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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460



OFFICE OF PREVENTION,
PESTICIDES AND TOXIC
SUBSTANCES

October 13, 2004

DP Barcode: D309020
PC Code: 122804

MEMORANDUM

SUBJECT: Revised Drinking water assessment for Abamectin

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Health Effects Division (7509C)

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CONCLUSIONS

A screening assessment of estimated environmental concentrations (EECs) for abamectin and its major soil degradate (a mixture of a 8- α -hydroxy and a ring opened aldehyde derivative) in drinking water resulting from an additional use (Head Lettuce in CA), was requested by the Health Effects Division (HED). The product considered was Agri-Mek @ 0.15 EC (EPA Reg.No. 100-898) containing the active ingredient abamectin, which itself is a mixture of abamectins containing $\geq 80\%$ abamectin B_{1a} (5-0-demethyl abamectin A_{1a}) and $\leq 20\%$ abamectin B_{1b} (5-0-demethyl-25-de(1-methylpropyl)-25-(1-methylethyl) abamectin A_{1a}). Screening models were used to determine estimated concentrations in ground water and surface water. Based on PRZM/EXAMS modeling, the acute surface water Expected Environmental Concentration (EEC) of abamectin and its major degradate (a mixture of a 8- α -hydroxy and a ring opened aldehyde derivative) for the use on

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lettuce is 0.335 µg/L. The 1 in 10 year annual mean and 36 year overall mean surface water values for use in HED's drinking water assessment are 0.139 and 0.111 µg/L, respectively. Although these EECs were based on a different crop in a different region of the U.S., the values were not very different from those generated previously applying abamectin on FL strawberries (Revised Drinking water assessment for Abamectin; September 16, 2004). The acute surface water Expected Environmental Concentration (EEC) of abamectin and its major degradate (a mixture of a 8- α -hydroxy and a ring opened aldehyde derivative) for the use on strawberries in Florida was 0.295 µg/L. The 1 in 10 year annual mean and 36 year overall mean surface water values for use in HED's drinking water assessment were 0.101 and 0.082 µg/L, respectively

The estimated ground water concentration of abamectin and its major degradate (a mixture of a 8- α -hydroxy and a ring opened aldehyde derivative) after application of abamectin to lettuce is 0.0017 µg/L. This estimate was derived using the EFED model SCI-GROW, and assuming application at the maximum annual rate of 0.056 lb a.i. per acre. Because SCI-GROW is a screening level model, we have only moderate confidence in this result.

Background

Abamectin (also known as Avermectin) is the active ingredient in the miticide/insecticide Agrimek ® 0.15, which is proposed for control of a number of insect pests, specifically mites and leafminers in avocados, celeriac, citrus, cucurbits, fruiting vegetables, grapes, herb crops, hops, leafy vegetables, mint, pome fruits, stone fruit, strawberries, tree nuts, and tuberous roots and corn vegetables.

Groundwater and surface water monitoring data are not available to the Environmental Fate and Effects Division (EFED) for abamectin at this time. Screening models were used to determine estimated concentrations for abamectin in groundwater and surface water for the proposed uses. Of all the crops listed on the label, lettuce has the highest seasonal application rate, at two times, 0.028 lb a.i./acre.

SURFACE WATER

PRZM-EXAMS simulations were conducted for abamectin use on lettuce to evaluate the cumulative probability distribution for peak and annual mean EECs.

Surface Water Exposure Inputs for PRZM/EXAMS for Parent Abamectin and its major degradate (a mixture of a 8- α -hydroxy and a ring opened aldehyde derivative)		
MODEL INPUT VARIABLE	INPUT VALUE	COMMENTS
Application Rate (lbs ai/A)	0.028	Current label (EPA Reg. No. 100-898)
Maximum No. of Applications	2	Current label
Application Interval (days)	7	Current Label
K _d (mL/g)	50	MRID 40856301; no data for degradate.
Aerobic Soil Metabolic Half-life (days)	150	90% upper-bound confidence limit of mean half-life (cumulative).
Is the pesticide wetted-in?	No	Current label
Depth of Incorporation (in.)	0	Current label
Spray Drift	6.4%	For ground spray
Solubility (μ g/L)	78	10x reported value; no data for degradate.
Aerobic Aquatic Metabolic Half-life (days)	300	No acceptable aerobic aquatic metabolism data were available. Therefore, since there were no data and the hydrolysis rate is stable, per current EFED guidance, use 2x aerobic soil metabolism half-life as input value.
Hydrolysis (pH 7) half-life (days)	0	Stable. No MRID available. Review dated 4/18/83; no data for degradate.
Photolysis Half-life (days)	0.5	Dark-control adjusted half-life. Ku and Jacob, 1983, No MRID available, Review dated 3/28/84; no data for degradate.

Drinking water EECs for abamectin and its major degradate (a mixture of a 8- α -hydroxy and a ring opened aldehyde derivative) for use on lettuce in California, incorporating the regional Percent Cropped Area adjustments, are presented below. Because lettuce is a minor use crop, as are other crops to which abamectin is applied in California, the regional PCA value of 0.56 was applied to these estimates.

Estimated drinking water concentrations to be used for exposure to Abamectin and its major degradate (a mixture of a 8- α -hydroxy and a ring opened aldehyde derivative) in drinking water derived from Surface Water.

Toxicity Endpoint	Model EEC Value ($\mu\text{g/L}$)	Use Modeled	PCA Modeled
Acute	0.335	Lettuce in California; 2 aerial applications @ 0.028 lb ai/A; application intervals of 7 days.	The regional PCA factor of 0.56 was used to reflect lettuce and other minor use crops grown in the California.
One-in-10-year annual mean	0.139		
36 year overall mean	0.111		

Ground Water

The SCI-GROW model is based on scaled ground water concentration from ground water monitoring studies, environmental fate properties (aerobic soil half-lives and organic carbon partitioning coefficients- K_{oc} 's) and application rates. The model is based on permeable soils that are vulnerable to leaching and on shallow ground water (10-30 feet). SCI-GROW version 2.3 (executable file dated 08/05/2003) was used to estimate concentrations of abamectin and its major degradate (a mixture of a 8- α -hydroxy and a ring opened aldehyde derivative) that could be found in drinking water derived from ground water, using the input values listed in the table below.

Ground Water Exposure Inputs for SCI-GROW for parent abamectin and its major degradate (a mixture of a 8- α -hydroxy and a ring opened aldehyde derivative).

MODEL INPUT VARIABLE	INPUT VALUE	COMMENTS
Application Rate (lbs. ai/A)	0.028 (lettuce)	Current label ((EPA Reg. No. 100-898)
Maximum No. of Applications	2	Current label.
K_{oc}	2,531	Lowest non-sand K_{oc} of 2,531 in Three Bridges silt loam (1.22 % OC). Lowest K_{oc} was used since the K_{oc} 's differed by more than a factor of 3. MRID 40856301; no data for degradate.
Aerobic Soil Metabolic Half-life (days)	101	Mean of 101 days from cumulative half-lives of 53.5, 49.4, 169.9, and 133.3 days. Ku and Jacob, 1983, No MRID available, Review dated 3/28/84.

Results from the SCI-GROW screening model predict that the maximum concentration of parent abamectin and its major degradate (a mixture of a 8- α -hydroxy and a ring opened aldehyde derivative) in shallow ground water is not expected to exceed 0.0017 $\mu\text{g/L}$ for the current maximum seasonal use rate on lettuce.

**APPENDIX I
PRZM/EXAMS OUTPUT FILE FOR ABAMECTIN ON CA HEAD LETTUCE**

stored as AvrmCAIt.out
 Chemical: Avrmctn
 PRZM environment: calettuceC.txt modified Thuday, 12 August
 EXAMS environment: ir298.exv modified Thuday, 29 August
 Metfile: w23273.dvf modified Wedday, 3 July 2002
 Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.3223	0.3081	0.2584	0.1929	0.162	0.0809
1962	0.518	0.5003	0.4373	0.3587	0.3292	0.2022
1963	0.4996	0.4825	0.4465	0.3703	0.3265	0.1917
1964	0.413	0.3981	0.3454	0.2761	0.2408	0.1576
1965	0.682	0.6584	0.5818	0.4531	0.3943	0.2298
1966	0.4647	0.4494	0.395	0.324	0.2863	0.1994
1967	0.5254	0.5139	0.4759	0.3983	0.3542	0.233
1968	0.4294	0.414	0.3593	0.2877	0.2505	0.1585
1969	0.6013	0.581	0.5091	0.4177	0.3706	0.2394
1970	0.4733	0.4563	0.396	0.3206	0.2807	0.1862
1971	0.4658	0.4506	0.4014	0.3368	0.3178	0.2068
1972	0.4094	0.3944	0.3415	0.2721	0.2371	0.161
1973	0.5513	0.5337	0.4713	0.3923	0.354	0.2478
1974	0.5702	0.5515	0.485	0.4033	0.3563	0.2627
1975	0.5603	0.5437	0.4842	0.4058	0.3615	0.2477
1976	0.4691	0.453	0.4087	0.332	0.2908	0.2178
1977	0.4926	0.4798	0.4386	0.3916	0.3645	0.225
1978	0.6443	0.6249	0.56	0.4663	0.4447	0.3142
1979	0.5031	0.4864	0.4273	0.352	0.3106	0.2008
1980	0.5209	0.5042	0.4454	0.3693	0.3263	0.2182
1981	0.5281	0.5103	0.4471	0.3676	0.3282	0.2031
1982	0.5735	0.5523	0.482	0.3844	0.3383	0.1959
1983	0.5326	0.5156	0.469	0.3911	0.3452	0.2325
1984	0.4234	0.4083	0.3547	0.2832	0.2465	0.1543
1985	0.4277	0.4127	0.3597	0.2895	0.2529	0.1642
1986	0.5602	0.5406	0.4711	0.3793	0.3305	0.2023
1987	0.4689	0.4525	0.3945	0.3208	0.2813	0.1804
1988	0.4858	0.4705	0.4355	0.3753	0.333	0.1991
1989	0.4248	0.4099	0.3567	0.2863	0.2499	0.148
1990	0.4014	0.3866	0.3345	0.2655	0.2303	0.1257

Sorted results	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	0.682	0.6584	0.5818	0.4663	0.4447	0.3142
0.064516	0.6443	0.6249	0.56	0.4531	0.3943	0.2627
0.096774	0.6013	0.581	0.5091	0.4177	0.3706	0.2478
0.129032	0.5735	0.5523	0.485	0.4058	0.3645	0.2477
0.16129	0.5702	0.5515	0.4842	0.4033	0.3615	0.2394

0.193548	0.5603	0.5437	0.482	0.3983	0.3563	0.233
0.225806	0.5602	0.5406	0.4759	0.3923	0.3542	0.2325
0.258065	0.5513	0.5337	0.4713	0.3916	0.354	0.2298
0.290323	0.5326	0.5156	0.4711	0.3911	0.3452	0.225
0.322581	0.5281	0.5139	0.469	0.3844	0.3383	0.2182
0.354839	0.5254	0.5103	0.4471	0.3793	0.333	0.2178
0.387097	0.5209	0.5042	0.4465	0.3753	0.3305	0.2068
0.419355	0.518	0.5003	0.4454	0.3703	0.3292	0.2031
0.451613	0.5031	0.4864	0.4386	0.3693	0.3282	0.2023
0.483871	0.4996	0.4825	0.4373	0.3676	0.3265	0.2022
0.516129	0.4926	0.4798	0.4355	0.3587	0.3263	0.2008
0.548387	0.4858	0.4705	0.4273	0.352	0.3178	0.1994
0.580645	0.4733	0.4563	0.4087	0.3368	0.3106	0.1991
0.612903	0.4691	0.453	0.4014	0.332	0.2908	0.1959
0.645161	0.4689	0.4525	0.396	0.324	0.2863	0.1917
0.677419	0.4658	0.4506	0.395	0.3208	0.2813	0.1862
0.709677	0.4647	0.4494	0.3945	0.3206	0.2807	0.1804
0.741935	0.4294	0.414	0.3597	0.2895	0.2529	0.1642
0.774194	0.4277	0.4127	0.3593	0.2877	0.2505	0.161
0.806452	0.4248	0.4099	0.3567	0.2863	0.2499	0.1585
0.83871	0.4234	0.4083	0.3547	0.2832	0.2465	0.1576
0.870968	0.413	0.3981	0.3454	0.2761	0.2408	0.1543
0.903226	0.4094	0.3944	0.3415	0.2721	0.2371	0.148
0.935484	0.4014	0.3866	0.3345	0.2655	0.2303	0.1257
0.967742	0.3223	0.3081	0.2584	0.1929	0.162	0.0809

0.1 0.59852 0.57813 0.50669 0.41651 0.36999 0.24779

Average of yearly averages: 0.19954

Inputs generated by pe4.pl - 8-Aug-03

Data used for this run:

Output File: AvrmCAIt

Metfile: w23273.dvf

PRZM scenario: calettuceC.txt

EXAMS environment file: ir298.exv

Chemical Name: Avrmctn

Description	Variable	Name	Value	Units	Comments
Molecular weight	mwt		873.11	g/mol	
Henry's Law	Const.		henry	2.20E-09	atm-m ³ /mol
Vapor Pressure	vapr		1.50E-09	torr	
Solubility	sol		78	mg/L	
Kd	Kd		50	mg/L	
Koc	Koc	mg/L			
Photolysis half-life	kdp		0.5	days	Half-life
Aerobic Aquatic Metabolism	kbacw		300	days	Halfife
Anaerobic Aquatic Metabolism	kbacs		0	days	Halfife
Aerobic Soil Metabolism	asm		150	days	Halfife
Hydrolysis pH		7	0	days	Half-life

Method: CAM 2 integer See PRZM manual
 Incorporation Depth: DEPI 0 cm
 Application Rate: TAPP 0.03 kg/ha
 Application Efficiency: APPEFF 0.95 fraction
 Spray Drift: DRFT 0.16 fraction of application
 Application Date: Date 1-Apr dd/mm or dd/mm
 Interval Record 1 interval 7 days Set to
 17:00 FILTRA
 Record IPSCND 1
 UPTKF
 18:00 PLVKRT
 PLDKRT
 FEXTRC 0.5
 Flag for Index Res. Run IR IR
 Flag for runoff calc. RUNOFF total none,

SCIGROW VERSION 2.3

ENVIRONMENTAL FATE AND EFFECTS DIVISION
 OFFICE OF PESTICIDE PROGRAMS
 U.S. ENVIRONMENTAL PROTECTION AGENCY
 SCREENING MODEL
 FOR AQUATIC PESTICIDE EXPOSURE

SciGrow version 2.3
 chemical: abamectin
 time is 10/14/2004 12: 6: 8

Application rate (lb/acre)	Number of applications	Total Use (lb/acre/yr)	Koc (ml/g)	Soil Aerobic metabolism (days)
0.028	2.0	0.056	2.53E+03	101.0

groundwater screening cond (ppb) = 1.69E-03
