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

OFFICE OF PREVENTION, PESTICIDES AND TOXIC SUBSTANCES

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MEMORANDUM

SUBJECT: Revised Drinking water assessment for Avermectin
PC Code: 122804

FROM: Ibrahim Abdel-Saheb, Agronomist
Environmental Resources Branch II
Environmental Fate and Effects Division

9-16-04

Dana Spatz, Senior Chemist
Environmental Resources Branch II
Environmental Fate and Effects Division

9-16-04

THRU: Tom Bailey, Ph.D., Chief
Environmental Resources Branch II
Environmental Fate and Effects Division

Tom A Bailey 9-20-04

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

CONCLUSIONS

As requested by the Health Effects Division (HED), a screening assessment of estimated environmental concentrations (EECs) for avermectin and its major soil degradate (a mixture of a 8-α-hydroxy and a ring opened aldehyde derivative) in drinking water resulting from the proposed label uses for 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 was performed. 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 avermectins containing ≥80% avermectin B_{1a} (5-0-demethyl avermectin A_{1a}) and ≤20% avermectin B_{1b} (5-0-demethyl-25-de(l-methylpropyl)-25-(I-methylethyl) avermectin 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 strawberries in Florida is 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 are 0.10 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 strawberries is 0.0026 µg/L. This estimate was derived using the EFED model SCI-GROW, and assuming application at the maximum annual rate of 0.075 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 Avamectin) 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 leafy vegetables, fruiting vegetables, and tree crops.

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, strawberries have the highest seasonal application rate, at four times 0.01875 lb a.i./acre. Based upon a recently reviewed plastic mulch runoff study conducted by the registrant on Florida strawberries (DP292938), the PRZM scenario for Florida strawberries was modified to include a curve number of 88, instead of the previous values of 95-97. PRZM and EXAMS were then run to generate EECs for crops with relatively high seasonal use rates, including strawberries. The strawberry EECs turned out to be the highest, and are therefore reported here for use in HED's drinking water assessment.

SURFACE WATER

This assessment replaces the one performed four years ago for abamectin on leafy and fruiting vegetables (DP Barcode 265145; dated 4/20/2000). PRZM-EXAMS simulations were conducted for abamectin use on strawberries to evaluate the cumulative probability distribution for peak and annual mean EECs. Previous modeling took the use of plastic mulch on Florida strawberries into account by using estimated high curve numbers in the PRZM scenario. The current assessment differs in that a measured curve number (value of 88) derived from a small plot runoff study conducted by the registrant was used in the scenario.

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)	0.01875	Current label (EPA Reg.No. 100-898)
Maximum No. of Applications	4	Current label
Application Interval (days)	7 (between applications 1 and 2, 3 and 4) 21 (between applications 2 and 3)	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; 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) on strawberries in Florida, incorporating the Index Reservoir and Percent Cropped Area adjustments, are presented below. Because strawberries are a minor use crop, as are other crops to which abamectin is applied in Florida, the regional PCA value of 0.38 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 (μg/L)	Use Modeled	PCA Modeled
Acute	0.295	Strawberries in Florida; 4 ground applications @ 0.01875 lb ai/A; application intervals of 7 days, 21 days, 7 days (per label instructions for strawberries)	The regional PCA factor of 0.38 was used to reflect strawberries and other minor use crops grown in the southeast.
One-in-10-year annual mean	0.101		
36 year overall mean	0.082		

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. 01875 (strawberries)	Current label ((EPA Reg.No. 100-898)
Maximum No. of Applications	4 (Strawberries)	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 chronic 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 0.0026 µg/L for the current maximum seasonal use rate on strawberries.