

Human health risk assessment of residues in 4 crops

Hazard identification

The following residue detections have been reported in following crops as part of the Food Residue Programme:

FRSP	Crop type	Residues	Amount (mg/kg)	MRL (mg/kg)
428	beans	acephate	0.016	0.01
Out of scope				
506	blackberry	Out of scope		
		acephate	0.015	0.01
Out of scope				

Acephate

Acephate binds to and inhibits the enzyme acetylcholinesterase (AChE) in nervous system tissues. As a result, the neurotransmitter acetylcholine accumulates and repeatedly activates cholinergic receptors.

Human volunteers ingested a single dose of acephate. No physiological changes were observed at the highest doses tested, 1.2 mg/kg in men and 1.0 mg/kg in women. Ten male volunteers each ingested 0.25 mg/kg/day acephate for 28 days. No acetylcholinesterase inhibition, clinical or physiological changes were observed. The U.S. EPA designated acephate as Group C, possible human carcinogen based on increases in liver adenomas and carcinomas in female mice. No human data were found on carcinogenic effects of acephate.

Out of scope

Out of scope

Hazard characterisation

Acephate

The EPA NZ has set an acceptable daily intake (ADI) of 0.0012 mg/kg bw based on the no-observed-adverse-effect level (NOAEL) of 0.12 mg/kg bw/day from a 90 day rat study (the toxic effect at the LOAEL of 0.15 mg/kg bw/day was brain acetyl cholinesterase inhibition) with an uncertainty factor of 100 and assuming oral absorption in the study of 100% (US EPA, 2001).

JMPR (2005) established an ADI of 0–0.03 mg/kg bw based on the NOAEL of 0.25 mg/kg bw per day from the study of repeated doses in humans and an overall safety factor of 10. JMPR also established an ARfD of 0.1 mg/kg bw on the basis of the NOAEL of 1.2 mg/kg bw from the study of single doses in humans and an overall safety factor of 10. The overall safety factor of 10 was derived by dividing the default value of 10 by 2 (because inhibition of acetylcholinesterase activity depends on the C_{max}) and by multiplying by 2 (because some uncertainty remains with respect to the *in vivo* sensitivity to inhibition of human brain acetylcholinesterase activity relative to that of erythrocyte acetylcholinesterase activity, since brain acetylcholinesterase may be more sensitive than erythrocyte acetylcholinesterase).

Out of scope

Out of scope

Exposure assessment and risk characterisation

FRSP	Crop	Compound		Residue (mg/kg)	Acute est. exposure (µg/kg bw/d)	Est. exposure (µg/kg bw/d)	% of ADI	% of ARfD
428	Beans (Legume vegetables)	acephate	Adult	0.016	0.04	0.01	0.8	0.04
			Child	0.016	0.09	0.02	2.1	0.1

Out of scope

	Blackberries (Berries and other small fruits)	acephate	Adult	0.015	0.07	0.01	0.8	0.1
			Child	0.015	0.15	0.02	1.5	0.1

Out of scope

Risk Characterisation

Dietary exposure assessment of all the residues detected in 4 samples identifies that concentrations are far below a level at which a dietary risk would be present for New Zealand adults or children.

9(2)(a)

4 February 2019

Human health risk assessment of residues in endive, witloof or chicory.

Hazard identification

The following residue detections have been reported in endive, witloof or chicory as part of the Food Residue Programme:

Compound	Level (mg/kg)
Out of scope	
Acephate	9.5
Out of scope	
Methamidophos	0.86

Methamidophos detection included as risk categorisation for acephate must consider cumulative exposure of total organophosphate level. Further explanation on page 7 of this appendix, and in response letter.

Out of scope

Acephate

Acephate binds to and inhibits the enzyme acetylcholinesterase (AChE) in nervous system tissues. As a result, the neurotransmitter acetylcholine accumulates and repeatedly activates cholinergic receptors.

Human volunteers ingested a single dose of acephate. No physiological changes were observed at the highest doses tested, 1.2 mg/kg in men and 1.0 mg/kg in women. Ten male volunteers each ingested 0.25 mg/kg/day acephate for 28 days. No acetylcholinesterase inhibition, clinical or physiological changes were observed. The U.S. EPA designated acephate as Group C, possible human carcinogen based on increases in liver adenomas and carcinomas in female mice. No human data were found on carcinogenic effects of acephate.

Out of scope

Methamidophos

Methamidophos (O,S-dimethyl phosphoramidothioate), an organophosphorus insecticide which acts by inhibiting cholinesterase activity, is a racemate and a major metabolite of acephate.

Methamidophos is acutely toxic when administered orally, with an LD₅₀ of 13–16 mg/kg bw in rats. The clinical signs of toxicity are those typical of cholinergic effects. In short-term studies of toxicity in mice (oral, dermal, intraperitoneal), rats (oral, dermal, inhalation, intraperitoneal), rabbits (dermal) and dogs (oral), methamidophos caused signs of toxicity related to inhibition of cholinesterase activity. In view of the lack of evidence for genotoxicity or for carcinogenic potential in mice or rats, JECFA (2002) concluded that methamidophos is unlikely to pose a carcinogenic risk to humans.

Hazard characterisation

Out of scope

Acephate

The EPA NZ has set an acceptable daily intake (ADI) of 0.0012 mg/kg bw based on the no-observed-adverse-effect level (NOAEL) of 0.12 mg/kg bw/day from a 90 day rat study (the toxic effect at the LOAEL of 0.15 mg/kg bw/day was brain acetyl cholinesterase inhibition) with an uncertainty factor of 100 and assuming oral absorption in the study of 100% (US EPA, 2001).

JMPR (2005) established an ADI of 0–0.03 mg/kg bw based on the NOAEL of 0.25 mg/kg bw per day from the study of repeated doses in humans and an overall safety factor of 10. JMPR also established an ARfD of 0.1 mg/kg bw on the basis of the NOAEL of 1.2 mg/kg bw from the study of single doses in humans and an overall safety factor of 10. The overall safety factor of 10 was derived by dividing the default value of 10 by 2 (because inhibition of acetylcholinesterase activity depends on the C_{max}) and by multiplying by 2 (because some uncertainty remains with respect to the *in vivo* sensitivity to inhibition of human brain acetylcholinesterase activity relative to that of erythrocyte acetylcholinesterase activity, since brain acetylcholinesterase may be more sensitive than erythrocyte acetylcholinesterase).

Out of scope

Out of scope

Methamidophos

JECFA (2002) established an ADI of 0–0.004 mg/kg bw on the basis of the NOAEL of 0.1 mg/kg bw per day for inhibition of erythrocyte and brain cholinesterase activity in the 2-year study of toxicity and carcinogenicity in rats and a safety factor of 25. This value is supported by the NOAEL of 0.1 mg/kg bw per day for inhibition of erythrocyte cholinesterase activity in the multigeneration study of reproductive toxicity in rats and by the NOAEL of 0.06 mg/kg bw per day for inhibition of erythrocyte and brain cholinesterase activity in the 1-year study of toxicity in dogs.

JECFA (2002) established an acute RfD of 0.01 mg/kg bw on the basis of the NOAEL of 0.3 mg/kg bw for inhibition of erythrocyte and brain cholinesterase activity in the study of neurotoxicity in rats given single doses and a safety factor of 25. The results of the study in volunteers were supportive of both the ADI and the acute RfD because methamidophos did not cause toxic effects other than those associated with, or secondary to, inhibition of cholinesterase activity.

EPA NZ has set the ADI at 0.0001 mg/kg bw per day.

Exposure assessment and risk characterisation

No specific consumption values are available for endive, witloof or chicory in New Zealand, therefore to estimate the chronic exposure, the population mean consumption values for leafy vegetable in the relevant New Zealand nutrition surveys were used; 53.3 g/day for adults and 33.2 g/day for children. Normalising this to an 82 kg adult male and a 23 kg 5-6 year old child delivers intake values of 0.65 g/kg bw and 1.44 g/kg bw respectively.

To estimate the acute exposure, the population high (97.5th percentile) consumption values for endive, witloof or chicory (leafy vegetable) in the relevant New Zealand nutrition surveys were used; 242.4 g/day for adults and 148.2 g/day for children. Normalising this to an 82 kg adult male and a 23 kg 5-6 year old child delivers intake values of 2.96 g/kg bw and 6.44 g/kg bw respectively.

<i>Compound</i>	<i>Level (mg/kg)</i>		Est. exposure (µg/kg bw/d)	Acute est. exposure (µg/kg bw/d)	% of ADI	% of ARfD
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Out of scope

Acephate	9.5	Adult	6.18	28.09	514.8	28.1
		Child	13.72	61.22	1143.7	61.2
Out of scope						
Methamidophos	0.86	Adult	0.56	2.54	559.2	25.4
		Child	1.24	5.54	1242.5	55.4

Cumulative exposure

Some of residues detected are within the organophosphates chemical classes. All organophosphates are acetylcholinesterase (AChE) enzyme inhibitors and as a result the toxicity may be additive on this end point. To account for this potential risk a cumulative assessment has been undertaken. To account for varying toxic potencies of the individual chemicals they are weighted against the toxicity of a marker OP, which for this assessment is methamidophos.

This weighting is referred to as a relative potency factor (RPF). By adding the weighted exposures it was possible to characterise the risk due to cumulative dietary exposure to all of the detected organophosphate insecticides.

	NOAEL for AChE inhibition (mg/kg bw/day)	RPF against methamidophos
Methamidophos	0.1	1
Acephate	0.25	0.4

		Est. exposure (µg/kg bw/d)	Weighted exposure (µg/kg bw/d)	Cumulative exposure (µg/kg bw/day)	% of ADI (methamidophos)
Acephate	Adult	6.18	2.47		
	Child	13.72	5.49		
Methamidophos	Adult	0.56	0.56	3.03	3032
	Child	1.24	1.24	6.73	6728

Risk Characterisation

Dietary exposure assessment of acephate and methamidophos detected in the endive, witloof or chicory samples identifies that concentrations are above a level at which a dietary risk would be present for New Zealand adults or children. Out of scope

In addition, the cumulative chronic exposure to organophosphates is calculated to exceed the health based guidance value for the marker compound methamidophos for adults or children. It has to be noted that the dietary intake values for endive, witloof or chicory for children are likely to be

conservative. However, no dietary intake values for endive, witloof or chicory for children are available.

9(2)(a)

1 June 2018

Released under the Official Information Act 1982

From: 9(2)(a)
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: Dietary Risk assessment for peas and wheat sample results
Date: Friday, 1 July 2016 2:51:20 pm
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)

Hi 9(2)

I have ran the Dietary Intake Risk Assessment for the ingredients/commodities you have sent through to me.
Please note that the potential daily exposure via food (PDE(food)) is used for dietary intake calculation where a value has been set by the EPA NZ.
An appropriate acceptable daily intake (ADI) is used in the absence of a PDE(food).
The intake values are from the New Zealand 2008 Adult Nutrition Survey and the 2002 Child Nutrition Survey.

Out of scope

Ps. If one of the actives listed below is detected at levels above the currently approved MRLs in other commodities, then the dietary intake values for that active has to be recalculated.

Out of scope

Out of scope

Out of scope

Out of scope

Out of scope

4) Glyphosate (wheat)

The ADI of 0.3mg/kg bw/day was considered appropriate for use in the assessment of dietary exposure.

Based on all the currently approved uses and MRLs, the NEDI for Glyphosate is equivalent to less than 1% of the ADI.

Residues detected in wheat:

Wheat	Glyphosate	ADI ARfD	0.3 mg/kg bw/day N.A.	(codex has not set a value due to low toxicity)
	Wheat intake (g/kg bw/day)	Residue (mg/kg)	Exposure (mg/kg bw/day)	as % JECFA ADI/ARfD
Adult (82 kg) mean	1.29	5.900	0.00760	2.5
Adult 97.5th percentile	3.98	5.900	0.02349	23.5
Child (23 kg) mean	5.49	5.900	0.03241	10.8
Child 97.5th percentile	13.21	5.900	0.07795	77.9

Conclusion:

After accounting for the residues detected in wheat, the NEDI for Glyphosate is still equivalent to less than 5% of the ADI.

The chronic dietary exposure from all potential sources of Glyphosate is small, even after the highest observed residue of Glyphosate in wheat was accounted for.

Therefore, there is no food safety concern with the Glyphosate detection in peas.

Out of scope



Out of

From: 9(2)(a)
Sent: Monday, 27 June 2016 2:46 p.m.
To: 9(2)(a)
Subject: Dietary Risk assessment for peas and wheat sample results

Hi 9(2)

We have completed peas and wheat samples and I've extracted all the results that were above the MRLs. Could you please provide me with the Dietary Intake Risk Assessment for the highest and the lowest of the common residues?

Sample_no	country_of_origin	commodity	compound_name	compound_amount mg/kg	NZ MRL
Out of scope					
FRSP164	New Zealand	Wheat	Glyphosate	5.9	0.10
FRSP188	New Zealand	Wheat	Glyphosate	2.8	0.10
FRSP186	New Zealand	Wheat	Glyphosate	2	0.10
FRSP184	New Zealand	Wheat	Glyphosate	1.8	0.10
FRSP187	New Zealand	Wheat	Glyphosate	1.7	0.10
FRSP178	New Zealand	Wheat	Glyphosate	1.5	0.10
FRSP179	New Zealand	Wheat	Glyphosate	1.5	0.10
FRSP191	New Zealand	Wheat	Glyphosate	1.5	0.10
FRSP165	New Zealand	Wheat	Glyphosate	1.4	0.10
FRSP160	New Zealand	Wheat	Glyphosate	1.3	0.10
FRSP147	New Zealand	Wheat	Glyphosate	1	0.10
FRSP146	New Zealand	Wheat	Glyphosate	0.92	0.10
FRSP185	New Zealand	Wheat	Glyphosate	0.88	0.10
FRSP155	New Zealand	Wheat	Glyphosate	0.54	0.10
FRSP158	New Zealand	Wheat	Glyphosate	0.51	0.10
FRSP152	New Zealand	Wheat	Glyphosate	0.41	0.10
FRSP192	New Zealand	Wheat	Glyphosate	0.41	0.10
FRSP189	New Zealand	Wheat	Glyphosate	0.39	0.10
FRSP174	New Zealand	Wheat	Glyphosate	0.26	0.10
FRSP148	New Zealand	Wheat	Glyphosate	0.2	0.10
Out of scope					

*Peas without pods

Thank you and Kind regards,
9(2)(a), Chemical & Microbiological Assurance
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