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

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

Memorandum

SUBJECT: Quantitative Usage Analysis for Malathion

FROM: Don Atwood, Entomologist
Science Information and Analysis Branch
Biological and Economic Analysis Division (7503P)

THRU: Diann Sims, Chief
Science Information and Analysis Branch
Biological and Economic Analysis Division (7503P)

TO: Andrew Shelby, Physical Scientist
Mark Corbin, Chief
Environmental Risk Branch 6
Environmental Fate and Effects Division (7507P)

Product Review Panel Date: June 11, 2014

Background

Malathion is registered for application to numerous agricultural and non-agricultural use sites in the United States. As part of the Malathion Review process, EFED indicated that they would need more detailed analysis of the usage data than is provided in the SLUA (Screening Level Usage Analysis) in order to complete the required risk assessment. This document provides the requested information for the years 2008 through 2012 for agricultural crops. These years were chosen to capture the most recent typical use patterns for malathion in the associated use sites. Malathion usage for post-harvest grain treatment, other agricultural sites, and non-agricultural sites are limited to the most recently available estimate due to the lack of available usage surveys from USDA and Proprietary sources. In some instances the most reliable estimate may precede the 2008 to 2012 time frame.

Malathion Use and Usage on Agricultural Sites

Malathion is used to control numerous insect pests of agricultural crops with registration on more than 100 agricultural crops. Table 1 provides best available estimates of malathion use in terms of acres treated, percent crop treated, total lbs applied, lbs malathion/acre/year, number of applications, and average application rate for each agricultural crop. Four estimates are provided for cotton. Two estimates are included which show usage in the Boll Weevil Eradication Program (BWEP) in 2012 and 2013 to illustrate that malathion usage is declining significantly as the BWEP nears its end. BWEP is now only active in south Texas with eradication achieved in all other production areas. The other two cotton estimates indicate the total usage of malathion on cotton not related to BWEP and the total malathion usage including BWEP usage for 2013. Although cotton remains the highest usage crop for malathion at this time, due to the BWEP, usage on alfalfa and strawberries may well eclipse use on cotton depending upon the continued success of BWEP. Overall agricultural use of malathion represents 46% of total malathion use.

Malathion usage for post-harvest treatments has significantly decreased for corn and wheat but increased for oats since the 2002 BEAD QUA (Table 2). Malathion post-harvest usage on corn has decreased from 13,000 lbs in 1997 to 2,300 lbs in 2004 (82% decrease). Malathion use on post-harvest wheat has decreased from 331,000 lbs in 1997 to 1,700 lbs in 2009 (99.5% decrease). In contrast, malathion post-harvest usage on oats has increased from 200 lbs in 1999 to 400 lbs in 2007 (a 100 % increase). Overall, the best available estimate for usage of malathion as a post-harvest grain treatment is currently 4,400 lbs per year as compared to 344,000 lbs reported in 2002

Beef cattle remain the primary site for malathion livestock usage with an annual average of 140,900 lbs of the total malathion usage on all livestock (147,900 lbs) (Table 3). However, only 1% of beef cattle, dairy cattle, and sheep in the U.S. are treated with malathion. Less than 0.5% of swine are treated with malathion.

Table 4 provides the usage of malathion on agricultural facilities and for general farm use. Available data indicates that usage is approximately 385,000 lbs per year. The two largest uses of malathion are for empty grain storage applications and general farm use (roadways, ditches, etc). Combined these two sites account for 84% of general farm and facilities usage.

Malathion Use and Usage on Non-Agricultural Sites

Use of malathion on non-agricultural sites now represents approximately 54% of all U.S. malathion use. As shown in Table 5, homeowner use is the largest non-agricultural usage of malathion at 1,170,000 lbs per year. Malathion use by Mosquito Abatement Districts (MAD's) is approximately 700,000 lbs per year with greatest use in the Southern United States.

Table 1. Estimated Yearly Usage (Average and Maximum) of Malathion on Agricultural Crops Based on Usage from 2008-2012[1]

Site	Acres Grown (000)	Acres Treated (000)		% of Crop Treated		Lb AI Applied (000)		Average Yearly Application Rate			States with Most Usage (% of total Lb AI used)
		Avg	Max	Avg	Max	Avg	Max	Lb AI/ A/Yr	# App/ Yr	Lb AI/ A/Appl	
Caneberries	29	19	28	33	46	35	57	1.8	2.0	0.9	WA CA OR (100%)
Blueberries [2]	68	18		29		59		3.6	1.1	3.3	GA MI NJ NC OR WA (100%)
Cranberries											
Strawberries	54	73	136	43	54	136	266	1.9	3.1	0.6	CA (98%)
Grapefruit	80	7	12	7	12	8	12	1.2	1.2	1	FL (100%)
Lemons	63	0	0	< 1	< 1	1	1	3.5	1.0	3.5	CA (100%)
Oranges	735	61	137	8	18	69	160	1.1	1.1	1.0	FL (92%)
Tangelos [2]	5	0		7		0	0	1	1.5	0.7	CA (100%)
Tangerines [2]	46	6		13		10	19	1.3	2	0.6	FL (100%)
Apples	337	1	2	< 1	< 1	1	2	1.1	1.9	0.6	CA OH (100%)
Pears	--	--	--	--	--	--	--	--	--	--	
Figs[3]	7	0	1	4	13	1	2	2.3	3	0.8	CA (100%)
Cherries	142	47	76	13	22	60	94	1.3	2.5	0.5	CA OR WA (100%)
Sweet Cherries											
Tart Cherries											
Peaches	118	3	7	1	3	3	9	1.2	2.2	0.5	TX GA (99%)
Apricots	--	--	--	--	--	--	--	--	--	--	
Plums and Prunes	98	0	0	< 1	< 1	0	0	0.5	2.0	0.3	CA (100%
Nectarines											
Dates											
Avocados											
Fruits, Passion											
Guavas											
Mangos											
Papayas											
Quinces											
Pineapples											
Grapes	924	7	11	1	1	13	27	1.9	1.1	1.7	CA (100%)

Site	Acres Grown (000)	Acres Treated (000)		% of Crop Treated		Lb AI Applied (000)		Average Yearly Application Rate			States with Most Usage (% of total Lb AI used)
		Avg	Max	Avg	Max	Avg	Max	Lb AI/ A/Yr	# App/ Yr	Lb AI/ A/Appl	
Raisin Grapes	255	1	1	< 1	< 1	3	3	2.5	1.9	1.3	CA (100%)
Table Grapes	92	0	0	1	1	1	1	2.5	1	2.5	CA (100%)
Wine Grapes	577	5	9	1	2	9	23	1.8	1.1	1.7	CA (100%)
Almonds	--	--	--	--	--	--	--	--	--	--	
Pecans	500	8	15	1	2	13	24	1.7	1.6	1.1	TX GA (96%)
Walnuts	277	16	29	5	9	61	120	3.7	1.2	3.1	CA (100%)
Macadamia Nuts											
Filberts	--	--	--	--	--	--	--	--	--	--	
Chestnuts											
Garlic	23	1	1	4	4	0	0	0.5	1.0	0.5	CA (100%)
Onion	138	5	8	3	4	6	10	1.2	1.2	1	CA OR ID (100%)
Eggplant											
Peppers	80	1	3	1	1	2	3	1.2	2.1	0.6	CA TX (100%)
Bell Peppers											
Hot Peppers											
Celery	29	7	11	17	22	11	16	1.5	1.5	1	CA (100%)
Lettuce	276	24	50	8	15	47	98	1.9	1.2	1.6	CA (99%)
Spinach	50	1	2	1	3	1	3	1.4	1.6	0.9	CA (100%)
Kale											
Parsley											
Broccoli	119	2	4	2	3	4	8	1.8	1.1	1.6	CA (100%)
Brussels Sprouts											
Cabbage	64	2	5	2	4	3	6	1.1	2.2	0.5	FL CA (89%)
Cauliflower	26	1	2	2	4	1	3	1.6	1.2	1.4	CA AZ (100%)
Collards											
Cabbage, Chinese											
Broccoli raab											
Broccoli, Chinese											

Site	Acres Grown (000)	Acres Treated (000)		% of Crop Treated		Lb AI Applied (000)		Average Yearly Application Rate			States with Most Usage (% of total Lb AI used)
		Avg	Max	Avg	Max	Avg	Max	Lb AI/ A/Yr	# App/ Yr	Lb AI/ A/Appl	
Cucumbers	133	7	10	2	4	8	11	1.1	2.3	0.5	FL (100%)
Pumpkins	81	0	0	< 1	< 1	0	1	1	1.2	0.9	OH PA (93%)
Squash	51	5	12	3	8	6	16	1.2	3.3	0.4	FL TX CA OH (97%)
Mushrooms											
Kohlrabi											
Swiss Chard											
Melons, other	--	--	--	--	--	--	--	--	--	--	
Cantaloupes	72	2	2	2	3	2	2	1.2	1.3	0.9	CA FL GA (97%)
Watermelons	130	3	5	1	2	3	5	1.1	1.7	0.7	MS (88%)
Asparagus	29	1	2	5	7	1	2	1.1	1.0	1.1	CA (100%)
Okra											
Beets											
Carrots	85	8	25	6	17	10	31	1.3	1.6	0.8	CA (100%)
Potatoes	1046	2	5	< 1	< 1	2	5	0.9	1.5	0.6	CO ID (100%)
Radishes											
Rutabagas											
Sweet Potatoes											
Turnips											
Sweet Corn	551	5	9	1	1	5	9	1	1.1	0.9	CA (100%)
Tomatoes	345	5	16	1	3	8	27	1.6	1.9	0.8	CA FL (100%)
Beans/Peas, Dry	2572	4	9	< 1	< 1	5	12	1.1	1.5	0.7	CA TX ID (99%)
Beans, Green	266	2	3	< 1	< 1	2	4	1.3	3.1	0.4	FL (100%)
Peas, Green	--	--	--	--	--	--	--	--	--	--	
Sorghum	6160	6	6	0	0	6	6	0.9	2.0	0.5	TX (100%)

Site	Acres Grown (000)	Acres Treated (000)		% of Crop Treated		Lb AI Applied (000)		Average Yearly Application Rate			States with Most Usage (% of total Lb AI used)
		Avg	Max	Avg	Max	Avg	Max	Lb AI/ A/Yr	# App/ Yr	Lb AI/ A/Appl	
Corn	86410	9	9	0	0	5	5	0.6	1.0	0.6	MN (100%)
Barley	--	--	--	--	--	--	--	--	--	--	
Oats/Rye											
Rice	2999	46	177	1	2	31	112	0.7	2.0	0.3	MS LA (91%)
Wheat	--	--	--	< 1	< 2.5	--	--	--	--	--	
Wheat, spring	16637	21	30	0	0	15	19	0.7	1.0	0.7	MT ND (100%)
Wheat, winter	41076	9	19	0	0	7	18	0.8	1.0	0.8	KS TX OK (97%)
Wild Rice											
Alfalfa	19947	150	298	1	1	100	186	0.7	1.4	0.5	AR CA SD NV WY (80%)
Pasture	--	--	--	--	--	--	--	--	--	--	
Canola	--	--	--	--	--	--	--	--	--	--	
Peanuts	--	--	--	--	--	--	--	--	--	--	
Soybeans	75977	122	323	0	0	75	202	0.6	1.0	0.6	MS (89%)
Sunflower	1969	10	10	1	1	1	1	0.1	1.0	0.1	ND (100%)
Cotton (less BWEP)	10921	81	142	0	1	90	167	1.1	1.7	0.6	LA TX 88%
Cotton (TX 2012 BWEP) [4]	890	905	--	100	--	453	--	--	--	0.5	TX (100%)
Cotton (TX 2013 BWEP) [5]	735	357	--	49	--	179	--	--	--	0.5	TX (100%)
Cotton (plus BWEP 2013)	10921	438	--	4		269	--			0.5	
Flax											
Sugarbeets	--	--	--	--	--	--	--	--	--	--	
Mint											
Hops											
Safflower											

Site	Acres Grown (000)	Acres Treated (000)		% of Crop Treated		Lb AI Applied (000)		Average Yearly Application Rate			States with Most Usage (% of total Lb AI used)
		Avg	Max	Avg	Max	Avg	Max	Lb AI/ A/Yr	# App/ Yr	Lb AI/ A/Appl	
Tobacco	345	0	0	0	0	0	0	1.2	1	1.2	TN (100%)
Woodland											
Total (less BWEP)		814				938					
Total (including BWEP)		1171				1117					

[1] Unless otherwise specified, all data is EPA proprietary data for the period 2008-2012
[2] USDA/NASS Quick Stats – Blueberries. 2009 and 2011
[3] CADPR Pesticide Usage Data. 2008-2012.
[4] Based on 2012 estimate of 905,000 acres treated in Texas and 890,000 acres planted in the treatment zone. BWEP application rate is 12 fl oz/acre or 0.5 lb/acre. Texas Boll Weevil Eradication Foundation.
[5] Based on 2013 estimate of 357, 000 acres treated in Texas and 735,000 acres planted in the treatment zone. BWEP application rate is 12 fl oz/acre or 0.5 lb/acre. Texas Boll Weevil Eradication Foundation.

Table 2. Estimated Use of Malathion on Post Harvest Treatments

Site	Volume handled (000 Bushels)	Bushels Treated (000)	% of Bushels Treated	Lb AI Applied (000)	Average Application Rate		
					Lb AI/1000 Bushel/Yr	# app/yr	Lb AI/1000 Bushel/Appl
Corn	6,734,800	11,449	0.17	2.3	0.2	1	0.2
Wheat	2,906,000	8,718	0.3	1.7	0.204	1	0.195
Oats	147,069	1,029	0.7	0.4	0.415	1	0.415
Total		21,196		4.4			

Source(s):
USDA/NASS Agricultural Chemical Usage Postharvest Applications Quick Stats – Wheat (2009)
USDA/NASS Agricultural Chemical Usage Postharvest Applications – Oats and Potatoes Summary (March, 2007)
USDA/NASS Agricultural Chemical Usage Postharvest Applications – Corn and Soybeans (March, 2004)

Table 3. Estimated Usage of Malathion on Livestock

Site	Number of Animals (000 head)	Animals Treated (000)		% of Animals Treated		Lbs AI applied (000)	Average Application Rate		
		Est Min (head/yr)	Est Max (head/appl)	Est Min (head/yr)	Est Max (head/appl)		Rate per head/yr (lbs)	# appl/yr	Rate per head/appl (lbs)
Beef Cattle	99,115	839	3131	1%	3%	140.9	0.168	3.7	0.045
Dairy Cattle	7,523	39	217	1%	3%	1.3	0.033	5.5	0.006
Sheep	5,635	50	60	1%	1%	0.3	0.006	1.2	0.005
Swine	61,417	108	386	0%	1%	5.4	0.05	3.6	0.014
Other Livestock[1]	--	--	--	--	--	--	--	--	--
Total						147.9			

[1] Includes equine and goats

Source(s):

USDA/NASS Agricultural Chemical Usage - 1999 Cattle and Cattle Facilities (April, 2000)
USDA/NASS Agricultural Chemical Usage - Swine and Swine Facilities (December, 2006)
USDA/NASS Agricultural Chemical Usage - 2006 Dairy Cattle and Dairy Facilities Summary (May, 2007)
USDA/NASS Agricultural Chemical Usage - Sheep – Quick Stats (2010)

Table 4. Estimated Usage of Malathion on Agricultural Facilities and General Farm Use

Site	Lbs AI applied (000)
Beef Facilities	15.1
Dairy Facilities	2.1
Sheep Facilities	0.2
Swine Facilities	4.1
Grain Storage Facilities, empty	164.4
Agricultural Building and Structures	41.7
Roads, Ditches and Misc. General Farm Use	157.4
Total	385

Source(s):

USDA/NASS Agricultural Chemical Usage – 1997 Livestock and General Farm Summary (April, 1999)
USDA/NASS Agricultural Chemical Usage - 1999 Cattle and Cattle Facilities (April, 2000)
USDA/NASS Agricultural Chemical Usage - Swine and Swine Facilities (December, 2006)
USDA/NASS Agricultural Chemical Usage - 2006 Dairy Cattle and Dairy Facilities Summary (May, 2007)
USDA/NASS Agricultural Chemical Usage - Sheep – Quick Stats (2010)

Table 5. Estimated Usage of Malathion on Non-agricultural Sites 2010-2012.

Site	Acre Treatments (000)	Lb AI Applied (000)
Outdoor insecticides, homeowner	--	1,170
Golf Courses	0.1	0.2
Horticultural Nurseries	10.9	27.6
Institutional Turf	0.9	2.4
Landscape Contractors	1.1	5.8
Lawn Care Operators	25.4	70.3
Mosquito Abatement Districts	11,274	695.9
North Central		4.4
Northeast		5.6
South		582.9
West		103.0
Rangeland	--	--
Roadways	--	--
Total		1,972.2

Source:
Proprietary data 2010-2012

Table 6. Estimated Total Pounds of Malathion Applied to All Sites.

Total Pounds of Malathion Applied	Lb AI Applied (000)
Total (less the usage in USDA Boll Weevil Eradication Program)	3,447.5
Total (including the usage in the USDA Boll Weevil Eradication Program)	3,626.5

Notes on Table Data

1. Usage data primarily covers 1998-2012. Where data was not available for this period, the most recently available data has been provided as the best estimate of usage.
2. Calculations of the above numbers may not appear to agree because they are displayed as rounded: to the nearest 1000 for acre treatments and lb. a.i. applied (therefore 0 = <500) and to the nearest whole percentage point for % of crop treated (therefore 0% = <0.5%).
3. A (--) indicates no reported usage.
4. A ( ) indicates no available data.