8-14-89

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

14 AUG 1989
14 AUG 1989

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: NON-DIETARY EXPOSURE ASSESSMENT FOR THE APPLICATION OF CAPTURE 2 EC (BIFENTHRIN) TO SEED CORN AND POP CORN (HED PROJECT # 9-1859 and 9-1524)

TO: James A. Tompkins
Team # 41
Registration Division (H7505c)

FROM: Steven M. Knott, Chemist
Environmental Chemistry Review Section
Non-Dietary Exposure Branch
Health Effects Division (H7509c)

THRU: Michael P. Firestone, Ph.D., Section Head
Environmental Chemistry Review Section
Non-Dietary Exposure Branch
Health Effects Division (H7509c)

Charles L. Trichilo, Ph.D., Chief
Non-Dietary Exposure Branch
Health Effects Division (H7509c)

A. INTRODUCTION

Texas Department of Agriculture has applied for a section 18 exemption covering the use of the pyrethroid miticide, Bifenthrin (EPA Reg. # 279-3069), in the lower Rio Grande Valley of Texas. This specific exemption covers the application of Bifenthrin (Capture 2 EC) to seed corn and pop corn. NDEB has assessed Mixer/Loader and Applicator, daily and annual exposure to Bifenthrin for this application.

B. CONCLUSION

NDEB has assessed Mixer/Loader and Applicator exposure resulting from the use of Bifenthrin on seed corn and pop corn. The detassling of seed corn has not been assessed due to the absence of data for such an assessment. The exposure estimates assume a 70 kg individual and have not been adjusted for dermal absorption. NDEB defers to Toxicology Branch I-IRS the adjustment of the dermal exposure estimates for the dermal

1/9

absorption of Bifenthrin. The results of the exposure assessment are as follows.

	Estimated Annual Exposure (mg/kg/yr)
Mixer/Loader	
Commercial	
Aerial	0.17
Ground-Boom	0.031
Grower	
Ground-Boom	0.0077
Applicator	
Commercial	
Aerial	0.021
Ground-Boom	
Open Cab	5.0
Combined M/L/A	5.0
Closed Cab	0.19
Combined M/L/A	0.22
Grower	
Ground-Boom	
Open Cab	1.2
Combined M/L/A	1.2
Closed Cab	0.049
Combined M/L/A	0.057

For future applications for exemption, NDEB recommends that additional usage information be provided by the state. Information, such as the following, would be useful for future exposure assessments:

a) Percent of Crop actually treated with the product.

b) Percent of Crop treated by a particular equipment type (e.g., aerial or ground boom equipment).

c) Typical commercial applicator usage practices (e.g., Acres/year or Days/year of treatment).

d) Any other information which might influence the amount of product used during the time period covering the exemption.

If the registrant should seek full registration of Bifenthrin, usage information, such as (c) and (d) above, should be generated and evaluated by BAB/BEAD prior to its use by NDEB in estimating occupational exposure.

C. DETAILED CONSIDERATIONS

1.0 USE INFORMATION

Bifenthrin is applied to seed corn and pop corn for the purpose of controlling mites. BAB/BEAD provided use information to NDEB on August 2, 1989 covering this application of Bifenthrin.

Bifenthrin is applied at a rate of 0.09 lb ai/acre with a maximum of 8 applications per year. The average commercial applicator can treat 1120 acres per day aerially or 200 acres per day by ground-boom requiring 3.47 and 8.6 hours, respectively. The average grower can treat 50 acres per day by ground-boom requiring 2.15 hours. Commercial mixer/loaders can handle 100.8 lb ai for aerial and 18 lb ai for ground-boom applications per treatment day. The grower will handle 4.5 lb ai per treatment day.

2.0 UNDERLYING ASSUMPTIONS

Due to restrictions imposed by the manufacturer, the following assumptions concerning product usage have been made:

a) Mixing/Loading will be done via a closed pour system (direct pumping from drums).

b) During aerial applications, mechanical flaggers will be used, precluding the assessment of flagger exposure.

c) Certified commercial or private pesticide applicators will be used (mixer/loader and applicator may or may not be the same person).

d) Mixer/loaders must wear at least long sleeves, long pants, gloves and goggles.

3.0 NON-DIETARY EXPOSURE TO MIXER/LOADERS

To estimate the unit exposure to mixer/loaders using a closed loading system, two studies, available in the published literature, were used. These studies, which were previously reviewed by NDEB, are listed below.

STUDY	REPLICATES	EXPOSURE (mg/lb ai)	CLOTHING
Dubelman	9	0.0041	Long-Sleeved Shirts, Long Pants, Gloves
Peoples	9	0.025	Long-Sleeved Shirts, Long Pants, Gloves

The total of 18 replicates yields an arithmetic mean of 0.015 mg/lb ai. Based on the above usage information, the exposure per treatment day to Bifenthrin for mixer/loaders would be:

COMMERCIAL

AERIAL 0.015 mg/lb ai x 100.8 lb ai x 1/70 kg = 0.022 mg/kg/d

GROUND BOOM 0.015 mg/lb ai x 18 lb ai x 1/70 kg = 0.0038 mg/kg/d

GROWER

GROUND BOOM 0.015 mg/lb ai x 4.5 lb ai x 1/70 kg = 0.00096 mg/kg/d

With 8 applications per year (4 appl./season x 2 growing seasons/yr), the annual mixer/loader exposure would be:

COMMERCIAL

AERIAL 0.0216 mg/kg/d x 8 d/yr = 0.17 mg/kg/yr

GROUND-BOOM 0.00386 mg/kg/d x 8 d/yr = 0.031 mg/kg/yr

GROWER

GROUND-BOOM 0.00096 mg/kg/d x 8 d/yr = 0.0077 mg/kg/yr

(See Attachment 1 for tabulated data and calculations)

4.0 NON-DIETARY EXPOSURE TO AERIAL APPLICATORS

To estimate the unit exposure to Pilots, 5 studies, available in the published literature, have previously been reviewed by NDEB. Results from these studies, normalized to an application rate of 1 lb ai/acre, are:

STUDY	REPLICATES	EXPOSURE (mg/hr)	CLOTHING
Lavy-82	3	0.10	Long-Sleeved Shirt, Long Pants
Maddy	4	0.021	Long-Sleeved Shirt, Long Pants
Peoples	11	0.86	Long-Sleeved Shirt, Long Pants
Mumma	6	0.80	Long-Sleeved Shirt, Long Pants
Atallah	4	0.38	Long-Sleeved Shirt, Long Pants

Results from the above 5 studies (a total of 28 replicates) yields a weighted arithmetic mean of 0.58 mg/hr. Based on the above usage data, the average daily exposure to the pilot would be:

0.58 mg/hr/lb ai/acre x 0.090 lb ai/acre x 3.47 hr/d x 1/70 kg = 0.0026 mg/kg/d

The average annual exposure to the pilot would be:

0.0026 mg/kg/d x 8 d/yr = 0.021 mg/kg/yr

5.0 NON-DIETARY EXPOSURE TO GROUND-BOOM APPLICATORS

5.1 OPEN CAB

Unit exposure to an applicator within an open cab tractor can be assessed using results from the following two studies (normalized to an application rate of 1 lb ai/acre is assumed in each):

Study	Replicates	Exposure (mg/hr)	Clothing
Abbott	18	39.9	Long-Sleeved Shirt, Long Pants
Wojeck	21	76.7	Long-Sleeved Shirt, Long Pants

The total of 39 replicates yields a weighted geometric mean of 56.7 mg/hr (based on the above two arithmetic means). These two studies represent a subset of a data set which has previously been assumed to follow a log normal distribution. Therefore, a geometric rather than an arithmetic mean was calculated. Based on the usage information described earlier in this section, the daily and annual (open cab) ground-boom applicator exposure would be:

COMMERCIAL

DAILY 56.7 mg/hr/lb ai/acre x 0.090 lb ai/acre x 8.6 hr/d x 1/70 kg = 0.63 mg/kg/d

ANNUAL 0.63 mg/kg/d x 8 d/yr = 5.0 mg/kg/yr

GROWER

DAILY 56.7 mg/hr/lb ai/acre x 0.090 lb ai/acre x 2.15 hr/d x 1/70 kg = 0.16 mg/kg/d

ANNUAL 0.16 mg/kg/d x 8 d/yr = 1.2 mg/kg/yr

If the applicator also acts as the mixer/loader, the combined daily and annual exposure would be:

COMMERCIAL

DAILY 0.63 mg/kg/d + 0.0038 mg/kg/d = 0.63 mg/kg/d

ANNUAL 5.0 mg/kg/yr + 0.031 mg/kg/yr = 5.0 mg/kg/yr

GROWER

DAILY 0.16 mg/kg/d + 0.00096 mg/kg/d = 0.16 mg/kg/d

ANNUAL 1.2 mg/kg/yr + 0.0077 mg/kg/d = 1.2 mg/kg/d

5.2 CLOSED CAB

Unit exposure to an applicator within a closed cab tractor can be assessed using results from the following two studies (normalized to an application rate of 1.0 lb ai/A), also a subset of the studies for ground-boom applicator exposure:

Study	Replicates	Exposure (mg/hr)	Clothing
Wojeck	2	28.4	Long-Sleeved Shirt, Long Pants
Dubelman	6	0.93	Long-Sleeved Shirt, Long Pants

The total of eight replicates yields a weighted geometric mean of 2.2 mg/hr (based on the above two arithmetic means). The daily and annual exposure to a ground boom applicator in a closed cab is:

COMMERCIAL

DAILY 2.2 mg/hr/lb ai/acre x 0.090 lb ai/acre x 8.6 hr/d x 1/70 kg = 0.024 mg/kg/d

ANNUAL 0.024 mg/kg/d x 8 d/yr = 0.19 mg/kg/yr

GROWER

DAILY 2.2 mg/hr/lb ai/acre x 0.090 lb ai/acre x 2.15 hr/d x 1/70 kg = 0.0061 mg/kg/d

ANNUAL 0.0061 mg/kg/d x 8 d/yr = 0.049 mg/kg/yr

Combined mixer/loader and applicator exposure would be:

COMMERCIAL

DAILY 0.024 mg/kg/d + 0.0038 mg/kg/d = 0.028 mg/kg/d

ANNUAL 0.19 mg/kg/yr + 0.031 mg/kg/d = 0.22 mg/kg/yr

GROWER

DAILY 0.0061 mg/kg/d + 0.00096 mg/kg/d = 0.0071 mg/kg/d

ANNUAL 0.049 mg/kg/yr + 0.0077 mg/kg/yr = 0.057 mg/kg/yr

6.0 NON-DIETARY EXPOSURE FROM DETASSLING SEED CORN

At the present time, there are no data sufficient for calculating exposure from detassling seed corn. NDEB suggest that chemical specific studies (e.g., foliar dissipation studies) be conducted to provide these data.

Attachments 1

cc: Circulation
Correspondence File
Bifenthrin File
SACB
M. VanGemert (TB-HFAS)
TB-IRS

Attachment 1

N DIETARY EXPOSURE ASSESSMENT OF BIFENTHRIN APPLIED TO SEED AND POP CORN

CROP/ APPL. QUIP.	APPL. RATE (lb ai /A)	ACRES TREATED PER DAY	TOTAL lb HANDLED PER DAY	APPL. TIME (hr) PER DAY	M/L UNIT EXPOSURE (mg/lb ai)	M/L SINGLE DAY EXP. (mg/kg/d)	GROUNDBOOM UNIT EXP. OPEN CAB mg/hr/lb ai	GROUNDBOOM UNIT EXP. CLOSED CAB mg/hr/lb ai	GROUNDBOOM OPEN CAB EXPOSURE (mg/kg/day)	GROUNDBOOM CLOSED CAB EXPOSURE (mg/kg/day)	AERIAL UNIT EXP. (mg/hr/lb ai)	AERIAL EXPOSURE PER DAY (mg/kg/d)
BN ERIAL)	0.09	1120	100.8	3.47	0.015	0.0216	0	0	0	0	0.58	0.002587
			0			0			0	0		0
			0			0			0	0		0
BN B)	0.09	50	4.5	2.15	0.015	0.000964285	56.7	2.2	0.156735	0.006081428		0
			0			0			0	0		0
			0			0			0	0		0
BN B) OMMERC)	0.09	200	18	8.6	0.015	0.003857142	56.7	2.2	0.62694	0.024327714		0
			0			0			0	0		0
			0			0			0	0		0

CROP/ APPL. QUIP.	# APPL./YEAR (2 GROWING SEASONS)	ANNUAL EXP. G.B. OPEN CAB (mg/kg/yr)	ANNUAL GB CLOSED CAB (mg/kg/yr)	ANNUAL AERIAL EXP. (mg/kg/yr)	TOTAL lb HANDLED PER YEAR	ANNUAL M/L EXPOSURE (mg/kg/yr)	COMBINED G-B OPEN CAB M/L/A EXP. (mg/kg/yr)	COMBINED G-B CLOSED C M/L/A EXP. (mg/kg/yr)
BN ERIAL)	8	0	0	0.020701028	806.4	0.1728	0.1728	0.1728
		0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BN B)	8	1.25388	0.0486514	0	36	0.007714285	1.261594285	0.056365714
		0	0	0	0	0	0	0
		0	0	0	0	0	0	0
BN B) OMMERC)	8	5.01552	0.1946057	0	144	0.030857142	5.046377142	0.225462857
		0	0	0	0	0	0	0
		0	0	0	0	0	0	0
		0	0	0	0	0	0	0
		0	0	0	0	0	0	0

9