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

OFFICE OF PESTICIDES AND TOXIC SUBSTANCES

October 9, 1984

Memorandum

Subject: **Revised and Supplemented Captan Exposure Assessment**

To: Ester Saito, Chemist
SIS, HED (TS-759)

From: Harold R. Day, Chemist HRD
RS #2, EAB, HED (TS-769)

Thru: Chief, RS #2, EAB, HED (TS-769)

As requested at the Captan team meeting on September 24, I have attached an exposure assessment for Captan. This exposure analysis represents a revision of Janice Jensen's original exposure analysis of May 21, 1982. The changes and reasons for the revision are summarized as follows:

1. Revision of exposure values for airblast application.

   Reason-We now have more reliable information on which to estimate typical exposure for this application method.

2. Revision of exposure values for ground boom application.

   Reason-We now have more reliable information on which to estimate typical exposure for this application method.

3. Additional exposure estimates are added to cover additional crops.

   Reason-Janice Jensen's original exposure assessment was limited in the exposure to certain crops. It was requested at the team meeting that additional exposure estimates be provided for additional crops. I have used Dr. Pelletier's (BUD) information to construct a revised exposure analysis for Captan use on additional crops.

I have also included pages ii and iii (Janice's Exposure Summary Tables) for reference.

cc: Section 2 File

Revised Exposure Assessment for Captan

This exposure assessment represents a revision of Janice Jensen's original captan exposure assessment. It is revised to include additional crops and changes in exposure estimates for airblast and ground boom application.

Original Crops and Exposures (no protective clothing-typical use)

Crops	Original Estimate				New Estimate NC=no change			
	mg/day		mg/yr		mg/day		mg/yr	
	Dermal	Resp.	Dermal	Resp.	Dermal	Resp.	Dermal	Resp.
Apples								
Loaders	100	3.2	1000	32	NC	NC	NC	NC
Sprayers	10.8	0.3	108	3	154(1)	NC(2)	1540	NC
Strawberries (mix + appl.)	9.4	0.02	94	0.2	19(3)	1(4)	190	10
Home Gardens	2	0.002	8	0.008	NC	NC	NC	NC
Almonds								
Pilots	9	neg	18	neg.	NC	NC	NC	NC
Loaders	800	3.2	1600	6.4	NC	NC	NC	NC
Apples (dip)								
mixers	38.3	1.5	1148	45	NC	NC	NC	NC
Potatoes								
Cutters	8.2	0.7	41	3.5	NC	NC	NC	NC
Planters	2	0.2	10	1	NC	NC	Nc	NC
Soybeans								
Seed	9.5	1	19	2	NC	NC	NC	NC
Planters	neg	neg	neg	neg	NC	NC	NC	NC

(1) Estimate based on airblast application of 4.8(4 lb/A.)+16 = 35
(2) Inhalation estimate calculsted to be same as original estimate.
(3) Estimate of dermal exposure is 19 mg/hr by gound boom application.
(4) Estimate of respiratory exposure based on ground boom application

er/Loader Exposure Estimate for Individual Crops

Fruit Crops	AI/A. Rate	Hrs Day	Hrs Yr.	Max. Appl. Numb./ Season	Exposure in mg (1,2) Hourly Dermal	Hourly Inhalation	Yearly Dermal	Yearly Inhalation
Apricots	4	0.5	2	4	180	6	360	12
Avocado	4	0.5	2	4	180	6	360	12
Blackberry	1	0.5	2.5	5	180	6	450	15
Blueberry	1	0.5	5	10	180	6	900	30
Cherries	4	0.5	5	10	180	6	900	30
Citrus	4	0.5	1	2	180	6	180	6
Cranberry	4	0.5	1.5	3	180	6	270	9
Grapes	1.5	0.5	3	6	180	6	540	18
Mangos	5	0.5	6	12	180	6	1100	36
Nectarine	5	0.5	2.5	5	180	6	450	15
Peaches	5	0.5	2.5	5	180	6	450	15
Pears	2.5	0.5	3	4	180	6	540	18
Plum	3	0.5	3.5	7	180	6	630	21
Pineapple	2	0.5	13	26	180	6	2300	78
Vegetable Crops								
Beans	2.5	0.5	4	8	180	6	720	24
[illegible]s	2.5	0.5	3.5	7	180	6	630	21
[illegible]ots	2.5	0.5	4	8	180	6	720	24
Celery	5	0.5	6.5	13	180	6	1200	39
Cucurbits	2	0.5	6.5	13	180	6	1200	39
Eggplant	2	0.5	7	14	180	6	1300	42
Lettuce	2.5	0.5	4	8	180	6	720	24
Peppers	2.5	0.5	10	20	180	6	1800	60
Potatoes	4	0.5	8.5	17	180	6	1500	51
Rhubarb	4	0.5	5	10	180	6	900	30
Spinach	4	0.5	2	4	180	6	360	12
Sweetcorn	4	0.5	5	10	180	6	900	30
Tomatoes	4	0.5	6.5	13	180	6	1200	39
Ornamentals								
Azaleas	2	0.5	2	4	180	6	360	12
Begonias	2	0.5	6	12	180	6	1100	36
Carnations	2	0.5	10	20	180	6	1800	60
Mums	2	0.5	10	20	180	6	1800	60
Diconda(CA)	2	0.5	1.5	3	180	6	270	9
Turf	2	0.5	10	20	180	6	1800	60
Roses	2	0.5	10	20	180	6	1800	60
Flowers	2	0.5	7.5	15	180	6	1400	45

(1) Mixing/loading exposure estimated at 181 mg/hr dermal, 5.9 mg/hr by inhalation (From Stauffer Chemical Co. Study, Hickey, 1981) No protective clothing, body wt., or absorption factor is included in estimates.

Applicator Exposure Estimate for Crops not Previously Included

Fruit Crops	AI/A. Rate	(2) Hrs Day	Hrs Yr	Max. Appl. Season	(3) Appl. Mode	Exposure in mg (1) Hourly Dermal	Hourly Inhalation	Yearly Dermal	Yearly Inhalation
Apricots	4	6	24	4	AB	35	0.06	840	1
Avacado	4	6	24	4	AB	35	0.06	840	1
Blackberry	1	6	30	5	GB	19	1	570	30
Blueberry	1	6	60	10	GB	19	1	1100	60
Cherries	4	6	60	10	AB	35	0.06	2100	4
Citrus	4	6	12	2	AB	35	0.06	420	1
Cranberry	4	6	18	3	GB	19	1	340	18
Grapes	1.5	6	36	6	GB	19	1	680	36
Mangos	5	6	72	12	AB	40	0.06	2900	4
Nectarines	5	6	30	5	AB	40	0.06	1200	2
Peaches	5	6	30	5	AB	40	0.06	1200	2
Pears	2.5	6	24	4	AB	28	0.06	670	2
Plums	3	6	42	7	AB	30	0.06	1300	3
Pineapple(4)	2	6	156	26	GB	19	1	3000	160
Vegetable Crops									
Beans	2.5	6	48	8	GB	19	1	910	48
Beets	2.5	6	42	7	GB	19	1	800	42
Carrots	2.5	6	48	8	GB	19	1	910	48
Celery	5	6	78	13	GB	19	1	1500	78
Curbubits	2	6	78	13	GB	19	1	1500	78
ggplant	2	6	84	14	GB	19	1	1600	84
ettuce	2.5	6	48	8	GB	19	1	910	48
Peppers	2.5	6	120	20	GB	19	1	2300	120
Potatoes	4	6	102	17	GB	19	1	1900	100
Rhubarb	4	6	60	10	HS	1.7	0.0017	100	0.1
Spinach	4	6	24	4	GB	19	1	460	24
Sweetcorn	4	6	60	10	GB	19	1	1100	60
Tomatoes	4	6	78	13	GB	19	1	1500	78
Ornamentals									
Azaleas	2	6	24	4	GB	19	1	460	24
Begonias	2	6	72	12	GB	19	1	1400	72
Carnations	2	6	120	20	GB	19	1	2300	120
Mums	2	6	120	20	GB	19	1	2300	120
Diconda(CA)	2	6	18	3	GB	19	1	340	18
Turf	2	6	120	20	GB	19	1	2300	120
Roses	2	6	120	20	GB	19	1	2300	120
Flowers	2	6	90	15	GB	19	1	810	90

(1) Estimate does not include protective clothing, absorption factor, body wt
(2) Estimate assumes 6 hrs per day application time.
(3) The following exposure values by method are:
(4) Pineapple seed pieces are also treated with a dip; exposure rate same as potato seed pieces

Method	Abbreviation	Dermal mg/hr	Respiratory mg/hr	Reference
Airblast	AB	4.8(Rate)+ 16	0.06	Reinert(1983) Davis (1978)
ground	GB	19	1	Versar (1984)
handspray	HS	1.7	0.0017	Jensen (1982)

Clothing Assumed)

CROP/PERSONNEL	DAILY EXPOSURES (mg/day)				ANNUAL EXPOSURES (mg/year)			
	TYPICAL CASE		RANGE		TYPICAL CASE		RANGE	
	DERMAL	RESPIRATORY	DERMAL	RESPIRATORY	DERMAL	RESPIRATORY	DERMAL	RESPIRATORY
APPLES								
Loaders	90 ~~100~~	3.0 ~~3.2~~	13 51-~~133~~	1.7-4.3	900 ~~1000~~	30 ~~32~~	204-1995	7-65
Sprayers	180 ~~10.8~~	~~0.3~~ 1	5.4-14.2	0.1-0.3	~~108~~ 1800	3	21.6-213	0.4-4.5
STRAWBERRIES	9.4	0.02	6.3-26.3	0.01-0.06	94	0.2	25-526	0.04-1.2
HOMEGARDENS	2.0	0.002	0.6-2.6	0.0006-0.003	8.0	0.008	1.2-10.4	0.001-0.01
ALMONDS								
Pilots	9	neg	9*	neg*	18	neg	18-54	neg
Mixer/Loaders	800	3.2	800*	3.2*	1600	6.4	1600-4800	6.4-19.2
APPLES (POST-HARVEST)								
Mixers	38.3	1.5	13-51	0.5-2	1148	45	390-8160	15-320
POTATOES								
Fillers/Cutters	8.2	0.7	8.2*	0.7*	41	3.5	16.4-123	1.4-10.5
Planters	2.0	0.2	2.0*	0.2*	10	1	4-30	0.4-3
SOYBEANS								
Seed T./H. Fillers	9.5	1	9.5*	1*	19	2	19-57	2-6
Seed Planters	neg.	neg.	neg.	neg.	neg.	neg.	neg.	neg.

* No range given because it was assumed that a typical case was a full work day.

CAPTAN PD 2/3 APPLICATOR EXPOSURE ESTIMATES
(With Special Protective Clothing Assumed)

CROP/PERSONNEL	DAILY EXPOSURES (mg/day)				ANNUAL EXPOSURES (mg/year)			
	TYPICAL CASE		RANGE		TYPICAL CASE		RANGE	
	DERMAL	RESPIRATORY	DERMAL	RESPIRATORY	DERMAL	RESPIRATORY	DERMAL	RESPIRATORY
APPLES								
Loaders	20	0.3	10.2-26.6	0.17-0.43	200	3	40.8-399	0.7-6.5
Sprayers	2.2	0.3	1.1-2.8	0.1-0.3	21.6	3	4.3-42.6	0.4-4.5
STRAWBERRIES	1.9	0.01	1.3-5.3	0.005-0.03	18.8	0.1	5-105.2	0.02-0.6
HOMEGARDENS	0.4	0.001	0.1-0.5	0.0003-0.0015	1.6	0.004	0.2-2.1	0.0005-0.005
ALMONDS								
Pilots	1.8	neg	1.8*	neg*	3.6	neg	3.6-10.8	neg
Mixer/Loaders	160	0.3	160*	0.3*	320	0.6	320-960	0.6-1.9
APPLES (POST-HARVEST)								
Mixers	7.7	0.15	2.6-10.2	0.05-0.2	229.6	4.5	78-1632	1.5-32
POTATOES								
Fillers/Cutters	4.1	0.07	4.1*	0.07*	20.5	0.35	8.2-61.5	0.1-1.1
Planters	2.0	0.2	2.0*	0.2*	10	1	4-30	0.4-3
SOYBEANS								
Seed T./H. Fillers	1.9	0.1	1.9	0.1	3.8	0.2	3.8-11.4	0.2-0.6
Seed Planters	neg.	neg.	neg.	neg.	neg.	neg.	neg.	neg.

* No range given because it was assumed that a typical case was a full work day.

eferences

1. Davis, J, An Analysis of Exposure Data Obtained During the Air-blast Spraying of Orchards with Selected Pesticides, Unpublished, 1978.

2. Pelletier, N., Supplemental Information for Captan Exposure Analysis, Memorandum dated September 26, 1984.

3. Reinert, J.R., Dermal Exposure to Pesticides: EPA's Viewpoint, ACS Symposium Series, In Press, 1983.

4. Versar, Inc., Applicator and Mixer/Loader Exposure to Pesticides During Ground Boom Spraying Operations, Jan. 16, 1984.