Food and Agriculture Organization of the United Nations

World Health Organization

2023 JOINT FAO/WHO MEETING ON PESTICIDE RESIDUES

Washington, DC, 19-28 September 2023

SUMMARY REPORT

ACCEPTABLE DAILY INTAKES, ACUTE REFERENCE DOSES, RESIDUE DEFINITIONS,

RECOMMENDED MAXIMUM RESIDUE LIMITS, SUPERVISED TRIALS MEDIAN RESIDUE VALUES

AND OTHER VALUES

RECORDED BY THE 2023

MEETING

Issued October 2023

The following extracts of the results of the 2023 Joint FAO/WHO Meeting on Pesticide Residues (JMPR) are provided to make them accessible to interested parties at an early date.

The Meeting evaluated 35 pesticides. The Meeting estimated maximum residue levels, which it recommended for use as maximum residue limits (MRLs) by the Codex Committee on Pesticide Residues (CCPR). It also estimated supervised trials median residue (STMR) and highest residue (HR) levels as a basis for estimation of the dietary exposure to residues of the pesticides reviewed. The allocations and estimates are shown in table 1.

Pesticides for which the estimated dietary exposures might, on the basis of the available information, exceed their Acceptable Daily Intakes (ADIs) are marked with footnotes, which are also applied to specific commodities when the available information indicated that the Acute Reference Dose (ARfD) of a pesticide might be exceeded when the commodity was consumed.

The table includes the Codex reference numbers of the compounds, and the Codex classification numbers (CCNs) of the commodities, to facilitate reference to the Codex maximum limits for pesticide residues (Codex Alimentarius, Vol. 2B) and other documents and working documents of the Codex Alimentarius Commission. Both compounds and commodities are listed in alphabetical order.

Apart from the abbreviations indicated above, the following qualifications are used in the Table.

* (following recommended MRL)	At or about the limit of quantification
ar	The median or highest residue is reported at the moisture content of the feed commodity "as received"
dw	The value is reported in the dry weight of the feed commodity
HR-P	Highest residue in a processed commodity, in mg/kg, calculated by multiplying the HR in the raw commodity by the processing factor
Po	The recommendation accommodates post-harvest treatment of the commodity.
PoP (following recommendation for processed foods) (classes D and E in the Codex classification)	The recommendation accommodates post-harvest treatment of the primary food commodity.
STMR-P	An STMR for a processed commodity calculated by applying the concentration or reduction factor for the process to the STMR calculated for the raw agricultural commodity.
W (in place of a recommended MRL)	The previous recommendation is withdrawn, or withdrawal of the recommended MRL or existing Codex or draft MRL is recommended.

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
1,4-dimethylnaphthalene (331) ADI: 0–0.3 mg/kg bw ARfD: Unnecessary		Baked potato (unpeeled)	-	-	5.1	-
		Boiled potato (peeled)	-	-	0.17	-
		Boiled potato (unpeeled)	-	-	2.3	-
		Canned potatoes (unpeeled)	-	-	2.2	-
	MO 0105	Edible offal (mammalian)	0.5	-	0.22	-
	PE 0112	Eggs	0.03	-	0.017	-
		Fried potato (unpeeled)	-	-	5.2	-
	MF 0100	Mammalian fats	0.03	-	0.018	-
	MM 0095	Meat (from mammals other than marine mammals)	0.03 (fat)	-	0.014 (muscle) 0.018 (fat)	-
		Microwaved potatoes (unpeeled)	-	-	1.5	-
	ML 0106	Milks	0.03	-	0.02	-
		Peeled potato	-	-	2.1	-
	VR 0589	Potato	15 (Po)	-	8.65	-
		Potato crisps (peeled)	-	-	1.2	-
		Potato crisps (unpeeled)	-	-	1.6	-
		Potato dried pulp			28	-
	DV 0589	Potato flakes (flour)	-	-	1.3	-
		Potato fries (chips) (peeled)	-	-	0.43	-
		Potato fries (chips) (unpeeled)	-	-	1.6	-
		Potato process waste	-	-	2.5	-
		Potato starch	-	-	3.9	-
	PO 0111	Poultry edible offal	0.2	-	0.12	-
	PF 0111	Poultry fats	0.3	-	0.11	-
	PM 0110	Poultry meat	0.3 (fat)	-	0.043 (muscle) 0.11 (fat)	-

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
		Sliced potato	-	-	3.9	-
Definition of the residue for compliance with the MRL for plant commodities: *1,4-dimethylnaphthalene.* Definition of the residue for dietary risk assessment for plant commodities: *Sum of 1,4-dimethylnaphthalene and metabolite 1-hydroxymethyl-4-methylnaphthalene (M21), expressed as 1,4-dimethylnaphthalene.* Definition of the residue for compliance with the MRL for animal commodities, except milk: *Sum of 1,4-dimethylnaphthalene and metabolite 4-methyl-1-naphthoic acid (M23), expressed as 1,4-dimethylnaphthalene.* The residue in animal commodities except milk is fat-soluble. Definition of the residue for compliance with the MRL for milk: *Glycine conjugate of 4-methyl-1-naphthoic acid (M02).* The residue definition in milk is not fat-soluble. Definition of the residue for dietary risk assessment for animal commodities: *Sum of 1,4-dimethylnaphthalene, metabolite 4-methyl-1-naphthoic* acid (*M23), and its glycine conjugate 4-methyl-1-naphthoic acid (M02) expressed as 1,4-dimethylnaphthalene.*						
Acetamiprid (246)	VP 0546	Soya bean (dry)	0.01	-	0.01	-
Definition of the residue for compliance with the MRL and for dietary risk assessment for plant commodities: *acetamiprid*. Definition of the residue for compliance with the MRL and for dietary risk assessment for animal commodities: *sum of acetamiprid and desmethyl-acetamiprid, expressed as acetamiprid.* The residue is not fat-soluble.						
Boscalid (221) ADI: 0-0.04 mg/kg bw ARfD: Unnecessary (2006)	FI 0355	Pomegranate	2	-	0.041	-
Definition of the residue for compliance with the MRL for plant commodities and for dietary risk assessment for plant and animal commodities: *Boscalid.* Definition of the residue for dietary risk assessment for animal commodities: *Sum of boscalid, 2-chloro-N-(4'-chloro-5-hydroxybiphenyl-2-yl) nicotinamide including its conjugate, expressed as boscalid.* The residue is fat-soluble.						
Carbendazim (72)	-	-	-	-	-	-
The present Meeting was asked by the CCPR to re-evaluate carbendazim under the periodic review programme. However, insufficient toxicological information was submitted to allow a re-evaluation of this substance to confirm or amend the reference values established in 1995 (ADI) and 2005 (ARfD). On this basis, the WHO Core Assessment Group withdraws the current ADI and ARfD values. Recommendations for maximum residue levels for carbendazim are reported under thiophanate-methyl.						
Carbofuran (96) ADI: 0–0.001 mg/kg ARfD: 0.001 mg/kg bw	FC 0004	Oranges, Sweet, Sour (subgroup)	W	0.5	-	-
	AL 1020	Alfalfa fodder	W	10	-	-
	AL 1021	*Alfalfa forage (green)*	W	10	-	-
	FI 0237	Banana	W	0.01 (*)	-	-
	VC 4199	Cantaloupe	W	0.2	-	-
	MF 0812	Cattle fat	W	0.05 (*)	-	-
	AB 0001	Citrus pulp, Dry [(1)]	W	2.0	-	-
	SB 0716	Coffee beans	W	1.0	-	-
	SO 0691	Cotton seed	W	0.1	-	-
	VC 0424	Cucumber	W	0.3	-	-
	MO 0105	Edible offal of cattle, goats, horses, pigs & sheep	W	0.05 (*)	-	-
	MF 0814	Goat fat	W	0.05 (*)	-	-
	MF 0816	Horse fat	W	0.05 (*)	-	-
	AF 0645	*Maize forage[(1)]*	W	0.5	-	-
	GC 0645	Maize[(1)]	W	0.05 (*)	-	-
	FC 0206	Mandarin[(1)]	W	0.5	-	-
	MM 0096	Meat of cattle, goats, horses, pigs & sheep	W	0.05 (*)	-	-
	ML 0106	Milks	W	0.05 (*)	-	-
	MF 0818	Pig fat	W	0.05 (*)	-	-
	VR 0589	Potato	W	0.2	-	-
	SO 0495	Rape seed	W	0.05 (*)	-	-

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
	AS 0649	Rice straw and fodder, dry	W	1.0	-	-
	CM 0649	Rice, husked	W	0.1	-	-
	MF 0822	Sheep fat	W	0.05 (*)	-	-
	GC 0651	Sorghum	W	0.1 (*)	-	-
	AF 0651	*Sorghum forage (green)*	W	2	-	-
	AS 0651	Sorghum straw and fodder, dry	W	0.5	-	-
	HS 0193	Spices, roots and rhizomes	W	0.1	-	-
	VC 0431	Squash, summer	W	0.3	-	-
	AV 0596	*Sugar beet leaves or tops*[(1)]	W	0.07	-	-
	VR 0596	Sugar beet[(1)]	W	0.2	-	-
	GS 0659	Sugar cane	W	0.1 (*)	-	-
	SO 0702	Sunflower seed	W	0.1 (*)	-	-
	VO 0447	Sweet corn (corn-on-the-cob)	W	0.1	-	-
[(1)]Arising from the use of carbosulfan						

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		$STMR_{chronic}$ or $STMR\text{-}P_{chronic}$ (mg/kg)	$STMR_{acute}$ or $STMR\text{-}P_{acute}$ (mg/kg)	$HR_{(acute)}$ or $HR\text{-}P_{(acute)}$ (mg/kg)
			New	Previous			
Carbosulfan (145) ADI: 0–0.01 mg/kg bw ARfD: 0.02 mg/kg bw	AB 0001	Citrus pulp, Dry	W	0.1	-	-	-
	SO 0691	Cotton seed	W	0.03 (*)	0.11	0.21	-
	MO 0105	Edible offal (mammalian)	W	0.05 (*)	-	-	-
	VO 0440	Eggplant	0.15		0.36	0.71	0.91
	PE 0112	Eggs	W	0.05 (*)	-	-	-
	GC 0645	Maize	W	0.05 (*)	-	-	-
	AF 0645	Maize forage	W	0.05 (*)	-	-	-
	FC 0206	Mandarin	W	0.1	-	-	-
	FI 0345	Mango	0.1	-	0.265	0.52	1.3
	MM 0095	Meat (from mammals other than marine mammals)	W	0.05 (*) fat	-	-	-
	ML 0106	Milks	W	0.03 (*)	-	-	-
	FC 0004	Oranges, sweet, sour (subgroup)	W	0.1	-	-	-
	VR 0589	Potato	W	0.05	-	-	-
	PM 0110	Poultry meat	W	0.05 (*)	-	-	-
	PO 0111	Poultry, edible offal of	W	0.05 (*)	-	-	-
	GC 0649	Rice	W	0.05 (*)	-	-	-
	AS 0649	Rice straw and fodder, dry	W	0.05 (*)	-	-	-

	HS 0191	Spices, fruits and Berries	W	0.07	-	-	-
	HS 0193	Spices, roots and rhizomes	W	0.1	-	-	-
	VR 0596	Sugar beet	W	0.3	-	-	-
	AV 0596	Sugar beet leaves or tops	W	0.05 (*)	-	-	-

$STMR(-P)_{chronic}$ Expressed as toxic equivalent residues (carbosulfan +10×carbofuran)

$STMR(-P)_{acute}$ Expressed as toxic equivalent residues (carbosulfan + 20×carbofuran)

$HR_{(acute)}$ Expressed as toxic equivalent residues (carbosulfan + 20×carbofuran)

Definition of the residue for compliance with the MRL for plant commodities: *Carbosulfan plus carbofuran (expressed as carbosulfan).*

Definition of the residue for dietary risk assessment for plant commodities: *Carbosulfan plus 10×(sum of carbofuran, 3-hydroxy carbofuran (free and conjugated), 3-hydroxy-7-phenol and 3-keto-7-phenol), expressed as carbosulfan* for long-term dietary exposure and *Carbosulfan plus 20×(sum of carbofuran, 3-hydroxy carbofuran (free and conjugated), 3-hydroxy-7-phenol and 3-keto-7-phenol), expressed as carbosulfan* for acute dietary exposure.

Definition of the residue for compliance with the MRL and for dietary risk assessment for animal commodities: *Not established.*

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
Clothianidin (238)	AM 0660	Almond hulls	0.1 (dw) T	-	0.02 (as)	-
	VS 0624	Celery	W	0.04, T	-	-
	HS 0780	Cumin seed	1	-	0.25	-
	VO 0050	Fruiting vegetables other than cucurbits	W	0.05	-	-
	VO 0050	Fruiting vegetables other than cucurbits except goji berry	0.05, T	-	0.02, T	0.03, T
	VO 2704	Goji berry	0.06, T	-	0.01, T	0.034, T
	DV 2704	Goji berry, dried	0.3, T	-	0.051, T	0.18, T
	TN 0085	Group of tree nuts	0.01*, T	-	0.01, T	0.01, T
	VA 0385	Onion, bulb	0.01*, T	-	0.01, T	0.01, T
	TN 0672	Pecan	W	0.01*	-	-
	VS 2080	Subgroup of stems and petioles	0.04 T	-	0.01 T	0.02 T
T = based on thiamethoxam use only, C = based on clothianidin use only (as) – as received; (dw) – dry weight Definition of the residue for compliance with the MRL and dietary risk assessment for plant and animal commodities: *clothianidin.* The residue is not fat-soluble.						
Cyantraniliprole (263) ADI: 0–0.03 mg/kg bw ARfD: Unnecessary	FI 0326	Avocado	0.4	-	0.03	-
	VD 0071	Bean (dry)	W	0.3		
	VD 2065	Beans, dry, subgroup of	0.6	-	0.032	-
	FB 2005	Cane berries, subgroup of	4	-	1	-
	PE 0112	Eggs	0.3	0.15	0.048	-
	AB 0269	Grape pomace, dried	15	-	3.4	-
	DF 0269	Grape, dried (=Currants, raisins, and sultanas)	3	-	0.73	-
	FB 0269	Grapes	2	-	0.56	-

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
	FT 0305	Olives	1	-	0.33	-
	SO 0305	Olives for oil production	1	-	0.33	-
	VD 2066	Peas, dry, subgroup of	0.6		0.032	-
	VD 4521	Soya bean (dry)	W	0.4	-	-
	DT 1114	Tea, green, black (black, fermented and dried)	50	-	4.05	-
	FB 1236	Wine-grapes	W	1	-	-
	For dietary exposure and/or dietary burden estimations					
		Grape	-	-	-	-
		Alcoholic fermentation wine	-	-	1.1	-
		Bottled wine	-	-	0.90	-
		Juice	-	-	0.49	-
		Malolactic fermentation wine	-	-	0.95	-
		Must	-	-	1.4	-
		Wet pomace	-	-	2.6	-
		Olive	-	-		-
		Processed olive	-	-	0.19	-
		Raw oil	-	-	0.40	-
		Refined oil	-	-	0.26	-
		Tea Infusion	-	-	0.055	-
		Poultry fat	-	-	0.009	-
		Poultry meat	-	-	0.004	-
		Poultry offal	-	-	0.036	-
Definition of the residue for compliance with the MRL for plant and animal commodities: *cyantraniliprole*. Definition of residue for estimation of dietary intake for unprocessed plant commodities: *cyantraniliprole*. Definition of residue for estimation of dietary intake for processed plant commodities: *sum of cyantraniliprole and IN-J9Z38, expressed as cyantraniliprole*. Definition of residue for estimation of dietary intake for animal commodities: *sum of cyantraniliprole, 2-[3-Bromo-1-(3-chloro-2-pyridinyl)-1H-pyrazol-5-yl]-3,4-dihydro-3,8-dimethyl-4-oxo-6-quinazolinecarbonitrile [IN-J9Z38], 2-[3-Bromo-1-(3-chloro-2-pyridinyl)-1H-pyrazol-5-yl]-1,4-dihydro-8-methyl-4-oxo-6-quinazolinecarbonitrile [IN-MLA84], 3-Bromo-1-(3-chloro-2-pyridinyl)-N-[4-cyano-2-(hydroxymethyl)-6-[(methylamino)carbonyl]phenyl]-1H-pyrazole-5-carboxamide [IN- N7B69] and3-Bromo-1-(3-chloro-2-pyridinyl)-N-[4-cyano-2[[(hydroxymethyl)amino]carbonyl]-6-methylphenyl]-1H-pyrazole-5-carboxamide [IN-MYX98], expressed a cyantraniliprole*. The residue is not fat-soluble. Note: metabolites IN-K5A78, IN-F6L99, and IN-N5M09 are assessed using Cramer Class III threshold of 1.5 µg/kg per day.						
Cyflumetofen (273)	SB 0716	Coffee bean	0.08	-	0.043	-
		Coffee beans instant powder	-	-	0.010	-
	SM 0716	Coffee beans roasted		-	0.027	-
	VC 0424	Cucumber	0.5	-	0.085	-
		Hops beer	-	-	0.049	-
		Hops extract	-	-	13.9	-
	MU 1100	Hops, dried	15	-	3.6	-
		Nectarine canned	-	-	0.012	-
		Nectarine jam	-	-	0.028	-
	DF 0245	Nectarine, dried	2	-	1.1	-
		Peach canned	-	-	0.012	-
		Peach jam	-	-	0.028	-
	DF 0247	Peach, dried	2	-	1.1	-
	FS 0013	Subgroup of cherries	0.4	-	0.106	-
	FS 2001	Subgroup of peaches	0.3	-	0.125	-
Definition of the residue for plant commodities (for compliance with the MRL): *Cyflumetofen.* Definition of the residue for plant commodities (for estimation of dietary intake): *Sum of cyflumetofen and 2-trifluoromethylbenzoic acid (metabolite B-1), expressed as cyflumetofen.*						

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
Definition of the residue for animal commodities (for compliance with the MRL and estimation of dietary intake): *Sum of cyflumetofen and 2-trifluoromethylbenzoic acid (metabolite B-1), expressed as cyflumetofen.* Residue is not fat-soluble.						
Deltamethrin (135)	FI 0350	Papaya	0.2	-	0.01	0.01
Definition of the residue for compliance with the MRL and for dietary risk assessment for plant and animal commodities: *sum of the deltamethrin and its trans- and α-R- isomers.* The residue is fat-soluble.						
Difenoconazole (224)	FB 2005	Cane berries	3	-	0.69	1.7
	CF 3516	Maize aspirated grain fractions [a]	-	-	0.5	-
	CF 3517	Maize gluten [a]	0.05	-	0.031	-
	OC 0645	Maize oil, crude	0.02	-	0.012	-
	AS 3569	Maize, bran [a]	-	-	0.032	-
	CF 1255	Maize, flour	0.015	-	0.008	-
	AS 0645	Maize, hay and/or straw [a]	15 (dw)	-	2.4 (as received)	8.5 (as received)
	VL 0485	Mustard greens	8	-	1.6	6.1
	FS 0014	Prunes	4	-	0.94	2.6
	VR 0494	Radish	0.7	-	0.17	0.31
	VL 0494	Radish leaves	8	-	1.6	6.1
	FS 0012	Stone fruits	1.5	-	0.365	1.02
	GC 2091	Subgroup of maize Cereals	0.015	-	0.01	-
	VR 0508	Sweet potato	4	-	1.2	1.9
(a) Value not relevant for IEDI assessment calculations. The definition of the residue for compliance with MRL and for dietary intake for plant commodities is parent *difenoconazole*, while for animal commodities it is defined as sum of difenoconazole and 1-[2-chloro-4-(4-chloro-phenoxy)-phenyl]-2-(1,2,4-triazol)-1-yl-ethanol (CGA205375), expressed as difenoconazole. The residue is fat-soluble.						
Diflubenzuron (130)	DT 1114	Black, Green tea infusions	-	-	0.038	-
		Tea, Black, Green, dried and fermented (subgroup)	40	-	9.4	-
Definition of the residue for compliance with the MRL for plant and animal commodities: *Diflubenzuron* Definition of the residue for dietary risk assessment for plant and animal commodities: *Diflubenzuron* The residue is fat-soluble.						
Dinotefuran (225)	VO 2704	Goji berry	0.6	-	0.12	0.34
	DV 2704	Goji berry, dried	2	-	0.26	1.1
	VO 0050	Group of fruiting vegetables other than cucurbits (except sweet corn and mushrooms)	W	0.5	-	-
	VO 0050	Group of fruiting vegetables other than cucurbits (except goji berry)	0.5	-	0.15 A)	0.55 A)
A) Residue recommendations were made by the 2012 JMPR. Definition of the residue for compliance with the MRL for plant commodities: *dinotefuran*. Definition of the residue for dietary risk assessment for plant commodities: sum of *dinotefuran, UF, and DN, expressed as dinotefuran*. Definition of the residue for compliance with the MRL and for dietary risk assessment for animal commodities: *sum of dinotefuran and UF, expressed as dinotefuran*. The residue is not fat-soluble.						
Emamectin (247)	-	-	-	-	-	-

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
(addendum) ADI: 0–0.0005 mg/kg bw ARfD: 0.02 mg/kg bw						
Emamectin was previously evaluated at JMPR 2011 when an ADI of 0–0.000 5 mg/kg bw and ARfD of 0.03 mg/kg bw were established for emamectin benzoate. Emamectin benzoate was evaluated by JECFA in 2013. The committee confirmed the HBGVs established by JMPR 2011. At JMPR 2014Meeting the ARfD of 0.03 mg/kg bw was withdrawn and an ARfD of 0.02 mg/kg bw established. Emamectin was evaluated by the present Meeting, due to a request for additional information on analytical methodology, storage stability and MRLs. The results of the newly submitted studies did not affect the previously established ADI or ARfD for emamectin benzoate.						
Florylpicoxamid (332) ADI: 0–0.1 mg/kg bw ARfD: Unnecessary	FB 0269	Grapes	3	-	0.375	-
	FB 0275	Strawberry	1.5	-	0.26	-
	FI 0327	Banana	0.4	-	0.021	-
	FI 0345	Mango	0.5	-	0.021	-
	VC 2039	Subgroup of fruiting vegetables, cucurbits - cucumbers and summer squashes	0.3	-	0.063	-
	VC 2040	Subgroup of fruiting vegetables, cucurbits – melons, pumpkins and winter squashes	0.4	-	0.0795	-
	VO 2045	Subgroup of tomatoes	0.9	-	0.12	-
	VO 0444	Peppers, chili	0.8	-	0.15	-
	VO 0445	Peppers, sweet	0.8	-	0.15	-
	HS 0444	Peppers, chili, dried	8	-	1.5	-
	VO 2046	Subgroup of eggplants	0.9	-	0.12	-
	VD 0533	Lentil (dry)	0.02	-	0	-
	VR 0596	Sugar beet	0.05	-	0.021	-
	GC 0654	Wheat	0.03	-	0.021	-
	SO 0495	Rape seed	0.15	-	0.021	-
	DF 0269	Grape, dried	7	-	0.8	-
	JF 0269	Grape, juice	-	-	0.1	-
		Grape, jelly	-	-	0.023	-
		Grape, wine (red)	-	-	0.02	-
		Grape, wine (white)	-	-	0.01	-
	DV 0448	Tomato, dried	6	-	0.72	-
	DM 0448	Tomato, paste/ puree	-	-	0.076	-
	JF 0448	Tomato, juice	-	-	0.01	-
		Tomato, canned fruit	-	-	<0.004	-
	DM 3523	Refined sugar	-	-	<0.004	-
	CM 0654	Wheat bran (unprocessed)	0.07	-	0.046	-
		Wheat white flour (550)	-	-	<0.019	-
		Wheat wholemeal flour	-	-	0.025	-
		Wheat wholemeal bread	-	-	0.021	-
	CF 1210	Wheat germ	-	-	<0.019	-
		Wheat starch	-	-	<0.019	-
	CF 3522	Wheat gluten	0.04	-	0.027	-
	MO 0105	Edible offal (Mammalian)	0.09	-	0.023 (liver)	-

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
					0.022 (kidney)	
	PE 0269	Eggs	0.02	-	0	-
	MF 0100	Mammalian fats (except milk fats)	0.15	-	0.043	-
	MM 0095	Meat (from mammals other than marine mammals)	0.15	-	0.024 (muscle) 0.043 (fat)	-
	ML 0095	Milks	0.03	-	0.013	-
	PF 0111	Poultry fats	0.02	-	0	-
	PM 0111	Poultry meat	0.02	-	0	-
	PO 0111	Poultry, edible offal of	0.02	-	0	-
	AS 0654	Wheat, hay and/or straw	2 (dw)	-	0.086 (as received)	-
	Additional values used in estimating livestock dietary burdens					
					Median residue (-P) mg/kg	highest residue (-P) mg/kg
	AS 3552	Wheat, forage	-	-	0.22	6
	AS 0654	Wheat, hay and/or straw	-	-	0.086	1.6
	AM 0495	Rape seed, forage	-	-	0.07	0.12
	AM 0596	Sugar beet, leaves or tops	-	-	0.0325	0.2
		Sugar beet pulp, dry	-	-	0.13	-
		Sugar beet, ensiled pulp	-	-	0.02	-
		Sugar beet, molasses	-	-	0.004	-
	CF 3521	Wheat aspirated grain fractions	-	-	0.18	-
	CF 3522	Wheat gluten feed meal	-	-	0.02	-
	CF 3515	Wheat milled bypdts (Shorts)	-	-	0.025	-
	DM 3525	Tomato pomace, wet	-	-	1.4	-
	AM 0495	Rapeseed, forage	-	-	0.07	0.12
The residue definition for compliance with the MRL and dietary exposure for plant commodities is *sum of florylpicoxamid and X12485649 expressed as florylpicoxamid.* The residue definition for compliance with the MRL and dietary exposure for animal commodities is *sum of florylpicoxamid and X12485649 expressed as florylpicoxamid.* The residue is fat-soluble.						
Fluazinam (333)	-	-	-	-	-	-
Definition of the residue for plant commodities for enforcement of MRLs: *fluazinam* Definition of the residue for plants for dietary risk assessment: *the Meeting was unable to conclude on a residue definition for risk assessment.*						
Fluopyram (243)	GC0640	Barley	0.4	0.2	0.041	-
	GC0641	Buckwheat	0.4		0.041	-
	MO0105	Edible offal, (mammalian)	8	8	3.8	7.4
	PE0112	Eggs	2	2	0.46	1.5
	MF0100	Mammalian fats (except milk fats)	1.5	1.5	0.67	1.5
	MM0095	Meat (from mammals other than marine mammals)	1.5	1.5	muscle: 0.51 fat: 0.67	muscle: 1.0 fat: 1.5
	ML0106	Milks	0.8	0.8	0.48	-

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
	GC0647	Oats	0.4	0.2	0.041	-
	PO111	Poultry, edible offal of	4	5	0.88	3.1
	PF0111	Poultry fats	1	1	0.28	0.90
	PM0110	Poultry meat	1.5	1.5	Muscle: 0.19 Fat: 0.28	Muscle: 0.97 Fat: 0.90
	GC0650	Rye	0.2	0.9	0.035	-
	GC0651	Sorghum	0.6		0.18	-
	GC0653	Triticale	0.2	0.9	0.035	-
	GC0654	Wheat	0.2	0.9	0.035	-
	CF0654	Wheat bran	0.6	-	0.081	-
	CF1211	Wheat flour	-	-	0.0036	-
	CF1210	Wheat germ	0.5	-	0.072	-
		(animal feed commodities)			(median)	(highest)
		Aspirated grain fraction of wheat	-	-	2.1	
	AS0640	Barley, hay and/or straw	6 (dw)	-	Straw: 0.67 Hay: 1.2 (ar)	straw: 1.9 hay: 4.1 (ar)
	AS0640	Barley straw and fodder, dry	W	2	-	-
	AS3559	Oat, hay and/or straw	6 (dw)	-	Straw: 0.67 Hay: 1.2 (ar)	straw: 1.9 hay: 4.1 (ar)
	AS0647	Oat straw and fodder, dry	W	2	-	-
	AS0650	Rye, forage	-	-	0.24 (ar)	1.3 (ar)
	AS3560	Rye, hay and/or straw	6 (dw)		Straw: 0.67 Hay: 1.2 (ar)	straw: 1.9 hay: 4.1 (ar)
	AS0650	Rye straw and fodder, dry	W	23	-	-
	AS0651	Sorghum, forage (green)	-	-	0.43 (ar)	3.2 (ar)
	AS3561	Sorghum, stover	3 (dw)	-	0.45 (ar)	1.5 (ar)
	AS0653	Triticale, forage			0.24 (ar)	1.3 (ar)
	AS0653	Triticale, hay and/or straw	6 (dw)	-	Straw: 0.67 Hay: 1.2 (ar)	straw: 1.9 hay: 4.1 (ar)
	AS0653	Triticale straw and fodder, dry	W	23	-	-
	AS3552	Wheat, forage	-	-	0.24 (ar)	1.3 (ar)
	AS0654	Wheat, hay and/or straw	6 (dw)	-	Straw: 0.67 Hay: 1.2 (ar)	straw: 1.9 hay: 4.1 (ar)
	AS0654	Wheat straw and fodder, dry	W	23	-	-

dw: dry weight basis, ar: as received.
Definition of the residue for compliance with MRL and for estimation of dietary risk assessment for plant commodities: *fluopyram.*

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
Definition of the residue for compliance with the MRL for animal commodities: *sum of fluopyram and 2-(trifluoromethyl)benzamide, expressed as fluopyram.* Definition of the residue for dietary risk assessment for animal commodities: *sum of fluopyram, 2-(trifluoromethyl)benzamide and the combined residues of N-(E)-2-[3-chloro-5-(trifluoromethyl)pyridine-2-yl]ethenyl)-2-trifluoromethyl)benzamide and N-(Z)-2-[3-chloro-5-(trifluoromethyl)pyridine-2-yl]ethenyl)-2-trifluoromethyl)benzamide, all expressed as fluopyram.* The residue is not fat-soluble.						
Imazapyr (267)	GC 0649	Rice	0.06	-	0.01	-
	CM 1206	Rice bran, unprocessed	0.2	-	0.015	-
	AS 0649	Rice, hay and/or straw	0.015	-	-	-
	CM 0649	Rice, husked	0.07	-	0.01	-
	CM 1205	Rice, polished	0.05	-	0.01	-
	GC 0654	Wheat	0.6	0.05 *	0.079	-
	CM 0654	Wheat bran, unprocessed	1	-	0.116	-
	CF 1210	Wheat germ	1	-	0.11	-
	AS 0654	Wheat straw and fodder, dry	W	0.05 *	-	-
	AS 0654	Wheat, hay and/or straw	1 (dw)	-	-	-
	Dietary exposure					
		Wheat gluten	-	-	0.032	-
		Wheat starch	-	-	0.004	-
	CF 1212	Wheat whole meal (flour)	-	-	0.078	-
		Wheat whole meal bread	-	-	0.062	-
	CF 1211	Wheat, flour	-	-	0.050	-
	Animal dietary					
					Median residue mg/kg	**Highest residue mg/kg**
		Rice straw	-	-	0.01 (ar)	0.013 (ar)
	CF 3522	Wheat gluten meal	-	-	0.035	-
		Wheat hay	-	-	0.32 (dw)	0.532 (dw)
	CF 3514	Wheat middlings	-	-	0.057	-
	CF 3514 and 3515	Wheat milled byproducts	-	-	0.078	-
	CF 3515	Wheat shorts	-	-	0.063	-
		Wheat straw	-	-	0.005 (dw)	0.012 (dw)
(ar), as received. Definition of the residue for compliance with the MRL and for dietary risk assessment for plant and animal commodities: *Imazapyr*. The residue is not fat-soluble.						
Iprodione (111) ADI: 0–0.06 mg/kg bw ARfD: 0.6 mg/kg bw	TN 0660	Almond	0.3	0.2	0.17	0.0395
	AM 0660	Almond hulls	50 (dw)	2	n.a.	14.85 (ar)
	FP 0226	Apple (in 1994 10 Po was withdrawn)	-	-	-	-
	GC 0640	Barley	W	2	-	-
	AL 0061	Bean, hay and/or straw *(Phaseolus* spp)	20 (dw)	100	highest: 7.72 (ar)	median: 3.7 (ar)
	VD 0071	Beans (*Phaseolus* spp) - dry	W	0.1	-	-
	VP 0061	Beans with pods (*Phaseolus* spp) - immature pods and succulent seeds	1.5	-	0.81	0.31

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
	FB 0264	Blackberries	W	30	-	-
	VB 0400	Broccoli [a]	40	25	24	9.4
	FB 2005	Cane berries, subgroup of	50	-	22.6	13.5
	VR 0577	Carrot	W	10 (Po)	-	-
	FS 0013	Cherries, subgroup of	0.3	10	0.14	0.042
	VP 2845	Common bean (pods and/or immature seeds)	W	2	-	-
	VC 0424	Cucumber	W	2	-	-
	FB 0269	Grapes	W	10	-	-
	FI 0341	Kiwifruit	W	5	-	-
	VL 0482	Lettuce, head	W	10	-	-
	VL 0483	Lettuce, leaf	W	25	-	-
	VA 0385	Onion, bulb	0.15	0.2	0.11	0.05
	FS 2001	Peaches (including Nectarines and Apricots), Subgroup of	0.05*	-	0.05	0.05
	FS 0247	Peaches	W	10	-	-
	FP 0009	Pome fruits (group)	W	5 (Po)	-	-
	VR 0589	Potato	0.05*	-	0.05	0.05
	VR 0589	Potato culls	0.15	-	n.a.	0.10
	DV 0589	Potato flakes/granules	0.05*	-	-	0.0145
	SO 0495	Rape seed	W	0.5	-	-
	FB 0272	Raspberries, red, black	W	30	-	-
	GM 0649	Rice, husked	W	10	-	-
	HS 0193	Spices, roots and rhizomes	W	0.1	-	-
	HS 0190	Spices, seeds	W	0.05 (*)	-	-
	FB 0275	Strawberry	W	10	-	-
	VR 0596	Sugar beet	W	0.1 (*)	-	-
	SO 2091	Sunflower seed	W	0.5	-	-
	VO 0448	Tomato	W	5	-	-
	VL 2832	Witloof chicory (sprouts)	W	1	-	-
		Potato chips	-	-	n.a.	0.023
	Residue level for feed					
	AL 1030	Bean, forage (*Phaseolus* spp)	n.a.	-	12.2 (ar)	7.4 (ar)
	VR 0589	Potato culls	0.15	-	n.a.	0.10
(ar) – as received; (dw) – dry weight; n.a. = not applicable [a] On the basis of the information provided to the JMPR it was concluded that the estimated acute dietary exposure to residues of iprodione for the consumption of broccoli may present a public health concern. Definition of the residue for compliance with the MRL and for dietary risk assessment for plant commodities: *iprodione*. Definition of the residue for compliance with the MRL for animal commodities: *not concluded.* Definition of the residue for dietary risk assessment for animal commodities: *iprodione + 3-(3,5-dichlorophenyl)-2,4-dioxoimidazolidine-1-carboxamide (RP302490) + N-(3,5-dichloro-4-hydroxyphenyl)-2-carbamoylacetamide (RP36114).*						
Isocycloseram (334) ADI: 0–0.02 mg/kg bw ARfD: 0.5 mg/kg bw general population 0.08 mg/kg bw females of child-	AB 1230	Apple pomace, wet	1	-	0.25	-
	VB 0400	Broccoli	0.7	-	0.211	0.46
	VB 0402	Brussels sprouts	2	-	0.072	0.81
	VB 0041	Cabbages, head	4	-	0.0385	1.2
	VB 0404	Cauliflower	0.5	-	0.051	0.32
	OR 0001	Citrus Oil	80	-	13	-
	SB 0716	Coffee bean	0.04	-	0.01	-
	SO 0691	Cotton seed	0.5	-	0.11	-
	VC 0424	Cucumber	0.1	-	0.024	0.063
	MO 0105	Edible offal	0.3	-	0.013	0.16

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
bearing age		(Mammalian)				
	VO 0440	Eggplant	0.3	-	0.07	0.18
	FP 0009	Group of pome fruits	0.4	-	0.105	0.27
	GC 0645	Maize	0.01(*)	-	0.01	-
	AL 3558	Maize, stover	1.5	-	0.46	1
	MF 0100	Mammalian fats (except milk fats)	0.4	-	0.024	0.37
	MM 0095	Meat (from mammals other than marine mammals)	0.02	-	Muscle (0.0022) Fat (0.024)	Muscle (0.011) Fat (0.362)
	VC 0046	Melons, except watermelon	0.15	-	0.024	0.078
	ML 0106	Milks	0.05	-	0.0021	0.043
	VA 0385	Onion, bulb	0.01(*)	-	0.01	0.01
	AB 0004	Oranges, dried pulp	3	-	0.41	
	VO 0444	Peppers, chili	0.6	-	0.15	0.4
	(HS 0444)	Peppers, chili, dried	4.2	-	1.1	2.8
	VO 0445	Peppers, sweet	0.3	-	0.0935	0.18
	VR 0589	Potato	0.01(*)	-	0	0
	DF 0014	Prune, dried	1.5	-	0.22	-
	VD 0541	Soya bean (dry)	0.15	-	0.0225	-
	AL 3533	Soya bean hulls	1	-	0.14	-
	AL 0541	Soya bean, hay and/or straw	20	-	5.3	14
	VC 0431	Squash, summer	0.09	-	0.012	0.063
	FS 0013	Subgroup of cherries	1	-	0.344	0.62
	FC 0002	Subgroup of lemons and limes (including citron)	0.5	-	0.052	0.25
	FC0003	Subgroup of Mandarins (including mandarin-like hybrids)	0.4	-	0.088	0.25
	FC 0004	Subgroup of oranges, sweet, sour (including orange-like hybrids)	0.4	-	0.064	0.22
	FS 2001	Subgroup of peaches (including nectarine and apricots)	0.3	-	0.0985	0.23
	FS 0014	Subgroup of plums (including fresh Prunes)	0.4	-	0.071	0.32
	FC 0005	Subgroup of pummelo and grapefruits (including shaddock-like hybrids, among others grapefruit)	0.3	-	0.0645	0.15
	VO 0448	Tomato	0.5	-	0.1	0.43
	DV 0448	Tomato, dried	2	-	0.32	1.4
	DM 3525	Tomato, pomace	8	-	1.6	-

Definition of the residue for compliance with the MRL for plant commodities and for dietary risk assessment for plant commodities: *isocycloseram*.
Definition of the residue for compliance with the MRL for animal commodities: *isocycloseram*.
Definition of the residue for dietary risk assessment for animal commodities: the sum of *isocycloseram and metabolites* N-[2-amino-1-(hydroxymethyl)-2-oxo-ethyl]-4-[5-(3,5-dichloro-4-fluoro-phenyl)-5-(trifluoromethyl)-4H-isoxazol-3-yl]-2-methyl-benzamide and 4-[5-(3,5-dichloro-4-fluoro-phenyl)-5-(trifluoromethyl)-4*H*-isoxazol-3-yl]-2-methyl-*N*-(3-oxoisoxazolidin-4-yl)benzamide (expressed as isocycloseram).

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
The residue is fat-soluble.						
Isoflucypram (330) ADI: 0–0.06 mg/kg bw ARfD: Unnecessary	GC 0640	Barley	0.1	-	0.020	
	GC 0653	Triticale	0.05	-	0.020	
	GC 0654	Wheat	0.05	-	0.020	
	AS 0640	Barley, hay and/or straw	5	-	Median: 0.70 (dw)	
	AS 0653	Triticale, hay and/or straw	5	-	Median: 1.1 (dw)	
	AS 0654	Wheat, hay and/or straw	5	-	Median: 1.1 (dw)	
	ML 0106	Milks	0.005*	-	0.012	
	FM 0183	Milk fats	0.005*	-	-	
	MM 0095	Meat (from mammals other than marine mammals)	0.01*	-	Muscle: 0.034 Fat: 0.034	
	MF 0100	Mammalian fats (except milk fats)	0.01*	-	0.034	
	MO 0105	Edible offal (mammalian)	0.01*	-	0.034	
	PE 0112	Eggs	0.01*	-	0.012	
	PM 0110	Poultry meat	0.01*	-	Muscle: 0.012 Fat: 0.0012	
	PF 0111	Poultry fats	0.01*	-	0.012	
	PO 0111	Poultry, edible offal of	0.01*	-	0.012	
	-	Barley brewer's grain	-	-	Median: 0.028	
	-	Barley beer	-	-	0.0076	
	-	Pearl barley	-	-	0.0076	
	CF 3511	Barley flour	0.02	-	0.035	
	CM 3510	Barley bran, unprocessed	0.05	-	Median: 0.064	
	CF 1210	Wheat germ	0.015	-	-	
	-	Wheat bran, unprocessed	0.015	-	-	

Isoflucypram residues in livestock feeds

CCN	Commodity	Median/ Median-P (mg/kg)	Highest (mg/kg)
GC 0640	Barley	0.010	-
GC 0653	Triticale	0.010	-
GC 0654	Wheat	0.010	-
AS 0640	Barley, hay and/or straw	0.28	1.1
AS 0653	Triticale, hay and/or straw	0.55	3.6
AS 0654	Wheat, hay and/or straw	0.55	3.6
-	Barley brewer's grain	0.017	-
CM 3510	Barley bran, unprocessed	0.043	-
-	Wheat aspirated grain fractions	1.5	-
CF 1210	Wheat germ	0.011	-
-	Wheat gluten	0.0094	-

Sum of isoflucypram and isoflucypram-desmethyl-propanol (free and conjugated) residues, expressed as isoflucypram, in feeds.

CCN	Commodity	Median (mg/kg)	
GC 0640	Barley	0.022	
GC 0653	Triticale	0.020	
GC 0654	Wheat	0.020	
AS 0640	Barley, hay and/or straw	0.38	
AS 0653	Triticale, hay and/or straw	0.57	
AS 0654	Wheat, hay and/or straw	0.57	
-	Barley bran, unprocessed	0.079	
-	Barley brewer's grain	0.037	

	Isoflucypram-desmethyl-propanol (free and conjugated), expressed as isoflucypram, in foods.			
	CCN	**Commodity**	**Median (mg/kg)**	
	GC 0640	Barley	0.012	
	GC 0653	Triticale	0.010	
	GC 0654	Wheat	0.010	
	ML 0106	Milks	0.0013	
	MM 0095	Meat (from mammals other than marine mammals)	0.0035	
	MF 0100	Mammalian fats (except milk fats)	0.0035	
	MO 0105	Edible offal (mammalian)	0.0035	
	PE 0112	Eggs	0.0015	
	PM 0110	Poultry meat	0.0015	
	PF 0111	Poultry fats	0.0015	
	PO 0111	Poultry, edible offal of	0.0015	
	-	Barley beer	0.0072	
	-	Pearl barley	0.0042	
	-	Barley flour	0.025	
	Metabolites of containing the isoflucypram-desfluoro-N-methyl-cyclopropyl-pyrazole-carboxamide-mercapto structure, expressed as isoflucypram, in rotational crops.			
	CCN	**Commodity**	**Median (mg/kg)**	
	VL 2052	Subgroup of Leaves of Root and Tuber Vegetables	0.010	
	VL 2050	Subgroup of leafy greens	0.015	
	VL 0054	Subgroup of leaves of Brassicaceae, raw	0.015	
Definition of the residue for compliance with the MRL for plant and animal commodities: *Isoflucypram.* Definition of the residue for dietary risk assessment for plant commodities: *Sum of isoflucypram and isoflucypram-propanol (free and conjugated), expressed as isoflucypram.* Definition of the residue for dietary risk assessment for animal commodities: *Sum of isoflucypram, isoflucypram-propanol (free and conjugated), isoflucypram-carboxylic acid, isoflucypram-desmethyl-carboxylic acid, and isoflucypram-2-propanol (free and conjugated), expressed as isoflucypram.* The residue is fat-soluble.				

Compound	**CCN**	**Commodity**	**Recommended Maximum residue level (mg/kg)**		**STMR or STMR-P mg/kg**	**HR or HR-P mg/kg**
			New	**Previous**		
Isotianil (335) ADI: 0–0.05 mg/kg bw ARfD: Unnecessary	FI0327	Banana	0.01 (*)	-	0	-
	FC0002	Subgroup of lemons and limes (including citron)	0.5	-	0.012	-
	FC0003	Subgroup of Mandarins (including mandarin-like hybrids)	0.4	-	0.012	-
	FC0004	Subgroup of oranges, sweet, sour (including orange-like hybrids)	0.4	-	0.012	-
	FC0005	Subgroup of Pummelo and grapefruits (including shaddock-like hybrids, among other grapefruit)	0.2	-	0.00715	-
	PO0111	Poultry, Edible offal	0.02 (*)	-	0	-

		of				
	PF0111	Poultry fats	0.02 (*)	-	0	-
	PM 0110	Poultry meat	0.02 (*)	-	0	-
	MO 0105	Edible offal (Mammalian)	0.02 (*)	-	0	-
	MF 0100	Mammalian fats (except milk fats)	0.02 (*)	-	0	-
	MM 0095	Meat (from mammals other than marine mammals)	0.02 (*)	-	0	-
	ML 0106	Milks	0.02 (*)	-	0	-
	OR 0001	Citrus oil, edible	40	-	7.86	-
		Orange juice		-	0.0204	-
		Orange oil		-	7.86	-
		Orange peel processed		-	0.216	-
		Marmalade		-	0.0204	-

	Residue values used for estimation of livestock dietary burdens (isotianil+DCIT-acid)			
			Total residue	
	CCN	**Commodity**	**Median or median-P (mg/kg)**	**Highest or highest-P mg/kg**
	AB0001	Citrus pulp, dried	0.1158	

Compound	**CCN**	**Commodity**	**Recommended Maximum residue level (mg/kg)**		**STMR or STMR-P mg/kg**	**HR or HR-P mg/kg**
			New	**Previous**		
Mepiquat-chloride (336) ADI: 0–0.3 mg/kg bw ARfD: 0.6 mg/kg bw	SO0691	Cotton seed	4	-	1.3	-
	OC0691	Cotton seed oil, crude	-	-	0.056	-
	OR0691	Cotton seed oil, edible	-	-	0.052	-
	MO0105	Edible offal (mammalian)	0.04	-	Liver: 0.047 Kidney: 0.027	Liver: 0.059 Kidney: 0.036
	PE0112	Eggs	0.008(*)	-	0	0
	FB0269	Grapes	4	-	0.705	2.6
	DF0269	Grape, dried (=currants, raisins and sultanas)	20	-	2.7	10
	JF0269	Grape juice		-	0.78	-
	MF0100	Mammalian fat (except milk fats)	0.01	-	0.0092	0.0092
	MM0095	Meat (from mammals other than marine mammals)	0.01	-	Muscle: 0.0092 Fat: 0.0092	Muscle: 0.0092 Fat: 0.0092
	ML0106	Milk	0.008(*)	-	0.018	-
	PO0111	Poultry, edible offal of	0.008(*)	-	0	0
	PF0111	Poultry fats	0.008(*)	-	0	0
	PM0110	Poultry meat	0.008(*)	-	0	0
			-	-		-
		(animal feed commodities)	-	-	Median	-
		Cotton delinted seed	1.6	-		-
	AM3588	Cotton seed hulls		-	0.36	-
	AM3589	Cotton seed meal	8	-	2.5	-
	AB0269	Grape pomace, dried	15	-	1.8	-
		Grape pomace, wet		-	0.78	-
All residue estimates above are expressed as mepiquat cation. Definition of the residue for compliance with the MRL for plant and animal commodities: *mepiquat cation*						

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
Definition of the residue for dietary exposure assessment for plant commodities: *mepiquat cation* Definition of the residue for dietary exposure assessment for animal commodities: *mepiquat cation and 4-hydroxy-1,1-dimethylpiperidinium cation (4-hydroxymepiquat cation, free and conjugated), expressed as mepiquat cation.* The residue is not fat-soluble.						
Oxathiapiprolin (291)	AM0660	Almond hulls	0.05	-	0.02	-
	FI0326	Avocado	0.09	-	0.0575	-
	TN0085	Group of tree nuts	0.01 (*)	-	0.01	0.01
	MU1100	Hops, dried	5	-	1.55	
	FB2006	Subgroup of bush berries	0.5	-	0.056	-
(as) – as received; (dw) – dry weight Definition of the residue for compliance with the MRL: *oxathiapiprolin.* Definition of the residue for dietary risk assessment for plant and animal commodities: *Sum of oxathiapiprolin, 5-(trifluoromethyl)-1H-pyrazole-3-carboxylic acid and 1-ß-D-glucopyranosyl-3-(-(trifluoromethyl)- H-pyrazole-5-carboxylic acid, expressed as parent equivalents*. The residue is not fat-soluble.						
Permethrin (120)	-	-	-	-	-	-
Definition of the residue for plant and animal commodities (for compliance with the MRL): Permethrin (sum of *cis* and *trans* isomers). Definition of the residue for plants and animals for dietary risk assessment: The Meeting was unable to conclude on a residue definition for risk assessment. No MRLs are recommended, nor are levels estimated for use in long-term and acute dietary exposure assessments as the Meeting could not reach a conclusion on the residue definition for risk assessment for plants and animals, and due to late submission of the relevant key data.						
Piperonyl butoxide (062)	-	-	-	-	-	-
Due to insufficient trials or limited data obtained from supervised trials, the Meeting did not make any recommendations for establishing MRLs and for IEDI assessments. The definition of the residue for compliance with MRLs and for dietary risk assessment for plant and animal commodities: *piperonyl butoxide*. The residue is fat-soluble.						
Prochloraz (142) ADI: 0–0.02 mg/kg bw ARfD: 0.2 mg/kg bw	-	-	-	-	-	-
The Meeting did not finalize the review for residues and will continue the periodic review in 2024.						
Propiconazole (160)	FI 0326	Avocado	0.02	-	0.085	0.12
	MO 0105	Edible offal (mammalian)	0.2	0.5	2.4	4.5 (liver) 5.0 (kidney)
	PE 0112	Eggs			0.08	0.10
	MF 0100	Mammalian fats (except milk fats)	0.05	0.01 (*)	0.11	0.23
	MM 0095	Meat (from mammals other than marine mammals)	-	-	0.07 (muscle) 0.11 (fat)	0.12 (muscle) 0.24 (fat)
	ML 0106	Milks	-	-	0.03	
	SO 0697	Peanut	0.03	-	0.03	0.05
	AL 0697	Peanut, hay and/or straw	50 (dw)	-	36.5 (as received)	91 (as received)
	PF 0111	Poultry fats	0.01 (*)	-	0.05	0.05
	PM 0110	Poultry meat		-	0.05	0.05
	PO 0111	Poultry, edible offal of	0.01 (*)	-	0.11	0.12
	CM 1206	Rice bran, processed	80	-	48	-
	GC 0649	Rice grain	30[a]	-	16.5	-
	CM 1207	Rice, hulls	80	-	67	-

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
	CM 0649	Rice, husked	4	-		-
	CM 1205	Rice, polished	10	-	1.95	-
	Input for dietary burden calculations for maximum residue level estimation using parent propiconazole residues					
	CCN	**Commodity**	**Recommended residue level(mg/kg)**			
			Median		**Highest**	
		Peanut meal	0.005 (0.01 x 0.5)			
	AL 0697	Peanut, hay and/or straw	9.515 (as received)		30 (as received)	
	CM 1206	Rice bran, unprocessed	18 (7.7 × 2.39)		-	
	GC 0649	Rice grain	7.7		-	
	CM 1207	Rice hulls	19 (7.7 × 2.5)		-	
	Definition of the residue for compliance with the MRL for plant and animal commodities: *propiconazole.* Definition of the residue for dietary risk assessment for plant and animal commodities: *propiconazole plus all metabolites convertible to 2,4-dichlorobenzoic acid, expressed as propiconazole.* The residue is fat-soluble.					
Pyrethrins (063)	-	-	-	-	-	-
On the basis of the data obtained from supervised trials, the Meeting did not make any recommendations for establishing MRLs and for IEDI assessments. This was due to the fact that no trial matched the GAP and / or insufficient data. The definition of the residue for compliance with MRLs and for dietary risk assessment for plant and animal commodities: *total pyrethrins, calculated as the sum of pyrethrins 1 and 2, cinerins 1 and 2, and jasmolins 1 and 2, determined after calibration with World Standard pyrethrum extract*. The residue is fat-soluble						
Tetraniliprole (324)	-	-	-	-	-	-
The critical GAP for mandarins and lemons is the same (citrus fruit). As such the residues from both crops can be assessed against the critical GAP in the USA for citrus fruit of three foliar applications at 60 g ai/ha, with a retreatment interval of 5 days and a PHI of 1 day. • Residues of tetraniliprole in mandarins both for maximum residue estimation and risk assessment in ranked order were (n=4): 0.17, 0.18, 0.19 and 0.54 mg/kg in whole fruit. • Residues of tetraniliprole in lemons both for maximum residue estimation and risk assessment in ranked order were (n=5): 0.062, 0.13, 0.19, 0.20 and 0.77 mg/kg in whole fruit. The combined dataset for residues in mandarins and lemons both for MRL and risk assessment in ranked order were (n=9): 0.062, 0.13, 0.17, 0.18, 0.19, 0.19, 0.20, 0.54 and 0.77 mg/kg in whole fruit. Mandarins are a major crop and as such at least 6 trials should be available. Considering the request of the EU, noting that the median residues for mandarins and lemons are similar and the data sets are of a similar population (Mann-Whitney) the 2023 Meeting agreed to combine the datasets. The 2023 Meeting estimated a maximum residue level of 1.5 mg/kg, and an STMR of 0.19 mg/kg for Subgroup of Mandarins (including mandarin-like hybrids), based on the combined dataset of mandarins and lemons. Thereby replacing its previous recommendation (JMPR 2022) of a maximum residue level of 1.0 mg/kg and an STMR of 0.185 mg/kg for tetraniliprole in the Subgroup of Mandarins (including mandarin-like hybrids).						
Thiamethoxam (245)	AM 0660	Almond hulls	2 (dw)	-	0.32 (as)	-
	VS 0624	Celery	W	1	-	-
	HS 0780	Cumin seed	1	-	0.26	-
	VO 0050	Fruiting vegetables other than cucurbits	W	0.7	-	-
	VO 0050	Fruiting vegetables other than cucurbits except goji berry	0.7	-	0.08	0.47
	VO 2704	Goji berry	1.5	-	0.21	0.65
	DV 2704	Goji berry, dried	5	-	0.225	1.7
	TN 0085	Group of tree nuts	0.01*	-	0.01	0.01
	VA 0385	Onion, bulb	0.02	-	0.01	0.014
	TN 0672	Pecan	W	0.01*	-	-
	VS 2080	Subgroup of stems and petioles	0.8	-	0.215	0.4

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)			STMR or STMR-P mg/kg		HR or HR-P mg/kg	
			New	Previous					
(as) – as received; (dw) – dry weight Definition of the residue for compliance with the MRL and dietary risk assessment for plant commodities: *thiamethoxam.* Definition of the residue for compliance with the MRL and dietary risk assessment for animal commodities (except poultry): *thiamethoxam and clothianidin* (considered separately). Definition of the residue for dietary risk assessment for poultry: *sum of thiamethoxam, CGA 265307, and MU3, expressed as thiamethoxam and clothianidin* (clothianidin considered separately). The residue is not fat-soluble.									
Thiophanate-methyl (077) ADI: 0–0.09 mg/kg bw ARfD: 1 mg/kg bw	TN 0660	Almond	0.15*	0.1		TM	0.05	TM	0.05
						MBC	0.05	MBC	0.05
	FS 0240	Apricot	W	2	B	-	-	-	-
	VS 0621	Asparagus	W	0.2	C	-	-	-	-
	FI 0327	Banana	W	0.2	B	-	-	-	-
	GC 0640	Barley	W	0.5	C	-	-	-	-
	AS 0640	Barley, hay and/or straw	W	2	C	-	-	-	-
	VD 0071	Beans (dry)	W	0.5	Th	-	-	-	-
	FB 0018	Berries and other small fruits, except grapes	W	1	B, Th	-	-	-	-
	VB 0402	Brussels sprouts	W	0.5	B	-	-	-	-
	VR 0577	Carrot	W	0.2	B	-	-	-	-
	MM 0812	Cattle meat	W	0.05*	B	-	-	-	-
	FS 0013	Cherries (subgroup)	W	10	T	-	-	-	-
	PF 0840	Chicken fat	W	0.05	B	-	-	-	-
	SB 0716	Coffee beans	W	0.1	C	-	-	-	-
	VP 0526	Common bean (pods and/or immature seeds)	W	0.5	T	-	-	-	-
	VC 0424	Cucumber	W	0.05*	B, C	-	-	-	-
	MO 0105	Edible offal (mammalian)	W	0.05*	B	-	-	-	-
	PE 0112	Eggs	W	0.05*	B	-	-	-	-
	VP 0529	Garden pea, shelled (succulent seeds)	W	0.02	T	-	-	-	-
	VC 0425	Gherkin	W	0.05*	B, C	-	-	-	-
	FB 0269	Grapes	W	3	B, T	-	-	-	-
	VL 0482	Lettuce, head	W	5	T	-	-	-	-
	FI 0345	Mango	W	5	C	-	-	-	-
	ML 0106	Milks	W	0.05*	B	-	-	-	-
	FS 0245	Nectarine	W	2	B	-	-	-	-
	FC 0004	Oranges, sweet, sour (including orange-like hybrids) (subgroup)	W	1	B	-	-	-	-
	FS 0247	Peach	W	2	B	-	-	-	-
	SO 0697	Peanut	W	0.1*	T	-	-	-	-
	AL 0697	Peanut fodder	W	3	T	-	-	-	-
	VO 0444	Peppers chili	W	2	T	-	-	-	-
	HS 0444	Peppers chili, dried	W	20	C	-	-	-	-
	FI 0353	Pineapple	W	5	B	-	-	-	-
	FS 0014	Plums (including fresh prunes) (subgroup)	W	0.5	B	-	-	-	-

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)			STMR or STMR-P mg/kg		HR or HR-P mg/kg	
			New	Previous					
	FP 0009	Pome fruits (group)	W	3	B, C, T	-	-	-	-
	PM 0110	Poultry meat	W	0.05 *	B	-	-	-	-
	SO 0495	Rape seed	W	0.05 *	C	-	-	-	-
	AS 0469	Rice, hay and/or straw	W	15	C	-	-	-	-
	CM 0649	Rice, husked	W	2*	B	-	-	-	-
	GC 0650	Rye	W	0.1	C, T	-	-	-	-
	VD 0541	Soya bean (dry)	W	0.5	T	-	-	-	-
	AL 0541	Soya bean, hay and/or straw	W	0.1	C	-	-	-	-
	HS 0191	Spices, fruits and berries	W	0.1		-	-	-	-
	HS 0193	Spices, roots and rhizomes	W	0.1		-	-	-	-
	HS 0190	Spices, seeds	W	5		-	-	-	-
	VC 0431	Squash, summer	W	0.5	T	-	-	-	-
	VR 0596	Sugar beet	W	0.1*	T	-	-	-	-
	VO 0448	Tomato	W	0.5	B, C	-	-	-	-
	TN 0085	Tree nuts (group)	W	0.1*	B	-	-	-	-
	GC 0654	Wheat	W	0.05 *	B, T	-	-	-	-
	AS 0654	Wheat, hay and/or straw	W	1	Risk a	-	-	-	-
Note: Previous MRL was the sum of benomyl, carbendazim, and thiophanate-methyl, expressed as carbendazim. Letters in upper case indicate the source(s) of the data on which the MRL is based. (B: benomyl; C: carbendazim; T: thiophanate-methyl). Definition of the residue for compliance with the MRL for plant commodities: *the sum of thiophanate-methyl and carbendazim, expressed as thiophanate-methyl.* Definition of the residue for compliance with the MRL for animal commodities: *the sum of thiophanate-methyl, carbendazim, and sodium 2-(methoxycarbonylamino)-1H-benzimidazol-5-yl (5-OH-MBC) (free and conjugated), expressed as thiophanate-methyl.* Definition of the residue for dietary risk assessment for plant and animal commodities: *thiophanate-methyl.* Carbendazim and 5-OH-MBC (free and conjugated) need to be assessed, separately, against the TTC Cramer Class III threshold. The threshold applies to both chronic and acute exposure estimates. The residue is not fat-soluble.									
Tricyclazole (337) ADI: 0–0.05 mg/kg bw ARfD: 0.05 mg/kg bw	MO 0105	Edible offal (mammalian)	0.1	-		Liver 0.016 (Kidney 0.008)		Liver 0.18 (Kidney 0.025)	
	PE 0112	Eggs	0.01 (*)	-		0		0	
	CM 0649	Husked rice	0.3	-		0.01		-	
	MF 0100	Mammalian fats (except milk fats)	0.01 (*)	-		0		0	
	MM 0095	Meat (from mammals other than marine mammals)	0.01 (*)	-		0		0	
	ML 0106	Milks	0.01 (*)	-		0		-	
	CM 1205	Polished rice	0.3	-		0.01		-	
	PF 0111	Poultry fats	0.01 (*)	-		0		0	
	PM 0110	Poultry meat	0.01 (*)	-		0		0	
	PO 0111	Poultry, edible offal of	0.01 (*)	-		0.009		0.010	
	GC 0649	Rice	5	-		0.735		-	
	AS 0649	Rice, hay and/or straw	5 (dw)	-		0.01 (median, ar)		3.47 (highest, ar)	
	AS 3570	Rice, hulls	15 (dw)	-		0.02 (median,		-	

Compound	CCN	Commodity	Recommended Maximum residue level (mg/kg)		STMR or STMR-P mg/kg	HR or HR-P mg/kg
			New	Previous		
					ar)	
	For calculating animal dietary burden and dietary risk assessment					
	CM 1206	Rice bran, unprocessed	-	-	0.058 ar	-
		Rice germ	-	-	0.058 ar	-
ar, as received. Definition of the residue for compliance with the MRL for plant and animal commodities: *Tricyclazole.* Definition of the residue for risk assessment for plant and animal commodities: *Sum of tricyclazole and 1,3,4-triazolo[3,4-b][1,3]benzo-thiazol-5-methanol, expressed as tricyclazole.* The residue is not fat-soluble.						
Zeta-cypermethrin (118) ADI: ARfD:	FI0326	Avocado	0.5	-	0.14	0.28
	VA2031	Subgroup of bulb onions	0.05*	0.01*	0	0
	FB2006	Subgroup of bush berries	1.5	-	0.40	0.53
Definition of the residue for both compliance with MRL and estimation of dietary intake for plant and animal commodities: *cypermethrins (sum of alpha and zeta).* The residue is fat-soluble.						

2. General consideration

2.1 Developments in dietary exposure methodology for pesticide residues in foods

Principles of dietary exposure assessment

As outlined in the Codex Alimentarius Commission Procedural manual (FAO/WHO, 2023):

> *"Risk assessments should be based on realistic exposure scenarios, with consideration of different situations being defined by risk assessment policy. They should include consideration of susceptible and high-risk population groups."*

This is reiterated in updated Chapter 6 of Environmental Health Criteria 240 (EHC 240: Section 6.1.2; WHO/FAO, 2020).

> *"Dietary exposure assessments should cover the general population as well as specific population subgroups that have been identified as relevant from toxicological profiling (e.g. infants, children, pregnant women, older adults)".*

Individuals likely to have dietary exposures at the top end of the distribution of exposure due to factors such as their dietary habits (for example, high consumers) or age, are always a subpopulation of interest, and (in the bullet point that follows the above):

> *"Information on high-percentile dietary exposures may be expected to cover all groups that may not have typical food consumption patterns (e.g. people with diabetes or people with specific diets, such as vegans or vegetarians)."*

Additionally, the Codex Committee on Pesticide Residues (CCPR, 2015) endorsed a recommendation in 2015 :

> *The JMPR Secretariat also referred to future developments to improve the characterization of chronic risks expected to occur for exposure during less than life-time. An upcoming meeting organized jointly by JECFA and JMPR Secretariats would be convened. The Committee supported this initiative and the development of an approach for appropriate scenarios.*

and again in 2023 (CCPR, 2023):

> *"Ask JECFA and JMPR to continue working towards harmonizing their risk assessment methodologies, including ways to establish single, harmonized acceptable daily intake values and MRLs for dual-use compounds."*

Background

The JMPR currently estimates chronic dietary exposure to pesticide residues in foods by the international estimate of dietary intake (IEDI) using the GEMS/Food cluster diets (Sy et al., 2013) to provide food consumption information, and supervised trials median residue values (STMR) for residues in food commodities. The GEMS/Food cluster diets are derived from national food balance sheet information, grouped into clusters of countries with similar food profiles (Sy et al., 2013). The GEMS/Food cluster diets express food available for consumption on a per capita basis (population mean) for a group of countries but do not provide any information on subpopulations, high consumers or variability between or within countries within a cluster.

Data sets containing individual food consumption information (individual dietary records) are the most appropriate for chronic dietary exposure assessment (EFSA/EMA, 2022; WHO/FAO, 2020). Such data sets allow consideration of population subgroups and provide information on the distribution of dietary exposures, including highly exposed subpopulations.

FAO and WHO have collated individual food consumption data from national dietary surveys to support chronic dietary exposure assessment and created the FAO/WHO chronic individual food consumption database – Summary statistics (CIFOCOss; see the following link for details: https://apps.who.int/foscollab/Download/DownloadConso). Currently, approximately 40 countries have shared their national data which are available for international risk assessment, including more than 200 population subgroups, disaggregated by age and/or sex. Surveys are required to include food consumption data from at least two non-consecutive survey days, with summary statistics reported for consumers-only and the total survey population.

The availability of the CIFOCOss resource coincided with a FAO/WHO Expert Meeting held in November 2011 on dietary exposure assessment methodologies for residues of veterinary drugs (WHO, 2012).

The above 2011 FAO/WHO Expert Meeting considered an existing validated approach as a possible candidate for using summary statistics of food consumption data to estimate high dietary exposure. This approach used the population mean food consumption for all except the two highest contributing foods, for which a high percentile (95th or 97.5th) of the consumer-only food consumption distribution was used (Pesticide Safety Directorate, 2004)

This FAO/WHO Expert Meeting considered that, in the longer term, an individual would be a high-level consumer (one from the high end of the distribution of normal food consumption amounts) of only one category of food, and that their consumption of other foods containing the residue would remain at the total population mean. The 2011 FAO/WHO Expert Meeting proposed a global estimate of chronic dietary exposure (GECDE) methodology. The GECDE approach is based on summary statistics of national food consumption data from CIFOCOss. The Expert Meeting proposed that for high-level consumption the 97.5th percentile food consumption values for consumers-only should be used, to be derived from surveys with individual records two or more days in duration averaged for each individual. The 97.5th percentile was proposed because it was most commonly reported in the data submitted. However, the experts recognized that the 90th or 95th percentile could also be considered to represent chronic (regular) high consumption. In any case, they considered it essential to document information on the number of consumers upon which any percentile is based to demonstrate that the estimate is sufficiently robust.

A FAO/WHO Expert Working Group, established following the 2016 JECFA and the 2014 JMPR Meetings (Arcella et al., 2019), further developed the GECDE approach, including:

- consideration of residues of dual-use compounds (used as both veterinary drugs and pesticides);
- consideration of the appropriateness of the GECDE for compounds with toxicological concerns over less-than-lifetime exposure time frames. Less-than-lifetime toxicological concerns may refer to a life stage (infancy, childhood, women during pregnancy) or high exposure for a period less than lifetime (for example, due to seasonal use of a pesticide or veterinary drug, or seasonal consumption of a food);
- substitution of the 97.5th percentile consumer food consumption for a single food by the highest reliable percentile (HRP) consumer food consumption. If there are more than 180 consumers of a commodity, a 97.5th percentile food consumption for consumers-only is used; if there are more than 60 but fewer than 181 consumers, a 95th percentile food consumption is used; if there are more than 30 but fewer than 61 consumers, a 90th percentile food consumption is used, and if there are more than 10 but fewer than 31 consumers, a median food consumption is used and in the report of the working group there is indication that if there are fewer than 11 consumers, only the mean food consumption for the whole population is used.

During the current JMPR Meeting, an evaluation was undertaken of the CIFOCOss dataset to determine how often the consumers-only 97.5th percentile consumption figure would be the HRP. It was determined that the 97.5th percentile would be relevant for 7% of foods, with the 95th percentile being relevant for 9% of foods, the 90th percentile for 8% of foods, the median (50th percentile) for 16% of foods and the mean would actually be selected for 60% of the foods.

Trialing GECDE at JMPR

Based on a general consideration developed at JMPR 2018 as part of a trial exercise, the GECDE model developed by JECFA (veterinary drugs) in 2011 (WHO, 2012) was used for estimating less-than-lifetime dietary exposure to pesticide residues for population subgroups of toxicological concern, as identified using the decision tree for toxicological profiling. Mean estimates of dietary exposure were derived using food consumption data from CIFOCOss (GECDE-mean) in addition to the original GECDE (GECDE-high).

Since 2019, JMPR reports have included a summary of the estimates of dietary exposure derived using the GECDE method in section 4 and sometimes in the dietary exposure section of individual compounds for which less-than-lifetime toxicity issues have been identified. In section 4, GECDE (mean and high) estimates are derived for each country-cohort combination for all (general population), all adults, female adults, children and adolescents, infants and toddlers.

Foods in CIFOCOss are described using the FoodEx 2 food classification hierarchy (up to level 7) that includes both individual food commodities and composite foods (that is, food containing multiple ingredients). A recipe tool has been developed by the Netherlands National Institute for Public Health and the Environment (RIVM, acting as a WHO collaborating centre) and this is currently being refined. This project applies standard recipes to composite foods to identify ingredients that may contain

residues of the pesticide of interest and develops appropriately weighted STMRs for composite foods. It has been incorporated into the GECDE calculations conducted by JMPR.

Comparison of dietary exposure estimates from the GECDE and IEDI

At JMPR 2022 the exposure group carried out comparisons of dietary exposure estimates derived from GECDE and IEDI. It was considered that the most appropriate GECDE metric for comparison was the mean dietary exposure estimate for adults, as this is the closest estimate to a population mean dietary exposure. In most cases the differences between the GECDE-mean estimate and the IEDI value were within a factor of two. Following the 2022 JMPR, some marked differences were noted between the results from IEDI and GECDE-mean assessments. To provide further context for differences between IEDI and GECDE-mean estimates, several instances were examined in more detail to determine the basis for the differences.

Limited analysis suggests that at least part of the difference observed between dietary exposure estimates based on IEDI and GECDE mean is due to the clustering process behind IEDI.

For chronic dietary exposure assessment, a high percentile estimate of dietary exposure has been shown to be between two- and five-fold higher than the mean estimate of dietary exposure (US FDA, 2006). The upper limits of the GECDE-mean and GECDE-high mostly conform to this expectation.

Advantages of the GECDE

The GECDE includes the ability to derive life-stage specific estimates of dietary exposure, to provide information on the variability in dietary exposure across countries and within countries. The IEDI does not incorporate these features.

The flexibility of being able to use the GECDE for subpopulation groups should ideally be combined with further development of the decision-making process based on toxicological profiling of compounds, to ensure that dietary exposure estimates are matched to the risk assessment requirements and are reported for the appropriate population subgroups where relevant.

The ability to use food consumption data from a large number of countries and population subgroups from the CIFOCOss database in the GECDE calculations can assist in identifying vulnerable groups for consideration during risk management.

Further improvements to the GECDE method

Further development of the GECDE method will include:

- improved consideration of complex foods, where a commodity (or commodities) of interest may be components of the complex food; work on the recipe tool to disaggregate complex foods into their component ingredients and to assign residue values to the ingredients is well advanced and will continue as required;
- identification of key foods driving exceedances of the ADI in a format to support decision-making by CCPR;
- provision of additional information about the estimates of dietary exposure to assist decision-making by CCPR (for example, information on the number/proportion of population groups or subgroups where an exceedance of the ADI has been calculated);
- incorporation of quality checks on the appropriateness of input and output high percentiles of food consumption amounts used in the GECDE method (for example, the ratio of consumer mean to consumer HRP may be calculated to examine whether the distribution of consumer intakes follows an expected pattern).

Discussion in JMPR 2023 about the implementation of GECDE

The Meeting recognized that the introduction of food consumption data reported by individuals at the national level provides relevant information such as consumed quantities, sex, gender and individual variabilities. This information is not available through food balance sheets that are intended to estimate the availability of food per capita within clusters of countries.

The Meeting agreed that the GECDE-mean reasonably reflects the mean estimated dietary exposure of the general population and the mean dietary exposure of specific population groups that may have a higher exposure than the general population.

Regarding the GECD-high, the Meeting raised concerns that the use of consumers-only high percentiles from two-day dietary survey data may unrealistically overestimate food consumption, and therefore dietary exposure and risk estimates. Specifically that consumers-only mean and high percentiles decline as the number of consumption days increases. It was further highlighted that this overestimation may be greater where the proportion of consumers is low.

Decisions of the JMPR

The Meeting agreed that JMPR should:

- transition from the use of the IEDI to the use of GECDE-mean;
- continue to investigate implementation and modification options for the GECDE-high for the assessment of dietary exposure to pesticide residues for chronic and shorter-than-lifetime assessments with the aim of a transition to adoption;
- further investigate the degree of conservatism in the GECDE (mean and high) and the IEDI;
- encourage and support the continued collection of surveys of individual dietary records of at least two non-consecutive days duration, and the future transition to the use of these resources as the basis for dietary exposure assessment by JMPR.

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2.2 Development of guidance on the assessment and interpretation of nonlinear toxicokinetics

Following the recommendation of JMPR 2022 an electronic working group (eWG) on the assessment and interpretation of nonlinear toxicokinetics commenced development of draft guidance on the assessment and interpretation of nonlinear toxicokinetics. The eWG held virtual meetings on several occasions throughout 2022. The scope of the guidance was discussed, and a first draft prepared. Feedback was sought from the current Meeting.
This guidance is structured around three overarching aims:

- to aid and facilitate the recognition of toxicologically relevant non-linearity in toxicology studies;
- to provide guidance on the appropriateness of dose selection in toxicology studies when nonlinear toxicokinetics is considered to occur;
- to provide guidance on when nonlinearity is, or is not, likely to be relevant to the determination of health-based guidance values, risk assessment and risk management.

While the guidance will incorporate a data interpretation procedure, the document explicitly refrains from providing specific recommendations on decision making when toxicologically relevant nonlinearity is present. Decision making should always follow a case-by-case assessment, based on sound scientific principles and weight of evidence, regardless of the presence of toxicokinetic linearity or otherwise.
The first draft of JMPR guidance for interpreting nonlinear toxicokinetics has been prepared.

The draft guidance covers:

- the biological basis for nonlinearity in toxicokinetics;
- in vivo data and approaches used to determine nonlinearity in the major toxicokinetic processes of absorption distribution, metabolism and excretion;
- in vitro data and approaches used to characterize nonlinearity in toxicokinetic processes;
- the implications of nonlinearity in relationship to dose–response relationships, determination of points of departure, interspecies extrapolation, intraspecies variability and health-based guidance values;
- the implications of nonlinearity when providing advice on potential risks to consumers;
- criteria for establishing nonlinearity in toxicokinetics and toxicokinetic processes;
- statistically-, graphically- and physiologically-based toxicokinetic and other modelling approaches;
- interpretation of data provided in support of the nonlinearity of toxicokinetics and toxicokinetic processes;
- suitability of dose selection and study designs submitted by sponsors, based on the supporting information provided on toxicokinetics.
- suggestions for the use of toxicokinetic data to better design studies;
- suggestions on study designs to facilitate the generation of usable toxicokinetic data;
- brief guidance on the broader uses of toxicokinetics in risk assessment;

- case studies and examples to illustrate key points.

Recommendations

The Meeting expressed general agreement with the outline of the draft guidance and recommended that the eWG proceeds with the development of the guidance, aiming for completion by the next JMPR Meeting in 2024.

To facilitate development of the guidance, examples and case studies (both in vivo and in vitro) in the following areas would be of value. Stakeholders are encouraged to submit relevant studies in the following areas:

- nonlinear toxicokinetics due to reduced absorption;
- nonlinear toxicokinetics due to capacity limitation in first-pass metabolism;
- nonlinear toxicokinetics resulting from dose-dependent changes in distribution (including plasma protein binding and transport-dependent cellular uptake/efflux);
- nonlinear kinetics resulting from capacity limitation in elimination processes (including enzymatic transformation, auto-induction, auto-inhibition, transport-dependent excretion and re-uptake);
- nonlinear metabolic activation (that is, conversion to a more toxic metabolite) and its implications for study design and interpretation.

2.3 The need for sponsors to provide accurate chemical structures and related information on metabolites

At recent JMPR Meetings an approach to assess the toxicological relevance of metabolites and degradates has been proposed. In silico and read-across methods are frequently employed in relation to the threshold of toxicological concern (TTC). In particular, in silico analysis for genotoxicity prediction increasingly plays an important role in the weight-of-evidence approach for genotoxicity (*Pesticide residues in food: guidance document for WHO monographers and reviewers*, 2015, www.who.int/publications/i/item/WHO-HSE-FOS-2015.1). Accurate information on the chemical structure of metabolites is essential for in silico analysis. If the raw data for a chemical structure obtained from analytical methods is incorrectly transferred to a Markush structure and chemical name, the in silico analysis for genotoxicity prediction will lead to scientifically inappropriate conclusions. Additionally, when a Markush structure is assessed in silico, sponsors should provide the output for all possible structural variants. Therefore, sponsors should ensure that Markush representations of compounds are accurate and all plausible structures are covered in the analysis. While it is the sponsors responsibility to carry out in silico analyses, corresponding SMILES codes should accompany the results.

2.4 Resolving inconsistent assessment of common metabolites

Close to the finalization of the assessments at the 2022 Meeting of JMPR, it was identified in the case of several pyrazole-based pesticides, that the conclusions on some common metabolites differed (for instance assessed against a TTC versus covered by the parent health-based guidane value) depending on the parent compound. The reasons for the inconsistencies were investigated and found to include:

- different toxicological information had been presented on a metabolite from different parent compounds, for example, one dossier presented only in silico data while another contained data from toxicity studies;
- the naming of compounds differed across different parent compounds, with respect for example to company codes and chemical names;
- chemical structures were presented in a different manner (mirror images, presentation of terminal groups such as CH_3), which meant any similarities were only evident on an in-depth check but not on an initial viewing of the individual pesticides.

In addition to the pyrazole group there are a number of types of pesticide chemistry which give rise to metabolites that are common to two or more compounds within a group. Companies developing the pesticides will be aware that other companies are producing compounds based on the same common moiety. In order to facilitate JMPR in making a consistent assessment of the same metabolite, sponsors are requested to form an industry Task Force and make a single toxicological submission for common metabolites of a group of pesticides (as has been done for some triazole metabolites).

2.5 On the rolling submission of data

In the JMPR call for data, sponsors are requested to submit all data and studies, both published and unpublished, for the toxicological and/or residue evaluations of the compounds. Several chemical dossiers submitted for evaluation were subject to multiple progressive updates and submissions over the course of evaluation (rolling submission of data). This practice causes confusion, disruption and delay in evaluation. This is particularly so when the new material is submitted close to the JMPR Meeting date. It is recommended that a single, fully complete, chemical dossier should be submitted in response to the call for data, rather than a long series of updated dossiers or dossier variations over time. This issue has been the subject of previous comments by the JMPR Meetings in 2015, 2018 and 2019.

It may not be possible for JMPR to evaluate late submissions. Sponsors should note that the submission of an incomplete chemical dossier may result in an additional uncertainty factor in the toxicological evaluation.

Late submissions are leading to additional burdens for experts and ultimately delays in the discussions. For optimal use of the time and resources of the experts and the Joint Secretariat, the Meeting re-emphasized the importance of a complete submission of data on all compounds and their metabolites to enable JMPR to perform a state-of-knowledge risk assessment.

2.6 Why is a residue definition sometimes not agreed when there is an ADI/ARfD?

In response to a question raised at CCPR 2023, JMPR wishes to clarify why, even though an ADI/ARfD had been established, the residue cannot sometimes be defined.

While an ADI/ARfD is established for a pesticide active substance based on toxicity studies on that active substance, the residue present in commodities following the use of a pesticide may also contain one or more metabolites the safety of which needs to be assessed. These metabolites may be plant and/or livestock-specific and not present in the animals used in toxicity studies. Therefore, there is no direct link between having an ADI/ARfD for a pesticide active substance and the residue definition. In fact, it is not always possible to assess the safety of metabolites present in commodities in order to decide on their inclusion within the residue definition. The numbers of metabolites, their levels and toxicity are very variable. A scheme for assessing metabolites has been produced by JMPR.

The levels of the active substance and its metabolites are often assessed using a radiolabelled version of the active substance. When it occurs that significant amounts of the radiolabel cannot be attributed to individual chemicals, the residue definition also cannot be concluded.

In summary, there might be toxicological or analytical issues that prevent the proper assessment of the safety of metabolites, and hence, prevent finalization of the residue definition despite the establishment of an ADI/ARfD for the active parent compound.

2.7 Enhancement of process

At JMPR's invitation, Mr Aaron Niman, chair of the electronic working group (EWG) on the Enhancement of CCPR and JMPR Operational Procedures, under the Codex Committee on Pesticide Residues (CCPR), presented the current state of the activities of the EWG in enhancing processes.

The Meeting considered some of the possibilities to enhance operational procedures and commented on some of the issues raised by the EWG. These included, among others, long-standing issues such as the enhancement of electronic quality of data, improved file naming and timely submission of full dossiers by the sponsors.

Other issues discussed included:

- the challenges of the limited evaluation capacity available, as well as the option to engage full-time paid evaluators, with JMPR serving as peer reviewers;
- early submission of data, allowing a quality control screen and the early elimination of unsatisfactory dossiers from the assessment process;
- the focus on submission of only toxicological studies relevant to dietary exposure as a potential mechanism to reduce workload.

Noting that the JMPR Meetings are already intensive and long, any benefits that might result from either lengthening the Meeting or trying to timetable additional meetings were considered unlikely to increase output. The issue of adequate, timely submissions of data was also discussed above, under general considerations item 2.5.

2.8 Strategy and timing for JMPR re-evaluation of dithiocarbamates

A request has been received by JMPR from the CCPR, to prioritize dithiocarbamate fungicides for periodic review within the CCPR system.

The Meeting noted that this could be a very extensive task possibly occupying an entire JMPR Meeting, as there were 10 compounds in the group, with eight of them and two significant metabolites (ETU and PTU) previously evaluated by JMPR in the 1990s.

In an attempt to better identify the scale of the task and plan the best way forward, taking account of the extensive workload already planned for forthcoming JMPR Meetings, the Meeting agreed to request sponsors to respond to the following questions:

- Which of the dithiocarbamate compounds and metabolites do they intend to support for periodic review?
- What new toxicology data have been generated since the last JMPR evaluations on the compounds being supported?
- Do the new data address issues already identified as concerns for dithiocarbamates, for example endocrine activity or tumour mode of action?
- What is the extent of the additional published literature database?
- If information is to be made available on individual metabolites/degradants, how many common metabolites/degradants will this involve?
- Do current analytical methods provide data on individual metabolites present as the residue in commodities, or is the common moiety method (carbon disulfide) still the standard analytical methodology?
- For the compounds to be reviewed, what use patterns are being supported and how many field trials are likely to need evaluation?
- Will an industry task force be formed to coordinate a submission to JMPR (the Meeting's preferred option) or will there be numerous individual submissions?

3. Response to specific concerns raised by CCPR

3.1 Indoxacarb

At the 54th CCPR Meeting a concern form relating to indoxacarb was submitted. The EU reported that in 2018 it had lowered its ADI and ARfD values to 0.005 mg/kg bw per day based on maternal toxicity in the rat developmental study. Previously the ADI and ARfD were 0.006 mg/kg bw per day and 0.125 mg/kg bw respectively. Also, the EU expressed concerns relating to the clarity of the JMPR conclusion on metabolite IN-JT333.

At the 2005 Meeting the JMPR established an ADI of 0–0.01 mg/kg bw on the basis of the NOAEL of 1.1 mg/kg bw per day in the one-year dog study, and an ARfD of 0.1 mg/kg bw on the basis of the NOAEL of 12.5 mg/kg bw in an acute neurotoxicity study.

The 2005 JMPR Meeting considered three rat developmental studies with indoxacarb (two pilot studies and the main 1997 study by Munley). The NOAELs in all three studies were concluded to be between 1.5 and 2 mg/kg bw per day. It is unclear from the EU documentation if the EU conclusion was based on findings in a different main study, which was available to the EU, but not to the JMPR. There is no indication from the JMPR 2005 text that there were any biologically relevant effects at either 2 or 1 mg/kg bw per day in the main rat developmental study. The EU is invited to explain in more detail the basis for their conclusion that the NOAEL for findings in a rat developmental study is 0.5 mg/kg bw per day, and how these findings might be produced by a single dose.

The EU is correct in stating that the 2005 JMPR report on IN-JT333 does not specify how intakes should be addressed. The report describes acute, repeat (14-day) and genotoxicity studies which indicate it is more toxic than indoxacarb, but that it is not genotoxic.

Although the JMPR description of the approach to IN-JT333 is not conclusive, it is unclear why the EU has a concern with dietary intakes of IN-JT333, as the EFSA conclusion indicates residues are unlikely to be above the limit of quantitation and agrees that IN-JT333 is not genotoxic. The Meeting performed an initial assessment using the limit of quantitation and the threshold of toxicological concern (TTC) approach for non-genotoxic compounds (Cramer class III at 1.5 µg/kg bw per day). Concerns over dietary exposures would seem unlikely as this would equate to a 10 kg person consuming approximately 1.5 kg of a commodity that contained residue at 0.01 mg/kg.

On the evidence presented by the EU in the concern form, the Meeting sees no reason to propose reprioritization of the periodic review of indoxacarb.

3.2 Mefentrifluconazole

Background

Mefentrifluconazole was evaluated as a new compound by the 2022 JMPR and maximum residue levels were estimated for a range of commodities. In evaluating mefentrifluconazole residues in leafy vegetables, the 2022 JMPR estimated maximum residue levels of 30 mg/kg for each of the subgroups of leafy greens and leaves of Brassicacea.

However, the Meeting noted that the acute dietary exposure assessment showed that residues in leafy greens and leaves of Brassicacea exceeded the ARfD of 0.3 mg/kg bw for several subpopulations and that no alternative GAP was available. On the basis of this information, it was concluded that the estimated acute dietary exposure to residues of mefentrifluconazole for the consumption of commodities from the subgroup of leafy greens and leaves of Brassicaceae may present a health concern.

The current Meeting received a concern raised by the Delegation of the USA noting that the request was for a maximum residue level for head lettuce only and that no request was made for the group of leafy vegetables (including *Brassica* leafy vegetables).

Comments by the JMPR

The current meeting re-assessed the data for leafy greens in the context of the request in the concern form, and noted that the 2022 JMPR recommended a maximum residue level for the leafy greens subgroup, despite median residues for the representative crops being greater than 5-fold. Therefore, the Meeting withdraws its previous recommendation of 30 mg/kg for the subgroup of leafy greens. In turn, individual maximum residue levels for each of the representative crops should have been determined, as follows:

Leafy vegetables (including Brassica leafy vegetables)

Leafy greens
The critical GAP is from the USA for leafy vegetables (including Brassica leafy vegetables); 3 × 146 g ai/ha, 7 day-RTI, 0-day PHI. The 2022 Meeting received trials from Canada and the USA on head lettuce, leaf lettuce, cos lettuce, spinach and radish leaves. All trials matched the critical GAP.

Mefentrifluconazole residues in head lettuce with wrapper leaves, in ranked order were (n = 8): 0.12, 0.27, 0.32, 0.89, 1.30, 1.50, 2.1 and 2.2 mg/kg.

The Meeting estimated a maximum residue level of 5 mg/kg, an STMR of 1.095 mg/kg and an HR of 2.2 mg/kg for head lettuce.

Mefentrifluconazole residues in leaf lettuce in ranked order were (n = 7): 2.4, 2.7, 3.0, 4.2, 4.4, 6.4 and 7.2 mg/kg.

The Meeting estimated a maximum residue level of 15 mg/kg, an STMR of 4.2 mg/kg and an HR of 8.3 mg/kg (based on the highest residue of replicate samples) for leaf lettuce.

Mefentrifluconazole in one sample of cos lettuce was 2.3 mg/kg. As there are an insufficient number of trials on cos lettuce, the current Meeting could not estimate a maximum residue level for cos lettuce.

Mefentrifluconazole residues in spinach in ranked order were (n = 8): 3.8, 4.6, 4.9, 5.2, 11, 12 (2) and 17 mg/kg.

The Meeting estimated a maximum residue level of 30 mg/kg, an STMR of 8.1 mg/kg and an HR of 18 mg/kg (based on the highest residue of replicate samples) for spinach.

The Meeting noted that the acute dietary exposure assessment showed that residues in leaf lettuce exceeded the ARfD of 0.3 mg/kg bw, at 170% for Chinese children 1-6 years while residues in spinach exceeded the ARfD at 140% for Belgian toddlers. No alternative GAP was available.

Recommendations

On the basis of the data from supervised trials the Meeting concluded that the residue levels listed below are suitable for establishing maximum residue limits and for IEDI and IESTI assessment.

CCN	Commodity name	Recommended Maximum residue level (mg/kg)		STMR (-P) (mg/kg)	HR (-P) (mg/kg)
		New	Previous		
VL 2050	Leafy greens, Subgroup of	W	30		
VL 0482	Head lettuce	5		1.095	2.2
VL 0483	Leaf lettuce	15		4.2	8.3
VL 0502	Spinach	30		8.1	18

Dietary Risk Assessment

Long-term dietary exposure
The ADI for mefentrifluconazole is 0–0.04 mg/kg bw. The International Estimated Daily Intakes (IEDIs) for mefentrifluconazole were estimated for the 17 GEMS/Food Consumption Cluster Diets using the STMR or STMR-P values estimated by the 2022 and current JMPR. The results are shown in Annex 3 of the 2023 JMPR Report.

The IEDIs ranged from 4-20% of the maximum ADI.

Acute dietary exposure
The ARfD for mefentrifluconazole is 0.3 mg/kg bw. The International Estimate of Short-Term Intakes (IESTIs) for mefentrifluconazole were re-calculated for the food commodities and their processed commodities for which HRs/HR-Ps or STMRs/STMR-Ps were estimated by the 2022 and current Meetings for which consumption data were available. The results are shown in Annex 4 of the 2023 JMPR Report.

The IESTIs were at or less than 100% of the ARfD, except for:
Leaf lettuce (170% for Chinese children)
Spinach (140% for Belgian toddlers)

The meeting concluded that acute dietary exposure to residues of mefentrifluconazole in commodities where the ARfD is exceeded may present a public health concern.

3.3 Metalaxyl

The Meeting noted the concern submitted by the Republic of Korea regarding no recommendation given for ‘Ginseng, extracts’ by the 2022 JMPR was withdrawn following clarification provided by the JMPR Secretariat during the CCPR 54.

3.4 Phosmet

At the 54th CCPR Meeting, the EU raised concerns regarding intake estimates for phosmet, which using EU modelling methods are up to 67 000 times the new EU ARfD value, and also concerns about the residue definition.

As a result of recent EU reviews (2020 and 2022) the EU established ADI and ARfD values of 0.001 mg/kg bw per day for phosmet. These were on the basis of the NOAEL for the rat two-generation study and applying a 1000-fold safety factor due to concerns about the absence of a developmental neurotoxicity study and from epidemiological evidence.

In 1994 the JMPR Meeting established an ADI of 0–0.01 mg/kg bw on the basis of a NOAEL of 20 ppm (equal to 1.3 mg/kg bw per day) in a two-generation reproductive study in rats, based on parental/reproductive effects, and applying a 100-fold safety factor. This value was confirmed in by JMPR in 1998. In 1998 the JMPR Meeting established an ARfD of 0.02 mg/kg bw on the basis of a NOAEL in a rabbit developmental study for minor skeletal variations, and applying a 100-fold safety factor. In 2003, JMPR reviewed the ARfD. A new ARfD was established at 0.2 mg/kg bw on the basis of a NOAEL of 2 mg/kg bw in an ethically valid human volunteer study using both males and females. The JMPR Meeting in 2003 concluded that the measurements performed in the human study were adequate to cover the most sensitive markers for phosmet toxicity.

Initially the JMPR Secretariat was unable to confirm the intake estimate and requested the EU provide additional details. Additional information was provided and this confirmed that the EU methodology was similar to that of JMPR. The EU intake estimates indicated that JMPR's existing ARfD could be exceeded by up to 300%.

The Meeting concluded that, as phosmet was last reviewed over 20 years ago and since then analytical methods have evolved and new intake estimates indicate that JMPR's ARfD could be exceeded, phosmet should be reprioritized within the CCPR periodic review scheme. The Meeting noted that the periodic review of phosmet has now been scheduled for 2024.