Animal Residue Data Sheet
Deltamethrin

Deltamethrin is registered in Australia for use on cotton, cereals (pre- and post-harvest), pulses, oilseeds, Brassica vegetables, cape gooseberries, rosella, sweet corn and tomatoes. Deltamethrin is also registered as an ectoparasiticide for treatment of cattle, sheep and goats. Details of the registered use patterns can be found on the approved labels of registered products containing deltamethrin as the active constituent. This Animal Residue Data Sheet provides information on the possible residues in feed commodities obtained from crops treated with deltamethrin. It also provides information on the anticipated maximum dietary exposure of animals fed treated commodities, which should not result in the violation of animal MRLs.

Current MRLs

The Australian MRLs for deltamethrin in food and animal feed commodities, as listed in Table 1 and Table 4 of the *MRL Standard* (as at July 2004) are shown below. The residue definition of deltamethrin is deltamethrin *per se*.

Code	Food	MRL, mg/kg
Food Commodities		
VB 0040	Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead brassica	*0.05
GC 0080	Cereal grains	2
VO 0050	Fruiting vegetables, other than Cucurbits	0.1
VP 0060	Legume vegetables	0.1
SO 0088	Oilseed	0.1
MM 0818	Pig meat [in the fat]	0.1
MO 0818	Pig, edible offal of	*0.01
VD 0070	Pulses	0.1
VO 1275	Sweet corn (kernels)	0.1
CM 0654	Wheat bran, unprocessed	5
CF 1210	Wheat germ	3
Animal commodities		
MO 0812	Cattle, Edible offal of	0.1
MM 0812	Cattle meat [in the fat]	0.5
PE 0112	Eggs	*0.01
MO 0814	Goat, Edible offal of	0.1
MM 0814	Goat meat [in the fat]	0.2
ML 0106	Milks	0.05
PM 0110	Poultry meat [in the fat]	*0.01
PO 0111	Poultry, edible offal of	*0.01
MO 0822	Sheep, Edible offal of	0.1
MM 0822	Sheep meat [in the fat]	0.2
Animal feed commodities		
	Fodder and forage of cereal grains	5
	Fodder and forage of oilseeds	5
	Fodder and forage of pulses	5
	Fodder and forage of sweet corn	5
	Rice hulls	7

Summary of maximum feeding levels and livestock dietary intakes

The Maximum Feeding Level (MFL, the feeding level at which the MRLs are based), the equivalent Daily Dietary Intake For Livestock (DDIL) and the equivalent daily intake of deltamethrin are summarised below.

Species	**MFL, ppm in diet**	**Equivalent DDIL, mg/kg bw**	**Equivalent intake of deltamethrin, mg/animal/day**
Cattle[a]	9.4	0.38	188
Sheep[b]	7.5	0.31	18.8
Pig[c]	3.7	0.15	9.2
Poultry[d]	2.5	0.19	0.38

[a] Based on a 500 kg animal consuming 20 kg DM/day
[b] Based on a 60 kg animal consuming 2.5 kg DM/day
[c] Based on a 60 kg animal consuming 2.5 kg DM/day
[d] Based on a 2 kg animal consuming 150 g DM/day

Detailed information

All feed commodities

Feed commodities that may contain residues of deltamethrin are listed in the table below. The theoretical maximum proportion of the diet that the commodity can comprise, when residues are present at the MRL, without the significant risk of animal commodity MRLs being violated is also given. It should be noted that the feeding levels assumed by the NRA when setting animal commodity MRLs are theoretical values, and they should not be taken as recommendations of appropriate rations for livestock.

Commodity [a]	Assumed Maximum proportion of diet (%)[b]	Feed intake (kg/animal/day)[c]	Residue (mg/kg) [d]	Maximum intake of deltamethrin from commodity (mg/animal/day)[e]	Theoretical maximum proportion of diet (%)[f]
Cattle (Based on a 500 kg animal consuming 20 kg DM/day)					
Cereal grains	100	20	2 (MRL)	40	100
Fodder and forage of cereal grains	100	20	5 (MRL)	100	100
Fodder and forage of oilseeds	100	20	5 (MRL)	100	100
Fodder and forage of pulses	100	20	5 (MRL)	100	100
Fodder and forage of sweet corn	100	20	5 (MRL)	100	100
Oilseeds	30	6	0.1 (MRL)	0.6	100
Pulses	100	20	0.1 (MRL)	2	100
Rice hulls	40	8	3.2 (STMR-P)	25.6	100
Wheat germ	40	8	0.84 (STMR-P)	6.7	100
Wheat bran	40	8	2.3 (STMR-P)	18.4	100
Sheep (Based on a 60 kg animal consuming 2.5 kg DM/day)					
Cereal grains	100	2.5	2 (MRL)	5	100
Fodder and forage of cereal grains	100	2.5	5 (MRL)	12.5	100
Fodder and forage of oilseeds	100	2.5	5 (MRL)	12.5	100
Fodder and forage of pulses	100	2.5	5 (MRL)	12.5	100
Fodder and forage of sweet corn	100	2.5	5 (MRL)	12.5	100
Oilseeds	30	0.75	0.1 (MRL)	0.075	100
Pulses	100	2.5	0.1 (MRL)	0.25	100
Rice hulls	40	1	3.2 (STMR-P)	3.2	100
Wheat germ	40	1	0.84 (STMR-P)	0.84	100
Wheat bran	40	1	2.3 (STMR-P)	2.3	100
Pigs (Based on a 60 kg animal consuming 2.5 kg DM/day)					
Cereal grains	100	2.5	2 (MRL)	5	100
Oilseed	30	0.75	0.1 (MRL)	0.075	100
Pulses	100	2.5	0.1 (MRL)	0.25	100
Rice hulls	40	1	3.2 (STMR-P)	3.2	100
Wheat bran	40	1	0.84 (STMR-P)	0.84	100
Wheat germ	40	1	2.3 (STMR-P)	2.3	100
Poultry (Based on a 2 kg animal consuming 150 g DM/day)					
Cereal grains	100	0.15	2 (MRL)	0.30	100
Oilseed	30	0.045	0.1 (MRL)	0.0045	100
Pulses	100	0.15	0.1 (MRL)	0.015	100

Rice hulls	20	0.03	3.2 (STMR-P)	0.096	75
Wheat bran	20	0.03	0.84 (STMR-P)	0.025	100
Wheat germ	20	0.03	2.3 (STMR-P)	0.069	100

[a] The feed commodities that may contain residues of deltamethrin, and may form more than 20% of an animals diet.
[b] The maximum % of the diet that the commodity is assumed to comprise for the purposes of setting MRLs, based on Stockfeed Information Document 1
[c] The equivalent amount of feed for an animal of designated weight and feed intake that is assumed for the purposes of setting MRLs
[d] The MRL for each feed commodity (correction for dry weight basis where required)
[e] The maximum intake of deltamethrin when the commodity is fed at the maximum assumed level (Column 1) in the absence of other sources of deltamethrin.
[f] The maximum % of the diet at which the commodity could theoretically be fed without significant risk of exceeding animal commodity MRLs. It is assumed that the residue in the feed commodity is present at the MRL (or dry weight equivalent) and other dietary sources of deltamethrin are absent.

Abbreviations and definitions

DM: Dry matter. The feed consumption for livestock and the residue levels in feed commodities are expressed on a dry matter basis.

DDIL: Daily Dietary Intake for Livestock. The level of dietary exposure for a specified chemical in a specified species that should not result in exceedance of the relevant animal commodity MRLs. Expressed in mg chemical/kg bodyweight.

HR: Highest residue observed in supervised residue trials

MFL: Maximum Feeding Level. The level of dietary exposure for a specified chemical in a specified species that should not result in exceedance of the relevant animal commodity MRLs. Expressed in terms of ppm in the feed.

MRL: The concentration of a chemical residue, in units of mg/kg, that is legally permitted in or on a food or food commodity.

ppm in the feed: Parts per million in the feed. An alternate way of expressing the level of dietary exposure for a chemical. The level of chemical intake is calculated as though it were present uniformly in the total feed intake. The ppm in the feed is calculated using the following formula: DDIL (mg chemical/kg bw) × body weight (kg) ÷ daily feed intake (kg).

STMR-P: Supervised Trial Median Residue of the processed commodity. The highest residue that livestock are likely to be exposed to in practice when fed processed commodities over a prolonged period. This is derived from the STMR of the whole commodity multiplied by the processing factor.

Attachment 1: Anticipated maximum dietary exposure

The following calculations outline the theoretical diet used to calculate the maximum anticipated dietary exposure, maximum feeding level (MFL) and the daily dietary intake for livestock (DDIL) for cattle, sheep, pigs and poultry.

Cattle

Feed group	Feed commodity	% in the diet	Feed intake, kg/animal/day[a]	Residue, mg/kg	% DM[b]	Intake of deltamethrin, mg/animal/day[c]
Forage/fodder	Fodder/forage of cereals	100	20	5 (MRL)	-	100
Total	-	100	20	-	-	100

[a]Based on assumed feed consumption of 20 kg dry matter/day
[b]Estimate of percentage dry matter. Applied to MRLs expressed on a fresh weight basis
[c]Based on assumed bodyweight of 500 kg

Maximum anticipated dietary exposure: 100 mg/animal/day
equivalent to: 0.2 mg/kg bw
equivalent to: 5 ppm in the diet

MFL (Based on the available cattle transfer data): 9.4 ppm in the diet
equivalent DDIL: 0.38 mg/kg bw

Sheep

Feed group	Feed commodity	% in the diet	Feed intake, kg/animal/day[a]	MRL, mg/kg	% DM[b]	Intake of deltamethrin, mg/animal/day[c]
Forage/fodder	Fodder/forage of cereals	100	2.5	5 (MRL)		12.5
Total	-	100	2.5	-	-	12.5

[a]Based on assumed feed consumption of 2.5 kg dry matter/day
[b]Estimate of percentage dry matter. Applied to MRLs expressed on a fresh weight basis
[c]Based on assumed bodyweight of 60 kg

Maximum anticipated dietary exposure: 12.5 mg/animal/day
equivalent to: 0.21 mg/kg bw
equivalent to: 5 ppm in the diet

MFL (Based on the available cattle transfer data): 7.5 ppm in the diet
equivalent DDIL: 0.31 mg/kg bw

Pigs

Feed group	Feed commodity	% in the diet	Feed intake, kg/animal/day[a]	MRL, mg/kg	% DM[b]	Intake of deltamethrin, mg/animal/day[c]
Grain	Cereal grain (eg wheat)	60	1.5	2 (MRL)	-	3
Processed grain fractions	Rice hulls	40	1	3.2 (STMR-P)	-	3.2
Total	-	100	2.5	-	-	6.2

[a]Based on assumed feed consumption of 2.5 kg dry matter/day
[b]Estimate of percentage dry matter. Applied to MRLs expressed on a fresh weight basis
[c]Based on assumed bodyweight of 60 kg

Maximum anticipated dietary exposure: 6.2 mg/animal/day
equivalent to: 0.10 mg/kg bw
equivalent to: 2.48 ppm in the diet

MFL (Based on the available cattle transfer data): 3.7 ppm in the diet
equivalent DDIL: 0.15 mg/kg bw

Poultry

Feed group	Feed commodity	% in the diet	Feed intake, kg/animal/day[a]	MRL, mg/kg	% DM[b]	Intake of deltamethrin, mg/animal/day[c]
Grain	Cereal grain (eg wheat)	80	0.12	2 (MRL)	-	0.24
Processed grain fractions	Rice hulls	20	0.03	3.2 (STMR-P)	-	0.096
Total	-	100	2.5	-	-	0.34

[a]Based on assumed feed consumption of 0.150 kg dry matter/day
[b]Estimate of percentage dry matter. Applied to MRLs expressed on a fresh weight basis
[c]Based on assumed bodyweight of 2 kg

Maximum anticipated dietary exposure: 0.34 mg/animal/day
equivalent to: 0.17 mg/kg bw
equivalent to: 2.3 ppm in the diet

MFL (Based on the available poultry transfer data: 2.5 ppm in the diet
equivalent DDIL: 0.19 mg/kg bw

Attachment 2: Residue data

The residue definition of deltamethrin in Australia is the parent compound *per se*.

Lactating cows – milk and tissues

Lactating cows were fed deltamethrin in the feed for 28 consecutive days at rates equivalent to 2 ppm and 10 ppm in the total diet. The average feed consumption during the acclimation period was 14.4 kg DM/day. Milk was collected twice daily and daily composite samples were analysed for deltamethrin residues. A single animal from each treatment group was slaughtered 1, 4 and 9 days after removal from treated feed. Tissue samples were analysed for residues of deltamethrin. [*J. Environ. Sci. Health*, B27(3), 235-253 (1992)]

Residues of deltamethrin in milk, corrected for recovery [1]

Days of feeding/withdrawal	2 ppm group	10 ppm group
1	<0.001	<0.001-0.005
2	<0.001	0.008-0.015
3	<0.001	0.008-0.035
4	0.007-0.012	0.011-**0.053**
10	0.005-0.017	0.024-0.038
11	0.006-0.007	0.021-0.030
18	0.009-**0.018**	0.020-0.038
25	<0.001-0.003	0.021-0.045
28	<0.004-0.016	0.024-0.035
1 day withdrawal	0.007-0.009	0.027-0.031
2 day withdrawal	<0.001	0.007-0.010
3 day withdrawal	<0.001	0.005
4 day withdrawal	<0.001	<0.001
5 day withdrawal	<0.001	<0.001
6 day withdrawal	<0.001	<0.001

1. Average recoveries for fortified milk samples- 101% @ 0.01 mg/kg, 103% @ 0.005 mg/kg, 71% @ 0.001 mg/kg, 81% @ 0.024 mg/kg, 77% @ 0.034 mg/kg.

Average milk fat contents for individual cows were as follows:

Cow	% fat in milk
2 ppm	
1	3.45
2	2.71
3	3.30
Average	3.15
10 ppm	
1	3.55
2	4.29
3	3.53
Average	3.79

Correcting for average fat content would give maximum residues in the fat of 0.57 mg/kg and 1.4 mg/kg for the 2 ppm and 10 ppm feed levels respectively.

Feed level	Deltamethrin, mg/kg [1]				
	Subcut. fat	Renal fat	Forequarter muscle	Hindquarter muscle	Liver
2 ppm					
+ 1 day [2]	0.042	0.046	<0.027	<0.027	<0.027
+ 4 days [3]	0.037	0.036	<0.027	<0.027	<0.027
+ 9 days [4]	0.027	0.037	<0.027	<0.027	<0.027
10 ppm					
+ 1 day [2]	0.128	0.266	<0.027	<0.027	<0.027
+ 4 days [3]	0.089	0.208	<0.027	<0.027	<0.027
+ 9 days [4]	0.081	0.132	<0.027	<0.027	<0.027

1. Results are corrected for recovery. Average recoveries at 0.027 mg/kg were subcut. fat- 68%, renal fat- 103%, hind muscle- 100%, fore muscle- 72%, liver- 91%. Results were not reported for kidney due to difficulties with the analysis.
2. Samples taken 1 day after treatment ceased
3. Samples taken 4 days after treatment ceased
4. Samples taken 9 days after treatment ceased

Broilers and Laying Hens

A poultry study was conducted with both chicks and laying hens. The birds were given ad libitum access to a feed containing 70% flour derived from wheat treated post-harvest with deltamethrin. The flour initially contained approximately 1 mg/kg of deltamethrin. The concentration of deltamethrin was therefore initially 0.7 mg/kg. The deltamethrin content in the flour was observed to be approximately 0.8 mg/kg after 12 months. Chicks were slaughtered after 14, 28, 49 and 70 days of feeding. Further chicks were slaughtered after 3, 7, 14 and 21 days withdrawal from treated feed. The average weight of the chicks increased from 41 g to approximately 1.5 kg over the feeding period and to approximately 2 kg after the withdrawal period. Eggs from the laying hens were collected after 0, 14, 28, 56 and 84 days of feeding and after 7, 14 and 28 days withdrawal from treated feed. [*J. Agric. Food Chem.*, **1995**, 43, 1039-1043]

Residues in tissues and eggs of poultry

Sample	Days of feeding (days withdrawn)	Deltamethrin residue, mg/kg
Muscle	14, 28, 49, 70	all <0.002
	(3, 7, 14, 21)	all <0.002
Fat	14	0.002
	28	0.002
	49	<0.002
	70	0.003
	(3)	<0.002
	(7)	0.003
	(14)	<0.002
	(21)	<0.002
Skin	14	0.01
	28	0.008
	49	0.01
	70	0.01
	(3)	0.01
	(7)	0.005
	(14)	0.005
	(21)	0.005
Liver	14, 28, 49, 70	all <0.002
	(3, 7, 14, 21)	all <0.002
Eggs	14, 28, 49, 70, 73, 77, 84	all <0.002
	(7)	<0.002