroom	North Korea	0.40
	Potato	Germany	0.40
Propamocarb	Spinach	Germany	10.0
	Head Lettuce	Germany	7.7
	Spinach	Unknown	3.1
	Borecole	Belgium	1.9
	Spinach	Spain	1.8
	Cucumber	Unknown	1.1
	Cucumber	Unknown	0.98
	Spinach	fehlt	0.94
	Leek	Unknown	0.71
	Cucumber	Unknown	0.70
	Cucumber	Unknown	0.68
	Cucumber	Unknown	0.62
	Cucumber	Unknown	0.60

Compound	Commodity	Country of origin	Residue level (mg/kg)
	Cucumber	Unknown	0.58
	Cucumber	Unknown	0.56
Bromide	Cumin	Unknown	210
	Turmeric	Unknown	115
	Turmeric	Unknown	112
	Turmeric	Unknown	96.6
	Dill Tips, dried	Unknown	82.3
	Basil	Kenya	64.1
	Turmeric	Unknown	56.7
	Spinach	Unknown	55.3
	Mate Tea	Argentina	51.3
	Cashews, shelled	Vietnam	46.6
	Chickpeas, dry	Canada	43.3
	Food Supplement	Unknown	43.1
	Turmeric	Unknown	42.5
	Food Supplement	Sri Lanka	41.2
	Parsley	Unknown	40.3
Propamocarb-N-oxide	Cucumber	Unknown	0.76
	Cucumber	Unknown	0.53
	Spinach	Unknown	0.51
	Cucumber	Unknown	0.43
	Head Lettuce	Germany	0.37
	Cucumber	Unknown	0.36
	Cucumber	Germany	0.36
	Cucumber	Unknown	0.35
	Cucumber	Unknown	0.32
	Cucumber	Unknown	0.32
	Cucumber	Unknown	0.29
	Brussels Sprouts	fehlt	0.27
	Cucumber	Unknown	0.26
	Cucumber	Unknown	0.18
	Borecole	Belgium	0.18
Propamocarb-N-desmethyl	Spinach	Unknown	0.30
	Head Lettuce	Germany	0.20
	Spinach	Germany	0.17
	Borecole	Belgium	0.17
	Cucumber	Unknown	0.14
	Cucumber	Unknown	0.12
	Cucumber	Unknown	0.082
	Cucumber	Unknown	0.077
	Cucumber	Unknown	0.074
	Cucumber	Unknown	0.060
	Cucumber	Unknown	0.050
	Cucumber	Unknown	0.048
	Cucumber	Unknown	0.045
	Spinach	Spain	0.045
	Cucumber	Unknown	0.042
Trimesium	Dill Tips, dried	Unknown	1.1
	Dill Tips, dried	Unknown	0.95
	Dill Tips, dried	Unknown	0.84
	Parsley, dried	Unknown	0.82
	Food Supplement	Unknown	0.23
	Tarragon	Unknown	0.22
	Chamomile Flower Tea	Unknown	0.20
	Dill Tips, dried	Unknown	0.19
	Green Tea	Thailand	0.17
	Green Tea	Unknown	0.11
	Marjoram, dried	Unknown	0.11
	Dill Tips, dried	Unknown	0.10
	Parsley, dried	Unknown	0.091
	Oregano, dried	Unknown	0.086
	Black Tea	Sri Lanka	0.082

Table 6: Top 10 residue levels of less frequently found QuPPe-compounds (with < 50 findings in total)

Compound	Commodity	Country of origin	Residue level (mg/kg)
Ethephon met. HEPA	Button Mushroom	Poland	0.45
	Button Mushroom	Poland	0.44
	Button Mushroom	Poland	0.41
	Button Mushroom	Germany	0.35
	Button Mushroom	Unknown	0.32
	Button Mushroom	Poland	0.29
	Button Mushroom	Poland	0.28
	Button Mushroom	Germany	0.25
	Field Mushroom	Unknown	0.21
	Grapes	Unknown	0.16
Ethephon	Grapes	Unknown	1.8
	Fig	Turkey	0.72
	Grapes	Egypt	0.68
	Blackberry	Unknown	0.53
	Pineapple	Honduras	0.41
	Grapes	Unknown	0.39
	Pineapple	Costa Rica	0.34
	Pineapple	Costa Rica	0.32
	Grapes	Unknown	0.31
	Grapes	Unknown	0.30
Chlormequat chloride	Paprika Spice	Unknown	27.6
	Food Supplement	Unknown	0.54
	Rye	Unknown	0.49
	Oats, rolled	Unknown	0.31
	Oats	Unknown	0.18
	Oats, rolled	Unknown	0.17
	Spelt Flour	Unknown	0.11
	Spelt Flakes	Unknown	0.10
	Wheat	Germany	0.094
	Spelt Flour	Unknown	0.081
Nicotine	Cinnamon Bark	Sri Lanka	0.32
	Cinnamon Bark	Madagascar	0.28
	Food Supplement	Unknown	0.25
	Black Tea	Sri Lanka	0.24
	Mushroom Product, Wild Mushroom	Unknown	0.16
	Tea	Unknown	0.15
	Marjoram, dried	Germany	0.14
	Food Supplement	Unknown	0.13
	Dill Tips, dried	Unknown	0.078
	Dill Tips, dried	Unknown	0.075
Thiram M1	Garlic	China	0.032
	Bean	Unknown	0.031
	Bean	Unknown	0.027
	Pear	Turkey	0.024
	Pear	Turkey	0.021
	Beans, dry	Argentina	0.018
	Pear	Unknown	0.016
	Pear	Turkey	0.014
	Bay Leaf Spice	Unknown	0.013
	Spring Onion	Unknown	0.011
Glyphosate	Chickpeas, dry	Canada	6.2
	Lentils	Czech Republic	1.2
	Lemons, dried	Unknown	1.1
	Paprika Spice	Unknown	0.89
	Lentils	Kazakhstan	0.63

Compound	Commodity	Country of origin	Residue level (mg/kg)
	Sweet Potato	Unknown	0.27
	Flaxseed, ground	Unknown	0.19
	Chickpeas, dry	Turkey	0.17
	Sultanas	Turkey	0.14
	Pomegranate	Turkey	0.10
Chloridazon-desphenyl	Parsley	Unknown	0.059
	Parsley	Germany	0.025
	Dill Leaves	Germany	0.023
	Dill Leaves	Germany	0.017
	Dill Leaves	Germany	0.015
	Parsley	Unknown	0.014
	Coriander	Germany	0.013
	Bean	Unknown	0.009
	Chives	Germany	0.008
	Head Lettuce	Germany	0.008
Mepiquat chloride	Cereal flakes & porridge	Slovakia	0.034
	Button Mushroom	Unknown	0.022
	Button Mushroom	Unknown	0.020
	Button Mushroom	Germany	0.016
	Field Mushroom	Unknown	0.014
	Button Mushroom	Unknown	0.012
	Button Mushroom	Germany	0.012
	Button Mushroom	Poland	0.012
	Button Mushroom	Unknown	0.009
	Button Mushroom	Unknown	0.008
Glufosinate MPPA	Nectarine	Unknown	0.074
	Plum	South Africa	0.066
	Passion Fruit	Vietnam	0.061
	Plum	Unknown	0.052
	Nectarine	South Africa	0.050
	Apricot	Unknown	0.046
	Grapes	Unknown	0.045
	Almond, ground	fehlt	0.041
	Almond, ground	fehlt	0.039
	Plum	Unknown	0.031
Maleic hydrazide	Potato	Unknown	22.4
	Potato	Germany	16.1
	Potato	Germany	14.9
	Potato	Germany	11.7
	Onion	fehlt	7.8
	Potato	Germany	6.4
	Potato	Unknown	6.1
	Onion	Unknown	4.4
	Onion	Germany	4.4
	Onion	Unknown	4.3
DFA	Hops	Germany	0.91
	Aubergine	Unknown	0.17
	Brussels Sprouts	Unknown	0.14
	Grapes	Turkey	0.14
	Aubergine	Unknown	0.13
	Grapes	Turkey	0.11
	Brussels Sprouts	Unknown	0.093
	Strawberry	Unknown	0.074
	Brussels Sprouts	Unknown	0.056
Dimethoate-O-desmethyl	Onion	Germany	0.045
	Mate Tea	Argentina	0.040
	Chili powder	Unknown	0.036

Compound	Commodity	Country of origin	Residue level (mg/kg)
	Raspberry	Unknown	0.027
	Avocado	Unknown	0.017
	Onion	Germany	0.006
Diquat[1)]	Beans, dry	Unknown	0.046
	Flaxseed, ground	Unknown	0.018
	Beans, dry	Argentina	0.014
	Lentils	Unknown	0.012
	Lentils	Kazakhstan	0.012
	Lentils	Unknown	0.011
ETU	Vine leaves	Turkey	0.26
	Vine leaves	Turkey	0.26
	Vine leaves	Turkey	0.15
	Vine leaves	Turkey	0.14
	Vine leaves	Turkey	0.079
EU (2-Imidazolidinone), EBDTC	Vine leaves	Turkey	0.11
	Vine leaves	Turkey	0.10
	Papaya	Brazil	0.050
	Vine leaves	Turkey	0.044
	Chives	Unknown	0.034
Fosetyl (levels of additionally determined **phosphonic acid** in the specific sample). The EURL-SRM experimentally demonstrated that fosetyl is gradually formed during storage of wine containing phosphonic acid.	Hops	Germany	44.6 (122)
	Grapes	Turkey	0.25 (5.1)
	Cucumber	Unknown	0.11 (10.5)
	Grapes	India	0.088 (6.5)
	Wine	Unknown	0.074(14.8)
4-Methylimidazoline DTC-Marker	Grapes	India	0.011
	Pomegranate	Peru	0.008
	Pomelo	China	0.005
	Pomegranate	Unknown	0.004
Morpholin	Cumin	Unknown	0.82
	Milk alternative, vegan	Italy	0.37
	Chives	Unknown	0.35
	Milk alternative, vegan	Italy	0.074
Nereistoxin	Tomato	Morocco	0.093
	Tomato	Morocco	0.061
	Cucumber	Spain	0.020
	Passion Fruit	Colombia	0.009
Amitrole	Wine	Germany	0.007
	Spring Onion	Germany	0.007
	Wine	Germany	0.006
Paraquat	Chickpea, dry	Canada	0.034
	Chickpea, dry	Canada	0.017

[1)] Further results on diquat, paraquat and metabolites thereof were compiled during a pilot monitoring project of EURL-SRM in 2024, entailing samples collected from different countries. Those results are included in a separate EURL-SRM pilot monitoring report.

Findings in organic samples

A look at the residues encountered in organic products gives an insight on compounds that potentially end up in food products from natural sources and on the matrices affected by such background contamination.

In 2025, the vast majority of the findings in organic products concerned compounds known to contaminate food products either naturally, or from applications other than the use of pesticides. Bromide is ubiquitous and is always contained in living organisms. Chlorate is often a result of using chlorinated water for irrigation or for sanitation purposes in packing and processing facilities (e.g. for washing surfaces or the products themselves). The contaminant perchlorate is often contained in fertilizers, including guano, which is used in organic agriculture. Nicotine contamination may occur through a multitude of pathways, e.g. when crops are grown on contaminated soil, when products are exposed to nicotine-containing smoke or air, or when products are touched by smokers (e.g. during harvest or processing). Melamine and cyanuric acid may also originate from fertilizers. Trimesium is naturally formed when certain products are dried, and can be thus considered a processing contaminant. Phosphonic acid may originate from past applications as it is quite persistent both in perennial plants and the soil. Contamination of organic products with HEPA and phosphonic acid naturally formed in manure used to fertilize fields (or in dung used as a substrate in mushroom cultivation) is also possible. In the case of phosphonic acid some findings raise the suspicion of a recent misuse and require further investigation. Afterall phosphonic acid is a very popular fungicide. Trifluoroacetic acid is a universal contaminant with multiple sources, beyond the use of fluorinated pesticides, such as Teflon, fabric impregnation products and blowing agents in sprays for personal use.

Table 7: Overview of findings in organic samples (no. of findings ≥5); (CVUA in 2025)

Compound Name	No. of samples	RL (mg/kg)	No. of findings >RL	Percentage of positives	Mean (mg/kg)	Max (mg/kg)	Remarks
Bromide	493	5	15	3.0	18.7	43.1	Ubiquitous element
Chlorate	493	0.005	57	11.6	0.018	0.10	May end up in organic products through irrigation or through sanitation procedures in the processing facilities
Cyanuric acid	493	0.005	172		0.032	0.33	May originate from fertilizers (incl. urea fertilizers)
Melamine	515	0.005	28		0.060	0.53	May originate from fertilizers (incl. urea fertilizers)
Nicotine	515	0.01	5		0.19	0.32	Contamination with nicotine can occur at various stages of food production and affect conventional and organic products alike. Findings concerned the following commodities: Cinnamon (3x), Ashwagandha powder and food supplement
Perchlorate	493	0.005	99		0.038	0.67	May originate from fertilizers including guano
Phosphonic acid	483	0.02	65		0.14	2.0	Phosphonic acid used to be employed by organic farmers in the past as it was marketed as a "leaf fertilizer" suitable for organic farming. As the compound is quite persistent, residues are still found. Contamination through manure is also conceivable source especially in vegetables
Trifluoro-acetic acid	483	0.02	87		0.16	2.1	May originate from various sources, distributed via air and water often found on leafy vegetables, herbs and exotic fruit
Trimesium	515	0.005	13		0.033	0.11	Was shown to be formed naturally during the drying process of various products