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

OFFICE OF PREVENTION, PESTICIDES AND TOXIC SUBSTANCES

October 13, 2004

MEMORANDUM

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= And

10-14-04

SUBJECT: Revised Drinking water assessment for Abamectin

- TO: Kelly O'Rourke, Biologist Registration Action Branch III Health Effects Division (7509C)
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CONCLUSIONS

THRU:

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_{la} (5-0-demethyl abamectin A_{1a}) and \leq 20% abamectin B_{1b} (5-0-demethyl-25-de(1methylpropyl)-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



lettuce is 0.335 μ g/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 μ g/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 μ g/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 μ g/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 μ g/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 corm 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 (µg/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; nordata for degradate.				

Drinking water EECs for abamectin and its major degradate (a mixture of a $8-\alpha$ -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 $8-\alpha$ -hydroxy and a ring opened aldehyde derivative) in drinking water derived from Surface Water.

Toxicity Endpoint	Model EEC Value (µg/L)	Use Modeled	PCA Modeled
Acute	0.335	Lettuce in California; 2	The regional PCA factor
One-in-10-year annual mean	0.139	0.028 lb ai/A; application (a) intervals of 7 days.	reflect lettuce and other minor use crops grown in
36 year overall mean	0.111		the California.

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., 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 $8-\alpha$ -hydroxy and a ring opened aldehyde derivative) in shallow ground water is not expected to exceed 0.0017 µg/L for the current maximum seasonal use rate on lettuce.

APPENDIX I

PRZM/EXAMS OUTPUT FILE FOR ABAMECTIN ON CA HEAD LETTUCE

stored Chemical:	as Avrmetn	AvrmCA	t.out				
PRZM	environment:	calettuce	C.txt	modified	Thuday.	12	August
EXAMS	environment:	ir298.exv	1	modified	Thuday.	29	August
Metfile:	w23273.dvf	modified		Wedday,	3	July	2002
Water	segment	concentr	ations	(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	5.	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	i ·	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) - ₁	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	1	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	۰. ا	0.4705	0.4355	0.3753	0.333	0.1991
1989	0.4248	i .	0.4099	0.3567	0.2863	0.2499	0.148
1990	0.4014		0.3866	0.3345	0.2655	0.2303	0.1257
Contori							
Soried	Results	06 hr		21 Dev	60 Day		Voorbe
- 100. - 0 0200E0	Lean U 600	30 11	0 6594	21 Day 0 5010		SU Day	
0.032230	0.002	· ·	0.0004	0.0010	0.4003	0.4447	0.3142
0.004010	0.0443		0.0249	0.00	0.4031	0.3943	0.2027
0.030774	0.0013		0.001	0.0091	0.4177	0.3700	0.2470
0 16129	0.0700		0.5515	0.400	0.4030	0.0040	0.2411
0.10120	0.07.02		0.0010	0.7072	0.7000	0.0010	0.2004

0.193548 0.225806 0.258065 0.290323 0.322581	0.5603 0.5602 0.5513 0.5326 0.5281	 1	0.5437 0.5406 0.5337 0.5156 0.5139	0.482 0.4759 0.4713 0.4711 0.469	0.398 0.392 0.391 0.391 0.384	3 0.3563 3 0.3542 6 0.354 1 0.3452 4 0.3383	0.233 0.2325 0.2298 0.225 0.2182
0.354839 0.387097 0.419355	0.5254 0.5209 0.518		0.5103 0.5042 0.5003	0.4471 0.4465 0.4454	0.379 0.375 0.370	3 0.333 3 0.3305 3 0.3292	0.2178 0.2068 0.2031
0.451613 0.483871 0.516129	0.5031 0.4996 0.4926	1000 - 1000 1000 - 1000 1000 - 1000	0.4864 0.4825 0.4798	0.4386 0.4373 0.4355	0.369 0.367 0.358	3 0.3282 6 0.3265 7 0.3263	0.2023 0.2022 0.2008
0.548387 0.580645 0.612903	0.4858 0.4733 0.4691		0.4705 0.4563 0.453	0.4273 0.4087 0.4014	0.35 0.336 0.33	2 0.3178 8 0.3106 2 0.2908	0.1994 0.1991 0.1959
0.645161 0.677419 0.709677	0.4689 0.4658 0.4647	· .	0.4525 0.4506 0.4494	0.396 0.395 0.3945	0.32 0.320 0.320	4 0.2863 8 0.2813 6 0.2807	0.1917 0.1862 0.1804
0.741935	0.4294 0.4277 0.4248	•	0.414	0.3597	0.289	5 0.2529 7 0.2505 3 0.2499	0.1642 0.161
0.83871	0.4234		0.4083	0.3547	0.283	2 0.2465 1 0.2468	0.1576 0.1543
0.935484 0.967742	0.4094 0.4014 0.3223		0.3944 0.3866 0.3081	0.3345 0.2584	0.265	5 0.2303 9 0.162	0.1257 0.0809
0.1	0.59852 Average	of	0.57813	0.50669 yearly	0.4165 averages	1 0.36999 0.19954	0.24779
Inputs	generated	by		pe4.pl	-	8-Aug-03	
Data Output Metfile:	used File: w23273.dvf	for AvrmCA	lt	this	run:		
PRZM EXAMS Chemical	scenario: environment Name:	calettuce file: Avrmctn	eC.txt	ir298.exv			
Descriptio n	Variable	Name		Value	Units	Comment s	
Molecular Henry's Vapor Solubility	weight Law Pressure sol	mwt Const. vapr	78	873.11 henry 1.50E-09 ma/L	g/mol 2.20E-0 torr	9 atm-m^3/m	lol
Kd Koc Photolysis	Kd Koc half-life	mg/L kdp	50	mg/L 0.5	davs	Half_life	
Aerobic Anaerobic Aerobic	Aquatic Aquatic Soil	Metaboli Metaboli Metaboli	sm sm sm	kbacw kbacs asm	30 15	0 days 0 days 0 days	Halfife Halfife Halfife
Hydrolysis	рН		7	0	days	Half-life	

Method: Incorporati on	CAM Depth:	DEPI	2 integer	See 0 cm	PRZM	manual
Applicatio n	Rate:	TAPP	C	0.03 kg/ha		
Applicatio n	Efficiency:	APPEFF	. C).95 fraction		
Spray	Drift	DRFT	Ċ	.16 fraction	of	application
Applicatio n	Date	Date	1-	Apr dd/mm	or	dd/mmm
Interval	17.00	interval	•	7 days	Set	to
Record	IPSCND UPTKF	FILTRA	1			
Record	18:00 PLDKRT	PLVKRT		• • • •		
Flag Flag	for for	Index runoff	Res. calc.	Run RUNOFF	IR total	IR 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	Number of	Total Use Koc	Soil Aerobic
rate (lb/acre)	applications	(lb/acre/yr) (ml/g)	metabolism (days)

0.028	2.0	0.056	2.53E+03	101.0

groundwater screening cond (ppb) = 1.69E-03