Edible fungi

Mushrooms

Natamycin is registered in Canada and the USA for use on cultivated mushrooms. The GAP is for surface drench applications at 2.2 kg ai/ha not less than six hours before harvest. The Canadian label allows two applications (at casing and at pinning) whereas the US label allows four applications (after casing and before flushing, after flushing, and any time between breaks).

Only one independent trial reflected the critical GAP and reported residues six hours after treatment was provided. The residue was:

Mushrooms (n=1): 4.7 mg/kg.

The Meeting determined that there are insufficient data to make a recommendation for mushrooms.

RECOMMENDATIONS

Based on the data from supervised trials, the Meeting concluded that the residue levels reported are suitable for establishing maximum residue limits. However, the JMPR couldn't complete the dietary risk assessment as no ADI was set.

Definition of the residue for plant commodities and fungi (for compliance with the MRL and for estimation of dietary intake): *Natamycin.*

DIETARY RISK ASSESSMENT

Long-term dietary exposure

The International Estimated Daily Intakes (IEDIs) of natamycin were calculated for the 17 GEMS/Food cluster diets using STMRs/STMR-Ps estimated by the current Meeting. The calculated IEDIs were up to 0.56 µg/kg bw/day. An ADI was not established.

Short-term dietary exposure

The International Estimated Short-Term Intakes (IESTIs) of natamycin were calculated using HRs/HR-Ps estimated by the current Meeting. The calculated IESTIs were up to 6.4 µg/kg bw. An ARfD was not established.

5.26 OXAMYL (126)

TOXICOLOGY

Oxamyl is the (ISO)-approved common name for *N,N*-dimethyl-2-methylcarbamoyloxyimino-2-(methylthio)acetamide (IUPAC), with the CAS number 23135-22-0. It is a carbamate insecticide that acts by inhibiting acetylcholinesterase activity. It was evaluated by the JMPR in 1980, 1983, 1984 and 1985. An ADI of 0–0.03 mg/kg bw was established in 1984 on the basis of a NOAEL of 2.5 mg/kg bw per day in a 2-year feeding study in rats supported by a NOAEL of 2.5 mg/kg bw per day in a 2-year feeding study in dogs. In 2002, the previous ADI was withdrawn and an ADI of 0–0.009 mg/kg bw and an ARfD of 0.009 mg/kg bw was established on the basis of the NOAEL of 0.09 mg/kg bw per day in a human volunteer study.

Oxamyl was evaluated by the present Meeting within the periodic review programme of the Codex Committee on Pesticide Residues. The present Meeting reviewed all previous studies, and new data have been included in the monograph.

All critical studies contained statements of compliance with GLP and were conducted in accordance with national or international test guidelines, unless otherwise specified. The study on human volunteers was conducted in accordance with the principles expressed in the Declaration of Helsinki or equivalent ethical standards.

Biochemical aspects

Absorption of oxamyl was rapid and nearly complete after oral administration to rats. Elimination was rapid, urine being the main route of excretion (80% within 24 h and 95% within 168 h). The tissue concentrations were low at 168 hours. Studies of biotransformation in vitro and in vivo indicated that oxamyl is metabolized in rats and mice via two major pathways: non-enzymatic hydrolysis to the oxime (IN-A2213) and enzymatic conversion to dimethyloxamic acid (IN-D2708) via dimethylcyanoformamide (IN-N009). These and other metabolites were present as polar conjugates in urine of rats. No marked sex difference was observed in the excretion pattern, tissue distribution or metabolite profile in rats.

Toxicological data

The oral LD_{50} in rats was 2.5 mg/kg bw; the inhalation LC_{50} (4 h, nose only) in rats was 0.05 mg/l; and the dermal LD_{50} in rabbits was >2000 mg/kg bw. The signs of acute intoxication with oxamyl were consistent with inhibition of acetylcholinesterase activity. Oxamyl was not irritating to the eyes or skin in studies in rabbits; however, ocular treatment induced signs of acute intoxication consistent with the inhibition of acetylcholinesterase activity. Oxamyl did not sensitize the skin of guinea-pigs and was not phototoxic *in vitro*.

Oxamyl was tested in a number of toxicity studies in mice, rats and dogs given repeated doses.. The most relevant effect of oxamyl was the inhibition of acetylcholinesterase activity, often accompanied by clinical signs at the same or higher doses. The effect of oxamyl on acetylcholinesterase activity occurs rapidly and is completely reversible. The NOAELs after dietary administration were higher than those after treatment by gavage. Other observed effects were on body weight and body-weight gain and, to a lesser degree, on food consumption and food use efficiency, sometimes accompanied by effects on organ weights.

In a 90-day dietary study in dogs fed oxamyl at a concentration of 0, 50, 100 or 150 ppm (equal to 0, 1.5, 2.8 or 5.0 mg/kg bw per day for males and 0, 1.3, 2.6 or 4.2 mg/kg bw per day for females) the NOAEL was 150 ppm (equal to 4.2 mg/kg bw per day), the highest dose tested. Acetylcholinesterase activity was not measured.

In a 1 year dietary study in dogs fed oxamyl at a concentration of 0, 50, 150 or 250 ppm (equal to 0, 1.6, 4.6 or 8.0 mg/kg bw per day for males and 0, 1.5, 4.5 or 7.8 mg/kg bw per day), no NOAEL could be identified because of the occurrence of tremors in females, and decreased body

weights and decreased acetylcholinesterase activity in the brains in males, at 50 ppm (equal to 1.5 mg/kg bw per day), the lowest dose tested.

On the basis of this study a second 1-year dietary study in male dogs was performed to determine the NOAEL for acetylcholinesterase inhibition in dogs. Animals were fed oxamyl at a concentration of 0, 12.5, 20, 35 or 50 ppm (equal to 0, 0.37, 0.58, 0.58, 0.93 or 1.36 mg/kg bw per day). The NOAEL was 35 ppm (equal to 0.93 mg/kg bw per day.), based on equivocal acetylcholinesterase inhibition at 50 ppm (equal to 1.36 mg/kg bw per day)Combining the two 1 year studies, the Meeting established an overall NOAEL of 35 ppm (equal to 0.93 mg/kg bw per day).

In a 2-year dietary study in mice fed oxamyl at a concentration of 0, 25, 50 or 75 ppm (equal to 0, 4.2, 8.7 or 13.5 mg/kg bw per day for males and 0, 5.2, 10.8, or 16.8 mg/kg bw per day for females), the NOAEL for systemic toxicity was 25 ppm (equal to 5.2 mg/kg bw per day), based on early mortality in females at 50 ppm (equal to 10.8 mg/kg bw per day). No treatment-related increases in tumour incidence were observed in this study. Acetylcholinesterase activity was not determined in this study.

In a 2-year dietary study in rats fed oxamyl at a concentration of 0, 25, 50, 100 or 150 ppm (equal to 0, 0.99, 2.0, 4.2 and 7.0 mg/kg bw per day for males and 0, 1.3, 2.7, 6.7 and 11 mg/kg bw per day for females), the NOAEL for systemic toxicity was 50 ppm (equal to 2.0 mg/kg bw per day), based on effects on body weights and clinical signs at 100 ppm (equal to 4.2 mg/kg bw per day). Adequate measurement of acetylcholinesterase activity was not provided. No treatment-related increases in tumour incidence were observed in this study.

The Meeting concluded that oxamyl is not carcinogenic in mice or rats.

Oxamyl was tested for genotoxicity in an adequate range of in vitro and in vivo assays. No evidence of genotoxicity was.

The Meeting concluded that oxamyl is unlikely to be genotoxic.

In view of the lack of genotoxicity and the absence of carcinogenicity in mice and rats, the Meeting concluded that oxamyl is unlikely to pose a carcinogenic risk to humans.

In a two-generation reproductive dietary toxicity study in rats fed oxamyl at a concentration of 0, 25, 75, or 150 ppm (equal to 0, 1.4, 4.2 or 8.7 mg/kg bw per day for males and 0, 1.7, 5.4 or 12.2 mg/kg bw per day for females), the NOAEL for parental toxicity was 25 ppm (equal to 1.4 mg/kg bw per day), based on the decreases of body weights, food consumption, food efficiency and increase in relative testis weight. The NOAEL for reproductive toxicity was 75 ppm (equal to 5.4 mg/kg bw per day), based on reduced pup numbers per litter. The NOAEL for offspring toxicity was 25 ppm (equal to 1.7 mg/kg bw per day), based on reduced pup weight. Similar effects were observed at similar dose levels in an older, three generation study of reproductive toxicity. Measurements of acetylcholinesterase activity in brain or erythrocytes were not included in the study.

In a developmental toxicity study in rats given oxamyl by gavage at 0, 0.2, 0.5, 0.8 or 1.5 mg/kg bw per day, the NOAEL for maternal toxicity was 0.5 mg/kg bw per day, based on decreases in food consumption and body weight gain and tremors at 0.8 mg/kg bw per day. The NOAEL for foetal toxicity was 0.5 mg/kg bw per day, on the basis of decreased fetal body weight at 0.8 mg/kg bw group. Acetylcholinesterase activity was not measured in the study.

In a developmental toxicity study in rabbits given oxamyl by gavage at 0, 1, 2 and 4 mg/kg bw per day, the NOAEL for maternal toxicity was 1 mg/kg bw per day on the basis of decreased bw weight gain at 2 mg/kg bw per day. The NOAEL for fetal toxicity was 2 mg/kg bw per day on the basis of an increased incidence of resorptions in the highest dose group. Acetylcholinesterase activity was not measured in the study.

The Meeting concluded that oxamyl is not teratogenic.

In an acute neurotoxicity study in rats given oxamyl by gavage at 0, 0.1, 1 or 2 mg/kg bw to males and 0, 0.1, 0.75, or 1.5 mg/kg bw to females, the NOAEL was 0.1 mg/kg bw on the basis of

acetylcholinesterase inhibition in in brain and erythrocytes, a variety of clinical signs and effects in the FOB at 0.75 mg/kg bw.

In a 90-day dietary neurotoxicity study rat fed oxamyl at a dietary concentration of 0, 10, 30 or 250 ppm (equal to 0, 0.55, 1.7, or 15 mg/kg bw per day in males and 0, 0.67, 2.0, or 20 mg/kg bw per day in females), the NOAEL was 30 ppm (equal to 1.7 mg/kg bw per day), based on effects on body weight and body-weight gain, clinical effects, the behavioural changes in the FOB and the inhibition of acetylcholinesterase activity in brainand erythrocytes.

An open literature article on non-guideline compliant acute neurotoxicity studies evaluated different sensitivities between pups and adult rats regarding acetylcholinesterase activity inhibition. The data indicated that pups were generally not more sensitive than adults with regards to acetylcholinesterase inhibition by oxamyl.

There was no evidence that a single dose of oxamyl to hens induced delayed polyneuropathy.

The Meeting concluded that oxamyl is neurotoxic through inhibition of acetylcholinesterase activity.

Oxamyl was tested in a range of guideline and GLP compliant in vivo and in vitro assays for its potential to interact with the endocrine system and no significant effects were.

Toxicological data on metabolites and/or degradates

A number of non-guideline, non-GLP toxicity tests were carried out with metabolites IN-A2213, IN-D2708 and IN-N009. Studies were submitted in the form of one-page data sheets.

Metabolite IN-A2213 (also referred as DMTO or oxamyl-oxime)

Metabolite IN-A2213 (Methyl 2-(dimethylamino)-N-hydroxy-2-oxoethanimidothioate) is a plant, rat and mouse metabolite (44% of radioactivity in mice). Its acute oral LD_{50} was >7500 mg/kg bw.

Metabolite IN-D2708 (also referred as DMOA)

Metabolite IN-D2708 ((Dimethylamino)oxoacetic acid) is a plant and rat (no quantitative data available) metabolite. Its acute oral LD_{50} in male rats was 3540 mg/kg bw.

Metabolite IN-N009 (also referred as DMCF)

Metabolite IN-N009 (Dimethylcarbonocyanidic amide) is a rat (no quantitative data available) and plant metabolite. Acute oral, short-term toxicity studies and a genotoxicity Ames test were performed with this metabolite.

Its acute oral LD_{50} in male rats was >300 mg/kg bw.

In a 90-day dietary toxicity study, which incorporated a modified one-generation reproductive toxicity phase, rats were fed IN-N009 at a concentration of 0, 50, 150 or 450 ppm (equal 0, 4.9, 11.4, or 34.3 mg/kg bw per day for males and 0, 4.2, 12.6, or 35.7 mg/kg bw per day for females). The NOAEL for systemic toxicity was 50 ppm (equal to 4.2 mg/kg bw per day) based on reduced WBC. The NOAEL for reproductive toxicity was 450 ppm (equal to 34.3 mg/kg bw per day), the highest dose tested. The NOAEL for offspring toxicity was 150 ppm (equal to 12.6 mg/kg bw per day), based on reduced pup weight at weanling.

IN-N009 did not induce reverse mutations in bacteria.

Metabolite IN-QKT34 (also referred as IN-A2213 glucoside or metabolite A)

Metabolite IN-QKT34 ([(Hexopyranosyloxy)imino]-N,N-dimethyl-2- (methylthio)acetamide) is a rat (70–80% of radioactivity) and plant metabolite. No specific toxicological data were available, but the Meeting concluded that metabolite IN-QKT34 would be covered by toxicological studies on the parent.

The Meeting noted that the studies provided for metabolites IN-A2213, IN-D2708 and IN-N009 suggest that these plant and animal metabolites are less toxic than oxamyl. The Meeting also noted that none of the metabolites contain the carbamate moiety responsible for acetylcholinesterase inhibition.

Human data

In a human study male volunteers received a single gelatine capsule containing oxamyl at a dose of 0, 0.005, 0.015, 0.03, 0.06, 0.09 or 0.15 mg/kg bw. The NOAEL was 0.09 mg/kg bw, based on acetylcholinesterase activity inhibition in erythrocytes (>20% inhibition within 0.5–1 h) and increased salivation at a dose of 0.15 mg/kg bw.

No information was provided on the health of workers involved in the manufacture or use of oxamyl. No information on accidental or intentional poisoning in humans was made available to the Meeting.

The Meeting concluded that the existing database on oxamyl was adequate to characterize the potential hazards to the general population, including fetuses, infants and children.

Toxicological evaluation

The Meeting reaffirmed the ADI for oxamyl 0.009 mg/kg bw, established by the 2002 JMPR, on the basis of the NOAEL of 0.09 mg/kg bw per day in a single dose male volunteers study, in whom increased salivation and decreased erythrocytes acetylcholinesterase activity were observed at higher doses. A safety factor of 10 was applied.

The toxicological profile of oxamyl showed rapid and complete restoration of acetylcholinesterase activity after inhibition, and that repeated administration did not change the recovery characteristics. Moreover, no sex differences were found with respect to the effects of oxamyl in experimental animals. The Meeting considered appropriate to establish both the ADI and the ARfD from a single dose study conducted in males.

The Meeting reaffirmed the ARfD for oxamyl 0.009 mg/kg bw, established by the 2002 JMPR, on the basis of the NOAEL of 0.09 mg/kg bw per day in a single dose male volunteers study. A safety factor of 10 was applied.

Both the ADI and the ARfD are supported by the NOAEL of 0.1 mg/kg bw in the study of acute neurotoxicity in rats.

A toxicological monograph was prepared.

Levels relevant to risk assessment of oxamyl

Species	Study	Effect	NOAEL	LOAEL
Mouse	Two year study of toxicity and carcinogenicity [a,b]	Toxicity	25 ppm, equivalent to 5.2 mg/kg bw per day	50 ppm, equivalent to 10.8 mg/kg bw per day
		Carcinogenicity [c]	75 ppm, equal to 13.5 mg/kg bw per day	—
Rat	Two year study of toxicity and carcinogenicity [a,b]	Toxicity	50 ppm, equal to 2 mg/kg bw per day	100 ppm, equal to 4.2 mg/kg bw per day
		Carcinogenicity [c]	150 ppm, equal to 7 mg/kg bw per day	—
	Two-generation study of reproductive toxicity [a,b]	Reproductive toxicity	75 ppm, equal to 5.4 mg/kg bw per day	150 ppm, equal to 12.2 mg/kg bw per day
		Parental toxicity	25 ppm, equal to 1.4	75 ppm, equal to 4.2

			mg/kg bw per day	mg/kg bw per day
		Offspring toxicity	25 ppm, equal to 1.7 mg/kg bw per day	75 ppm, equal to 5.4 mg/kg bw per day
	Developmental toxicity [b,d]	Maternal toxicity	0.5 mg/kg bw per day	0.8 mg/kg bw per day
		Embryo and fetal toxicity	0.5 mg/kg bw per day	0.8 mg/kg bw per day
	Acute neurotoxicity [d]	Neurotoxicity	0.1 mg/kg bw	0.75 mg/kg bw per day
	90 days neurotoxicity [a]	Neurotoxicity	30 ppm, equal to 1.7 mg/kg bw per day	250 ppm, equal to 15 mg/kg bw per day
Rabbit	Developmental toxicity [b,d]	Maternal toxicity	1 mg/kg bw per day	2 mg/kg bw per day
		Embryo and fetal toxicity	2 mg/kg bw per day	4 mg/kg bw per day
Dog	1-year studies of toxicity [a,e]		35 ppm, equal to 0.93 mg/kg bw per day	50 ppm, equal to 1.6 mg/kg bw per day
Human	Study in volunteers with single doses [f]	Acetylcholinesterase inhibition, salivation	0.09 mg/kg bw per day	0.15 mg/kg bw per day

[a] Dietary administration

[b] (Adequate) measurement of acetylcholinesterase activity not included

[c] Highest dose tested

[d] Gavage administration

[e] Two studies combined

[f] Capsule administration

Estimate of acceptable daily intake (ADI) for oxamyl, IN-A2213, IN-QKT34, IND2708 and IN-N009

0-0.009 mg/kg bw

Estimate of acute reference dose for oxamyl, IN-A2213, IN-QKT34, IND2708 and IN-N009

0.009 mg/kg bw

Information that would be useful for the continued evaluation of the compound

Results from epidemiological, occupational health and other such observational studies of human exposure.

Summary of critical end points of oxamyl

Absorption, distribution, excretion and metabolism in animals	
Rate and extent of absorption	Rapid and extensive: 81% within 24h.
Dermal absorption	No data
Distribution	Throughout body, highest concentration in blood, heart, liver, kidney, lung, spleen and gastrointestinal tract
Potential for accumulation	Low
Rate and extent of excretion	Relatively rapid (mouse: 76 % after 6 h, 89 % after 24 h. Rat: 81% after 24 h), mainly in urine.

Metabolism in animals	Extensively metabolized, no parent compound in urine
Toxicologically significant compounds in animals and plants	Oxamyl
Acute toxicity	
LD50, oral	2.5 mg/kg bw, rat
LD50, dermal	>2 000 mg/kg bw, rabbit
LC50, inhalation	0.05 mg/L, rat
Dermal irritation	Not irritating, rabbit
Ocular irritation	Not irritating, rabbit, toxicity
Dermal sensitization	Not sensitizing (Buehler test)
Short-term toxicity	
Target/critical effect	Inhibition of acetylcholinesterase activity in brain and erythrocytes, clinical and behavioural effects associated with acetylcholinesterase inhibition, reduction in body weight and weight gain
Lowest relevant oral NOAEL	0.93 mg/kg bw per day (dog)
Lowest relevant dermal NOAEL	2.5 mg/kg bw per day (rabbit)
Lowest relevant inhalation NOAEC	No data
Long-term toxicity and carcinogenicity	
Target/critical effect	Reduction in body weight and body weight gain (acetylcholinesterase activity not assessed)
Lowest relevant NOAEL	2 mg/kg bw per day (rat)
Carcinogenicity	Not carcinogenic in mouse or rat
Genotoxicity	Not genotoxic in vitro and in vivo.
Reproductive toxicity	
reproduction target/critical effect	Reduction in number of pups per litter (in the presence of parental toxicity)
Lowest relevant parental NOAEL	1.4 mg/kg bw per day (rat)
Lowest relevant offspring NOAEL	1.7 mg/kg bw per day (rat)
Lowest relevant reproductive NOAEL	5.4 mg/kg bw per day (rat)
Developmental toxicity	
Target/critical effect	Reduction in body weight (in the presence of maternal toxicity)
Lowest relevant maternal NOAEL	0.5 mg/kg bw per day (rat)
Lowest relevant embryo/fetal NOAEL	0.5 mg/kg bw per day (rat)
Neurotoxicity/Delayed neurotoxicity	
Acute neurotoxicity NOAEL	0.1 mg/kg bw (rat)
Subchronic neurotoxicity NOAEL	1.7 mg/kg bw per day (rat)
Delayed neurotoxicity	No concern
Developmental neurotoxicity NOAEL	No data
Other toxicological studies	
Immunotoxicity	No data
Studies on toxicologically relevant	
Metabolite IN-A2213	LD_{50}> 7500 mg/kg bw (rat)
Metabolite IN-D2708	LD_{50}: 3540 mg/kg bw (male rat)

Metabolite IN-N009	LD_{50}>300 mg/kg bw (male rat)
	90-day rat, with one-generation phase:
	Systemic/Parental NOAEL: 4.2 mg/kg bw per day
	Offspring NOAEL: 12.6 mg/kg bw per day
	Reproductive NOAEL: 34.3 mg/kg bw per day, highest dose tested
	Not genotoxic in vitro (Ames)
Human data	
Single dose volunteer study	Inhibition of AChE activity in erythrocytes, and increased saliva production.
Lowest relevant oral NOAEL	0.09 mg/kg bw

Medical data

No information was provided on the health of workers involved in the manufacture or use of oxamyl.

Summary

	Value	Study	Safety factor
ADI[a]	0–0.009 mg/kg bw	Acute toxicity study (human)	10
ARfD[a]	0.009 mg/kg bw	Acute toxicity study (human)	10

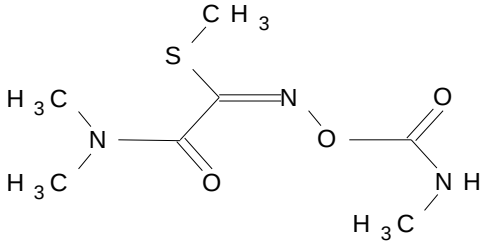
[a] Applies on oxamyl, IN-A2213, IN-QKT34, IND2708 and IN-N009

RESIDUE AND ANALYTICAL ASPECTS

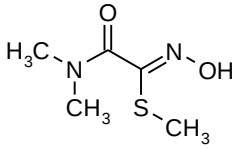
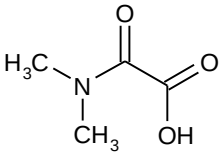
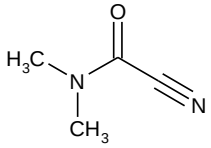
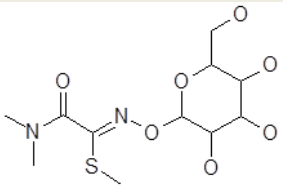
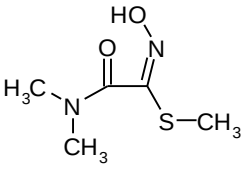
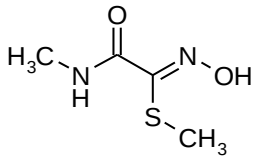
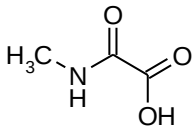
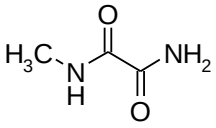
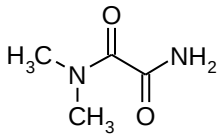
Oxamyl is a carbamate insecticide that acts by inhibiting acetylcholinesterase activity. It was first evaluated by JMPR in 1980 (T, R) and a periodic re-evaluation conducted in 2002 (T, R). It was included in the Priority List under the Periodic Re-Evaluation Program at the 48th Session of the CCPR (2016) for evaluation by the 2017 JMPR.

The Meeting received information on physical and chemical properties, animal and plant metabolism, rotational crop residues, environmental fate, analytical methods, GAP information, storage stability, processing and residue trial data on Brussel sprout, cucumber, courgette, melon, tomato, pepper, eggplant, carrot, sugar beet and potato.

N,*N*-dimethyl-2-methylcarbamoyloxyimino-2-(methylthio) acetamide



In this appraisal, the following abbreviated names were used for metabolites.

IN-A2213	IN-D2708	IN-N0079
		
Synonym: Oxamyl-oxime		Synonym: DMCF
Methyl 2-(dimethylamino)- *N*-hydroxy-2-oxoethanimidothioate	(Dimethylamino)oxoacetic acid	Dimethylcarbonocyanidic amide
IN-QKT34	IN-F3905	IN-L2953
		
Synonym: IN-A2213 glucoside		
[(Hexopyranosyloxy)imino]- *N*,*N*-dimethyl-2- (methylthio)acetamide	Methyl (*E*) 2-(dimethylamino)- *N*-hydroxy-2-oxoethanimidothioate	Methyl *N*-hydroxy-2-(methylamino) -2-oxoethanimidothioate
IN-KP532	IN-KV998	IN-T2921
		
(Methylamino)oxoacetic acid	*N*-Methylethanediamide	*N*,*N*-Dimethylethanediamide

Plant metabolism

The Meeting received plant metabolism studies on potato and tomato conducted with [1-^{14}C]-oxamyl.

In a potato metabolism study, [^{14}C]-oxamyl was applied to soil at a rate of 8 kg ai/ha immediately after seed potatoes were planted in plastic pots. TRR in the peels and peeled potatoes from the ^{14}C-oxamyl treated plants were 1.1 and 0.86 mg eq/kg, respectively. The majority (~91%) of the radioactivity was extracted from the peels (1.0 mg eq/kg) and peeled potatoes (0.79 mg eq/kg).

The major extracted residue in the peels (68% TRR, 0.76 mg eq/kg) and the peeled potato (71% TRR, 0.61 mg eq/kg), extracted with methanol/water, was IN-D2708. Other extracted components ranged in concentration from 0.02–0.07 mg eq/kg. The concentration of each of these polar and unknown metabolites were < 0.04 mg eq/kg in the whole potato. No oxamyl or IN-A2213 (oxamyl-oxime) was detected.

The majority of the residues in foliage were extracted with methanol/water (78% TRR, 1.2 mg eq/kg). The major foliage metabolite (46% TRR, 0.69 mg eq/kg) was a water-soluble component that was resistant to enzyme (β-glucosidase) and acid (0.1 M HCl, 90 °C, 6 hours) hydrolysis. This metabolite was characterized as IN-QKT34 (IN-A2213 glucoside).

In a tomato metabolism study, [^{14}C]-oxamyl was applied at a rate of 2.0 kg ai/ha immediately after transplant of the tomato plants. The 3 subsequent applications for both the foliar and soil experiments were carried out 14 days apart at a rate of 1.0 kg ai/ha for each application. Following one 2 kg ai/ha and three 1 kg ai/ha foliar applications of [^{14}C]-oxamyl, TRRs ranged between 0.72–1.4 mg eq/kg in fruit and 4.8–40 mg eq/kg in foliage. Following soil applications at the same rates and application timing, fruit TRRs ranged between 0.33–0.81 mg eq/kg and foliage 5.5–11 mg eq/kg.

For the foliar applications, TRR in fruit collected 7 and 21 days after the fourth foliar treatment (DALA) were 0.72 and 0.99 mg eq/kg, respectively. A surface wash with water of fruit at 7 and 21 DALA released 31% TRR (0.22 mg eq/kg) and 1.3% TRR (0.013 mg eq/kg), respectively. The surface wash and methanol/water extract from homogenised samples were combined, resulting in a total extractability of 94–96%. Oxamyl was the principal extracted fruit residue at 7 DALA accounting for 31% TRR (0.22 mg eq/kg). Oxamyl concentrations in the 21 DALA fruit sample decreased to 2.9% TRR (0.027 mg eq/kg). Other components identified as major metabolites in the 7 and 21 DALA fruit included IN-N0079 (9.0–13% TRR, 0.088–0.090 mg eq/kg) and IN-D2708 (21% TRR, 0.21 mg eq/kg).

TRR in foliage collected 7 and 21 DALA of the foliar treatment were 9.9 and 40 mg eq/kg, respectively. Surface wash with water of foliage at 7 and 21 DALA were 37% TRR (3.6 mg eq/kg) and 22% TRR (8.7 mg eq/kg), respectively. The TRRs of surface wash and the methanol/water extract of homogenised samples were combined, resulting in a total extractability of 97–98%. Oxamyl was the predominant component (73–78% TRR, 7.2–31 mg eq/kg) detected in the foliage at both sampling points. IN-QKT34 (11–13%TRR, 1.2–4.2 mg eq/kg) was the principal metabolite in tomato foliage.

For soil applications, TRR in fruit collected 7, 14 and 21 DALA of the soil treatment ranged from 0.33–0.81 mg eq/kg. Low levels of oxamyl were detected (5.9% TRR, 0.047 mg eq/kg) in the 7 DALA fruit but not in subsequent fruit samples. Fruit major metabolites included IN-A2213 (8.4–11% TRR, 0.031–0.089 mg eq/kg), IN-QKT34 (4.8–11% TRR, 0.016–0.071 mg eq/kg), IN-N0079 (2.3–22% TRR, 0.015–0.073 mg eq/kg) and IN-D2708 (21% TRR, 0.14 mg eq/kg).

TRR in foliage collected 7, 14 and 21 DALA of the soil treatment were 5.5, 7.1 and 11 mg eq/kg, respectively. Oxamyl was detected at 19, 11 and 6.3% TRR (1.1, 0.75 and 0.73 mg eq/kg) in the 7, 14 and 21 DALA foliage, respectively. IN-QKT34 (35–63% TRR, 1.9–7.1 mg eq/kg) was the principal foliage metabolite.

In summary, oxamyl was primarily metabolised in potato and tomato by hydrolysis of the methylcarbamoyl group and subsequent conjugation to yield IN-A2213 and IN-QKT34 (IN-A2213 glucoside). IN-A2213 was also metabolised by cleavage to give IN-N0079 which is further metabolized by oxidation to IN-D2708.

Animal metabolism

The Meeting received animal metabolism studies with oxamyl on lactating goat and laying hens. The metabolism and distribution of oxamyl in animals was investigated using the [1-^{14}C]-oxamyl.

Lactating goats were orally dosed with 59 mg [1-^{14}C]-oxamyl daily for 5 consecutive days at a dose level of 31 ppm in the diet. The majority (52%) of the administered dose was eliminated in urine and faeces.

Following the administration of [1-^{14}C]-oxamyl, TRRs were 8.4 mg eq/kg in liver, 4.6 mg eq/kg in kidney, 1.3 mg eq/kg in muscle and 0.64 mg eq/kg in fat. Methanol/water extracted 30–67% of TRR in tissues. Most of the unextracted residue (31–58% TRR) in tissues was released by protease digestion. TRRs in milk reached a maximum of 4.6 mg eq/L on day 5 (a plateau had not been reached). Approximately 2% of the TRR in milk was found in the chloroform extract, 67–73% TRR was in methanol/water extract and about 25–31% TRR in milk remained in the pellet. Most of unextracted residue (23–29% TRR) in milk was released by protease digestion.

Thiocyanate was the major metabolite found in milk (23–36% TRR, 0.35–1.5 mg eq/L in the methanol/water extract with a further 9.4–12% TRR (0.17–0.51 mg eq/L) in the protease extract) and

it was also detected in all tissue extracts (2.8–31% TRR, 0.14–0.43 mg eq/kg). No measured parent oxamyl was found in any of analysed tissues or milk fractions.

Laying hens were orally dosed with 3.6 mg [1-^{14}C]-oxamyl daily for 3 consecutive days at a dose level of 43 ppm in the diet. The hens excreted 71% of the total administered dose.

TRRs were 2.0 mg eq/kg in liver, 1.7 mg eq/kg in kidney, 0.44–0.68 mg eq/kg in muscle, 0.71 mg eq/kg in skin and 0.064 mg eq/kg in fat. Eggs collected following the last dose, 48–72 hour (Day 3) samples, contained 1.1 mg eq/kg and 1.2 mg eq/kg, respectively, for the yolk and white. 47–93% of TRR in tissues and egg was extracted by hexane, methyl chloride, ethyl acetate and methanol/water. 22% TRR in liver was extracted into methanol/water and 24% TRR in liver was extracted with the ethyl acetate. Most of unextracted residue (33% TRR) in liver was released by protease digestion.

No oxamyl was present in any tissue sample and there were no carbamate-containing metabolites detected. The major metabolite in all tissues and eggs was identified as thiocyanate. It represented 14% TRR in liver (0.27 mg eq/kg), 14% TRR in muscle (0.088 mg eq/kg), 26% TRR (0.30 mg eq/kg) in the Day 3 egg white and 33% TRR (0.35 mg eq/kg) in the Day 3 egg yolk.

In summary, oxamyl was degradated extensively into small molecular weight compounds such as thiocyanate and CO2 in goats and hens. The residues associated with protein in tissues was 31–58% TRR. In rats, the radioactivity in tissues was not identified, but was found to be neither oxamyl nor its metabolites.

Environmental fate

In soil

The Meeting considered information on degradation in aerobic soil, soil photolysis and field dissipation studies because oxamyl is intended for use as soil treatment.

In degradation in aerobic soil studies, [1-^{14}C]-oxamyl was applied at a rate of 2 or 5 mg/kg (dry soil basis) to viable agricultural soils and incubated at 20 °C.

There were three significant degradation products - IN-A2213, IN-D2708 and $^{14}CO_2$. No other metabolite was observed at >3.8% of the applied radioactivity. The $^{14}CO_2$, found in the caustic trap, was the final and most significant degradate. For the eight soils tested the DT_{50} for oxamyl was 3–12 days, except in one soil that had a DT_{50} of 112 days. Maximum levels of IN-A2213 and IN-D2708 were 5.0–51% and 25–78% of applied radioactivity (AR), respectively.

In field soil dissipation studies, oxamyl was applied once at 1.5–20 kg ai/ha to soils in Europe and the USA. The DT_{50} values of oxamyl, IN-A2213 and IN-D2708 for European soils were 3.3–11, 1.7–5.7 and 0.52–6.7 days, respectively. The DT_{50} values of oxamyl for US soils were 9–29 days.

In conclusion, oxamyl is not persistent in soil (DT_{50}: 3–29 days).

In a soil photolysis study, thin layers of soil (2 mm) were treated with oxamyl to obtain a concentration of 5.3 mg ai/kg dry weight soil. The soil samples were maintained at approximately 21 ± 2 °C with continuous irradiation for up to 15 days under simulated natural sunlight produced by a Xenon arc lamp.

The degradation products were IN-D2708, IN-N0079 and IN-A2213, which reached average maximum concentrations of 45% AR (Day 15), 8.7% AR (Day 5), and 3.6% AR (Day 3), respectively. The DT_{50} and DT_{90} for oxamyl were 4.7 and 15.7 days in irradiated samples and 24.2 and 80.5 days in non-irradiated samples, respectively.

Photolysis on the soil surface is a degradation route for oxamyl.

In water

The Meeting considered information on hydrolysis.

In the hydrolytic degradation study, oxamyl was hydrolytically stable at pH 4, but unstable at pH 7 and 9 after incubation at 20–30 °C. The DT_{50} of oxamyl was 4.2–21 days at pH 7 and < 1 day at pH 9.

Rotational crop studies

The Meeting received confined rotational crop studies with [1-^{14}C]-labelled oxamyl and field rotational crop studies with unlabelled compound.

In confined rotational crop studies, rotational crops (barley, cabbage, beet, sorghum and lettuce) were sown at 30, 120 and 363 days after soil treatment (PBI). [1-^{14}C]-oxamyl was applied as a single application to soil at a rate of 8–20 kg ai/ha.

A sandy loam soil in containers was treated on the surface with [1-^{14}C]-oxamyl at 8.96 kg ai/ha, and aged in the greenhouse. Crops (red beet, cabbage and sorghum) seeds were sown in the containers at PBIs of 30 and 120 days. Crops planted into soil which had been aged 30 days exhibited TRRs of 0.6–4.2 mg eq/kg. The residue that could be ascribed to oxamyl and/or IN-A2213 was 0.01–0.12 mg eq/kg in crops planted at 30-day PBI.

[1-^{14}C]-oxamyl was applied to the surface of a sandy loam soil in containers at a nominal rate of 20.2 kg ai/ha. The crops (lettuce, beet and barley) were planted after an ageing period of 30, 120 and 363 days. TRRs were 3.1–38 mg eq/kg for crops sown at the 30-day PBI, 0.27–6.8 mg eq/kg for crops sown at the 120-day PBI and 0.03–0.29 mg eq/kg for crops sown at the 363-day PBI. Oxamyl and IN-A2213 were significant residues (oxamyl: 31–58% TRR, 0.53–12 mg eq/kg and IN-A2213: 11–18% TRR, 0.30–2.2 mg eq/kg) in barley forage at both the 30-day and the 120-day PBIs. These two components were not detected in barley grain. Oxamyl and IN-A2213 were detected in beet root and foliage, and lettuce, at the 30-day PBI, but in general never exceeded 11% TRR. At 120-day PBI, IN-A2213 was only detected (4.3% TRR, 0.04 mg eq/kg) in beet roots and no oxamyl was detected in any of the beet RAC. Neither oxamyl nor IN-A2213 was detected in lettuce from the 120-day PBI. However, polar unknowns were significant components of the TRR in barley forage (max 51% TRR, 0.87 mg eq/kg), barley straw (max 32% TRR, 12 mg eq/kg), barley grain (58% TRR, 0.76 mg eq/kg) and lettuce (82% TRR, 0.22 mg eq/kg).

[1-^{14}C]-oxamyl was applied as a single application at a rate of 8 kg ai/ha and barley was sown at a 30-day PBI. TRRs were 0.32 mg eq/kg in barley grain, 6.7 mg eq/kg in barley forage, 1.2 mg eq/kg in barley hay and 1.6 mg eq/kg in barley straw. The major extracted residue in the barley grain (51% TRR, 0.16 mg eq/kg) was IN-D2708. No oxamyl or other metabolites were identified in the grain. The major metabolite present in barley forage, hay and straw was IN-QKT34 (IN-A2213 glucoside) which was present at 24% TRR (1.6 mg eq/kg) in forage, 40% TRR (0.48 mg eq/kg) in hay and 28% TRR (0.45 mg eq/kg) in straw. In barley forage, hay and straw, IN-D2708 (2.9–8.2% TRR, 0.05–0.23 mg eq/kg), IN-A2213 (4.6–13% TRR, 0.06–0.90 mg eq/kg) and oxamyl (5.9–24% TRR, 0.07–1.6 mg eq/kg) were also identified.

The residue in confined rotational crops is comprised of several compounds including oxamyl, IN-D2708, IN-A2213 and IN-QKT34. The concentration of these compounds is likely to be lower at longer plantback intervals.

In a field rotational crop study in Northern Europe, the GR formulation was applied using a granular applicator at planting of potatoes at a target rate of 5.5 kg ai/ha. Potatoes were removed at 80 or 120 days after the final application to allow planting of succeeding crops (lettuce, carrot, winter barley and winter wheat) at the targeted PBIs.

Oxamyl residues in succeeding crops (lettuce, carrot roots and tops, and cereal grain, hay, and straw) planted 80 and 120 days after GR application and harvested at maturity were < 0.01 (<LOD) mg/kg.

In another field rotational crop study in Southern Europe, the SL formulation was applied by simulated drip irrigation immediately after transplanting melons and four additional times with the last application being 21 days before melon harvest. Applications were made on a 10-day retreatment

interval. First application was made at a target rate of 2 kg ai/ha and other applications were made at a target rate of 1 kg ai/ha. Melons were removed after the final application to allow the succeeding crops to be planted at the targeted PBIs of 30, 60, 90 or 120 days.

Oxamyl residues in rotational crops (lettuce and radish roots and radish tops) planted at 30, 60, 90 and 120 days after SL application and harvested at maturity were < 0.01 (<LOD) mg/kg.

In rotational crops, no significant oxamyl residues are expected.

Methods of analysis

The Meeting received descriptions and validation data for analytical methods for residues of oxamyl in plant and animal commodities.

In several similar methods for determination of oxamyl in plants, homogenized samples were extracted with acetone, and partitioned into dichloromethane/petroleum ether (1:1, v/v). An aliquot of extract was cleaned-up by a solid phase extraction using an aminopropyl-bonded cartridge. Oxamyl residues were determined by HPLC with post-column derivatization and fluorescence detection, MS or MS/MS detection. The methods of analysis were validated at various fortification levels with LOQs of 0.01 mg/kg for oxamyl. Another method utilised accelerated solvent extraction with acetone, and the extract was cleaned-up using an ENVI-Carb SPE cartridge and a Silica Mega Bond Elute SPE cartridge. An HPLC-UV equipped with column switching valve was used for analysis of both oxamyl and IN-A2213. The LOQs were 0.02 mg/kg for both analytes.

In the methods for determination of oxamyl in animal commodities, samples were homogenized with 0.1% formic acid in methanol. Following extraction, the sample was cleaned up with hexane and SAX (Strong Anion Exchanger) sorbent. The cleaned extracts were then subjected to LC-MS/MS analysis. The method of analysis was validated with LOQs of 0.01 mg/kg for oxamyl.

The QuEChERS method was used for determination of oxamyl residues in plant and animal commodities. The LOQ was 0.01 mg/kg for oxamyl.

The methods are suitable for the analysis of oxamyl residues in plant and animal commodities.

Stability of residues in stored analytical samples

The Meeting received information on the freezer storage stability of oxamyl in plant matrices (lettuce, tomato, sugar beet root, potato tuber and orange peel).

Storage stability results indicate that oxamyl residue was stable at approximately -18 °C for at least 24 months in lettuce (high water), tomato (high water), sugar beet root (high starch), potato tuber (high starch) and orange peel.

The periods of storage stability studies generally cover the sample storage intervals of residue trials.

Definition of the residue

Oxamyl is applied as a soil treatment for Brussels sprouts, fruiting vegetables and root and tuber vegetables. The plant metabolism studies for potato and tomato can predict the metabolites of oxamyl expected in fruiting vegetables and root and tuber vegetables. Rotational crop studies for cabbage and lettuce can predict the metabolites of oxamyl expected in Brussels sprouts.

In plant metabolism studies involving soil treatment conducted in potatoes and tomatoes, significant levels of oxamyl were only found in the foliage of both plants (1.1% TRR in potato and 6.3–19% TRR in tomato).

The metabolites IN-A2213, IN-QKT34 (IN-A2213 glucoside), IN-D2708 and IN-N0079 were major metabolites (> 10% TRR) in plants. These metabolites no longer contain the carbamate moiety.

IN-D2708 was identified in potato peels (68% TRR, 0.76 mg eq/kg) and peeled potatoes (71% TRR, 0.61 mg eq/kg). IN-QKT34 was found in tomato fruits (3.5–11% TRR, 0.016–0.077 mg eq/kg). IN-A2213 and IN-N0079 were detected in tomato fruits at 0.031–0.096 mg eq/kg (5.3–12% TRR) and 0.013–0.090 mg eq/kg (1.8–22% TRR), respectively.

No other individual metabolite was present at a level greater than 10% TRR.

The confined rotational crop studies also show that oxamyl is rapidly degraded to metabolites that no longer contain the carbamate moiety; IN-A2213, IN-D2708, IN-QKT34.

In processed commodities, oxamyl is degraded to IN-A2213 with increasing temperatures.

The toxicity of metabolites, that do not contain the carbamate moiety (IN-A2213, IN-QKT34, IN-D2708 and IN-N0079), is considered to be less than that of parent oxamyl and would be covered by the ADI and ARfD of oxamyl.

Based on the metabolism and toxicity data the Meeting concluded that oxamyl is the only residue of concern for both enforcement and for dietary risk assessment.

Analytical methods are available for the determination of oxamyl in plants.

The Meeting concluded that the residue definition for plants, for both compliance and risk assessment, is oxamyl only.

In animal metabolism studies, oxamyl was rapidly metabolized and oxamyl was not identified in any animal products. In addition, no metabolites containing the carbamate moiety were identified. The major metabolite identified in milk, eggs and tissues was thiocyanate.

Thiocyanate is a non-specific analyte present at high background levels in animals and is therefore not suitable as either a marker residue for enforcement or for the dietary risk assessment.

The Meeting concluded that oxamyl is the only residue of concern for both enforcement and for dietary risk assessment.

Analytical methods to determine residues of oxamyl in animal commodities are available.

The octanol/water coefficient (log Pow) of oxamyl is -0.43. The Meeting concluded that the residue is not fat soluble.

The Meeting recommended the following residue definition:

Definition of the residue (for compliance with the MRL and for estimation of dietary intake) for plants and animals: *Oxamyl*

The residue is not fat soluble.

Results of supervised residue trials on crops

The Meeting received supervised trial data for soil application of oxamyl on Brussels sprouts, cucumber, courgette, melons, tomato, peppers, eggplant, carrot, sugar beet and potato. Residue trials were conducted in Germany, Netherlands, the UK, France, Greece, Italy and Spain.

Labels from Netherlands, the UK, Italy and Spain were available.

Since no residue data (and/or use patterns) were provided for citrus fruit, apple, cotton seed, peanut, peanut fodder and spices, the Meeting withdraws the previous recommendations for maximum residue levels for these commodities.

Brussels sprouts

Data were available from supervised trials on Brussels sprouts in the Netherlands.

The GAP for Brussels sprouts in the Netherlands allows one soil application before planting at a rate of 4.0 kg ai/ha.

Oxamyl residues in Brussels sprouts from independent trials in the Netherlands matching GAP were (n=3): < 0.01 (3) mg/kg.

No oxamyl residues (< 0.01 mg/kg) are expected in Brussels sprouts according to the resiudes in other plant commodities such as tomatoes, peppers and eggplants and field rotational crop studies.

Based on the trials on Brussels sprouts in the Netherlands, the Meeting estimated a maximum residue level of 0.01 (*) mg/kg, an STMR and an HR value of 0 mg/kg for oxamyl in Brussels sprouts.

Fruiting vegetables, Cucurbits

Cucumber

Data were available from supervised trials on protected cucumber in Southern European countries.

The GAP for protected cucumber of Italy is two soil applications (drip irrigation) at a maximum crop cycle rate of 3.0 kg ai/ha and 10–14 days application interval with a PHI of 50 day.

Oxamyl residues in cucumbers from independent trials in Southern Europe matching Italian GAP were (n=6): < 0.01 (5) and 0.016 mg/kg.

Based on the trials on cucumbers in Southern Europe, the Meeting estimated a maximum residue level of 0.02 mg/kg, an STMR value of 0.01 mg/kg and an HR value of 0.016 mg/kg for oxamyl in cucumber to replace the previous recommendation for cucumber.

Summer Squash

Data were available from supervised trials on protected courgette in Southern European countries.

The GAP for protected courgette in Italy is two soil applications (drip irrigation) at a maximum crop cycle rate of 3.0 kg ai/ha and 10–14 days application interval with a PHI of 50 days.

Oxamyl residues in courgettes from independent trials in Southern Europe matching Italian GAP were (n=6): < 0.01 (5) and 0.022 mg/kg.

Based on the trials on courgettes in Southern Europe, the Meeting estimated a maximum residue level of 0.04 mg/kg, an STMR value of 0.01 mg/kg and an HR value of 0.022 mg/kg for oxamyl in summer squash.

Melons

Data were available from supervised trials on protected melon in Southern European countries.

The GAP in Italy and Spain for melons and watermelons is two soil applications (drip irrigation or irrigation via sprinkler) at a maximum crop cycle rate of 3.0 kg ai/ha and 10–14 days application interval with a PHI of 50 days.

Oxamyl residues in the whole fruits of melon from independent trials in Southern Europe matching GAP were (n=7): < 0.005 (5), 0.0053 and 0.0054 mg/kg.

Oxamyl residues in flesh of melon from independent trials in Southern Europe matching GAP were (n=7): < 0.005 (7) mg/kg.

Based on the trials on melon in Southern Europe, the Meeting estimated a maximum residue level of 0.01 mg/kg, an STMR value of 0.005 mg/kg and an HR value of 0.005 mg/kg for oxamyl in melons except watermelon to replace the previous recommendation for melons except watermelon.

The Meeting agreed that the maximum residue level for melons could be extrapolated to that of watermelon.

Fruiting vegetables, other than Cucurbits

Tomato

Data were available from supervised trials on protected tomatoes in Southern European countries.

The GAP in Italy and Spain for tomato is four soil applications (drip irrigation or irrigation via sprinkler) using a SL formulation at a maximum crop cycle rate of 5.0 kg ai/ha and 10–14 days application interval with a PHI of 28 days.

Oxamyl residues in tomatoes and cherry tomatoes from independent trials in Southern Europe matching GAP were (n=20): < 0.01 (22) mg/kg.

The GAP in Italy for protected tomato is one soil application before or at planting using a GR formulation at 3.0–3.5 kg ai/ha for soil incorporation in furrow and at 4.5–5.5 kg ai/ha for soil broadcast spray with incorporation.

Oxamyl residues in tomatoes from independent trials in Southern Europe matching GAP were (n=8): < 0.01 (8) mg/kg.

Based on the trials on tomato in Southern Europe, the Meeting estimated a maximum residue level of 0.01 (*) mg/kg, an STMR value of 0.01 mg/kg and an HR value of 0.01 mg/kg for oxamyl in tomato and cherry tomato to replace the previous recommendation for tomato.

Pepper

Data were available from supervised trials on protected peppers in Southern European countries.

The GAP in Italy and Spain for peppers is for three soil applications (drip irrigation or irrigation via sprinkler) using a SL formulation at a maximum crop cycle rate of 4.0 kg ai/ha and 10–14 days application interval with a PHI of 35 days.

Oxamyl residues in peppers from independent trials in Southern Europe matching GAP were (n=10): < 0.01 (10) mg/kg.

Based on the trials on pepper in Southern Europe, the Meeting estimated a maximum residue level of 0.01 (*) mg/kg, an STMR value of 0.01 mg/kg and an HR value of 0.01 mg/kg for oxamyl in subgroup of peppers (except Martynia, Okra and Roselle) to replace the previous recommendation for peppers.

Eggplant

Data were available from supervised trials on protected eggplants in Southern European countries.

The GAP in Italy and Spain for eggplants is four soil applications (drip irrigation or irrigation via sprinkler) using a SL formulation at a maximum crop cycle rate of 5.0 kg ai/ha and 10–14 days application interval with a PHI of 28 days.

Oxamyl residues in eggplants from independent trials in Southern Europe matching GAP were (n=5): < 0.01 (5) mg/kg.

Based on the trials on eggplant in Southern Europe, the Meeting estimated a maximum residue level of 0.01 (*) mg/kg, an STMR value of 0.01 mg/kg and an HR value of 0.01 mg/kg for oxamyl in subgroup of eggplants.

Root and tuber vegetables

Carrot

Data were available from supervised trials on carrots in European countries.

The GAP in the UK for carrots and parsnips is one soil application (incorporation) in seed furrow at planting of a GR formulation at a rate of 0.090 g ai/m with a PHI of 12 weeks.

Oxamyl residues in carrots from independent trials in Europe matching GAP were (n=7): < 0.01 (7) mg/kg. The residues on carrots were all less than the LOD (0.007 mg/kg).

Based on the trials on carrot in Europe, the Meeting estimated a maximum residue level of 0.01 (*) mg/kg, an STMR value of 0 mg/kg and an HR value of 0 mg/kg for oxamyl in carrot to replace the previous recommendation for carrot.

The Meeting agreed that the maximum residue level for carrots could be extrapolated to that of parsnip.

Sugar beet

Data were available from supervised trials on sugar beet in European countries.

The GAP of the Netherlands for sugar beet is one soil application (incorporation) in furrow at drilling of a GR formulation at a rate of 0.75–2.5 kg ai/ha.

Oxamyl residues in sugar beets from independent trials in Europe matching GAP were (n=19): < 0.01 (11) and < 0.02 (8) mg/kg. The residues on sugar beets were all less than the LOD (0.005 or 0.01 mg/kg).

Based on the trials on sugar beet in Europe, the Meeting estimated a maximum residue level of 0.01 (*) mg/kg, an STMR value of 0 mg/kg and an HR value of 0 mg/kg for oxamyl in sugar beet.

Potato

Data were available from supervised trials on potatoes in European countries.

The GAP in the UK for potato is one soil application (incorporation) at planting of a GR formulation at a rate of 5.5 kg ai/ha with a PHI of 80 days.

Oxamyl residues in potatoes from independent trials in Europe matching GAP were (n=8): < 0.005 (8) mg/kg. The residues on potatoes were all less than the LOD (0.0033 mg/kg).

Based on the trials on potato in Europe, the Meeting estimated a maximum residue level of 0.01 (*) mg/kg, an STMR value of 0 mg/kg and an HR value of 0 mg/kg for oxamyl in potato to replace the previous recommendation for potato.

Fate of residues during processing

High temperature hydrolysis

The hydrolytic stability of [^{14}C]-oxamyl was studied under conditions of high temperature in sterile aqueous buffers at pH 4, 5 and 6 for periods of up to 60 minutes so as to simulate common processing practices (pasteurization, baking/boiling, and sterilization). At pH 4 heating at 90 °C for 20 min, no degradation was observed. At pH 5 heating at 100 °C for 60 min, 58% of test material degraded to IN-A2213, while all the test material degrades to IN-A2213 after incubation at pH 6, at 120 °C for 20 min.

Residues in processed commodities

The fate of oxamyl residues has been examined in potato processing studies. Estimated processing factors and the derived STMR-Ps are summarized in the Table below.

Processing factors, STMR-P and HR-P for food and feed

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors*	PF (Mean or best estimate)	RAC STMR (mg/kg)	STMR-P (mg/kg)	RAC HR (mg/kg)	HR-P (mg/kg)
		Oxamyl	Oxamyl				
Potato tuber	Baked	< 0.05, 0.08, 0.15	0.08	0	0	0	0
	Boiled	< 0.04, < 0.04, < 0.05	< 0.04		0		0
	Microwaved	< 0.04, < 0.04, < 0.05	< 0.04		0		0

* Each value represents a separate study. The factor is the ratio of the residue in processed commodity divided by the residue in the RAC.

Residue in animal commodities

Farm animal dietary burden

The Meeting estimated the dietary burden of oxamyl in farm animals on the basis of the diets listed in Appendix IX of the FAO Manual third edition, 2016. Calculations from the highest residue, STMR (some bulk commodities) and STMR-P values provide levels in feed suitable for estimating MRLs, while calculations using STMR and STMR-P values for feed are suitable for estimating STMR values for animal commodities. The percentage dry matter is taken as 100% when the highest residue levels and STMRs are already expressed on a dry weight basis.

Estimated maximum and mean dietary burdens of farm animals

The calculations were made according to the animal rations from US-Canada, EU, Australia and Japan in the Table (Appendix IX of the 2016 edition of the FAO manual).

Potential feed items include: tomato wet pomace, carrot culls, sugar beet molasses and potato culls.

Livestock dietary burden, oxamyl, ppm of dry matter diet								
	US-Canada		EU		Australia		Japan	
	Max	Mean	Max	Mean	Max	Mean	Max	Mean
Beef cattle	0	0	0	0	**0.005**[a]	**0.005**[b]	0	0
Dairy cattle	0	0	0	0	**0.005**[c]	**0.005**[d]	0	0
Poultry – broiler	-	-	-	-	-	-	-	-
Poultry – layer	-	-	-	-	-	-	-	-

[a] - Highest maximum beef cattle dietary burden suitable for MRL estimates for mammalian meat, fat and edible offal

[b] - Highest mean beef cattle dietary burden suitable for STMR estimates for mammalian meat, fat and edible offal

[c] - Highest maximum dairy cattle dietary burden suitable for MRL estimates for milk

[d] - Highest mean dairy cattle dietary burden suitable for STMR estimates for milk

Farm animal feeding studies

Farm animal feeding studies were not submitted.

Animal commodities maximum residue levels

For MRL estimation, the residue definition in the animal commodities is oxamyl.

The maximum dietary burden for beef and dairy cattle is 0.005 ppm which is lower than the dose level in the lactating goat metabolism study (31 ppm). In the studies, no measured residues of oxamyl were found in any of analysed tissues and milk. No feed items for poultry were applicable.

The Meeting estimated maximum residue levels at the LOQ of 0.01* mg/kg and STMRs/HRs of 0 for animal products as milk, mammalian meat, mammalian edible offal and mammalian fat to replace the previous recommendations for milk, mammalian meat and mammalian edible offal. The Meeting withdrew the previous recommendations for eggs, poultry meat and poultry, edible offal of.

RECOMMENDATIONS

On the basis of the data from supervised trials, the Meeting concluded that the residue levels listed in Annex 1 are suitable for estimating maximum residue limits and for IEDI and IESTI assessment.

Plant and Animal commodities:

Definition of the residue for plant and animal commodities (for compliance with the MRL and for estimation of dietary exposure): *Oxamyl.*

The residue is not fat soluble.

DIETARY RISK ASSESSMENT

Long-term dietary exposure

The International Estimated Daily Intakes (IEDIs) of oxamyl were calculated for the 17 GEMS/Food cluster diets using STMRs/STMR-Ps estimated by the current Meeting (Annex 3). The ADI is 0–0.009 mg/kg bw and the calculated IEDIs were 0–1% of the maximum ADI (0.009 mg/kg bw). The Meeting concluded that the long-term dietary exposure to residues of oxamyl, resulting from the uses considered by current JMPR, is unlikely to present a public health concern.

Short-term dietary exposure

The International Estimated Short-Term Intakes (IESTI) of oxamyl were calculated for food commodities and their processed commodities using HRs/HR-Ps or STMRs/STMR-Ps estimated by the current Meeting (Annex 4). The ARfD is 0.009 mg/kg bw and the calculated IESTIs were a maximum of 20% of the ARfD for the general population and 10% of the ARfD for children. The Meeting concluded that the short-term dietary exposure to residues of oxamyl, when used in ways that have been considered by the current JMPR, is unlikely to present a public health concern.