

Table H.1. T-REX Analysis of Maximum S-Methoprene Application Rate Flowable Concentrate to Ornamental Woody Plants (0.428 lbs ai/A; 10 day interval, 4 applications)

TREX MODEL INPUTS

These values will be used in the calculation of exposure estimates for foliar, granular, liquid and/or seed applications of pesticides.

Chemical Name:	S-methoprene	Reset Model
Use:	shrubs	
Product name and form:	liquid	
% A.I. (leading zero must be entered for formulations <1% a.i.):	100.00%	
Application Rate (lbs/A):	0.428	Questions? Comments? Click here
Half-life (days):	7	
Application Interval (days):	10	
Number of Applications:	4	

Note: Sources of wildlife diet are assumed to be available for less than one year for this model.

Endpoints

Avian

Indicate test species below

LD50 (mg/kg-bw)	2000.00	Mallard duck	▼
LC50 (mg/kg-diet)	10000.00	Bobwhite quail	▼
NOAEL (mg/kg-bw)		Mallard duck	▼
NOAEC (mg/kg-diet)	30.00	Mallard duck	▼

Enter the Mineau et al. Scaling Factor 1.15

Mammals

LD50 (mg/kg-bw)	10000.00	
LC50 (mg/kg-diet)	2000.00	
Reported Chronic Endpoint	2500.00	mg/kg-diet ▼
Is estimated daily dose (mg/kg-bw) reported from the available chronic mammal study? (yes or no)		
Enter daily dose (mg/kg-bw)		
Estimated Chronic Daily Dose Equivalent to reported Chronic Dietary Endpoint	125	mg/kg-bw based on standard FDA lab rat conversion

Avian Results

Avian Class	Body Weight (g)	Ingestion (Fdry) (g bw/day)	Ingestion (Fwet) (g/day)	% body wgt consumed	FI (kg-diet/day)
Small	20	5	23	114	2.28E-02
Mid	100	13	65	65	6.49E-02
Large	1000	58	291	29	2.91E-01

Avian Body Weight (g)	Adjusted LD50 (mg/kg-bw)
20	1038.45
100	1322.00
1000	1867.37

Dose-based EECs (mg/kg-bw)	Avian Classes and Body Weights		
	small 20 g	mid 100 g	large 1000 g
Short Grass	182.59	104.12	46.62
Tall Grass	83.69	47.72	21.37
Broadleaf plants/sm insects	102.71	58.57	26.22
Fruits/pods/seeds/g insects	11.41	6.51	2.91

Dose-based RQs (Dose-based EEC/adjusted LD50)	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	0.18	0.08	0.02
Tall Grass	0.08	0.04	0.01
Broadleaf plants/sm insects	0.10	0.04	0.01
Fruits/pods/seeds/g insects	0.01	0.00	0.00

Dietary-based RQs (Dietary-based EEC/LC50 or NOAEC)	RQs	
	Acute	Chronic
Short Grass	0.02	5.34
Tall Grass	0.01	2.45
Broadleaf plants/sm insects	0.01	3.01
Fruits/pods/seeds/g insects	0.00	0.33

Note: To provide risk management with the maximum possible information, it is recommended that both the dose-based and concentration-based RQs be calculated when data are available

S-methoprene

shrubs

Upper bound Kenaga Residues

Mammalian Results

Mammalian Class	Body Weight	Ingestion (Fdry) (g bw/day)	Ingestion (Fwet) (g/day)	% body wgt consumed	FI (kg-diet/day)
Herbivores/ insectivores	15	3	14	95	1.43E-02
	35	5	23	66	2.31E-02
	1000	31	153	15	1.53E-01
Grainvores	15	3	3	21	3.18E-03
	35	5	5	15	5.13E-03
	1000	31	34	3	3.40E-02

Mammalian Class	Body Weight	Adjusted LD50	Adjusted NOAEL
Herbivores/ insectivores	15	21978.31	274.73
	35	17782.79	222.28
	1000	7691.61	96.15
Grainvores	15	21978.31	274.73
	35	17782.79	222.28
	1000	7691.61	96.15

Dose-Based EECs (mg/kg-bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15 g	35 g	1000 g	15 g	35 g	1000 g
Short Grass	152.86	105.64	24.49			
Tall Grass	70.06	48.42	11.23			
Broadleaf plants/sm insects	85.98	59.42	13.78			
Fruits/pods/seeds/lg insects	9.55	6.60	1.53	2.12	1.47	0.34

Dose-based RQs (Dose-based EEC/LD50 or NOAEC)	15 g mammal		35 g mammal		1000 g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	0.01	0.56	0.01	0.48	0.00	0.25
Tall Grass	0.00	0.26	0.00	0.22	0.00	0.12
Broadleaf plants/sm insects	0.00	0.31	0.00	0.27	0.00	0.14
Fruits/pods/lg insects	0.00	0.03	0.00	0.03	0.00	0.02
Seeds (granivore)	0.00	0.01	0.00	0.01	0.00	0.00

Dietary-based RQs (Dietary-based EEC/LC50 or NOAEC)	Mammal RQs	
	Acute	Chronic
Short Grass	0.08	0.06
Tall Grass	0.04	0.03
Broadleaf plants/sm insects	0.05	0.04
Fruits/pods/seeds/lg insects	0.01	0.00

Table H.2. T-Rex Printout for Granular Application Representing a Maximum of 0.03 lbs ai/A Broadcast to an Open Field (size of the granule is 0.425 mg, 30 day exposure in the environment).

Characterization of Granular LD50/Square Foot Results

Estimation of the number of granules needed to achieve toxicity thresholds	
No. of granules needed to achieve adjusted LD50	114984.17
No. of granules needed to achieve Acute LOC exceedance (1/2 adjusted LD50)	57492.09
No. of granules needed to achieve Endangered Species LOC exceedance (1/10 adjusted LD50)	11498.42

Minimum Foraging Area Needed to Allow for Ingestion of Sufficient Mass of a.i. to Achieve LOC Exceedance	
Foraging area (square feet) needed to achieve LOC exceedance assuming 100% feeding efficiency	3.32
Foraging area (square feet) needed to achieve LOC exceedance assuming 50% feeding efficiency	6.65
Foraging area (square feet) needed to achieve LOC exceedance assuming 10% feeding efficiency	33.24

ASSESSING TERRESTRIAL INVERTEBRATE EXPOSURE TO PESTICIDES:

In addition to the normal uncertainties associated with using one surrogate species to represent all members within its taxa (*e.g.*, using a rat to represent ‘mammals’), here are some things to consider when using, or considering to use, T-REX and bee contact studies to estimate exposure to terrestrial invertebrates – **CAUTION:** This is ***NOT*** an exhaustive list.

Is contact expected to be the most sensitive route of exposure (*e.g.*, if the most toxic route of exposure is through ingestion, what can a bee contact study tell you? Are more appropriate data, *e.g.*, dietary data, available from ECOTOX)?

Is the chemical expected to be equally toxic to all insect life stages (*e.g.*, if the chemical affects molting, larvae may be particularly sensitive to it, while adults may not be affected by the chemical at all).

Is there some specific reason(s) – based on its mode of action or available data - to suspect that some insect taxa may be more sensitive to a chemical than bees?

Is the toxicity from a dab of the chemical on the thorax of a bee representative of the toxicity due to a more uniform distribution of the chemical over the exposed parts of the entire insect?

And related to this, how representative is a bee to insects with large surface areas per volume (e.g., butterflies and moths)?

Method to estimate terrestrial insect exposure:

For terrestrial invertebrates, normally the only submitted data we have are LD₅₀ values for honeybees based on acute contact (a dab of the chemical on the thorax of a honeybee); sometimes we have LD₅₀ values from an oral dose of the chemical. Occasionally we may have open literature (ECOTOX) data for dietary exposure, etc., for different insect species.

One potential way to estimate exposure (modified from methods originally in Metolachlor salmonid assessment) is:

- 1) Estimate residue concentrations on fruits/seeds/pods/large insects using T-REX (version 1.2.3) for the particular use(s) being assessed (the EEC values are reported in 'ppm', which is equal to 'µg a.i./g of insect'). The EEC for fruits/seeds/pods/**large insects** should be from one of the non-body-weight-adjusted tables, that is, from a "dietary"-based table in TREX output. To assess the risk, use the broadleaf plant/small insect EEC from a dietary table. The resulting RQ should be approximately 9 times as high, assuming the same body weight and LD50 data.
- 2) If no other toxicity data are available for insects, use honey bees as a surrogate for terrestrial insects; otherwise use most sensitive terrestrial insect.
- 3) Estimate the residue for a bee (µg a.i./bee) using an adult honey bee weight of 0.128 g (i.e., multiply the EEC for seeds and pods in T-REX by '0.128'). Which equals the exposure in µg a.i./bee.
- 4) If toxicity data are available from more sensitive non-bee insect species, use the weight for an individual of that species (in grams) as the multiplier.

Another way to think about it:

Based upon an average fresh weight per honey bee of 128 milligrams, the LD₅₀ of honey bees (:g/bee) can be multiplied by 7.8 to determine the ppm toxicity. (Mayer, D. & C. Johansen. 1990. *Pollinator Protection: A Bee & Pesticide Handbook*. Wicwas Press. Cheshire, Conn. p. 161)

$$\mu\text{g/g} = \text{ppm}$$

$$\mu\text{g/bee} = \mu\text{g}/128 \text{ mg} = \mu\text{g}/0.128 \text{ g} = 7.8 \mu\text{g/g} = 7.8 \text{ ppm}$$

To convert ppm to µg/bee, the ppm value would be divided by 7.8.