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

OFFICE OF
PESTICIDES AND
TOXIC
SUBSTANCES

2/28/2002

MEMORANDUM

SUBJECT: Review of Documents Related to the Equivalency of Racemic Metolachlor (Metolachlor) and S-Metolachlor for Environmental Fate and Ecotoxicity

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THRU: Dana Spatz, Acting Chief [signature] 2-28-02
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Environmental Fate and Effects Division (7507C)

TO: Donald Stubbs, Branch Chief
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This memorandum provides clarification, reanalysis, and review of data on the equivalency of metolachlor and s-metolachlor with regard to environmental fate and ecotoxicity. Attached are completed reviews of documents to assess equivalency of metolachlor and s-metolachlor.

EFED concludes, based on Subdivision N laboratory data, there are sufficient bridging data to compare the environmental behavior of metolachlor to s-metolachlor. Metolachlor and s-metolachlor half-lives and degradation products in aerobic soil are similar. Additionally, the formation and degradation patterns of mobile degradation products, metolachlor ESA and metolachlor OA, were similar for metolachlor and s-metolachlor. The soil sorption affinity of metolachlor and s-metolachlor, expressed as K_f, K_d, or K_{oc}, are not significantly different. This conclusion is based on a comparison of laboratory data without enantioselective chemical analysis. Therefore, the stereochemistry of degradation products is unknown.

Extensive ground and surface water monitoring data for metolachlor in the United States indicates metolachlor and its degradation products (metolachlor OA and metolachlor ESA) are detected in ground and surface waters. The degradation products are generally detected at higher concentration than metolachlor in ground water. The registrant's assessment on the impact of switching from metolachlor to S-metolachlor on environmental loading is inconclusive because numerous variables (such as agricultural practices, climate, pesticide usage, etc) were not considered in the analysis. Registrant- sponsored monitoring data in Switzerland indicate the switch from metolachlor to S-metolachlor led to changes in enantiomeric ratios of metolachlor in surface water. This replacement , however, did not result in lower metolachlor concentrations. Additionally, preliminary retrospective field data from the Office of Research and Development (ORD)/National Exposure Research Laboratory (NERL) indicate preferential occurrence of s-metolachlor in deep soil samples and ground water at sites with historic metolachlor applications. This observation while still very preliminary may be attributed to preferential degradation of R enantiomers in anaerobic environments. Although there are extensive ground and surface water monitoring data of metolachlor in the United States, the available data are not sufficient to allow enantioselective differentiation of metolachlor. This type of information is needed to evaluate the direct impact of switching from metolachlor to s-metolachlor on water quality.

Available ground and surface water models such as GENEEC, SCI-GROW, PRZM-EXAMS predict that lower application rates of s-metolachlor will result in lower environmental concentrations when compared to metolachlor. Similar registrant modeling results were predicted for S-metolachlor concentrations in groundwater at GA and MN test sites. The significance of the modeling results is difficult to assess because the modeling was conducted using inadequate calibration techniques. Additionally, the Pesticide Root Zone Model (PRZM), which is based on linear processes, will predict lower concentrations with lower application rates regardless of the calibration technique.

The ecotoxicity data are supportive of bridging toxicity profiles of metolachlor and s-metolachlor. Although the ecotoxicity studies were not conducted using identical test conditions and procedures, the ecological effects of metolachlor and s-metolachlor are similar except for the risk to non-target plants. The very low avian toxicity for metolachlor suggest minimal expected differences between metolachlor and s-metolachlor. Also, there are adequate data to provide informed comparisons on toxicity for fish, plants, and invertebrates. The only difference in risk is associated with the slightly greater risk of s-metolachlor to non-target plants.

The uncertainties in this assessment are associated with the lack of enantioselective ground and surface water monitoring data to confirm the impact of s-metolachlor and metolachlor and their degradation products on water quality. Preliminary field data from ORD/ NERL indicate enantioselective occurrence of S-metolachlor in deep soil and groundwater samples at three sites with historic metolachlor applications. Additionally, enantioselective degradation of the metolachlor in surface soils was detected at some field sites. In order to address these uncertainities, environmental fate laboratory data are needed to clarify the equivalency of anaerobic aquatic/soil degradation for metolachlor and s-metolachlor. Also, any future ground and surface water monitoring for metolachlor and its degradation products should employ some enantioselective analysis techniques to confirm the potential loading and exposure of metolachlor stereoisomers and their degradation products.

Reevaluation of Existing Data on Equivalency of Metolachlor and S-Metolachlor for Environmental Fate

1.) *Review of the Stereochemistry of Metolachlor*

Metolachlor has four stable stereoisomers because there are two chiral centers. These stereoisomers exist as diastereomers (non-mirror images), enantiomers (mirror images), and atropisomers (conformation isomers). Enantiomers have the same chemical and physical properties (except for the direction they rotate plane polarized light), but can react differently with other chiral systems in the environment (e.g., soil metabolism rates and products could be different). This also can explain why one enantiomer may be more active than the other. Unlike enantiomers, diastereomers and atropisomers have different physical properties (i.e., solubility, melting point, density, etc.) and similar (not identical) chemical properties.

2.) ***Comparison of Metolachlor OA and Metolachlor ESA Degradate Formation and Decline Patterns for Racemic and S-Metolachlor***

A reevaluation of the photodegradation on soil (MRID 43928935) and aerobic soil metabolism (MRID 43928936) studies indicate the isomer ratio of applied metolachlor (100% S isomer or racemic metalachlor) did not impact the formation or degradation rate of metolachlor ESA and metolachlor OA.

Figures 1 through 3 graphically summarize the data from the aerobic soil metabolism study for both the racemic and enriched isomer versions of parent metolachlor (and s-metolachlor) as well as the corresponding degradates, ethanesulfonic acid (ESA) and oxanillic acid (OA). The data show that the degradation profile of metolachlor ESA and OA are similar for metolachlor and s-metolachlor.

Figures 4 through 7 graphically summarize the data for both the racemic and enriched isomer versions of parent Metolachlor (and s-metolachlor) as well as the corresponding oxanillic acid (OA) from the "Photodegradation of ^{14}C-Metolachlor and ^{14}C-CGA-77102 on Soil" (MRID 43928935). The degradate ESA was not detected in the Soil Photolysis study. The data show similar formation and decline patterns suggesting that neither the racemic nor the enriched isomer will form the OA degradate in greater amounts through photolysis on soil.

3) ***Review and Clarification of Batch Equilibrium Studies*:**

The Agency reevaluated the mobility assessment to provide 1) a formal review of all batch equilibrium data, 2) a statistical analysis for comparing sorption coefficients of S-metolachlor and metolachlor, and 3) reasons for relative differences in sorption coefficients for metolachlor and S-metolachlor.

The Agency reviewed the batch equilibrium data for S-metolachlor and metolachlor used for comparing equivalency in mobility (Table 1). The paired batch equilibrium data (Soil Behavior of Maize Chloroacetanilides, June 10, 1994 and Ecochemistry CGA-77102 Status Report July, 5 1994) were not reviewed because there was no documentation regarding the experimental design, material and methods, and discussion of results. The non-guideline batch equilibrium studies provide ancillary data on the soil:water partitioning of metolachlor and S-metolachlor. The review of the batch equilibrium data indicate a miscalculation for Koc values reported in Burkhart, 1978. Recalculation of the data yielded Koc values ~ 3 fold higher than reported in the registrant's data submission. These calculation errors were verified with the registrant (Warner Phelps, Syngenta, 10/10/01).

Table 1: Review Summary of Submitted Batch Equilibrium Data for S-metolachlor and racemic metolachlor

Study	Status	Quality of Data	Submission Deficiency
Racemic			
Burkhart, 1978 MRID 00078291	Ancillary	Moderate	Analysis is not chemical specific; residue specific methods referenced were not described; tabular raw data were not provided
Spare, 1987 MRID 40496404	Acceptable 2/25/93	High	None
Soil Behavior of Maize Chloroacetanilides, June 10, 1994	Not Acceptable	Low	Paired soil study; simple partitioning coefficient at 1 ppm; no estimate of Freundlich coefficient
S-Metolachlor			
Ellgehausen, H. 1997	Supplemental	Moderate	Foreign soils
Spare, 1995 MRID 43928937	Acceptable 4/23/97	High	No enantiometric ratios reported
Ecochemistry CGA-77102 Status Report July, 5 1994	Not Acceptable	Low	Paired soil study; simple partitioning coefficient at 1 ppm; no estimate of Freundlich coefficient

The registrant (Syngenta) provided statistical analysis of batch equilibrium data for metolachlor and S-metolachlor. Their analysis indicate s-metolachlor had statistically higher organic carbon sorption coefficients (K_{oc}) than metolachlor in non-paired batch equilibrium studies. Conversely, there were no statistical differences in Koc values for s-metolachlor and metolachlor in paired batch equilibrium studies. The Agency notes the statistical comparison of non-paired data was conducted on uncorrected data. The Agency's review indicated the K_{oc} coefficients for metolachlor and S-metolachlor are similar. This conclusion was reached through a non-statistical comparison of slopes between Kd and percent soil OC. The Agency hypothesized earlier that the higher K_{oc} partitioning coefficients for S-metolachlor in non-paired studies was due to a higher range of organic carbon content in test soils. This is an erroneous statement because organic carbon partitioning coefficients (Koc) are normalized for organic carbon content. The exact reason for differences in partitioning coefficients in non- paired batch equilibrium studies is difficult to assess at this time.

Additional statistical analysis of the batch equilibrium data were conducted to assess potential mobilities of S-metolachlor and racemic metolachlor. The data were analyzed using the following comparisons: 1) paired batch equilibrium data, 2) non-paired data from Subdivision N guideline batch equilibrium studies, and 3) all nonpaired batch equilibrium data. The paired batch equilibrium data were assessed separately because the test methods were not similar to the other studies, and the quality of the data are not known. The analysis indicates there are no statistical difference ($P > 0.05$) in Freundlich adsorption coefficients (Kf) or organic carbon partitioning coefficients (Koc) for the metolachlor and S-metolachlor. This conclusion was consistent among the different data comparisons. It is important to recognize differences in average Koc values were pronounced in non-paired studies [135 (racemic) vs 219 (S-enriched)]. However, the small sample size (n= 8 to 9 samples) coupled with the high standard deviations (85 to 94) led to nonsignificant differences in the Koc values. A significant difference in Koc may or may not occur with more observations.

5) Contact experts on chiral environmental chemistry or environmental chemistry of metolachlor in ORD (Dr. Wayne Garrison, ORD/Athens), USDA (Drs. Laura McConnel and Walter Schmidt), USGS (Drs. Dana Kolpin and William Foreman)

Dr. Wayne Garrison has conducted preliminary research showing enantioselective occurrence of S-metolachlor in deep soil samples and ground water at field sites with historical racemic metolachlor use. These data suggest anaerobic degradation of metolachlor is enantioselective. Similar enantiometric ratios of metolachlor were observed in surface soils and runoff waters when compared to the enantiomeric ratios in applied racemic metolachlor. However, more recent field data indicate enantioselective occurrence of S-metolachlor in surface soils. These data suggest enantioselective degradation of metolachlor may not be constant across different soil types.

6) Review Literature on Environmental Behavior and Stereochemistry of Metolachlor

Buser, H. R., T. Poiger, et al. (2000). "Changed enantiomer composition of metolachlor in surface water following the introduction of the enantiomerically enriched product to the market." Environ. Sci. Technol. 34(13): 2690-2696

The study provides data on the impact of the use of S-metolachlor in the watersheds of two Swiss lakes on enantiomer/isomer composition of metolachlor in surface water. The monitoring was conducted from early 1998 to 1999, a period of time S-metolachlor was starting to replace racemic metolachlor. The data indicate the ratios of S enantiomer of metolachlor was increasing relative to the R enantiomer in surface water. The authors attribute this observation to the replacement of racemic metolachlor with S-metolachlor.

Müller, M. D. and H. R. Buser (1995). "Environmental behavior of acetamide pesticide stereoisomers. 2. Stereo- and enantioselective degradation in sewage sludge and soil." Environ. Sci. Technol. 29(8): 2031-2037

The authors concluded metolachlor has low to moderate enantioselective degradation in anaerobic sewage sludge and aerobic soil.

Figures

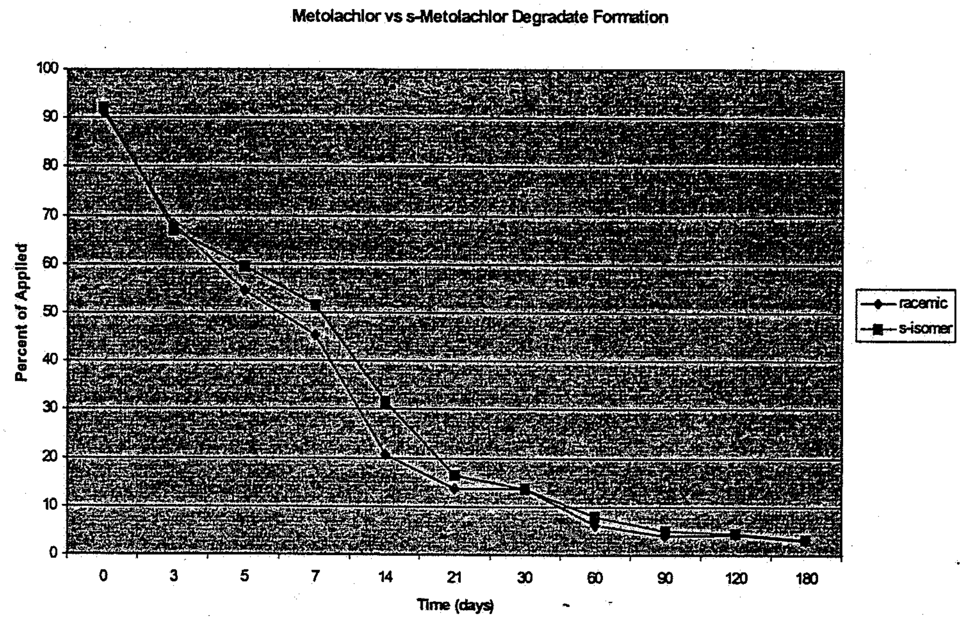

Figure 1. Comparison of Metolachlor and s-Metolachlor Decline from "Comparative Aerobic Soil Metabolism Study" (MRID 43928936)

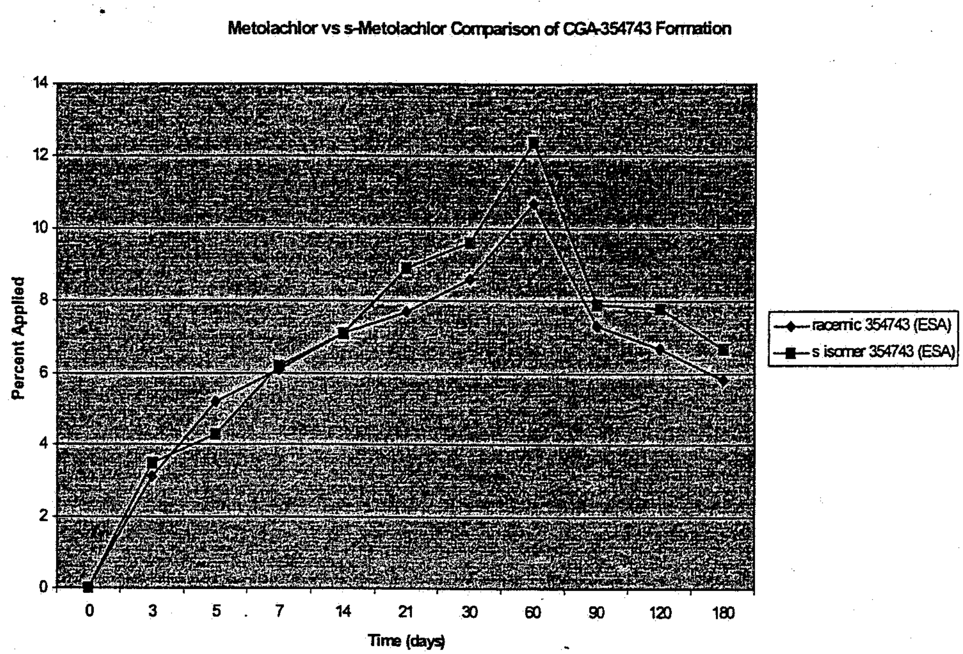

Figure 2. Comparison of CGA-354743 (Metolachlor ESA) Formation and Decline from "Comparative Aerobic Soil Metabolism Study" (MRID 43928936).

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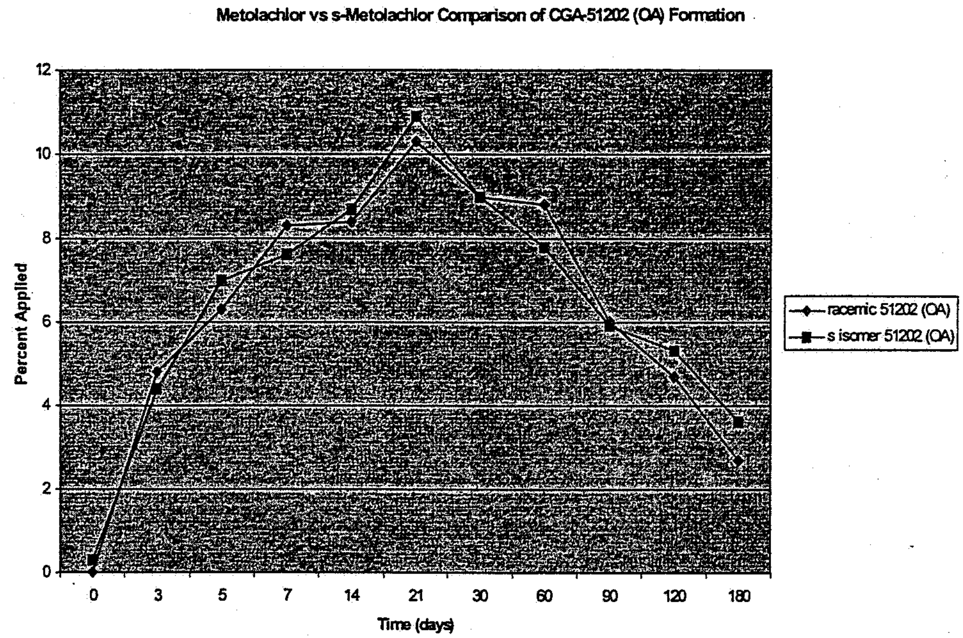

Figure 3. Comparison of CGA-51202 (Metolachlor OA) Formation and Decline from "Comparative Aerobic Soil Metabolism Study" (MRID 43928936).

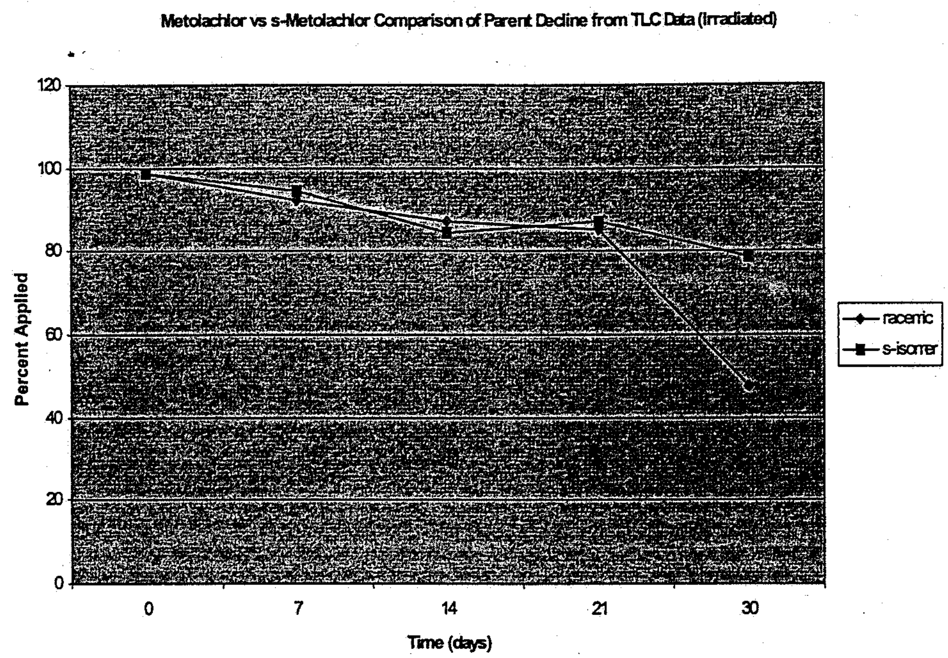

Figure 4. Comparison of Parent Decline from "Comparative Photodegradation on Soil Study" (MRID 43928935) with Irradiated Soil.

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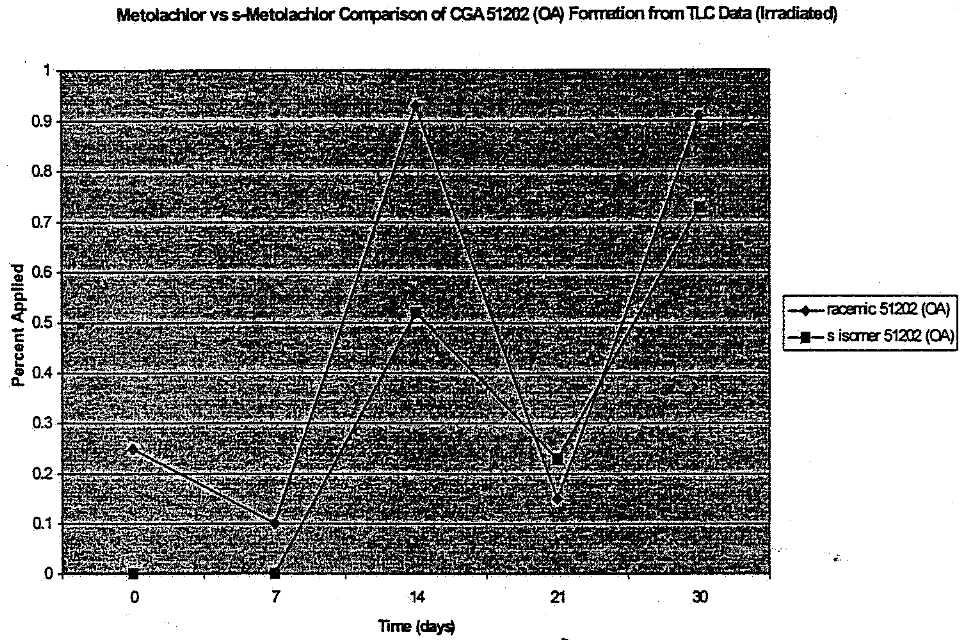

Figure 5. Comparison of CGA-51202 Formation and Decline from "Comparative Photodegradation on Soil Study" (MRID 43928935) using Irradiated Soil.

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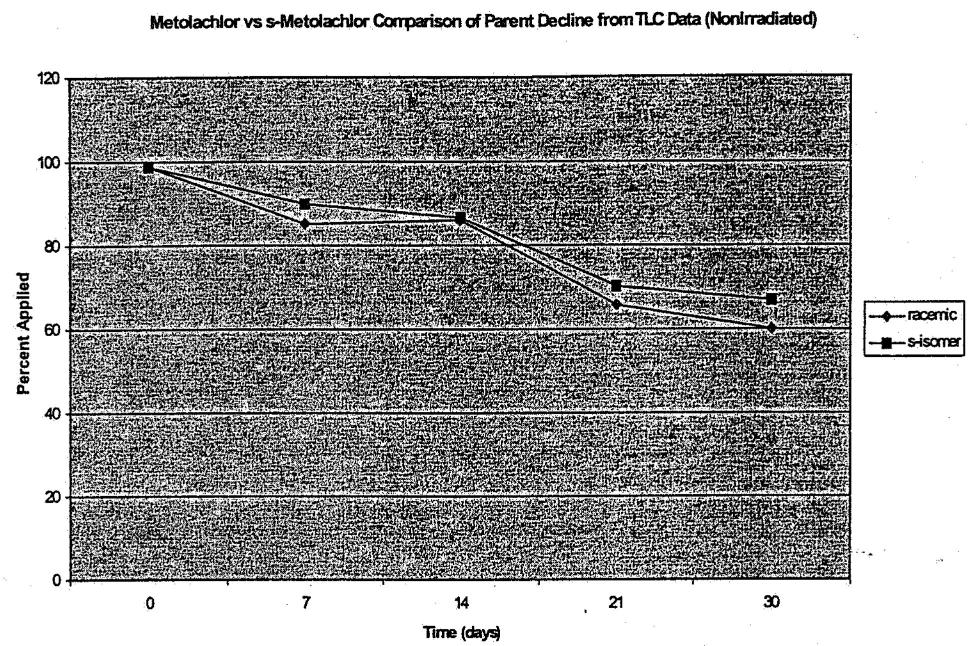

Figure 6. Comparison of Decline of Parent from "Comparative Photodegradation on Soil Study" (MRID 43928935) using Non-Irradiated Soil.

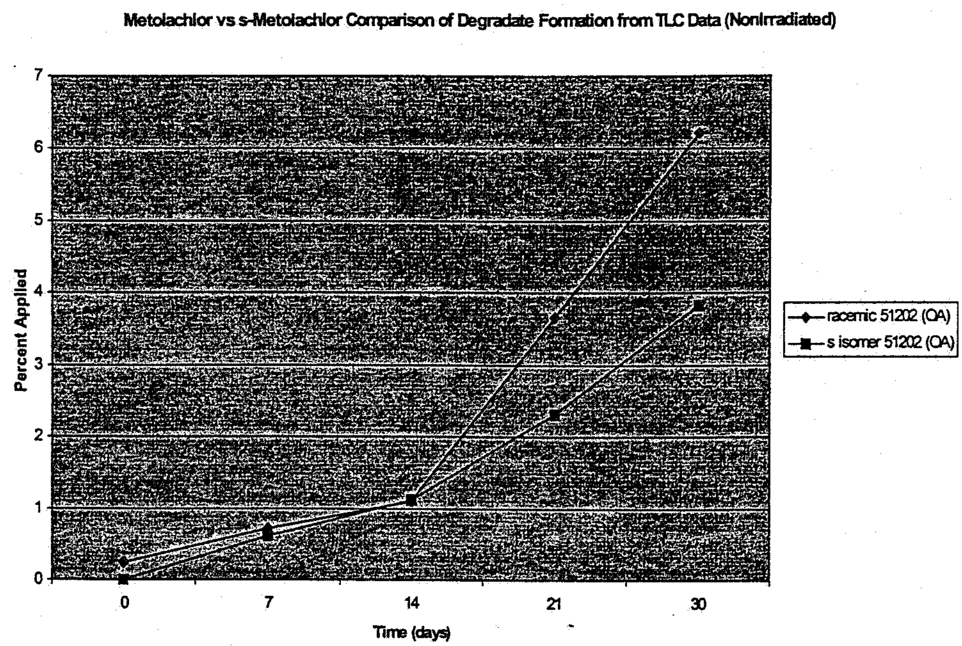

Figure 7. Comparions of CGA-51202 Formation and Decline from "Comparative Photodegradation on Soil Study" (MRID 43928935) using Non-Irradiated Soil.

DATA EVALUATION RECORD

I. Study Type: Batch Equilibrium

II. Citation:

Ellgehausen, H. 1995. Adsorption/Desorption of CGA 77102 in Various Soil Types. Submitted by Novartis Crop Protection AG,. Performed by Environmental Safety/ Ecochemistry, Basil, Switzerland. No MRID.

III. Reviewer:

Name: James A. Hetrick, Ph.D.
Title: Soil Chemist
Organization: Environmental Risk Branch #1
ERB1/EFED/OPP

James A. Hetrick 2/28/02

IV. Approved by:

Name: Dana Spatz
Title: Acting Branch Chief
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2/28/02

V. Conclusions:

The study provide supplemental data on the sorption of S-metolachlor to soil. The data are deemed as supplemental because foreign soils were not compared to U.S. soils.

Freundlich adsorption coefficients were 1.4 (1/n=0.90) for the Collombey loamy sand, 1.0 (1/n=.88) for the Speyer standard soil sand, 4.6 (1/n=0.97) for the Gartenacker silt loam, 11.5(1/n=1.00) for Vetroz silt loam, and 44.8 (0.92) for the Illarsaz humic silt loam. Freundlich desorption coefficients were 2.0 (1/n=0.92) for the Collombey soil, 1.7 (1/n=0.94) for the Speyer standard soil, 8.2(1/n=1.04) for the Gartenacker soil, 15.2 (1/n=1.02) for Vetroz soil, and 55.8 (1/n=0.93) for the Illarsaz soil.

VI. Materials and Methods:

Five foreign soils were evaluated in the batch equilibrium study. Physicochemical properties and origins of the test soils are shown in Table 1.

Preliminary Study

A preliminary study was conducted to assess the time required for reaching steady-state (equilibrium) conditions. Five grams of each test soil was placed into a centrifuge tube, suspended in 25 ml of 0.01 M $CaCl_2$, and pre-equilibrated for approximately 2 days (weekend) at room temperature. After pre-equilibration, each soil slurry was centrifuged and supernatant removed. The wet soil pellets were further suspended in 25 or 100 ml of stock solution containing 2 ug/ml of radiolabeled metolachlor and then shaken (equilibrated) for 0, 1, 2, 4,6, 8, and 24 hours. Soil solution ratios ranged from 5 to 20. After each equilibrium period, duplicate 100 µL aliqout samples for each soil were removed for chemical analysis using LSC. At the termination of the study, radiolabeled residues in the 24 hour sample were determined using HPLC.

Definitive Adsorption/Desorption Study

In the definitive study, ten grams of each soil was placed into each of twelve 150ml centrifuge tubes, suspended in pesticide free aqueous phase (assume 0.01M CaCl2) , and equilibrated for 24 hours. After the 24 hour pre-incubation, the supernatant was removed from each test system and then radiolabeled metolachlor stock solution plus 0.01M CaCl2 were added to obtain a final metolachlor concentrations of ~ 0.1 to 2.0 ug/ml. Soil solution ratios ranged from 2 to 20 depending on the soil type (Table 2).

The soil test systems were shaken at ~200 rpm at 20^{0}C for 24 hours in the dark. After equilibration, the soil suspensions were centrifuged at 2500 rpm for 5 minute and aliquots for chemical analysis by LSC. The remaining supernatant was removed and the wet soil pellet was weighed. Pesticide free 0.01M $CaCl_2$ was added to each soil pellet at volumes equal to those used in the adsorption experiment. After addition of the 0.01M $CaCl_2$ solution, the soil test systems were shaken for 24 hours at 20^{0}C in the dark. After the first desorption equilibration, the test systems were centrifuged and 2 aliquots of clear supernatant (1 ml) were taken for chemical analysis by LSC. The desorption process was sequentially repeated using a similar process.

After the desorption experiment, the radioactivity in each soil pellet was determined using combustion-LSC. Additionally, radioactivity adsorbed on the centrifuge walls was extracted using an acetone wash. The radioactivity in the acetone rinsate was determined by LSC.

After the adsorption step, soils in samples 1 and 2 were removed and extracted 3X with acetone/water. The radioactivity in the soil extracts was determined by LSC and thereafter combined for chemical analysis. Non-extractable radioactivity (remaining after a acetone/water extraction) in soil was determined by combustion-LSC.

The combined soil extracts were concentrated at 350C using vacuum rotary evaporator. The concentrated soil extracts were analyzed using HPLC. The HPLC system was equipped with a C18 column with a gradient solvent system of water/ acetone; UV/VIS and radioactive detectors were used for detection of residues.

Freundlich (non-linear sorption model) coefficients were estimated using a linearized Freundlich equation where the y intercept = -log Kf and slope=1/n.

VII. Study Author's Comments:

Steady-state ("equilibrium") conditions were reached within 24 hours of equilibration (Figure 1). The percent adsorption, at a concentration of 2 ug/ml, ranged from 11.97% for Speyer soil to 55.07% for the Illarsaz soil. Therefore, the study was conducted using a 24 hour equilibration time.

Freundlich adsorption coefficients were 1.4 (1/n=0.90) for the Collombey loamy sand, 1.0 (1/n=.88) for the Speyer standard soil sand, 4.6 (1/n=0.97) for the Gartenacker silt loam, 11.5(1/n=1.00) for Vetroz silt loam, and 44.8 (0.92) for the Illarsaz humic silt loam. Freundlich desorption coefficients were 2.0 (1/n=0.92) for the Collombey soil, 1.7 (1/n=0.94) for the Speyer standard soil, 8.2(1/n=1.04) for the Gartenacker soil, 15.2 (1/n=1.02) for Vetroz soil, and 55.8 (1/n=0.93) for the Illarsaz soil.

VIII. Reviewer's Comments

1.) Foreign soils were used in the study. The registrant failed to cross-reference the foreign soils to comparable US soils.

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Table 1: Origin and Properties of Soils used for the Adsorption/Desorption Experiments

Parameter Type	Soil				
	1	2	3	4	5
Name	Collombey	Stand. Soil Speyer 2.1	Gartenacker	Vetroz	Illarsaz
Origin	CH/VS/Les Barges	Lufa/Speyer/ FRG	CH/VS/Les Barges	CH/VS/Les Barges	CH/VS/Les Barges
Batch-No	1 / 75	SP 136	10 / 93	3 / 75	4 / 75
Classification	Loamy sand	Sand	Silt loam	Silt loam	Humic silt loam
pH	7.3	6.8	7.1	7.2	6.7
$CaCO_3$ (%)	11.2	0.1	7.4	56.0	6.10
Organic carbon (%)	0.80	0.30	2.0	4.70	19.80
CEC (meq / 100 g soil)	6.10	3.9	12.7	28.1	102.8
Particle size:					
Clay (%)	4.2	5.2	11.9	23.3	23.6
Silt (%)	18.3	6.1	48.0	58.5	55.4
Sand (%)	77.5	88.7	40.1	18.20	21.0

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Table 2: Soil-Solution Ratio

Pre-test

	Speyer	Collombey	Gartenacker	Vetroz	Illarsaz
Amount soil (g)	5.00	5.00	5.00	5.00	5.00
Aqueous phase (ml)	25.00	25.00	25.00	25.00	100.00

Adsorption/desorption Isotherms

	Speyer	Collombey	Gartenacker	Vetroz	Illarsaz
Amount soil (g)	10.00	10.00	10.00	10.00	5.00
Aqueous phase (ml)	20.00	20.00	50.00	50.00	100.00

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Table 3: Preparation of the Treatment Solution and Initial Concentrations of CGA 77 102 in 0.01 mole $CaCl_2$-Solution for Pre-Test

Sample No.	Soil		Conc. a.i. Stock sol. (ug/ml)	Volume Stock sol. [ml]	Amount CGA 77102 (ug)	Final Volume CaCl2 [ml]	Conc. a.i. [ug/ml]
	Type	Amount (g)					
1	Speyer 2.1	5.000	900.569	0.055	49.531	25.000	1.981
2		5.000	900.569	0.055	49.531	25.000	1.981
3	Collombey	5.000	900.569	0.055	49.531	25.000	1.981
4		5.000	900.569	0.055	49.531	25.000	1.981
5	Les Evouettes	5.000	900.569	0.055	49.531	25.000	1.981
6		5.000	900.569	0.055	49.531	25.000	1.981
7	Vetroz	5.000	900.569	0.055	49.531	25.000	1.981
8		5.000	900.569	0.055	49.531	25.000	1.981
9	Illarsaz	5.000	900.569	0.220	198.125	100.000	1.981
10		5.000	900.569	0.220	198.125	100.000	1.981
11		0.000	900.569	0.055	49.531	25.000	1.981
12		0.000	900.569	0.055	49.531	25.000	1.981

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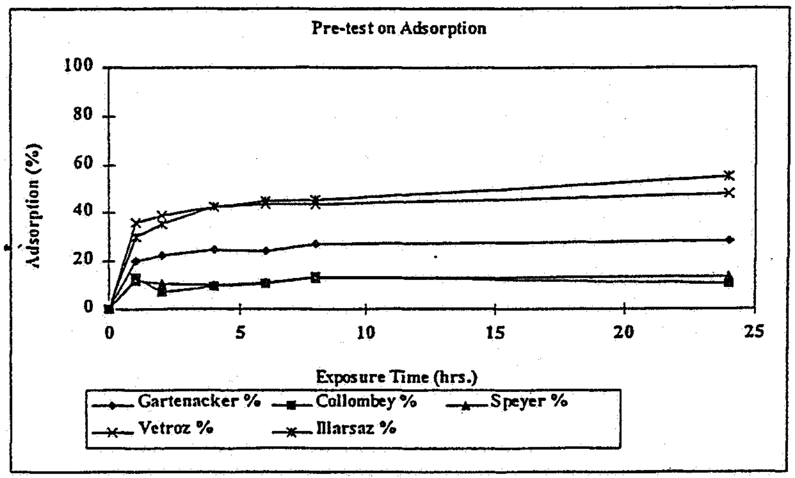
Figure 1: Rate of Adsorption of CGA 77 102 in various Soils



Exposure Time (hrs.)	Gartenacker %	Collombey %	Speyer %	Vetroz %	Illarsaz %
0	0.00	0.00	0.00	0.00	0.00
1	21.87	14.22	11.67	35.17	31.61
2	23.04	10.30	11.85	37.72	36.67
4	24.22	12.97	9.58	40.87	41.75
6	23.90	14.78	11.20	42.35	43.65
8	26.23	16.59	12.31	42.70	47.38
24	27.31	13.03	11.97	45.98	55.07

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Table 15: Adsorption- and Desorption Constants of CGA 77 102 for various Soils

Soil		OC (%)	Intercept	Slope (1/n)	R Square	K	Koc	Q
Collombey	Adsorption	0.8	0.1426	0.9085	0.9984	1.4	174	101
	Desorption 1		0.3044	0.9254	0.9995	2.0	252	146
	Desorption 2		0.4980	0.9598	0.9978	3.1	393	228
Speyer	Adsorption	0.3	-0.0199	0.8869	0.9871	1.0	318	185
	Desorption 1		0.2176	0.9449	0.9859	1.7	550	319
	Desorption 2		0.4902	0.9728	0.9921	3.1	1031	598
Gartenacker	Adsorption	2.0	0.6587	0.9711	0.9992	4.6	228	132
	Desorption 1		0.9148	1.0494	0.9981	8.2	411	238
	Desorption 2		1.2428	1.1399	0.9951	17.5	874	507
Vetroz	Adsorption	4.7	1.0591	1.0017	0.9984	11.5	244	141
	Desorption 1		1.1812	1.0289	0.9974	15.2	323	187
	Desorption 2		1.3094	1.0666	0.9960	20.4	434	252
Illarsaz	Adsorption	19.8	1.6512	0.9258	0.9996	44.8	226	131
	Desorption 1		1.7464	0.9315	0.9994	55.8	282	163
	Desorption 2		1.8156	0.9371	0.9993	65.4	330	192
Average (ads/des)				0.9767	0.9962		360	209
STDEV				0.0688	0.0044		179	104
Average Koc adsorption							238	
Average Q adsorption								138

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Table 9: Balance of Radioactivity with Soil Gartenacker after Adsorption and Desorption
(Values given in % of the Radioactivity applied)

Sample No.	Soil	CaCl2-Solution			Extractables	Non-Extractables	Washings	Total
		Adsorption	Desorption 1	Desorption 2				
3	9.89	61.91	15.72	7.36	-	-	0.07	94.95
4	10.09	60.96	16.07	7.36	-	-	0.11	94.57
5	11.22	61.25	17.09	7.94	-	-	0.06	97.56
6	11.62	61.79	17.00	8.21	-	-	0.12	98.74
7	13.29	61.96	18.32	8.70	-	-	0.10	102.37
8	13.04	61.03	18.32	9.06	-	-	0.10	101.56
9	14.75	60.48	18.63	9.50	-	-	0.12	103.48
10	14.85	61.84	18.40	9.51	-	-	0.07	104.67
11	16.87	58.56	18.92	9.75	-	-	0.13	104.23
12	16.85	58.73	19.22	9.77	-	-	0.10	104.67
Average	13.25	60.85	17.77	8.72	-	-	0.10	100.68
StDev	2.56	1.26	1.22	0.95	-	-	0.02	3.94

DATA EVALUATION RECORD

I. Study Type: Batch Equilibrium

II. Citation:

Burkhard, N.1978. Adsorption and Desorption of Metolachlor (Dual) in Various Soil Types. Submitted by Ciba-Geigy Limited. Performed by Biochemistry, Department R&D Plant Protection, Agrochemicals Division, Ciba-Geigy Limited, Basil, Switzerland. MRID 00078291.

III. Reviewer:

Name: James A. Hetrick, Ph.D. James A. Hetrick
Title: Soil Chemist
Organization: Environmental Risk Branch #1 2/28/02
ERB1/EFED/OPP

IV. Approved by:

Name: Dana Spatz 2-28-02
Title: Acting Branch Chief
Organization: Environmental Risk Branch #1
ERB1/EFED/OPP

V. Conclusions:

The study provides ancillary data on metolachlor residue partitioning in mineral soils. Deficiencies in the study are: 1.) the ionic strength of equilibration solutions was not controlled; 2.) Non-specific residue analysis was presented and used for calculation of Freundlich adsorption coefficients, 4.) Raw data of equilibrium concentration (Ce) and soil sorption (X/M) were not presented; and 5.) Foreign soils were used in the study. Although the data submission lacks detailed descriptions of the residue specific analysis and raw data, the data indicate metolachlor has a low sorption affinity for soil.

Estimated Freundlich coefficients for metolachlor, based on liquid scintillation counting, were 10 (1/n=.85) for Vetros soil, 3.18 (1/n=.85) for Les Evouettes soil, 1.54 (1/n= 0.84) for Collombey soil, and 1.69 (1/n=0.85) for Lakeland soil. Reversible sorption of metolachlor is unlikely because the desorption coefficients for Les Evouettes silty loam are slightly higher than the adsorption coefficients

VI. Materials and Methods:

The study was conducted on slightly-acid to alkaline Swiss soils and a US soil (Table 1). Soil physical properties of test soils ranged pH 6.3 to 7.8, $CaCO_3$ 0 to 15%, OM% 1.2 to 5.6, and

CEC 3.7 to 29.4 meq/100 g soil. Isotopic dilution of analytical grade metolachlor with radiolabeled metolachlor (SA= 20.8 µCi) was used to make standard metolachlor solutions. Ten to fifty grams of soil were mixed with 100 ml water containing radiolabeled metolachlor concentrations of 1, 2.5, 5.0, and 10 µg/ml. Solutions were mixed for 24 hours, filter extracted, and then analyzed using liquid scintillation and gas liquid chromatography Desorption studies were conducted on filtered soils from adsorption studies. Washed soil cakes were place into 100 ml of water and then mechanically shaken for 1 and 3 days at 20°C. After shaking, soil solutions were filter extracted and then analyzed by liquid scintillation. The extent of adsorption and desorption was determined by difference in concentrations from pre-equilibration and post-equilibration solutions. Freundlich (non-linear sorption model) coefficients were estimated using a linearized Freundlich equation where the y intercept = -log Kf and slope=1/n.

VII. Study Author's Comments:

The registrant stated the batch equilibrium data demonstrate "that metolachlor is not very strongly adsorbed to soil particles". Estimated Freundlich coefficients, based on liquid scintillation counting, were 10 (1/n=.85) for Vetros soil, 3.18 (1/n=.85) for Les Evouettes soil, 1.54 (1/n= 0.84) for Collombey soil, and 1.69 (1/n=0.85) for Lakeland soil (Table 2). Similar adsorption coefficients were reported for liquid gas chromatography analysis. (Reviewer Note: The data submission does not provide raw data to confirm residue specific Freundlich coefficients.) Desorption data for the Les Evouettes silty loam soil demonstrated that desorption occurred at slower rate than absorption (Fig 2). Also, reversible sorption of metolachlor is unlikely because the desorption coefficients are slightly higher than the adsorption coefficients.

VIII. Reviewer's Comments

1.) Equilibration were conducted in water rather than 0.01 M CaCl2 solution. As per Subdivision N guidelines, a 0.01 M $CaCl_2$ solution is required to control ionic strength of the equilibration solution. Schwarzenbach, et al., 1993 states that changes of typical levels of dissolved salts is not expected cause major changes in estimating the organic matter partitioning coefficients (K_{om}). Because the metolachlor exhibited low sorption affinity to the test soils, it is unlikely the use of 0.01 M $CaCl_2$ solution will alter study results and hence interpretation of metolachlor mobility.

2.) There was no detailed description of specific residue methods such as liquid gas chromatography (LGC) in the study submission. The lack of residue specific data limits the ability to confirm the presence of metolachlor in batch equilibrium studies.

3.) Foreign soils were used in the study. The registrant failed to cross-reference the foreign soils to comparable US soils.

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Table I Origin and properties of soils used for adsorption measurements

Origin	pH	$CaCO_3$ [%]	Organic Matter [%]	Cation exchange capacity [meq/100 g soil]	Mechanical Analysis Clay %	Silt %	Sand %
Collombey VS, Switzerland	7.8	11.5	2.2	14.0	2.8	10.2	87.0
Vetroz, VS, Switzerland	6.7	15.0	5.6	29.4	22.6	19.6	57.8
Les Evouettes VS, Switzerland	6.1	0	3.6	9.0	12.2	49.4	38.4
Lakeland, Florida, U.S.A.	6.3	0.1	1.2	3.7	1.5	2.1	96.4

Table II Constants from Freundlich adsorption isotherms for metolachor with various soils

soil	k [μg · g^{-1} of soil]	k_0 [μg · g^{-1} organic matter]	n^{-1}
Vetros	10.0 (12.6)*	179 (225)	0.85 (0.79)
Les Evouettes	3.18 (3.78)	88 (105)	0.85 (0.87)
Collombey	1.54 (1.67)	70 (76)	0.84 (0.89)
Lakeland	1.69 (2.11)	141 (176)	0.85 (0.78)

* Values in brackets obtained by GLC measurements.

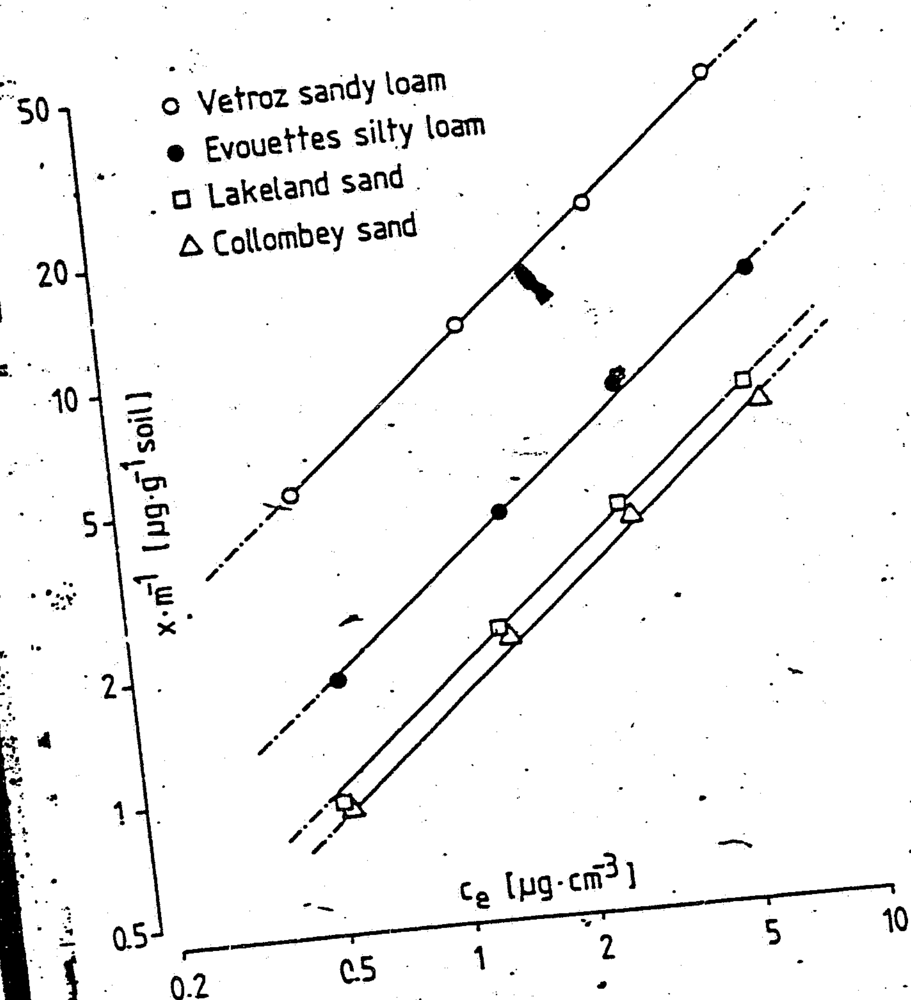

Fig. 1 Freundlich Adsorption Isotherms, Metolachlor for various Soil Types.

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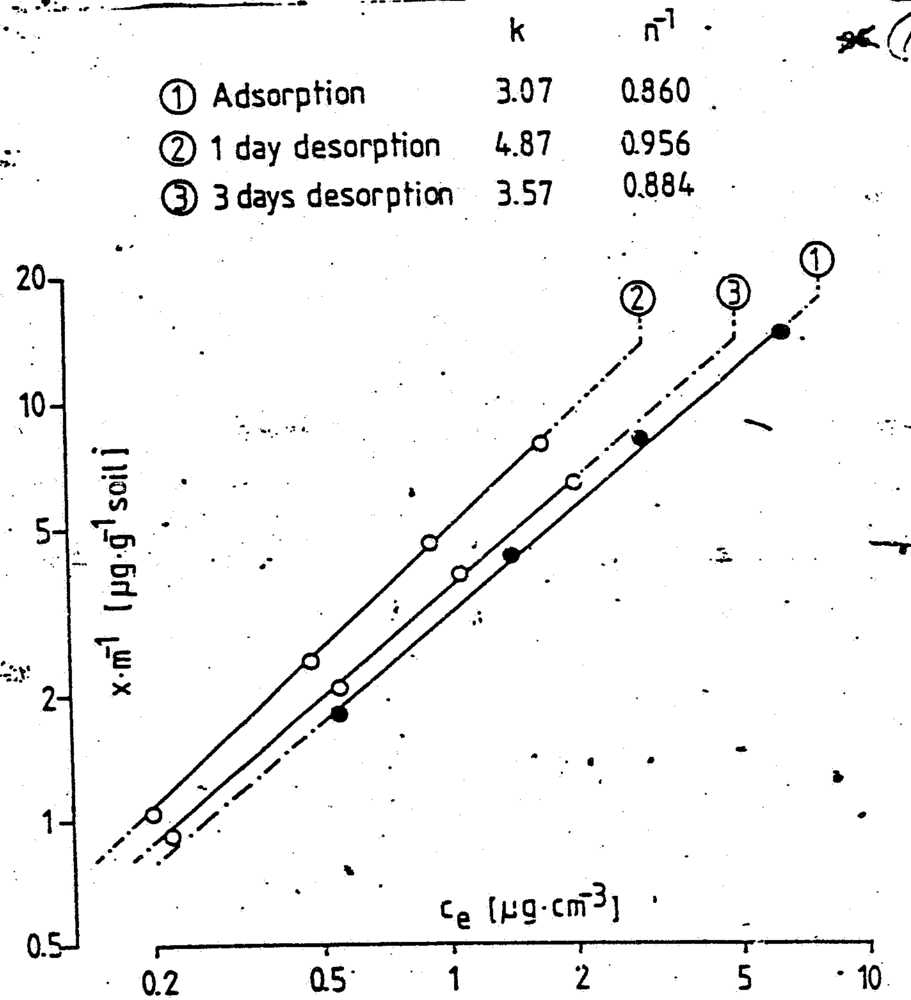

Fig. 2 Freundlich Adsorption and Desorption Isotherms of Metolachlor for Les Evouettes Silty Loam.

Data Requirement: PMRA Data Code:
EPA DP Barcode:
OECD Data Point:
EPA Guideline: 162-1

Test material:
Common name: (*S*)-Metolachlor.
Chemical name
IUPAC: mixture of 80-100% (*aRS*,1*S*)-2-chloro-*N*-(6-ethyl-*o*-tolyl)-*N*-(2-methoxy-1-methylethyl)acetamide and 20-0% (*aRS*,1*R*)-2-chloro-*N*-(6-ethyl-*o*-tolyl)-*N*-(2-methoxy-1-methylethyl)acetamide.
CAS name: 2-Chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-[(1*S*)-2-methoxy-1-methylethyl]acetamide.
CAS No: 87392-12-9.
Synonyms: CGA-77102; (*S*)-2-Chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)acetamide; Dual Magnum.
SMILES string:

Primary Reviewer: Lynne Binari
Dynamac Corporation
Signature:
Date:

QC Reviewer: Kathleen Ferguson
Dynamac Corporation
Signature:
Date:

Secondary Reviewer: James Hetrick
EPA
Signature: James A. Hetrick
Date: 2/28/02

Company Code: [for PMRA]
Active Code: [for PMRA]
Use Site Category: [for PMRA]
EPA PC Code: 108800

CITATION: Moore, P. 2000. Soil metabolism of ^{14}C-[phenyl]-CGA-77102 under aerobic and non-irradiated incubation conditions following surface and homogenous dosing. Unpublished study performed and sponsored by Novartis Crop Protection, Inc., Greensboro, NC. Laboratory Study ID: Novartis Number 342-97. Study initiated June 30, 1997 and completed November 15, 2000 (pp. 1, 13).

Data Requirement: PMRA Data Code:
EPA DP Barcode:
OECD Data Point:
EPA Guideline: 162-1

Test material:
Common name: (*S*)-Metolachlor.
Chemical name
IUPAC: mixture of 80-100% (*aRS*,1*S*)-2-chloro-*N*-(6-ethyl-*o*-tolyl)-*N*-(2-methoxy-1-methylethyl)acetamide and 20-0% (*aRS*,1*R*)-2-chloro-*N*-(6-ethyl-*o*-tolyl)-*N*-(2-methoxy-1-methylethyl)acetamide.
CAS name: 2-Chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-[(1*S*)-2-methoxy-1-methylethyl]acetamide.
CAS No: 87392-12-9.
Synonyms: CGA-77102; (*S*)-2-Chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)acetamide; Dual Magnum.
SMILES string:

Primary Reviewer: Lynne Binari
Dynamac Corporation
Signature: Lynne Binari
Date: 12/19/01

QC Reviewer: Kathleen Ferguson
Dynamac Corporation
Signature: Kathleen Ferguson
Date: 12/19/01

Secondary Reviewer: Mark Corbin
EPA
Signature:
Date:

Company Code: [for PMRA]
Active Code: [for PMRA]
Use Site Category: [for PMRA]
EPA PC Code: 108800

CITATION: Moore, P. 2000. Soil metabolism of ^{14}C-[phenyl]-CGA-77102 under aerobic and non-irradiated incubation conditions following surface and homogenous dosing. Unpublished study performed and sponsored by Novartis Crop Protection, Inc., Greensboro, NC. Laboratory Study ID: Novartis Number 342-97. Study initiated June 30, 1997 and completed November 15, 2000 (pp. 1, 13).

EXECUTIVE SUMMARY:

The biotransformation of [phenyl-U-^{14}C]-(*S*)-2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)acetamide [(*S*)-metolachlor, CGA-77102) was studied in sandy clay loam soil (pH 7.5, organic carbon 2.55%) from Maryland for 48 days under aerobic conditions in darkness at 25 ± 1°C and soil moisture of 75% of 1/3 bar. [^{14}C](*S*)-Metolachlor was applied at the nominal rate of 1.3 mg a.i./kg soil (equivalent to 1.5 kg a.i./ha). This experiment was conducted in accordance with USEPA Subdivision N Guideline §162-1 (1982) and in compliance with USEPA GLP Standards (40 CFR, Part 160, 1989). The test systems consisted of sealed vials containing a thin (*ca.* 2-4 mm) layer of soil or sealed bottles containing a thick (*ca.* 15 mm) layer of soil. One set of thin soil layers was surface-treated with [^{14}C](*S*)-metolachlor. Additional soil was treated with [^{14}C](*S*)-metolachlor, homogenously mixed, then incubated as thin and thick layers. CO_2 and volatile organics were collected at the time of sampling by flushing the sample headspace through volatile traps. Soil samples were analyzed after 0, 1, 4, 7, 11, 14, 19, 33 and 48 days of incubation. Soil samples were extracted with acetonitrile:water (80:20, v:v), and extracts were analyzed by normal-phase two-dimensional TLC with identifications of [^{14}C](*S*)-metolachlor and its transformation products based on comparison to R_f values of unlabeled reference standards. Identifications of parent [^{14}C](*S*)-metolachlor and its transformation products were confirmed using reverse-phase HPLC, GC/MS and LC/MS.

Overall material balances averaged 106.2 ± 2.5% (range 99.6-109.0%, n = 18) of the applied radioactivity in thin layer/surface-treated soil, 100.0 ± 4.4% (range 93.7-108.8%) in thin layer/homogenous-treated soil, and 100.5 ± 5.8% (range 81.5-108.4%) in thick layer/homogenous-treated soil (reviewer-calculated data; values differ slightly from study author); there was no consistent decline in material balances during the 48-day study. [^{14}C](*S*)-Metolachlor degraded more slowly in the surface-treated soil than in the homogenous-treated soil. In surface-treated thin layer soil, [^{14}C](*S*)-metolachlor decreased from an average 98.0 ± 0.3% (n = 2) of the applied at day 0 posttreatment to 52.8 ± 4.3% at 48 days. In both thin and thick-layered homogenous-treated soil, [^{14}C](*S*)-metolachlor decreased from 93.6-99.3% (n = 4) at day 0 to 54.1-59.0% at 7 days, 28.4-30.1% at 19 days and 8.8-10.4% at 48 days. Half-lives (linear, first order kinetics) of [^{14}C](*S*)-metolachlor were 50 days (r^2 = 0.788-0.823) in surface-treated soil and 14-15 days (r^2 = 0.966-0.975) in homogenous-treated soil.

There were no major transformation products of [phenyl-U-^{14}C](*S*)-metolachlor. Four minor transformation products, CGA-40172, NOA-436611, CGA-354743 and CGA-51202, were positively identified and one minor transformation product, CGA-46576, was tentatively identified. CGA-40172 was detected at ≤11.6% of the applied, NOA-436611 at ≤9.4%, CGA-354743 at ≤11.6%, CGA-51202 at ≤11.3% and CGA-46576 at ≤3.6%. Two unidentified [^{14}C]compounds were also detected in soil extracts of all three treatments each at ≤3.5% of applied. Extractable [^{14}C]residues in surface-treated soil decreased from 99.9-103.5% of the applied at 0-1 days to 81.5-86.9% at 33-48 days, and nonextractable [^{14}C]residues increased from

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3.8-5.0% to 20.2-24.6% during the same period. Extractable [^{14}C]residues in homogenous-treated soil decreased from 95.8-103.1% of the applied at 0-1 days to 47.0-53.2% at study termination, and nonextractable [^{14}C]residues increased from 5.3-6.6% to 40.8-45.5% during the same period. Evolution of $^{14}CO_2$ and volatile organics was not significant for any treatment totaling ≤4.7% and <0.1% of the applied, respectively, at study termination.

In biotransformation pathways proposed by the registrant, (*S*)-metolachlor can degrade by substitution of the -Cl with -OH to form CGA-40172 [2-OH-acetamide of (*S*)-metolachlor] then oxidize to form CGA-51202 [oxalamide], or conjugate to form CGA-46576 [cysteine conjugate] and through oxidation and decarboxylation of transitory sulfoxide precursors form NOA-436611 [sulfoxide of thioglycolic acid] and CGA-354743 [sulfonate].

Results Synopsis:

Soil type:	Maryland sandy clay loam.
Half-life, DT50 and DT90 values:	
thin soil layer/surface-treated:	
linear/first order:	50.1-50.3 days (r^2 = 0.788-0.823).
DT_{90} (calcuated):	167.1 days.
DT50, non-linear/one compartment:	42.2 days.
DT50, non-linear/two compartment:	
initial:	15.2 days.
secondary:	47.7 days.
thin soil layer/homogenous-treated:	
linear/first order:	14.9 days (r^2 = 0.966).
DT_{90} (calcuated):	49.6 days.
DT50, non-linear/one compartment:	10.7 days.
DT50, non-linear/two compartment:	
initial:	4.9 days.
secondary:	22.2 days.
thick soil layer/homogenous-treated:	
linear/first order:	13.9 days (r^2 = 0.975).
DT_{90} (calcuated):	46.1 days.
DT50, non-linear/one compartment:	10.2 days.
DT50, non-linear/two compartment:	
initial:	4.3 days.
secondary:	18.2 days
Major transformation products:	None.
Minor transformation products:	CGA-40172 [2-OH-acetamide of (*S*)-metolachlor]. NOA-436611 [sulfoxide of thioglycolic acid]. CGA-354743 [sulfonate]. CGA-51202 [oxalamide].

CGA-46576 (cysteine conjugate, tentative).
Two unidentified [^{14}C]compounds.

Study Acceptability: This study provides supplemental data on the aerobic soil metabolism of s-metolachlor. The data are deemed as supplemental because the vessels containing the treated soil were sealed for long-periods of time (1 to 15 days) and it was not demonstrated that aerobic conditions were maintained throughout the 48-day incubation. However, the half-lives of s-metolachlor and its degradation products (except NOA-436611) appear to consistent with reported data in aerobic soil metabolism studies (MRID 43928936).

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: This study was conducted in accordance with USEPA Subdivision N Guideline §162-1 (1982). A significant deviations from the Subdivision N Guideline §162-1 is:

The treated soil was incubated in sealed containers and it was not demonstrated that aerobic conditions were maintained. This does not affect the validity of the study.

COMPLIANCE: This study was conducted in compliance with USEPA GLP Standards (40 CFR, Part 160, 1989, p. 3). Signed and dated Data Confidentiality, GLP, and Quality Assurance statement were provided (pp. 2, 3, 5). A study certification of authenticity statement was not provided.

A. MATERIALS:

1. Test Materials: [Phenyl-U-^{14}C]-(*S*)-2-Chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)acetamide.

Chemical Structure:

Description: Technical, odorless, white to tan liquid (pp. 17, 38).

Purity: Radiochemical purity: 98.1% (p. 17).
Lot No.: CAS-X-81.
Specific activity: 82.9 µCi/mg.

Storage conditions of

test chemicals: Frozen (temperature not specified) until preparation of test solution (p. 20).

Table 1: Physico-chemical properties of (*S*)-metolachlor (CGA-77102).

Parameter	Values	Comments
Molecular weight:	283.8 g/mol.	
Water solubility:	480 mg/L.	
Vapor pressure/volatility:	3.66×10^{-8} atm. at 25°C.	
UV absorption:	Not reported.	
pK_a:	Not reported.	
K_{ow}/log K_{ow}:	Not reported.	
Stability of compound at room temperature:	Not reported.	

Data obtained from p. 38 of the study report.

2. Soil Characteristics:

Table 2: Description of soil collection and storage.

Description	Details
Geographic location:	Buckeystown, Frederick County, Maryland.
Pesticide use history at the collection site:	Not reported.
Collection date:	May 27, 1997.
Collection procedures:	Not reported.
Sampling depth:	0- to 6-inch depth.
Storage conditions:	Soil was moistened then stored in a plastic bag at 25°C.
Storage length:	44 days; experimental start date July 10, 1997.
Preparation:	2-mm sieved and moisture content brought to 75% of field moisture capacity at 1/3 bar prior to treatment.

Data obtained from pp. 13, 17, 93 of the study report.

Table 3: Properties of the soil.

Property	Details
Textural classification:	Sandy clay loam.
% sand:	60
% silt:	19
% clay:	21
pH:	7.5
Organic carbon[1] (%):	2.55
Organic matter (%):	4.4
CEC (meq/100 g):	14.3
Moisture at 1/3 bar (%):	16.2
Bulk density, disturbed (g/cm^3):	1.48
Soil Taxonomic classification:	Sequatchie series. [Fine-loamy, siliceous semiactive thermic Humic Hapludults (description obtained from the National Cooperative Soil Survey)]
Soil Mapping Unit:	Not reported.

[1]Determined by Dynamac reviewer using equation % organic carbon = % organic matter/1.724 (p. 18).
Data obtained from pp. 17, 18 of the study report.

B. EXPERIMENTAL CONDITIONS:

1. Preliminary experiments: None.

2. Experimental conditions:

Table 4: Study design.

Parameter	Details
Duration of the test:	48 days.
Soil condition (air dried/fresh):	Fresh.
Soil (g/replicate):	thin (*ca.* 2-4 mm) layer: *ca.* 7 g wet wt.
	thick (*ca.* 15 mm) layer: *ca.* 25 g wet wt.
Nominal application rate:	1.3 mg a.i./kg; 1.5 kg a.i./ha.
Control conditions, if used:	Untreated controls; thin and thick soil layers.

Parameter		Details	
No. of Replications:	Controls, if used:	Not reported.	
	Treatments:	Duplicate samples at each collection interval.	
Test apparatus (Type/material/volume):		thin (*ca.* 2-4 mm) layer: Clear, silylated, borosilicate vials (25-30 mL) sealed with a Teflon septum-type cap.	
		thick (*ca.* 15 mm) layer: Amber, silylated, glass bottles (125 mL) sealed with a Teflon septum-type cap.	
Details of traps for CO_2 and organic volatiles, if any:		Upon collection of the incubation containers at the 7-, 14-, 19-, 33- and 48-day sampling intervals, volatiles were collected by drawing filtered air (0.5-1 hour; flow rate not specified) through the headspace of each container then sequentially through ethylene glycol (one trap) and 10% potassium hydroxide (two traps).	
If no traps were used, is the system closed/open?		Closed. Volatiles traps were used to sample headspace air at the time of sampling.	
Identity and concentration of co-solvent:	Identity:	Acetonitrile.	
	Final concentration:	0.8%.	
Test material application:	Vol. of test solution used/treatment:	thin layer/surface-treated: 0.055 mL of 166.9 µg/mL test solution.	
		thin and thick layer homogenous mix: 5.9 mL of 166.9 µg/mL test solution.	
	Application method:	surface-treated: Applied using a Hamilton syringe to surface of thin (*ca.* 2-4 mm, *ca.* 7 g) soil layer contained in incubation bottle.	
		homogenous mix: Test solution (5.9 mL) applied to walls of a large jar and the solvent evaporated. Soil (750.0 g) was added to the jar and roller mixed for *ca.* 2.3 hours. Aliquots of the treated soil were placed in incubation containers to achieve either a thin (*ca.* 2-4 mm, *ca.* 7 g) or thick (*ca.* 15 mm, *ca.* 25 g) soil layer.	
	Co-solvent evaporated:	surface application: No.	
		homogenous mix: Yes.	
Any indication of the test material adsorbing to the walls of the test apparatus?		Not indicated.	
Microbial biomass/population of control soil:		Initial:	Final:
		Not reported.	Not reported.
Microbial biomass/population of treated soil:		Initial (prior to treatment):	Final (respiration rate at 33 days and plate counts at 14 days posttreatment):
	via glucose respiration rate:	424.9 mg C/kg dry wt. soil.	314.6 mg C/kg dry wt. soil.

Parameter		**Details**	
	total microbial population:	1.43 x 10^4 CFU/g soil.	5.67 x 10^4 CFU/g soil.
	fungi:	4.67 x 10^1 CFU/g soil.	2.3 x 10^1 CFU/g soil.
	actinomycetes:	2.7 10^4 CFU/g soil.	9.35 x 10^4 CFU/g soil.
Experimental conditions:	Temperature (°C):	25 ± 1°C. Samples incubated in a constant temperature room.	
	Moisture content: Moisture maintenance method:	75% of 1/3 bar. None.	
	Continuous darkness (Yes/No):	Yes.	
Other details, if any:		None.	

Data obtained from pp. 18-22, 27, 28 of the study report.

3. Aerobic conditions: It was not established that aerobic conditions were maintained throughout the study. The incubation containers were sealed until sampled, and no measurement of aerobicity such as redox potentials were made.

4. Supplementary experiments: None.

5. Sampling:

Table 5: Sampling details.

Criteria		Details
Sampling intervals:		0, 1, 4, 7, 11, 14, 19, 33 and 48 days.
Sampling method:	Controls:	Not reported.
	Treated:	Duplicate samples were collected at each interval.
Method of collection of CO_2 and volatile organic compounds:		Upon collection, filtered air was drawn (flow rate not specified) through the headspace of each incubation container for 0.5-1 hour and through the trapping solutions described above.
Sampling intervals/times for: Sterility check, if sterile controls are used: Moisture content: Redox potential/other:		 Sterile controls were not used. Soil weights of 0- and 48-day samples compared. Not determined.
Sample storage before analysis:		Soil samples were extracted within 1 day of collection; soil was stored frozen (temperature not specified) if not extracted the day collected. Soil extracts were stored frozen up to 42 days prior to TLC analysis.
Other observations, if any:		None.

Data obtained from pp. 19, 21, 175-179 of the study report.

C. ANALYTICAL METHODS:

Extraction/clean up/concentration methods: An aliquot (*ca.* 6 g and 23 g for thin and thick layer samples, respectively) of each soil sample was extracted twice with acetonitrile:water (80:20, v:v) with soil:solvent ratios of *ca.* 1:2 and 1:1 for the first and second extractions, respectively (pp. 20, 21, 155-168). For each extraction, the soil:solvent mixture was shaken (method and interval not specified), then the soil and extract were separated by centrifugation (speed and interval not specified). Extracts were combined and concentrated under a nitrogen stream.

Total ^{14}C measurement: For all sampling intervals, triplicate aliquots (volume not specified) of soil extracts and trapping solutions were analyzed for total radioactivity by LSC (pp. 22, 23, 147-149, 151-153). Aliquots (0.1-0.5 g) of the soil prior to and after extraction were analyzed for total radioactivity by LSC following combustion; combustion efficiencies during analysis of extracted soil were >93% (pp. 19, 22, 23, 155-168). Extracted soil samples were air-dried, then ground using a mortar and pestle to homogenize prior to combustion analysis; preparation of pre-extracted soil samples was not reported (p. 22). Total ^{14}C was determined by summing ^{14}C residues in the various sample fractions.

Nonextractable residue determination: The concentration of nonextractable residues in the soil was determined by LSC following combustion as described. The nature of the nonextractable [^{14}C]residues was not determined.

Derivatization method, if used: A derivatization method was not employed.

Identification and quantification of parent compound: Soil extracts were analyzed using normal-phase one-dimensional TLC on silica gel plates developed with chloroform:methanol:ammonium hydroxide:water (80:30:4:2, v:v; pp. 23, 24, 29, 64) and also by two-dimensional TLC with plates developed in the first direction using the previous solvent combination followed by toluene:acetone:formic acid (75:25:4, v:v; pp. 55-63). Following development, areas of radioactivity were detected using either a Packard Instant-Imager or Fujix Bioimager BAS 1000 and quantified by LSC analysis of silica gel removed from the plates. Parent [^{14}C](*S*)-metolachlor (CGA-77102) in the soil extracts was identified by comparison to the R_f values of unlabeled reference standard (*S*)-metolachlor detected under UV light (254 nm; pp. 24, 54).

Selected extracts were analyzed by reverse-phase HPLC under the following conditions: YMC ODS-AQ C18 column (4.6 x 250 mm, particle size not specified), gradient mobile phase combining (A) 0.05 M ammonium acetate and (B) acetonitrile [percent A:B at 0-5 min. 100:0 (v:v), 5-30 min. 75:25, 30-35 min. 75:25, 35-50 min. 35:65, 50-55 min. 35:65, 55-60 min. 0:100, 60-63 min. 0:100, 63-68 min. 90:10], injection volume not specified, flow rate 1 mL/minute, UV (254 nm) and radioactivity detection (p. 25). Quantitation was achieved via the radioactivity detector and also through collection of fractions at 1.0-minute intervals and analyzed by LSC. [^{14}C](*S*)-metolachlor in soil extracts was identified by comparison to the retention time of unlabeled reference standard (pp. 25, 65-68). HPLC column recoveries were reported as generally between 90-110%.

In addition, the 0-day soil extract was analyzed by GC/MS and/or LC/MS (pp. 110-141). GC conditions could not be determined from the information provided. Reverse-phase HPLC conditions were as follows: Inertsil ODS-2 column (2 x 150 mm, particle size not specified) or Genesis C-8 column (3 x 100 mm, 4 µm particle size), flow rate 0.4 mL/minute; additional conditions could not be determined. MS conditions were as follows: TSQ-7000 MS, ESI mode, positive and negative ion; additional conditions could not be determined.

Identification and quantification of transformation products: Refer to previous section, "Identification and quantification of parent compound". Transformation products in soil extracts were identified and quantified by two-dimensional normal phase TLC as described above. Identifications of transformation products were confirmed in selected samples using reverse-phase HPLC, GC/MS and/or LC/MS analyses as described above. Prior to MS analyses, (*S*)-metolachlor transformation products were separated by normal-phase one-dimensional TLC of soil extracts on silica gel plates developed with ethyl acetate:toluene:formic acid:water (87:3:5:5, v:v), extracted from the silica with methanol, and concentrated.

Detection limits (LOD, LOQ) for the parent compound: The Limit of detection (LOD) for LSC analyses was *ca.* 60 dpm (0.0003 µg, p. 23). Detection limits for the HPLC and MS analyses were not reported.

Detection limits (LOD, LOQ) for the parent compound and transformation products: Refer to "Detection limits (LOD, LOQ) for the parent compound".

II. RESULTS AND DISCUSSION:

A. TEST CONDITIONS: It was not established that aerobic conditions were maintained throughout the 48-day incubation. The vials and bottles containing the treated soil were sealed and no determinations were made, such as redox potentials, to verify that aerobic conditions were maintained throughout the study. It was not established that soil moisture was maintained at 75% of 1/3 bar throughout the incubation; net soil weight differentials between 0- and 48-day samples were reported as ≤5.4%, indicating minimal moisture loss, but recorded soil weights at sample collection were not provided for review (p. 27). The treated soil samples were maintained at 25 ± 1°C during incubation (p. 181).

B. MATERIAL BALANCE: During the 48-day incubation, overall recoveries of radiolabeled material averaged 106.2 ± 2.6% (range 99.7-109.0%) of the applied in thin layer/surface-treated soil, 100.0 ± 4.5% (93.5-108.8%) in thin layer/homogenous-treated soil, and 100.5 ± 5.9% (81.5-108.4%) in thick layer/homogenous-treated soil (study author's calculated data; pp. 28, 147-149). There was no consistent decline in material balances in any sample set.

Table 6: Biotransformation of [phenyl-U-^{14}C](*S*)-metolachlor (CGA-77102), expressed as percentage of applied radioactivity (mean ± s.d., n = 2)[1]*, in thin layer/surface-treated (Treatment A) sandy clay loam soil under aerobic conditions.

Compound	Sampling times (days)								
	0	1	4	7	11	14	19	33	48
(*S*)-Metolachlor (CGA-77102)	98.0 ± 0.3	99.7 ± 1.2	84.0 ± 1.8	78.4 ± 0.5	75.9 ± 7.6	71.7 ± 0.7	56.8 ± 3.8	53.7 ± 0.5	52.8 ± 4.3
CGA-40172	ND[2]	ND	1.7 ± 0.5	6.6 ± 0.1	6.0 ± 2.9	9.0 ± 0.3	10.7 ± 0.9	10.4 ± 0.2	10.6 ± 0.7
NOA-436611	ND	ND	1.1 ± 0.2	0.6 ± 0.6	0.9 ± 0.4	1.3 ± 0.3	3.4 ± 0.8	4.1 ± 0.1	3.2 ± 0.7
CGA-354743	ND	ND	0.5 ± 0.5	0.4 ± 0.4	1.9 ± 1.9	0.4 ± 0.4	1.6 ± 0.2	2.5 ± 0.0	2.0 ± 0.4
CGA-51202	ND	ND	0.8 ± 0.3	2.4 ± 1.4	2.0 ± 1.0	3.6 ± 0.3	4.0 ± 0.4	4.3 ± 0.4	6.1 ± 0.4
CGA-46576	ND	ND	0.1 ± 0.2	2.1 ± 1.5	0.5 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	0.9 ± 0.2	1.3 ± 0.2
Unknown (zone 4)	ND	ND-1	1.1-1.6	ND	ND	ND	ND	ND	ND
Unknown (zone 8)	ND	ND	ND-0.5	ND	ND-0.8	1.3-1.6	ND-1.9	3.3-3.5	ND-1.6
Total extractable residues	100.3 ± 0.4	102.9 ± 0.7	92.3 ± 0.7	95.2 ± 0.1	92.8 ± 4.7	92.8 ± 1.1	85.1 ± 3.5	83.7 ± 0.3	84.2 ± 2.7
CO_2	NA[3]	NA	NA	ND	NA	ND	<0.1	<0.1	<0.1
Organic volatiles	NA	NA	NA	<0.1	NA	<0.1	<0.1	<0.1	<0.1
Non-extractable residues	3.9 ± 0.1	4.9 ± 0.1	9.0 ± 1.0	12.6 ± 0.4	12.6 ± 2.1	15.2 ± 0.1	22.1 ± 2.2	24.4 ± 0.3	22.0 ± 1.8
Total % recovery	104.2 ± 0.5	107.8 ± 0.5	101.3 ± 1.6	107.8 ± 0.3	105.4 ± 2.6	108.0 ± 1.0	107.2 ± 1.4	108.1 ± 0.1	106.3 ± 0.9

[1]Standard deviations calculated by Dynamac reviewer (Attachment 2).
* Except where range or single value given
[2]Not detected; LSC limit of detection 0.003% of the applied radioactivity.
[3]Not analyzed.
Data obtained from pp. 34, 35, 151, 170 of the study report and Attachment 2.

Table 7: Biotransformation of [phenyl-U-^{14}C](*S*)-metolachlor (CGA-77102), expressed as percentage of applied radioactivity (mean ± s.d., n = 2)[1]*, in thin layer/homogenous-treated (Treatment B) sandy clay loam soil under aerobic conditions.

Compound	Sampling times (days)								
	0	1	4	7	11	14	19	33	48
(*S*)-Metolachlor (CGA-77102)	95.4 ± 1.8	91.3 ± 1.1	67.0 ± 0.2	57.6 ± 1.5	41.9 ± 0.0	35.9 ± 1.8	29.8 ± 0.4	16.2 ± 0.1	10.4 ± 0.0
CGA-40172	ND[2]	1.5 ± 0.0	3.1 ± 0.1	4.4 ± 0.2	5.0 ± 0.1	5.3 ± 0.1	5.8 ± 0.1	5.7 ± 0.1	5.7 ± 0.0
NOA-436611	ND	1.1 ± 0.1	2.4 ± 0.0	3.8 ± 0.5	6.3 ± 1.2	5.6 ± 0.4	7.7 ± 0.1	8.1 ± 1.3	8.5 ± 0.8
CGA-354743	ND	0.9 ± 0.0	2.7 ± 0.0	4.6 ± 0.1	5.9 ± 0.7	8.9 ± 0.1	7.4 ± 0.2	10.2 ± 1.4	9.4 ± 0.1
CGA-51202	ND	1.2 ± 0.0	3.0 ± 0.1	5.4 ± 0.2	7.2 ± 0.3	9.1 ± 0.3	9.1 ± 0.5	10.2 ± 0.1	10.8 ± 0.5
CGA-46576	ND	0.4 ± 0.0	0.9 ± 0.2	1.4 ± 0.3	1.8 ± 0.4	1.8 ± 0.2	1.9 ± 0.0	1.6 ± 0.2	1.6 ± 0.2
Unknown (zone 4)	ND	0.9	ND	ND-1.7	ND	ND	ND	ND	ND
Unknown (zone 8)	ND	ND-0.4	0.8-1.0	1.0-1.4	1.2-1.5	ND-1.6	1.2-1.4	1.6-1.9	1.3-1.5
Total extractable residues	98.4 ± 1.8	98.6 ± 1.1	82.4 ± 0.2	82.1 ± 1.8	72.8 ± 2.2	71.6 ± 0.3	67.8 ± 0.9	57.7 ± 0.3	52.7 ± 0.5
CO_2	NA[3]	NA	NA	0.254 ± 0.022	NA	0.417 ± 0.133	0.426 ± 0.153	0.594 ± 0.020	1.188 ± 0.473
Organic volatiles	NA	NA	NA	ND	NA	ND	ND	ND	ND
Non-extractable residues	6.3 ± 0.3	9.0 ± 0.1	15.4 ± 0.6	19.8 ± 0.4	26.0 ± 2.1	28.3 ± 1.1	29.4 ± 0.8	37.9 ± 2.4	40.9 ± 0.1
Total % recovery	104.7 ± 1.4	107.6 ± 1.2	97.8 ± 0.8	102.1 ± 1.4	98.8 ± 4.2	100.3 ± 1.3	97.7 ± 0.2	96.2 ± 2.7	94.8 ± 1.1

[1]Standard deviations calculated by Dynamac reviewer (Attachment 2).
* Except where range or single value given
[2]Not detected; LSC limit of detection 0.003% of the applied radioactivity.
[3]Not analyzed.
Data obtained from pp. 34, 35, 152, 171 of the study report and Attachment 2.

Table 8: Biotransformation of [phenyl-U-^{14}C](*S*)-metolachlor (CGA-77102), expressed as percentage of applied radioactivity (mean ± s.d., n = 2)[1]*, in thick layer/homogenous-treated (Treatment C) sandy clay loam soil under aerobic conditions.

Compound	Sampling times (days)								
	0	1	4	7	11	14	19	33	48
(*S*)-Metolachlor (CGA-77102)	98.2 ± 1.1	88.7 ± 1.4	70.6 ± 0.5	54.7 ± 0.5	41.4 ± 0.1	36.4 ± 0.0	28.9 ± 0.5	14.6 ± 0.3	8.9 ± 0.1
CGA-41072	ND[2]	1.4 ± 0.0	3.2 ± 0.1	4.2 ± 0.0	4.9 ± 0.2	5.5 ± 0.2	5.5 ± 0.1	5.6 ± 0.0	5.4 ± 0.2
NOA-436611	ND	2.3 ± 0.4	2.6 ± 0.0	4.0 ± 0.0	5.3 ± 0.4	5.1 ± 0.1	7.5 ± 0.1	9.1 ± 0.0	8.6 ± 0.3
CGA-354743	ND	0.4 ± 0.4	2.6 ± 0.1	4.1 ± 0.1	6.4 ± 0.4	7.6 ± 0.3	7.4 ± 0.2	9.2 ± 0.1	9.0 ± 0.1
CGA-51202	ND	ND	3.2 ± 0.1	5.5 ± 0.0	7.2 ± 0.5	8.0 ± 0.3	9.0 ± 0.3	9.4 ± 0.1	7.8 ± 0.0
CGA-46576	ND	0.4 ± 0.0	1.1 ± 0.1	1.4 ± 0.3	1.8 ± 0.4	1.8 ± 0.2	1.9 ± 0.0	1.6 ± 0.2	1.3 ± 0.1
Unknown (zone 4)	ND-0.7	1.0-1.2	ND-0.8	ND	ND	ND	ND	ND	ND
Unknown (zone 8)	ND	0.4-0.5	0.8-1.2	1.1-1.2	1.2-1.5	1.2-1.4	1.3-1.3	1.7-1.7	0.8-1.1
Total extractable residues	101.8 ± 1.3	96.6 ± 0.8	86.7 ± 0.4	78.4 ± 1.4	73.4 ± 1.1	69.3 ± 0.3	65.9 ± 0.1	55.8 ± 0.2	47.5 ± 0.5
CO_2	NA[3]	NA	NA	0.382 ± 0.002	NA	0.950 ± 0.108	0.703 ± 0.087	1.571 ± 0.121	4.595 ± 0.110
Organic volatiles	NA	NA	NA	ND	NA	ND	ND	ND	ND
Non-extractable residues	5.7 ± 0.4	9.0 ± 0.4	16.0 ± 0.4	22.6 ± 0.6	27.3 ± 1.0	29.6 ± 0.7	33.9 ± 0.1	32.6 ± 8.6	43.9 ± 1.6
Total % recovery	107.5 ± 0.9	105.7 ± 0.4	102.8 ± 0.0	101.4 ± 2.0	100.6 ± 2.0	99.8 ± 1.0	100.5 ± 0.1	90.0 ± 8.5	96.0 ± 1.3

[1]Standard deviations calculated by Dynamac reviewer (Attachment 2).
* Except where range or single value given
[2]Not detected; LSC limit of detection 0.003% of the applied radioactivity.
[3]Not analyzed.
Data obtained from pp. 34, 35, 153, 172 of the study report and Attachment 2.

C. TRANSFORMATION OF PARENT COMPOUND: Parent [phenyl-U-^{14}C](*S*)-metolachlor degraded more slowly in the surface-treated soil than in the homogenous-treated soil (pp. 35, 69 and Attachment 2). In thin layer/surface-treated soil (Treatment A), [^{14}C](*S*)-metolachlor decreased from an average 98.0 ± 0.3% (97.7-98.3%, n = 2) of the applied radioactivity at day 0 posttreatment to 52.8 ± 4.3% (48.5-57.0%) at 48 days. In thin layer/homogenous-treated soil (Treatment B), [^{14}C](*S*)-metolachlor decreased from 95.4 ± 1.8% (93.6-97.2%) of the applied at

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day 0 to 57.6 ± 1.5% (56.1-59.0%) at 7 days, 29.8 ± 0.4% (29.4-30.1%) at 19 days and 10.4 ± 0.0% (10.3-10.4%) at 48 days. In thick layer/homogenous-treated soil (Treatment C), [^{14}C](*S*)-metolachlor decreased from 98.2 ± 1.1% (97.1-99.3%) of the applied at day 0 to 54.7 ± 0.5% (54.1-55.2%) at 7 days, 28.9 ± 0.5% (28.4-29.4%) at 19 days and 8.9 ± 0.1% (8.8-9.0%) at 48 days.

HALF-LIFE/DT$_{50}$: Half-life values of [phenyl-U-^{14}C](*S*)-metolachlor were determined by the study author using linear regression analysis based on first-order kinetics calculated by Excel version 7.0. The study author's calculations were confirmed by the reviewer using Quattro Pro 8 software. DT50 values were determined by the study author using non-linear analysis based on one- and two-compartment models calculated by Origin version 5.0 (pp. 26, 27, 70-78). DT$_{90}$ (90% decline time) values were determined using the first-order kinetic equation and calculated k value, then DT$_{90}$ = -(ln 10/k).

Table 9: Half-life ($t_{1/2}$) values of (*S*)-metolachlor (CGA-77102) in aerobic sandy clay loam soil calculated using linear regression analysis and first-order kinetics.

Soil layer/treatment	Linear/First order half-life			DT$_{50}$ (days)	DT$_{90}$ (days)
	half-life (days)	Regression equation	R^2		
thin/surface	50.3	Linear form y = mx + b as lnC= -kt + lnC$_0$; lnC$_0$ is initial concentration (b = y intercept), lnC is concentration at time t (y), k is the slope (m), t is time (x) or kt = lnC$_0$ - lnC. Half-life (t ½) = -(ln 2/k).	0.823	ND[2]	167.1
thin/homogenous	14.9		0.966	ND	49.6
thick/homogenous	13.9		0.975	ND	46.1

[1]Determined by Dynamac reviewer as registrant did not report correlation coefficient (r^2) values (Attachment 2).
[2]Not determined.
Data obtained from p. 37.

Table 10: DT50 values of (*S*)-metolachlor (CGA-77102) in aerobic sandy clay loam soil calculated using non-linear analysis based on one-compartment model.

Soil layer/treatment	Non-linear/One-compartment model			DT$_{50}$ (days)	DT$_{90}$ (days)
	half-life (days)	Equation	R^2		
thin/surface	42.2	one-compartment C = C$_1$*exp((-k$_1$)*x) C = concentration of parent at any time C$_1$ = initial concentration of parent exp = exponential values of k$_1$ = initial rate constant of dissipation (slope of line) and x = sampling time	0.854	ND[1]	ND
thin/homogenous	10.7		0.982	ND	ND
thick/homogenous	10.2		0.987	ND	ND

[1]Not determined.
Data obtained from pp. 37, 73, 75, 77.

Table 11: DT50 values of (*S*)-metolachlor (CGA-77102) in aerobic sandy clay loam soil calculated using non-linear analysis based on two-compartment model.

Soil layer/ treatment	Non-linear/Two-compartment model				DT$_{50}$ (days)	DT$_{90}$ (days)
	half-life (days)		Equation	R^2		
thin/surface	initial	15.2	two-compartment $C = C_1*\exp((-k_1)*x) + C_2*\exp((-k_2)*x)$ C = concentration of parent at any time C_1 = initial concentration of parent C_2 = secondary phase concentration of parent exp = exponential values of k_1 = initial rate constant of dissipation (slope of line) k_2 = secondary phase rate constant of dissipation (slope) and x = sampling time	0.977	ND[1]	ND
	secondary	47.7				
thin/ homogenous	initial	4.9		0.997	ND	ND
	secondary	22.2				
thick/ homogenous	initial	4.3		0.999	ND	ND
	secondary	18.2				

[1]Not determined.
Data obtained from p. 37, 74, 76, 77.

TRANSFORMATION PRODUCTS: There were no major transformation products of [phenyl-U-^{14}C](*S*)-metholachlor. Four minor transformation products, CGA-40172, NOA-436611, CGA-354743 and CGA-51202, were positively identified and one minor transformation product, CGA-46576, was tentatively identified in soil extracts of all three treatments. In soil extracts from thin layer/surface-treated soil, CGA-40172 was detected at a maximum 11.6% of the applied at 19 days, NOA-436611 at 4.2% at 33 days, CGA-354743 at 2.5% at 33 days, CGA-51202 at 6.6% at 48 days and CGA-46576 at 3.6% at 7 days (p. 170). In soil extracts from thin layer/homogenous-treated soil, CGA-40172 was detected at a maximum 5.9% at 19-33 days, NOA-436611 at 9.4% at 33 days, CGA-354743 at 11.6% at 33 days, CGA-51202 at 11.3% at 48 days and CGA-46576 at 2.2% at 11 days (p. 171). In soil extracts from thick layer/homogenous-treated soil, CGA-40172 was detected at a maximum 5.7% at 14 and 33 days, NOA-436611 at 9.1% at 33 days, CGA-354743 at 9.3% at 33 days, CGA-51202 at 9.5% at 33 days and CGA-46576 at 2.1% at 19 days (p. 172). Two unidentified [^{14}C]compounds (HPLC zones 4 and 8) were also detected in soil extracts of all three treatments each at ≤3.5% of applied.

NONEXTRACTABLE AND EXTRACTABLE RESIDUES: In thin layer/surface-treated soil, extractable [^{14}C]residues decreased from 99.9-103.5% of the applied at 0-1 days to 81.5-86.9% at 33-48 days, while non-extractable [^{14}C]residues increased from 3.8-5.0% to 20.2-24.6% during the same period (p. 147). In thin layer/homogenous-treated soil, extractable [^{14}C]residues decreased from 96.7-100.2% of the applied at day 0 to 52.2-53.2% at 48 days, while non-extractable [^{14}C]residues increased from 5.9-6.6% to 40.8-41.0% (p. 148). In thick layer/homogenous-treated soil, extractable [^{14}C]residues decreased from 100.6-103.1% of the applied at day 0 to 47.0-48.0% at 48 days, while non-extractable [^{14}C]residues increased from 5.3-6.1% to 42.2-45.5% (p. 149).

VOLATILIZATION: Volatilization of $^{14}CO_2$ was not significant for any treatment, totaling 0.017-0.07% of the applied for thin layer/surface-treated soil, 0.714-1.660% for thin layer/homogenous-treated soil and 4.485-4.704% for thick layer/homogenous-treated soil at study termination (pp. 151-153). Organic volatiles were <0.1% of applied at any sampling interval for all three treatments.

TRANSFORMATION PATHWAY: Biotransformation pathways for the degradation of (*S*)-metolachlor in an aerobic soil were proposed by the registrant (pp. 32, 88). Biotransformation included substitution of the -Cl with -OH to form CGA-40172 then oxidation to form CGA-51202, or cysteine conjugation to form CGA-46576 then oxidation and decarboxylation of transitory sulfoxide precursors to form NOA-436611 then CGA-354743.

Table 12: Chemical names for identified transformation products of (*S*)-metolachlor (CGA-77102) in aerobic sandy clay loam soil.

Code	Chemical Name
CGA-40172	2-OH-Acetamide of (*S*)-metolachlor.
NOA-436611	Sulfoxide of thioglycolic acid of (*S*)-metolachlor.
CGA-354743	Sulfonate of (*S*)-metolachlor.
CGA-51202	Oxalamide of (*S*)-metolachlor.
CGA-46576[1]	Cysteine conjugate of (*S*)-metolachlor.

[1]Tentative identification.
Data obtained from pp. 39, 40 of the study report.

D. SUPPLEMENTARY EXPERIMENT-RESULTS: None performed.

III. STUDY DEFICIENCIES: This study is supplemental but cannot be used to fulfill Subdivision N Guideline §162-1 data requirements at this time because no data were provided to demonstrate that aerobic conditions were maintained throughout the 48-day incubation. The vials and bottles containing the treated soil layers were sealed until the time of sample collection. No determinations such as redox potentials were made to verify that aerobic conditions were maintained. It is possible, especially with the thick soil layer, that pockets of anaerobicity developed.

IV. REVIEWER'S COMMENTS:

1. No results were provided to demonstrate that soil moisture was maintained at 75% of 1/3 bar throughout the incubation. There was no attempt to maintain soil moisture during the 48-day

incubation. It was reported that net soil weight differentials between the 0- and 48-day samples were ≤5.4%, indicating minimal moisture loss, but recorded soil weights at sample collection were not provided for review.

2. The study author calculated half-life values (linear and non-linear) for (*S*)-metolachlor using mean values of metolachlor (percent of applied radioactivity) detected at each sampling interval (pp. 70-78). It is preferred that individual replicate values be used for calculations to more accurately reflect the behavior of the compound. However, similar half-life values (linear) for metolachlor were determined by the Dynamac reviewer using [^{14}C]metolachlor concentration in each replicate sample at all sampling intervals and least squares linear regression analysis assuming degradation followed first order kinetics as calculated by Corel Quattro Pro 8 software (Attachment 2).

3. Soil extracts were stored up to 42 days prior to TLC analysis. Re-analysis by TLC of a day 0 extract from thick layer/homogenous-treated soil indicates that (*S*)-metolachlor was stable during 69 days of frozen (temperature not specified) storage comprising 97.1% of applied at initial analysis and 98.0% after 69 days (pp. 46, 47).

4. HPLC column recoveries were reported as generally between 90-110%; however, individual column recoveries were not provided for review.

5. Detection limits for the HPLC and MS analyses were not reported.

6. GC/MS and LC/MS methods were not adequately described. The methods should have been summarized in the study text.

7. Peaks on the HPLC chromatograms should have been labeled as to compound (pp. 66-68).

8. Results from combustion and LSC analysis of non-extracted soil samples (total radioactivity prior to extraction) were not provided for review.

9. It would have been useful to determine the nature of the non-extractable [^{14}C]residues; residues associated with fulvic acid, humic acid and humin fractions of the soil.

10. The 1.3 mg a.i./kg treatment rate was selected to approximate the concentration of (*S*)-metolachlor that would be present in the 0- to 6-inch soil layer following application and/or incorporation of the maximum single field use rate of 2-3 lb a.i./A assuming an average soil bulk density of 1.5 g/cm^3 (p. 14).

11. (*S*)-Metolachlor chemical name mixture of 80-100% (*aRS*,1*S*)-2-chloro-*N*-(6-ethyl-*o*-tolyl)-*N*-(2-methoxy-1-methylethyl)acetamide and 20-0% (*aRS*,1*R*)-2-chloro-*N*-(6-ethyl-*o*-tolyl)-*N*-(2-methoxy-1-methylethyl)acetamide was identified as the IUPAC name by the Compendium

of Pesticide Common Names (http://www.hclrss.demon.co.uk/s-metolachlor.html). Additional IUPAC name mixture of 80-100% (*aRS*,1*S*)-2-chloro-6'-ethyl-*N*-(2-methoxy-1-methylethyl)acet-*o*-toluidide and 20-0% (*aRS*,1*R*)-2-chloro-6'-ethyl-*N*-(2-methoxy-1-methylethyl)acet-*o*-toluidide and CAS name 2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-[(1*S*)-2-methoxy-1-methylethyl]acetamide were also obtained from the Compendium of Pesticide Common Names. The following additional (*S*)-metolachlor synonyms were obtained from USEPA/OPP Chemical Databases (http://www.cdpr.ca.gov/cgi-bin/epa/chemidetriris.pl?pccode=108800 and (http://www.cdpr.ca.gov/cgi-bin/mon/bycode.pl?p_chemcode=5133): chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)acetamide; 2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)-,(*S*)-*, acetamide* and *R*-enantiomer; and acetamide, 2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)-,(*S*)-** and *R*-enantiomer. The registrant used the chemical name (*S*)-2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)acetamide (p. 38).

V. REFERENCES: The following references were cited in the study:

1. Anderson and Domsch. 1978. A physiological method for the quantitative measurement of microbial biomass in soils. Soil Biol. Biochem. Vol. 10: 215-221. MRID 43883401.

2. Clark, A. 1995. Comparative aerobic soil metabolism of phenyl ^{14}C-CGA-77102 and phenyl ^{14}C-metolachlor in a sandy loam soil. Ciba-Geigy ABR-95102, Study #338-94. MRID 43928936.

3. Lamoureux, G. and D. Rusness. 1989. Propachlor metabolism in soybean plants, excised soybean tissues, and soil. Pest. Biochem. Physiol. Vol. 34: 187-204.

4. Merritt, A. 1995. Photodegradation of ^{14}C-metolachlor and ^{14}C-CGA-77102 on soil under artificial light. Ciba-Geigy ABR-95128. MRID 43928935.

5. Moore, P. 1997. Field corn and soybean metabolism of dimethenamid. WSSA Mtg. Abstracts. Vol. 37: 166.

Attachment 1

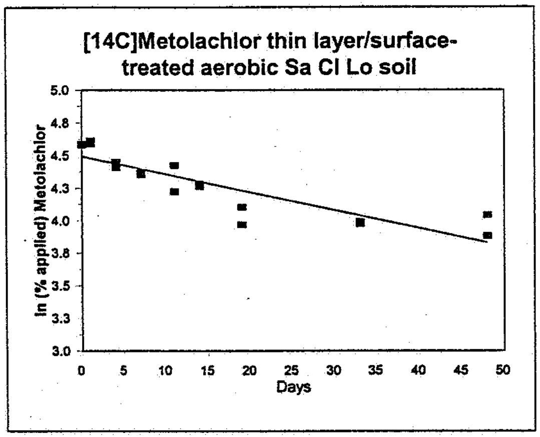
Quattro Pro Graphs and Spreadsheets
Excel Spreadsheets

50

Aerobic Metabolism of [^{14}C]S-Metolachlor (CGA-77102) in Sandy Clay Loam Soil.
MRID 45499606

Treatment A - Thin Layer/Surface-Treated Soil.
[Ph]enyl-U-^{14}C]S-Metolachlor
Half-life Determination

S-Metolachlor		
Day	%AR	Ln(%AR)
0	97.7	4.5819
0	98.3	4.58802
1	100.9	4.61413
1	98.5	4.59006
4	82.2	4.40916
4	85.8	4.45202
7	77.9	4.35543
7	78.9	4.36818
11	68.3	4.22391
11	83.5	4.42485
14	71.1	4.26409
14	72.4	4.28221
19	53.0	3.97029
19	60.6	4.10429
33	54.2	3.99268
33	53.3	3.97594
48	57.0	4.04305
48	48.5	3.88156



Regression Output:

Constant	4.495
Std Err of Y Est	0.115
R Squared	0.788
No. of Observations	18
Degrees of Freedom	16
X Coefficient(s)	-0.01382
Std Err of Coef.	0.00179

half-life 50.1 days

*AR = Applied Radioactivity
Linear regression analysis performed using Corel Quattro Pro 8.
Results from p. 170 of study report.

Aerobic Met ism of [^{14}C]S-Metolachlor (CGA-77102) in Sandy Clay Loam S
MRID 45499606

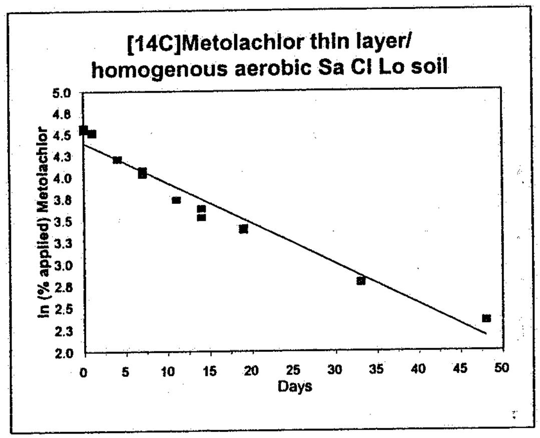
Treatment B - Thin Layer/Homogenous-Treated Soil.
[Phenyl-U-^{14}C]S-Metolachlor
Half-life Determination

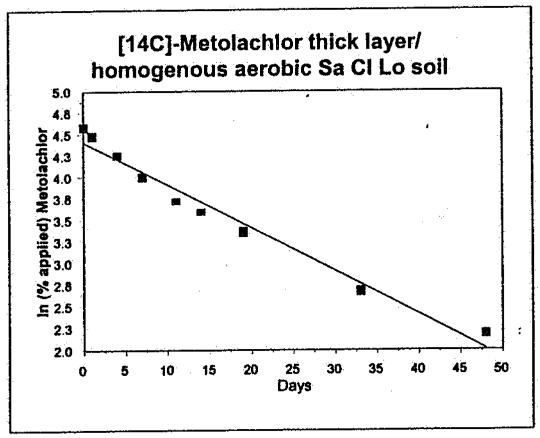
Day	S-Metolachlor %AR	Ln(%AR)
0	93.6	4.53903
0	97.2	4.57677
1	90.2	4.50203
1	92.4	4.52613
4	67.2	4.20767
4	66.8	4.2017
7	59.0	4.07754
7	56.1	4.02714
11	41.9	3.73529
11	41.9	3.73529
14	34.1	3.5293
14	37.8	3.63231
19	29.4	3.38099
19	30.1	3.40453
33	16.3	2.79117
33	16.1	2.77882
48	10.4	2.34181
48	10.3	2.33214

Regression Output:

Constant	4.392
Std Err of Y Est	0.14
R Squared	0.966
No. of Observations	18
Degrees of Freedom	16
X Coefficient(s)	-0.04646
Std Err of Coef.	0.00219

half-life 14.9 days





Treatment C - Thick Layer/Homogenous-Treated Soil.
[Phenyl-U-^{14}C]S-Metolachlor
Half-life Determination

Day	S-Metolachlor %AR	Ln(%AR)
0	97.1	4.57574
0	99.3	4.59815
1	87.3	4.46935
1	90.1	4.50092
4	71.1	4.26409
4	70.1	4.24992
7	55.2	4.01096
7	54.1	3.99083
11	41.3	3.72086
11	41.4	3.72328
14	36.4	3.59457
14	36.4	3.59457
19	28.4	3.34639
19	29.4	3.38099
33	14.3	2.66026
33	14.8	2.69463
48	9.0	2.19722
48	8.8	2.17475

Regression Output:

Constant	4.413
Std Err of Y Est	0.129
R Squared	0.975
No. of Observations	18
Degrees of Freedom	16
X Coefficient(s)	-0.04993
Std Err of Coef.	0.00201

half-life 13.9 days

*AR = Applied Radioactivity
Linear regression analysis performed using Corel Quattro Pro 8.
Results from pp. 171, 172 of study report.

Verification of Registrant's Half-life Values.

Treatment A
Thin Layer/Surface-Treated Soil.

Mean S-Metolachlor		
Day	%AR	Ln(%AR)
0	98.0	4.58497
1	99.7	4.60217
4	84.0	4.43082
7	78.4	4.36182
11	75.9	4.32942
14	71.7	4.27249
19	56.8	4.03954
33	53.7	3.98341
48	52.8	3.96651

Regression Output:

Constant	4.495
Std Err of Y Est	0.109
R Squared	0.823
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	-0.01377
Std Err of Coef.	0.00241

half-life 50.3 days

Treatment B
Thin Layer/Homogenous-Treated Soil.

Mean S-Metolachlor		
Day	%AR	Ln(%AR)
0	95.4	4.55808
1	91.3	4.51415
4	67.0	4.20469
7	57.6	4.05352
11	41.9	3.73529
14	35.9	3.58074
19	29.8	3.39451
33	16.2	2.78501
48	10.4	2.34181

Regression Output:

Constant	4.391
Std Err of Y Est	0.148
R Squared	0.966
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	-0.04638
Std Err of Coef.	0.00328

half-life 14.9 days

Treatment C
Thin Layer/Homogenous-Treated Soil.

Mean S-Metolachlor		
Day	%AR	Ln(%AR)
0	98.2	4.58701
1	88.7	4.48526
4	70.6	4.25703
7	54.7	4.00186
11	41.4	3.72328
14	36.4	3.59457
19	28.9	3.36384
33	14.6	2.68102
48	8.9	2.18605

Regression Output:

Constant	4.413
Std Err of Y Est	0.1368
R Squared	0.975
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	-0.0499
Std Err of Coef.	0.00302

half-life 13.9 days

*AR = Applied Radioactivity
Linear regression analysis performed using Corel Quattro Pro 8.
Results from p. 35 of study report.

Aerobic Metabolism of [^{14}C]*S*-Metolachlor (CGA-77102) in Sandy Clay Loam Soil.
MRID 45499606

Determination of Means/Standard Deviations for Applied Radioactivity in Extractable/Unextractable C]Residues in Soil and Volatiles.
eatment A - Thin Layer/Surface-Treated Soil.

	Soil pre-extraction			Soil extract			Unextractable [14C]			Volatilized [14C]			Material Balances[1]		
Day	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.
0	99.5			100.7			4.0			NA[2]			104.7		
0	87.6	93.6	6.0	99.9	100.3	0.4	3.8	3.9	0.1	NA			103.7	104.2	0.5
1	96.4			103.5			4.8			NA			108.3		
1	94.5	95.5	0.9	102.2	102.9	0.7	5.0	4.9	0.1	NA			107.2	107.8	0.5
4	96.8			93.0			9.9			NA			102.9		
4	96.9	96.9	0.1	91.6	92.3	0.7	8.0	9.0	1.0	NA			99.6	101.3	1.6
7	96.8			95.1			13.0			0.000			108.1		
7	94.4	95.6	1.2	95.3	95.2	0.1	12.2	12.6	0.4	0.066	0.033	0.033	107.6	107.8	0.3
11	107.8			88.1			14.7			NA			102.8		
11	96.0	101.9	5.9	97.5	92.8	4.7	10.5	12.6	2.1	NA			108.0	105.4	2.6
14	100.0			91.7			15.3			0.002			107.0		
14	96.1	98.1	1.9	93.9	92.8	1.1	15.1	15.2	0.1	0.003	0.003	0.000	109.0	108.0	1.0
19	119.7			81.6			24.3			0.006			105.9		
19	102.6	111.2	8.5	88.7	85.2	3.5	20.0	22.2	2.2	0.007	0.007	0.000	108.7	107.3	1.4
33	108.9			83.3			24.6			0.018			107.9		
33	113.3	111.1	2.2	84.0	83.7	0.3	24.1	24.4	0.3	0.048	0.033	0.015	108.1	108.0	0.1
48	122.0			86.9			20.2			0.021			107.1		
48	106.8	114.4	7.6	81.5	84.2	2.7	23.8	22.0	1.8	0.101	0.061	0.040	105.4	106.3	0.9
													Overall	106.2	2.5

[1]Material balance = sum of soil extract, unextractable [14C] and volatiles.
[2]NA = not analyzed.
Results (% AR) from pp. 147, 151 of the study report.
Means calculated using Corel Quattro Pro 8 program equation @avg(A1..A2).
ındard deviations calculated using Corel Quattro Pro 8 program equation @std(A1..A2).

Determination of Means/Standard Deviations for Applied Radioactivity in Extractable/Unextractable [^{14}C]Residues in Soil and Volatiles.
Treatment B - Thin Layer/Homogenous-Treated Soil.

	Soil pre-extraction			Soil extract			Unextractable [14C]			Volatilized [14C]			Material Balances[1]		
Day	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.
0	90.9			96.7			6.6			NA[2]			103.3		
0	78.4	84.7	6.3	100.2	98.5	1.8	5.9	6.3	0.3	NA			106.1	104.7	1.4
1	93.7			97.5			8.9			NA			106.4		
1	94.6	94.2	0.4	99.7	98.6	1.1	9.1	9.0	0.1	NA			108.8	107.6	1.2
4	99.3			82.6			16.0			NA			98.6		
4	88.4	93.9	5.5	82.2	82.4	0.2	14.9	15.5	0.6	NA			97.1	97.9	0.8
7	98.3			83.9			19.4			0.275			103.6		
7	86.4	92.4	6.0	80.3	82.1	1.8	20.2	19.8	0.4	0.232	0.254	0.022	100.7	102.2	1.4
11	101.9			75.0			28.0			NA			103.0		
11	96.0	99.0	2.9	70.7	72.9	2.2	23.9	26.0	2.1	NA			94.6	98.8	4.2
14	96.5			71.3			27.1			0.550			99.0		
14	93.6	95.1	1.5	71.9	71.6	0.3	29.4	28.3	1.1	0.284	0.417	0.133	101.6	100.3	1.3
19	99.3			67.0			30.2			0.273			97.5		
19	105.6	102.5	3.2	68.7	67.9	0.9	28.6	29.4	0.8	0.579	0.426	0.153	97.9	97.7	0.2
33	98.4			58.0			40.3			0.613			98.9		
33	94.6	96.5	1.9	57.4	57.7	0.3	35.5	37.9	2.4	0.574	0.594	0.020	93.5	96.2	2.7
48	95.3			53.2			41.0			1.661			95.9		
48	92.7	94.0	1.3	52.2	52.7	0.5	40.8	40.9	0.1	0.714	1.188	0.473	93.7	94.8	1.1
													Overall	100.0	4.4

[1]Material balance = sum of soil extract, unextractable [14C] and volatiles.
A = not analyzed.
Results (% AR) from pp. 148, 152 of the study report.
Means calculated using Corel Quattro Pro 8 program equation @avg(A1..A2).
Standard deviations calculated using Corel Quattro Pro 8 program equation @std(A1..A2).

Aerobic Metabolism of [^{14}C]S-Metolachlor (CGA-77102) in Sandy Clay Loam Soil.
MRID 45499606

Determination of Means/Standard Deviations for Applied Radioactivity in Extractable/Unextractable 'C]Residues in Soil and Volatiles.
eatment C - Thick Layer/Homogenous-Treated Soil.

	Soil pre-extraction			Soil extract			Unextractable [14C]			Volatilized [14C]			Material Balances[1]		
Day	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.
0	99.9			100.6			6.1			NA[2]			106.7		
0	95.7	97.8	2.1	103.1	101.9	1.3	5.3	5.7	0.4	NA			108.4	107.5	0.9
1	100.1			95.8			9.5			NA			105.3		
1	99.0	99.6	0.5	97.5	96.7	0.8	8.6	9.1	0.4	NA			106.1	105.7	0.4
4	99.2			87.1			15.6			NA			102.7		
4	91.2	95.2	4.0	86.3	86.7	0.4	16.4	16.0	0.4	NA			102.7	102.7	0.0
7	100.4			79.8			23.2			0.384			103.4		
7	101.8	101.1	0.7	77.0	78.4	1.4	22.0	22.6	0.6	0.380	0.382	0.002	99.4	101.4	2.0
11	98.2			72.3			26.3			NA			98.6		
11	120.9	109.6	11.3	74.4	73.4	1.1	28.2	27.3	1.0	NA			102.6	100.6	2.0
14	94.3			69.6			30.2			1.058			100.9		
14	114.7	104.5	10.2	69.1	69.4	0.3	28.9	29.6	0.7	0.841	0.950	0.108	98.8	99.8	1.0
19	95.0			66.0			33.8			0.616			100.4		
19	104.4	99.7	4.7	65.8	65.9	0.1	34.0	33.9	0.1	0.790	0.703	0.087	100.6	100.5	0.1
33	94.0			55.6			41.2			1.692			98.5		
33	126.0	110.0	16.0	56.0	55.8	0.2	24.0	32.6	8.6	1.450	1.571	0.121	81.5	90.0	8.5
48	92.1			48.0			42.2			4.485			94.7		
48	92.7	92.4	0.3	47.0	47.5	0.5	45.5	43.9	1.6	4.704	4.595	0.110	97.2	95.9	1.3
													Overall	100.5	5.8

[1]Material balance = sum of soil extract, unextractable [14C] and volatiles.
[2]NA = not analyzed.
Results (% AR) from pp. 149, 153 of the study report.
Means calculated using Corel Quattro Pro 8 program equation @avg(A1..A2).
ndard deviations calculated using Corel Quattro Pro 8 program equation @std(A1..A2).

Determination of Means/Standard Deviations for [^{14}C]Metolachlor (CGA-77102) and Degradates in Soil Extracts.
Treatment A - Thin Layer/Surface-Treated Soil.

Day	Metolachlor			CGA-40172			NOA-436611			CGA-354743			CGA-51202			CGA-46576 (?)		
	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.
0	97.7			<0.01[1]			<0.01			<0.01			<0.01			<0.01		
0	98.3	98.0	0.3	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0
1	100.9			<0.01			<0.01			<0.01			<0.01			<0.01		
1	98.5	99.7	1.2	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0
4	82.2			2.2			1.3			0.9			1.0			0.3		
4	85.8	84.0	1.8	1.2	1.7	0.5	0.9	1.1	0.2	0.0	0.5	0.5	0.5	0.8	0.3	0.0	0.2	0.2
7	77.9			6.5			1.2			0.8			3.7			0.6		
7	78.9	78.4	0.5	6.7	6.6	0.1	0.0	0.6	0.6	<0.01	0.4	0.4	1.0	2.4	1.4	3.6	2.1	1.5
11	68.3			8.8			1.2			0.0			2.9			0.7		
11	83.5	75.9	7.6	3.1	6.0	2.9	0.5	0.9	0.4	3.8	1.9	1.9	1.0	2.0	1.0	0.3	0.5	0.2
14	71.1			9.3			1.0			<0.01			3.3			0.8		
14	72.4	71.8	0.7	8.7	9.0	0.3	1.5	1.3	0.3	0.9	0.5	0.5	3.9	3.6	0.3	1.1	1.0	0.2
19	53.0			9.8			4.1			1.8			3.6			0.7		
19	60.6	56.8	3.8	11.6	10.7	0.9	2.6	3.4	0.8	1.5	1.7	0.2	4.4	4.0	0.4	1.0	0.9	0.2
33	54.2			10.2			4.0			2.4			3.9			0.7		
33	53.3	53.8	0.5	10.6	10.4	0.2	4.2	4.1	0.1	2.5	2.5	0.0	4.7	4.3	0.4	1.2	1.0	0.2
48	57.0			9.9			2.5			1.6			6.6			1.1		
48	48.5	52.8	4.3	11.4	10.7	0.7	3.8	3.2	0.7	2.4	2.0	0.4	5.7	6.2	0.4	1.5	1.3	0.2

[1]Detection limit 0.0003 µg (0.003% of applied).
Results (% AR) from pp. 170 of the study report.
Means calculated using Corel Quattro Pro 8 program equation @avg(A1..A2).
Standard deviations calculated using Corel Quattro Pro 8 program equation @std(A1..A2).

Aerobic M[illegible]olism of [^{14}C]S-Metolachlor (CGA-77102) in Sandy Clay Loam
MRID 4549[illegible]6

Determination of Means/Standard Deviations for [^{14}C]Metolachlor (CGA-77102) and Degradates in Soil Extracts.
Treatment B - Thin Layer/Homogenous-Treated Soil.

	Metolachlor			CGA-40172			NOA-436611			CGA-354743			CGA-51202			CGA-46576 (?)		
Day	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.
0	93.6			<0.01[1]			<0.01			<0.01			<0.01			<0.01		
0	97.2	95.4	1.8	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0
1	90.2			1.5			1.1			0.9			1.2			0.4		
1	92.4	91.3	1.1	1.5	1.5	0.0	1.0	1.1	0.1	0.9	0.9	0.0	1.2	1.2	0.0	0.4	0.4	0.0
4	67.2			3.0			2.4			2.6			2.9			0.7		
4	66.8	67.0	0.2	3.1	3.1	0.1	2.5	2.5	0.0	2.7	2.7	0.0	3.1	3.0	0.1	1.1	0.9	0.2
7	59.0			4.6			4.3			4.5			5.6			1.7		
7	56.1	57.6	1.5	4.3	4.5	0.2	3.3	3.8	0.5	4.7	4.6	0.1	5.2	5.4	0.2	1.1	1.4	0.3
11	41.9			5.0			7.4			6.7			7.4			2.2		
11	41.9	41.9	0.0	4.9	5.0	0.1	5.0	6.2	1.2	5.2	6.0	0.7	6.8	7.1	0.3	1.5	1.9	0.4
14	34.1			5.2			6.0			9.0			9.4			2.0		
14	37.8	36.0	1.8	5.3	5.3	0.1	5.2	5.6	0.4	8.8	8.9	0.1	8.8	9.1	0.3	1.6	1.8	0.2
19	29.4			5.7			7.5			7.6			8.5			1.8		
19	30.1	29.8	0.4	5.9	5.8	0.1	7.8	7.7	0.1	7.2	7.4	0.2	9.6	9.1	0.5	1.9	1.9	0.0
33	16.3			5.9			6.7			11.6			10.2			1.5		
33	16.1	16.2	0.1	5.6	5.7	0.1	9.4	8.1	1.3	8.8	10.2	1.4	10.1	10.2	0.1	1.8	1.7	0.2
48	10.4			5.6			9.3			9.5			10.3			1.3		
48	10.3	10.4	0.0	5.7	5.7	0.0	7.7	8.5	0.8	9.4	9.5	0.1	11.3	10.8	0.5	1.8	1.6	0.2

[1]Detection limit 0.0003 µg (0.003% of applied).
Results (% AR) from p. 171 of the study report.
Means calculated using Corel Quattro Pro 8 program equation @avg(A1..A2).
Standard deviations calculated using Corel Quattro Pro 8 program equation @std(A1..A2).

Aerobic Me lism of [^{14}C]*S*-Metolachlor (CGA-77102) in Sandy Clay Loam
MRID 45499606

Determination of Means/Standard Deviations for [^{14}C]Metolachlor (CGA-77102) and Degradates in Soil Extracts.
Treatment C - Thick Layer/Homogenous-Treated Soil.

Day	Metolachlor			CGA-40172			NOA-436611			CGA-354743			CGA-51202			CGA-46576 (?)		
	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.	% AR	Mean	s.d.
0	97.1			<0.01[1]			<0.01			<0.01			<0.01			<0.01		
0	99.3	98.2	1.1	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0	<0.01	0.0	0.0
1	87.3			1.4			1.9			0.8			<0.01			0.5		
1	90.1	88.7	1.4	1.3	1.4	0.0	2.7	2.3	0.4	0.0	0.4	0.4	<0.01	0.0	0.0	0.4	0.5	0.1
4	71.1			3.3			2.6			2.5			3.1			1.0		
4	70.1	70.6	0.5	3.2	3.3	0.1	2.6	2.6	0.0	2.7	2.6	0.1	3.4	3.3	0.1	1.2	1.1	0.1
7	55.2			4.2			4.0			4.2			5.6			1.3		
7	54.1	54.7	0.5	4.2	4.2	0.0	4.0	4.0	0.0	4.0	4.1	0.1	5.5	5.6	0.0	1.4	1.4	0.0
11	41.3			4.7			4.9			6.1			6.7			1.6		
11	41.4	41.4	0.1	5.1	4.9	0.2	5.7	5.3	0.4	6.8	6.5	0.4	7.8	7.3	0.5	1.9	1.8	0.2
14	36.4			5.3			5.2			7.3			8.3			1.7		
14	36.4	36.4	0.0	5.7	5.5	0.2	5.0	5.1	0.1	7.8	7.6	0.3	7.7	8.0	0.3	2.0	1.9	0.1
19	28.4			5.4			7.7			7.5			9.3			2.1		
19	29.4	28.9	0.5	5.5	5.5	0.1	7.4	7.6	0.1	7.2	7.4	0.2	8.7	9.0	0.3	2.0	2.1	0.1
33	14.3			5.7			9.1			9.3			9.3			1.6		
33	14.8	14.6	0.3	5.6	5.7	0.0	9.1	9.1	0.0	9.0	9.2	0.1	9.5	9.4	0.1	1.5	1.6	0.0
48	9.0			5.6			8.2			9.2			7.8			1.4		
48	8.8	8.9	0.1	5.3	5.5	0.2	8.9	8.6	0.3	8.9	9.1	0.1	7.8	7.8	0.0	1.1	1.3	0.1

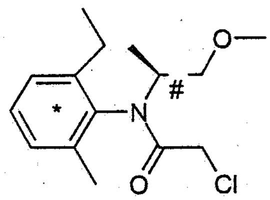
[1]Detection limit 0.0003 µg (0.0009% of applied).
Results (% AR) from p. 172 of the study report.
Means calculated using Corel Quattro Pro 8 program equation @avg(A1..A2).
Standard deviations calculated using Corel Quattro Pro 8 program equation @std(A1..A2).

Attachment 2

Structures of Parent and Transformation Products

59

S-metolachlor Chemical Structures



* = Uniformly labeld phenyl ring (UL)

= Chiral center

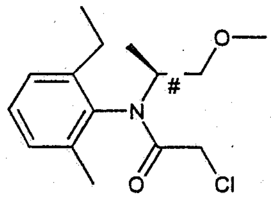
CGA-77102

IUPAC Name: mixture of 80-100% (*aRS*, 1*S*)-2-chloro-*N*-(6-ethyl-*o*tolyl)-*N*-(2-methoxy-1-methylethyl)acetamide and 20-0% (*aRS*, 1*S*)-2-chloro-*N*-(6-ethyl-*o*-tolyl)-*N*-(2-methoxy-1-methylethyl) acetatmide, ***or***
mixture of 80-100% (*aRS*, 1*S*)-2-chloro-6'-ethyl-*N*-(2-methoxy-1-methylethyl)acet-*o*-toluidide and 20-0% (*aRS*, 1*R*)-2-chloro-6'-ethyl-*N*-(2-methoxy-1-methylethyl-acet-*o*-toluidide

CAS Name: 2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-[(1*S*)-2-methoxy-1-methylethyl]acetamide

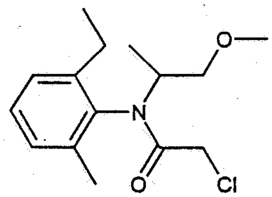
Other names: Chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-1-methylethyl)acetamide;
2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)-,(S)-*,acetamide* and R-enantiomer;
(S)-2-chloro-N-(2-ethyl-6methylphenyl)-N-(2-methoxy-1-methylethyl)acetamide;
acetamide,2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl)-,(S)-** and R-enantiomer

Degradates



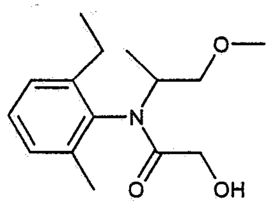
= Chiral center

CGA-77102
S-isomer of metolachlor

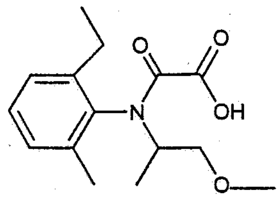


CGA-24705

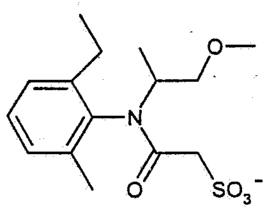
Metolachlor



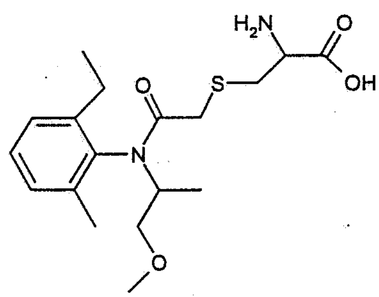
CGA-40172
2-OH-acetamide



CGA-51202
Oxalamide

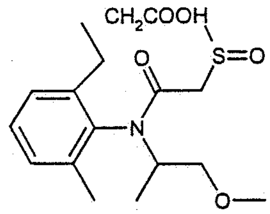


CGA-354743
Sulfonate

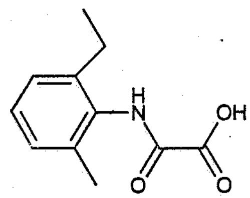


CGA-46576
Cysteine conjugate

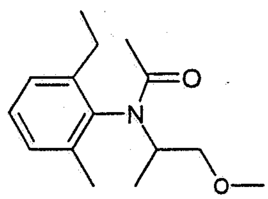
62



CGA-NOA-436611
Sulfoxide of thioglycolic acid

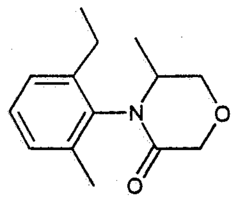


CGA-50720

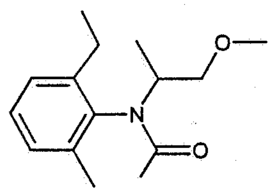


CGA-42446

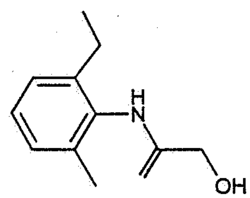
63



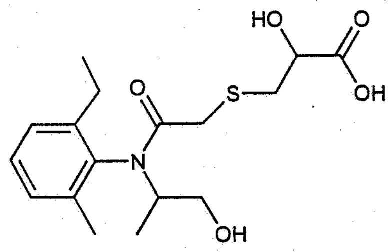
CGA-40919



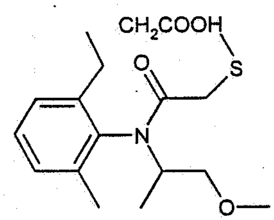
CGA-41507



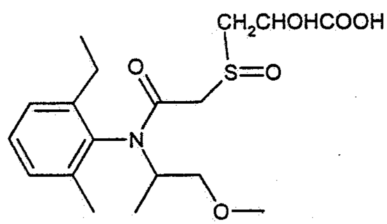
CGA-37735



CGA-382594

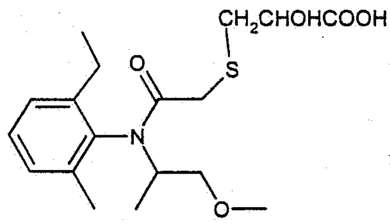


CGA-NOA-436609
Thioglycolic acid



CGA-118243
Sulfoxide of thiolactic acid

65



CGA-110186
Thiolactic acid

Attachment 3

Degradation Pathway Presented by Registrant

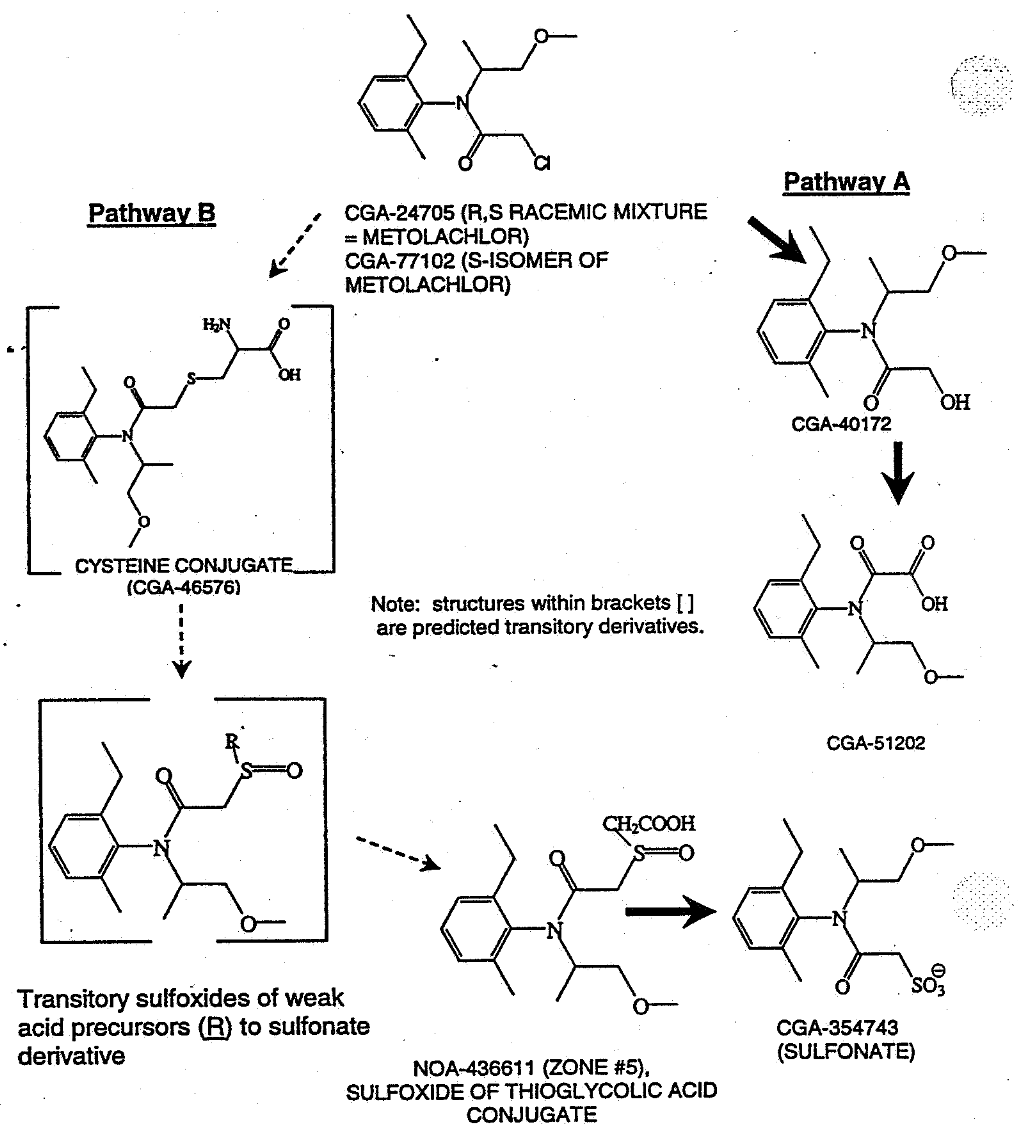


FIGURE 46. PROPOSED DEGRADATION PATHWAY OF CGA-77102 UNDER AEROBIC SOIL CONDITIONS

DATA EVALUATION RECORD

PC No. 108801 Metolachlor
DP Barcode D278934
FORMULATION-00-ACTIVE INGREDIENT
STUDY ID 45527503

Chen, Wenlin, 2001. Concentration Trend of Metolachlor and S-Metolachlor Resulting from the Reduced Use Rate of S-Metolachlor in Ohio Lake Erie Tributary Drainage Basins. Syngenta Crop Protection Report No. 1663-01. Unpublished study performed and submitted by Syngenta Crop Protection, Inc., Greensboro, NC.

REVIEWED BY: Mark Corbin
TITLE: Environmental Scientist
ORG: ERBI/EFED/OPP
TEL: 703/605-0033

SIGNATURE: [signature] DATE: 2/28/02

APPROVED BY: James Hetrick, Ph.D.
TITLE: Senior Scientist
ORG: ERBI/EFED/OPP
TEL: 703/305-5237

SIGNATURE: James G. Hetrick DATE: 2/28/02

ABSTRACT

This study is a non-guideline study and therefore does not satisfy any of the requirements of Subdivision N. The study author has utilized trend analysis to compare atrazine concentrations in surface water with concurrent metolachlor concentrations from two watersheds in the Lake Erie Drainage Basin using data collected between 1994 and 2000. The intent of the study is to correlate the change in metolachlor concentrations with the phaseout and replacement of racemic metolachlor with s-metolachlor. Several important points to note about this study follow:

1. Regression analysis is being used to demonstrate a cause and effect relationship between trends in atrazine and metolachlor. Without detailed information on the usage history of atrazine and metolachlor and the potential impact of other factors (climatic data, hydrologic data, and agricultural patterns) on trends in metolachlor concentrations EFED

cannot confirm the conclusions of the study.

2. The study author does not explain the rational for selecting only data from 1994, 1997, and 2000. No explanation is given why data from 1995, 1996, 1998, and 1999 were not included in the analysis.

3. No enantioselective monitoring data in the United States are available to document the effect of loadings on the transition from racemic metolachlor to s-metolachlor.

4. No degradates of metolachlor were analyzed in the data. Degradates have been found at higher concentrations and frequencies than parent metolachlor in ground water.

The study author reports that by 2000, s-metolachlor represented 44% of the total metolachlor used in the study area. The study author also reports that total metolachlor market share remained stable from 1994 to 2000 at between 30% and 34%. Regression of metolachlor concentrations with atrazine concentrations yielded r^2 values between 0.66 and 0.92, while regression of loadings (concentrations converted to mass flow) yielded r^2 between 0.88 and 0.92 indicating that between 60% and 92% of the variation between atrazine and metolachlor concentrations could be accounted for by the regression. The study author indicates that the data indicate a reduction in metolachlor concentrations in 2000 relative to 1994/1997 data by comparing the slopes of the regression from 1994, 1997 and 2000. A reduced slope would indicate that metolachlor concentrations (when plotted on the y-axis) are generally lower relative to the concurrent atrazine concentrations, or alternatively, that atrazine concentrations increased relative to metolachlor.

The slope of the regression for the 2000 data (slope = 0.40) is less than the 1994 data for both concentration and mass loading (slope =0.76 for concentration data and 0.90 for mass loading data) and the 1997 data (slope = 0.62 for the concentration data and 0.74 for mass loadings). The study author infers from this comparison that metolachlor concentrations were reduced in 2000. However, the author does not address the alternative possibility that atrazine concentrations increased. The study author also does not address the decrease in slopes between 1994 and 1997 when s-metolachlor was not yet on the market.

A total of 603 analytical results were reported for metolachlor (an unknown number of reported results represent averages when multiple samples were collected on a given day) between 1994 and 2000 from the Maumee River. A total of 629 analytical results were reported for metolachlor between 1994 and 2000 from the Sandusky River. EFED separated the data by tributary and analyzed each years worth of data separately. The maximum concentration of metolachlor detected in the Maumee River was 27.6 ppb (1997) while the maximum concentration of metolachlor detected in the Sandusky River was 33.3 ppb (1997). However, as the study author notes, an unknown number of reported daily values in the dataset represent averages where multiple samples were collected and analyzed on any given day. Therefore, these maximum concentrations from the data may under predict the actual maximum concentration detected in the entire dataset.

MATERIALS AND METHODS

Product use and market share data for racemic metolachlor and s-metolachlor for the three Ohio Crop Reporting Districts (CRD 1, 2, and 4) that overlay the two watersheds were obtained from Doane Marketing Research. Similar data were collected for atrazine from the same period from the Doane data. No s-metolachlor data was available prior to 1998. The study author relied on a qualitative comparison of the Doane data for metolachlor and atrazine. Ratios of combined metolachlor (racemic metolachlor and s-metolachlor) to atrazine were plotted. Apparently, no statistics were generated to compare metolachlor and atrazine use data to indicate if use patterns correlate. Additionally, none of the Doane data were provided with the study.

Surface water monitoring data for metolachlor and atrazine were obtained from the outlets of two Lake Erie tributaries. The tributaries are the Maumee and Sandusky Rivers. Surface water samples were collected from 1994 to 2000 by the Water Quality Laboratory of Heidelberg College in Ohio. The monitoring program by Heidelberg College was begun in 1983 for many compounds. The sampling frequency was designed to collect more samples during high runoff periods (April 15 to August 15) and typically consisted of three samples per day. Less frequent sampling occurred during the remainder of the year (typically two samples per month). Days with multiple samples were averaged for use in the regression. Daily water flow data were available from USGS gauging stations at the sampling sites and were incorporated into the tables.

The study author elected not to perform direct analysis of the metolachlor data. The author reports that uncertainty associated with the short use history for s-metolachlor (only on market since 1998) and "The overwhelmingly complicated impact of temporal variability in hydrological events (e.g.. magnitude and timing of thunderstorms) and agricultural practices on surface water residues" necessitated a different approach. Instead, the study author elected to use the atrazine data as a "reference compound" since the two pesticides are applied within a similar window (reported by the study author as being applied within two to three weeks apart), on similar crops (corn), and used as pre-emergent herbicides. Thus, the study author performed regression analysis of co-occurring atrazine and metolachlor concentrations using SigmaPlot statistical software. The study author also regressed atrazine versus metolachlor loadings using mass flow data. The authors do not explain how atrazine is not subject to the same "temporal variability" in hydrologic events and agricultural practices as is metolachlor. The study authors also do not attempt to explain the difference between the 1994 and 1997 data.

RESULTS/DISCUSSION

The study author reports (from Doane data) that s-metolachlor comprised 44% of the total amount of metolachlor applied in 2000, while the overall market share for combined metolachlor remained stable at approximately 30%. Finally, using Doane data the author reports that overall pounds of metolachlor used declined in 2000 by about 30%.

Regression of metolachlor concentrations with atrazine concentrations yielded r^2 values between 0.66 and 0.92, while regression of loadings (concentrations converted to mass flow) yielded r^2 between 0.88 and 0.92. The study author indicates that the data indicate a reduction in metolachlor concentrations in 2000 relative to 1994/1997 data by comparing the slopes of the regression from 1994, 1997 and 2000. A reduced slope would indicate that metolachlor concentrations (when plotted on the y-axis) are generally lower relative to the concurrent atrazine concentrations, or alternatively, that atrazine concentrations increased relative to metolachlor.

The slope of the regression for the 2000 data (slope = 0.40) is less than the 1994 data for both concentration and mass loading (slope =0.76 for concentration data and 0.90 for mass loading data) and the 1997 data (slope = 0.62 for the concentration data and 0.74 for mass loadings). The study author infers from this comparison that metolachlor concentrations were reduced in 2000. However, the author does not address the alternative possibility that atrazine concentrations increased. The study author also does not address the decrease in slopes between 1994 and 1997 when s-metolachlor was not yet on the market.

A total of 603 analytical results were reported for metolachlor (an unknown number of reported results represent averages when multiple samples were collected on a given day) between 1994 and 2000 from the Maumee River. A total of 629 analytical results were reported for metolachlor between 1994 and 2000 from the Sandusky River. EFED separated the data by tributary and analyzed each years worth of data separately. The maximum concentration of metolachlor detected in the Maumee River was 27.6 ppb (1997) while the maximum concentration of Metolachlor detected in the Sandusky River was 33.3 ppb (1997). However, as the study author notes, an unknown number of reported daily values in the dataset represent averages where multiple samples were collected and analyzed on any given day. Therefore, these maximum concentrations from the data may under predict the actual maximum concentration detected in the entire dataset.

DEFICIENCIES/DEVIATIONS

1. While the study author performed regression analysis comparing atrazine with metolachlor concentrations, no correlation was attempted to confirm that atrazine and metolachlor followed similar use patterns. The total pounds used and ratio of atrazine to metolachlor use have varied over the period covered by this study. Statistical analysis of the use information and ratio of atrazine/metolachlor usage would be important in assessing whether the underlying premise that atrazine makes a useful "reference compound".

2. The regression of atrazine versus metolachlor concentrations and mass loadings indicate that the slope of the regressions decreased between 1994 and 1997. A comparison of use data from these two periods suggest that roughly the same amount of metolachlor was used in both years. However the author does not attempt to explain what caused this decrease. Given that S-metolachlor was not yet on the market the decrease in slope must be the result of some other factor which the author does not address.

3. A close review of the regression in Figure 7 (page 17 of study) indicate that the mean/median of the concentrations was lowest in 1994, increased to higher levels in 1997 and then decreased in 2000. As with item 2 above, the author does not address changes

in concentration between 1994 and 1997. A table of annual mean and median values is presented below.

4. No use data were provided from the Doane Research data. Only summary figures were provided.

5. The study author reports daily averages for an unspecified number of days. Complete data should be provided to allow for an assessment of true daily peak values and to assess the variability in the data.

6. The analytical data for metolachlor does not distinguish between racemic metolachlor and s-metolachlor. Without data which distinguishes between the enantiomers, it is impossible to say with any confidence that the concentrations in surface water are reflective of s-metolachlor use.

Year	Mean Concentration	Median Concentration
1994	0.820	1.156
1994	0.719	1.287
1995	0.712	2.498
1995	0.801	1.940
1996	0.564	1.467
1996	0.577	1.657
1997	3.212	5.177
1997	3.345	5.468
1998	1.948	4.472
1998	0.909	3.921
1999	1.410	1.779
1999	0.975	1.578
2000	0.892	1.394
2000	0.780	1.891

FIGURE 1. THE MAUMEE AND SANDUSKY WATERSHEDS IN THE LAKE EIRE BASIN AND THE OHIO CROP REPORTING DISTRICT (CRD). (WALDRON, 1989. COOPERATIVE EXTENSION SERVICE BULLETIN 787. OHIO STATE UNIVERSITY, COLUMBUS, OH, USA.)

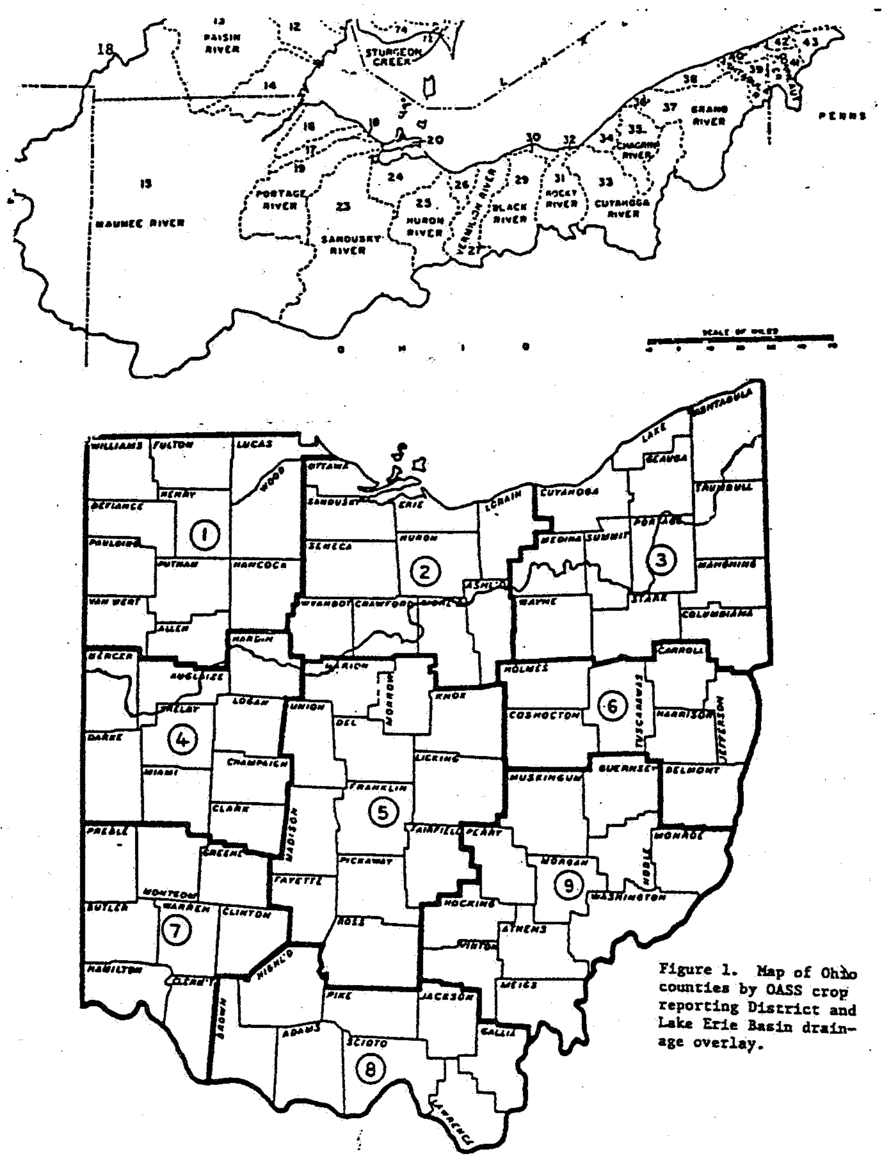


Figure 1. Map of Ohio counties by OASS crop reporting District and Lake Erie Basin drainage overlay.

FIGURE 2. TOTAL ANNUAL USES OF METOLACHLOR AND S-METOLACHLOR IN OHIO CROP REPORT DISTRICT 1, 2, & 4

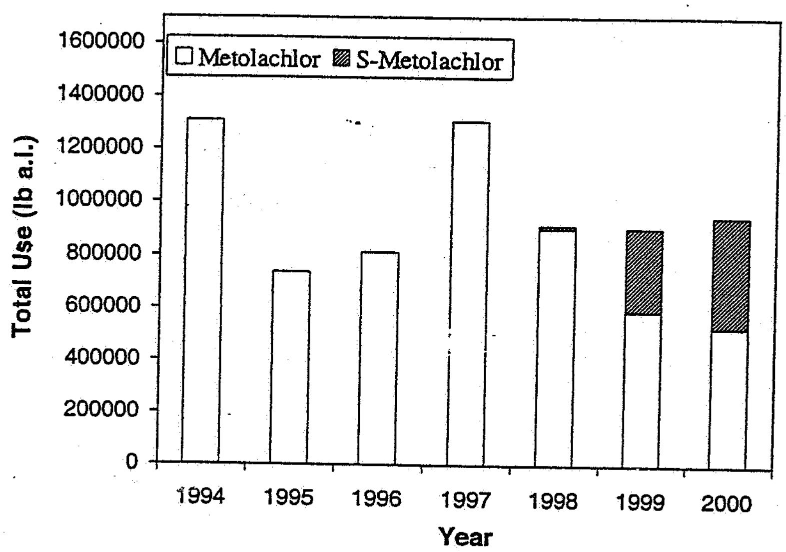


FIGURE 3. PERCENT OF METOLACHLOR AND S-METOLACHLOR USED ACRES IN TOTAL CORN PLANTED ACRES IN OHIO CROP REPORTING DISTRICT 1, 2 AND 4

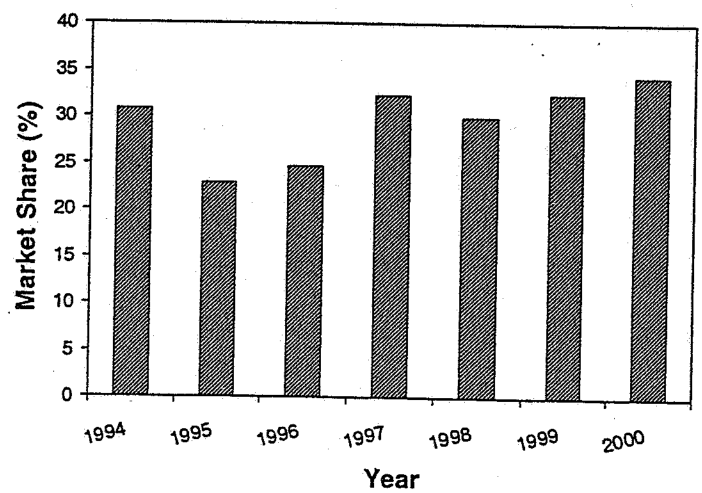


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FIGURE 4. TOTAL ANNUAL USES OF ATRAZINE AND TOTAL METOLACHLOR AND S-METOLACHLOR IN OHIO CROP REPORT DISTRICT 1, 2, & 4, 1994-2000

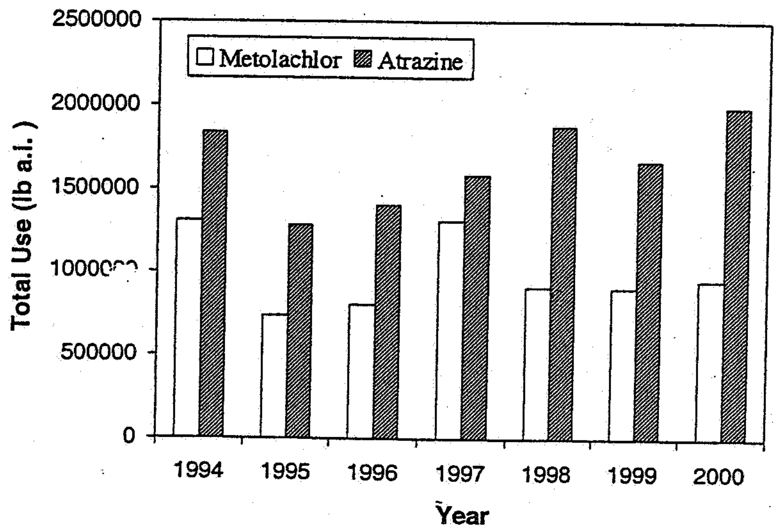

FIGURE 5. RATIO OF TOTAL METOLACHLOR AND S-METOLACHLOR USES TO ATRAZINE IN OHIO CROP REPORT DISTRICT 1, 2, & 4, 1994-2000

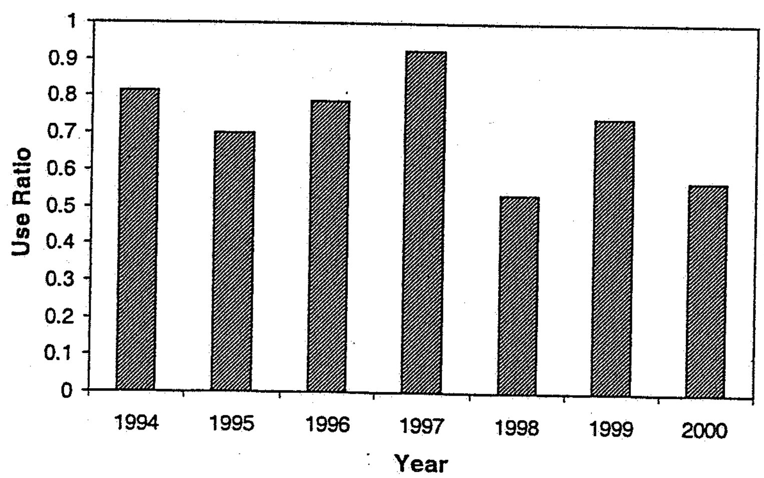

FIGURE 6. ANNUAL DISCHARGE VOLUME AT THE MAUMEE AND SANDUSKY RIVER SAMPLING STATIONS

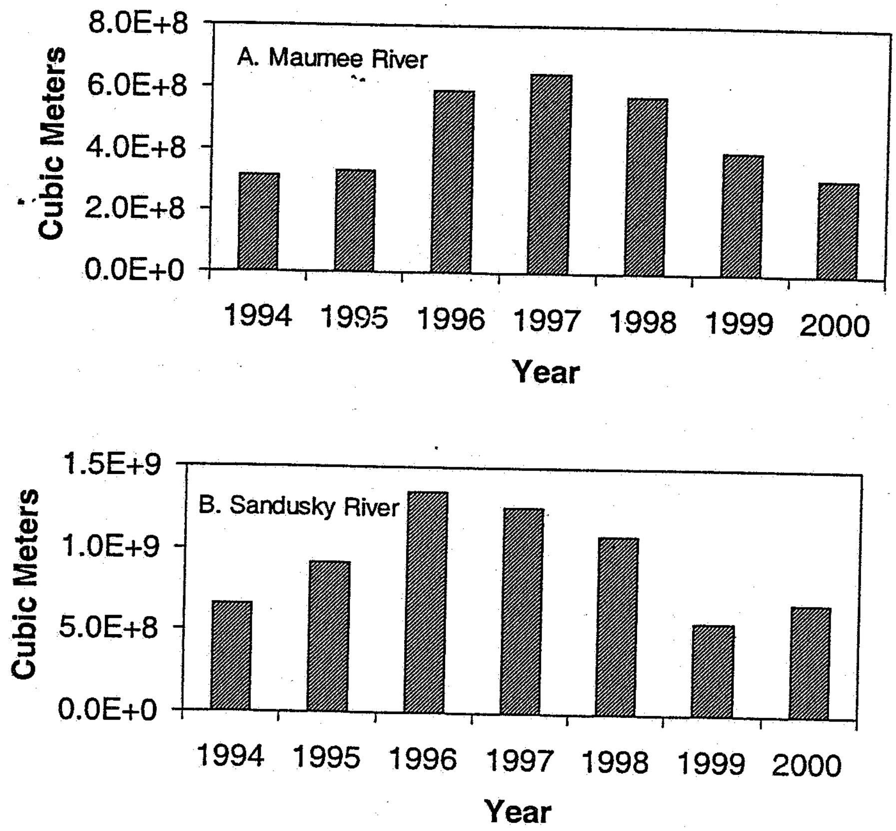

FIGURE 7. COMPARISON OF CONCENTRATION DATA AMONG 2000, 1994 AND 1997 (MARCH -SEPTEMBER), MAUMEE RIVER AND SANDUSKY RIVER, OHIO

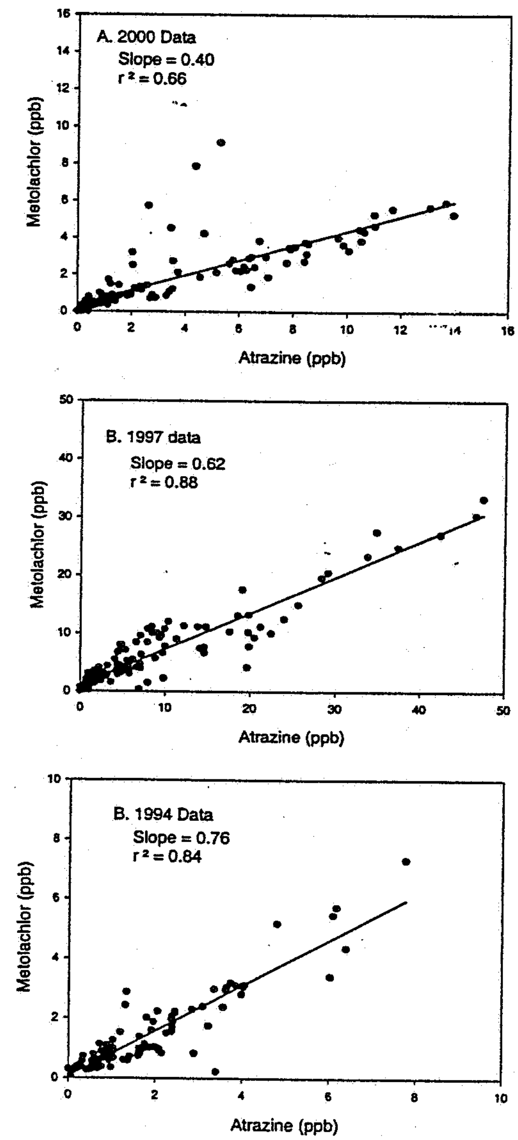

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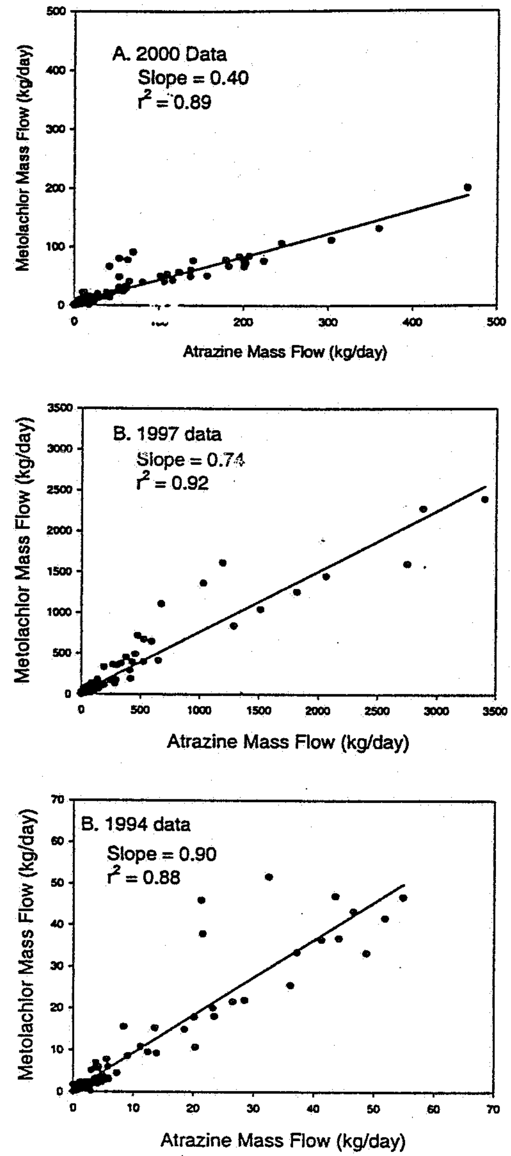
FIGURE 8. COMPARISON OF MASS FLOW DATA BETWEEN 2000, 1994 AND 1997 (MARCH-SEPTEMBER), MAUMEE RIVER AND SANDUSKY RIVER, OHIO



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DATA EVALUATION RECORD

PC No. 108801 Metolachlor
DP Barcode D278934
FORMULATION-00-ACTIVE INGREDIENT
STUDY ID 45527501

Tierney, D.P., et al, 2001. Exposure Analysis of Metolachlor in Community Water Systems in 27 States, 1993-2000, volume 1-5. Syngenta Crop Protection Report No. 2454-01. Unpublished study performed and submitted by Syngenta Crop Protection, Inc., Greensboro, NC and En fate, LLC, Plymouth, MN.

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ABSTRACT

This study is a non-guideline study and therefore does not satisfy any of the requirements of Subdivision N. The registrant completed an assessment of eight years of Community Water System (CWS) data from 27 states which were analyzed for metolachlor. Several important points to note about this study follow:

1. Data aggregation presents a national picture of exposure to metolachlor in drinking water. However, metolachlor exposure in drinking water is expected to be more dependent on regional issues (i.e. climate, pesticide usage, agricultural patterns). EFED reevaluated the data for the top ten use states which indicates that the percentage of population exposed is highly dependent on the population being evaluated.

2. The study does not attempt to distinguish between exposure to racemic metolachlor and s-metolachlor. The analytical data from both periods does not distinguish between racemic metolachlor and s-metolachlor. No enantioselective monitoring data are available in the United States to document the effect on loadings of the transition from racemic metolachlor to s-metolachlor.

3. No degradates of metolachlor were analyzed in the CWS data. Degradates have been found at higher concentrations and frequencies than parent metolachlor in ground water.

The study does include useful information on the occurrence of metolachlor in CWS. According to the study authors, metolachlor was not detected in 97.7% of the 98,680 samples collected. Six percent of the 21,976 CWS reporting data had at least one detection of metolachlor. Using the PLEX database the authors report that no detections of metolachlor were present in the CWS data for locations serving a population of 124.2 million people (out of a total of 141.7 million, or 88%). According to the study, of the six percent of CWS with detections of metolachlor, 64 CWS had mean concentrations greater than 1.0 ppb and the maximum mean concentration was 7.4 ppb and the maximum single metolachlor concentration detected was 28.0 ppb from Missouri.

MATERIALS AND METHODS

The study author requested data on the occurrence of metolachlor in CWS collected by states under the SDWA. Of the 32 states targeted by the study (representing greater than 95% of all metolachlor usage) 27 states responded with data on the occurrence of metolachlor in drinking water. Also included in the response was population data and source water type for each location. The study authors compiled the data submitted and completed exposure profiles for individual CWS locations, individual states, and the 27 state aggregate drinking water population. An annualized mean concentration was calculated for each individual CWS location. Individual mean concentrations were then used to estimate a state population weighted mean. Non detects were set at half the reported limit of quantitation (LOQ). The data did not include enantioselective information and therefore could not differentiate between racemic metolachlor and s-metolachlor. Also, the study did not include information on metolachlor degradates. Occurrence data consists of quarterly samples collected at each individual CWS location.

RESULTS/DISCUSSION

The study presents the results of the analysis of population based exposure estimates calculated from surface and ground water monitoring data compiled from CWS data from 27 states. The database includes analytical results from 98,690 samples collected from 21,976 CWS locations in the 27 states. The monitoring data analyzed account for slightly greater than 60% of the CWS and 75% of the population from the 27 states. The 141.7 million people served by the CWS reporting data represent 68% of the population in the 27 states. Of the 98,680 samples collected, 97.7% were reported as non-detections.

It is worth noting that detection limits varied from state to state and that some data were not included in the subsequent analysis. A total of 9,207 samples results from Alabama, California, Colorado, Indiana, and North Carolina were not used because a LOQ could not be determined. A total of 343 samples results were not used from Colorado and Iowa because the LOQ was reported to be greater than the HAL (100 ppb).

The authors report that of the 141.7 million people served by the CWS included in the study, 124.2 million (88%) had no detections of metolachlor. Approximately 12.3 million people (9%) were exposed to metolachlor concentrations above 1.0 ppb but less than 100 ppb. The maximum mean metolachlor concentration calculated by the study authors was 7.4 ppb and the maximum single metolachlor concentration detected was 28.0 ppb from Missouri (343 samples results were not used from Colorado and Iowa because the LOQ was reported to be greater than the HAL 100 ppb).

EFED reevaluated the data for the top ten use states (Table 2, page 17 of 1771 of study). The table below presents a summary of the data taken from the study (Tables 1 through 54 in Appendix B of the study, pages 47 through 134). The analysis of the data for the top ten states focused on the frequency of detection data and the percentage of population in each state exposed to metolachlor at concentrations above the LOQ. In the top use state of Iowa, greater than 42% of surface water samples and 21% of all samples contained metolachlor at concentrations above the LOQ. The analysis reveals that for the top ten states, 10.9 % of the population (6,869,782 people) are exposed to metolachlor above the LOQ. Further, focusing on the top five use states reveals that 18.0% of the population (4,660,204 people) are exposed to metolachlor above the LOQ. Finally, for the top state of Iowa, nearly 33% of the population (797,773 people) are exposed to concentrations of metolachlor above the LOQ.

This type of analysis indicates that the percentage of population exposed is highly dependent on the population being evaluated. Without the usage information for metolachlor (which was summarized in the study but not provided), it is impossible to determine the distribution of metolachlor use within the 27 states analyzed by the study authors.

Rank	State	Frequency of Detections in Surface Water (%)	Frequency of Detections in Ground Water (%)	Frequency of Detections in Other (%)	Frequency of Detections - Total (%)	Total Population in State	Total Population Exposed to Detections Above the LOQ	Percent of Total Population Exposed to Detections Above the LOQ
1	Iowa	42.1	15.1	36.1	21.1	2,926,324	797,773	32.89
2	Illinois	15.2	0.4	9.3	4.5	12,419,293	1,137,471	10.57
3	Nebraska	5.9	1.6	1.9	1.7	1,711,263	653,068	47.14
4	Kansas	32.1	6.4	31.2	19.5	2,688,418	763,425	39.98
5	Indiana	11.5	0.6	3.5	2.1	6,080,485	1,308,467	41.79
6	Ohio	20.6	0.0	15.4	8.4	11,353,140	1,928,045	19.61
7	Missouri	3.6	0.0	2.0	1.5	5,595,211	200,187	9.59

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Rank	State	Frequency of Detections in Surface Water (%)	Frequency of Detections in Ground Water (%)	Frequency of Detections in Other (%)	Frequency of Detections - Total (%)	Total Population in State	Total Population Exposed to Detections Above the LOQ	Percent of Total Population Exposed to Detections Above the LOQ
8	Wisconsin	0.0	0.8	0.0	0.8	5,363,675	17,255	0.52
9	Minnesota	0.0	0.2	1.6	0.3	4,919,479	12,572	0.33
10	Michigan	0.9	0.0	2.4	0.2	9,938,444	51,519	0.72
Totals						62,995,732	6,869,782	10.9

DEFICIENCIES/DEVIATIONS

1. It is important to note that the analysis is based on quarterly samples and does not represent a targeted sampling program. Typically, a targeted sampling program would be focused on more samples collected within a seasonal or agricultural window in order to capture as much of the peak runoff associated with pesticide usage. CWS data is not targeted in this manner and is likely to miss the peak concentrations and to under predict the long term (chronic) exposure.

2. The report includes a large volume of data which has not been summarized by the authors. The authors have summarized the aggregate exposure estimates calculated from the entire 27 state dataset. State by State summaries are presented in Appendix B but are not discussed in the report. A narrative summary of state occurrence data and the effect on state populations exposed would have been useful to fully characterize the data.

3. Use information for metolachlor was summarized in the study but not reported. It would be instructive to see the use data ranked in order to determine whether particular states (i.e. the 10 highest use states) should be evaluated as well.

4. It is also important to note that the data does not include degradate analysis. This is particularly important for the ground water portion of the study. Data from other monitoring studies (NAWQA) and the two PGW studies suggest that degradates occur in ground water at a much higher concentration and frequency than parent metolachlor.

5. Finally, the analytical data does not include enantioselective information and therefore could not differentiate between racemic metolachlor and s-metolachlor.. Without data which distinguishes between the enantiomers, it is impossible to say with any confidence that the concentrations in surface water are reflective of s-metolachlor use.

TABLE 1

THIRTY-TWO METOLACHLOR AND S-METOLACHLOR USE STATES RANKED BY ACRES TREATED IN 1996 AND 1999

State	1996 Rank	1999 Rank[1]
Iowa	2	1
Illinois	1	2
Nebraska	3	3
Kansas	5	4
Indiana	4	5
Ohio	8	6
Missouri	6	7
Wisconsin	10	8
Minnesota	7	9
Michigan	9	10
Texas	12	11
Pennsylvania	13	12
Arkansas	14	13
Kentucky	17	14
New York	11	15
North Carolina	16	16
South Dakota	21	17
Mississippi	18	18
Virginia	20	19
Tennessee	15	20
Maryland	22	21
Delaware	24	23
Georgia	25	24
Louisiana	19	25
South Carolina	28	26
Alabama	26	28
Colorado	23	29
California	--	30
Florida	29	32
New Jersey	27	33
North Dakota	30	37
Hawaii	--	--

-- Not surveyed for metolachlor

[1] Ranking provided by Syngenta Crop Protection, 2001

TABLE 2

METOLACHLOR AND S-METOLACHLOR MONITORING DATA FOR CWS ON SURFACE AND GROUNDWATER IN 27 MAJOR USE STATES FOR TWO TIME PERIODS (1994-1995 AND 1999-2000)

Medium		1994	1995	1999	2000
surface water	No. of CWS	810	766	1,067	1,048
	No. of Samples	2,309	2,310	3,146	3,348
	No. of Detections	179	252	146	82
	% Detections	7.8	10.9	4.6	2.4
groundwater	No. of CWS	4,360	4,680	3,893	4,057
	No. of Samples	13,018	11,414	7,7[illegible]	8,021
	No. of Detections	63	123	42	50
	% Detections	0.5	1.1	0.5	0.6
	LOQ Most Frequent	0.4	0.1	0.5	0.5
	LOQ Range	0.0005 - 50.0	0.04 - 52.0	0.005 - 10.0	0.01 - 10.0

FIGURE 1

TWENTY SEVEN METOLACHLOR MAJOR USE STATES

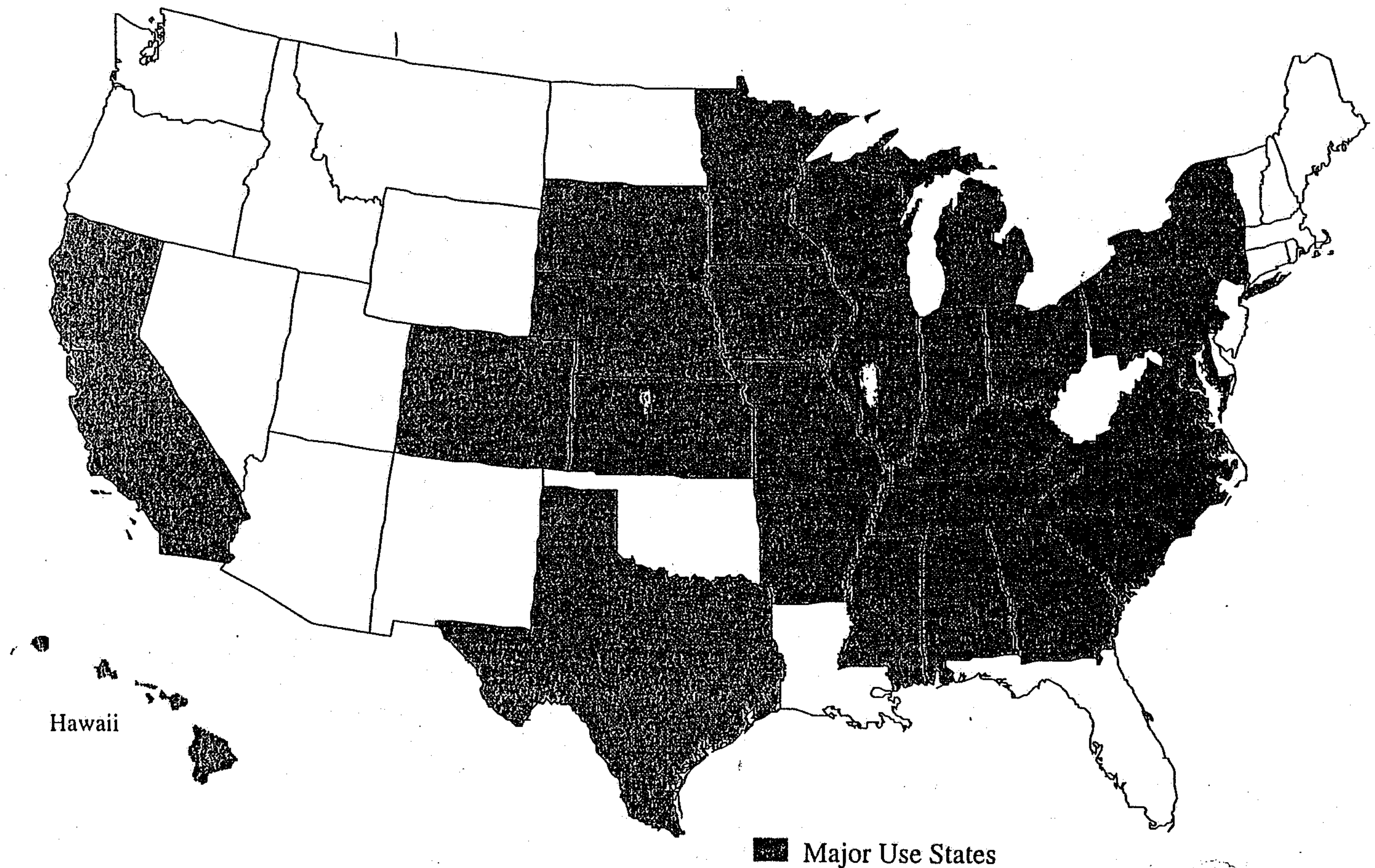
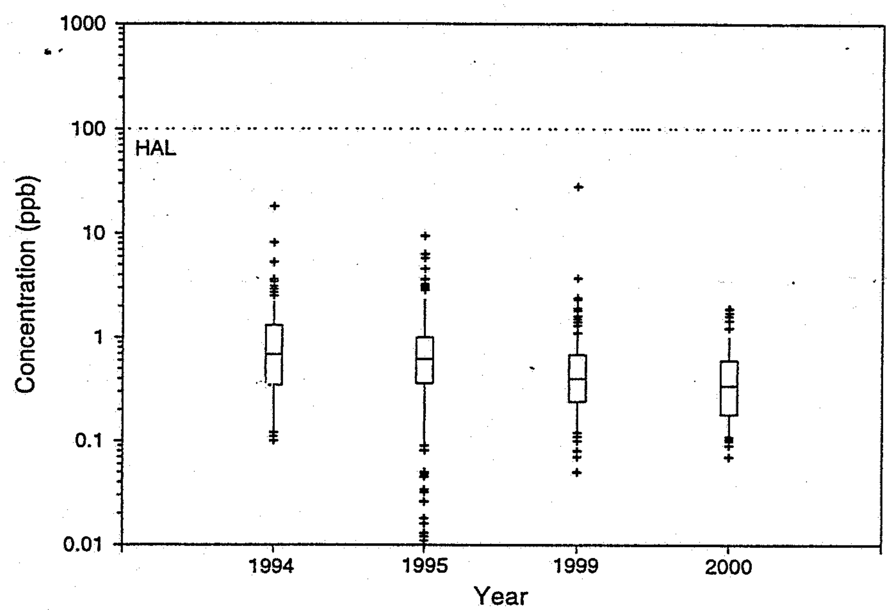


FIGURE 2

METOLACHLOR (1994-1995) AND S-METOLACHLOR (1999-2000) CONCENTRATION DISTRIBUTION PERCENTILE FOR CWS ON SURFACE WATER IN THE 27 MAJOR USE STATES

(Box Plot: Maximum, 75th, Median, 25th, and Minimum)



Detected Concentrations	1994	1995	1999	2000
Maximum	18.0	9.4	28	1.9
95th Percentile	3.1	3.0	1.5	1.45
75th Percentile	1.3	1.0	0.68	0.6
Median	0.68	0.62	0.4	0.34
25th Percentile	0.35	0.36	0.24	0.18
Minimum	0.1	0.005	0.05	0.07

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FIGURE 3

METOLACHLOR (1994-1995) AND S-METOLACHLOR (1999-2000) DISTRIBUTION OF DETECTIONS FROM CWS ON SURFACE WATER IN THE 27 MAJOR USE STATES

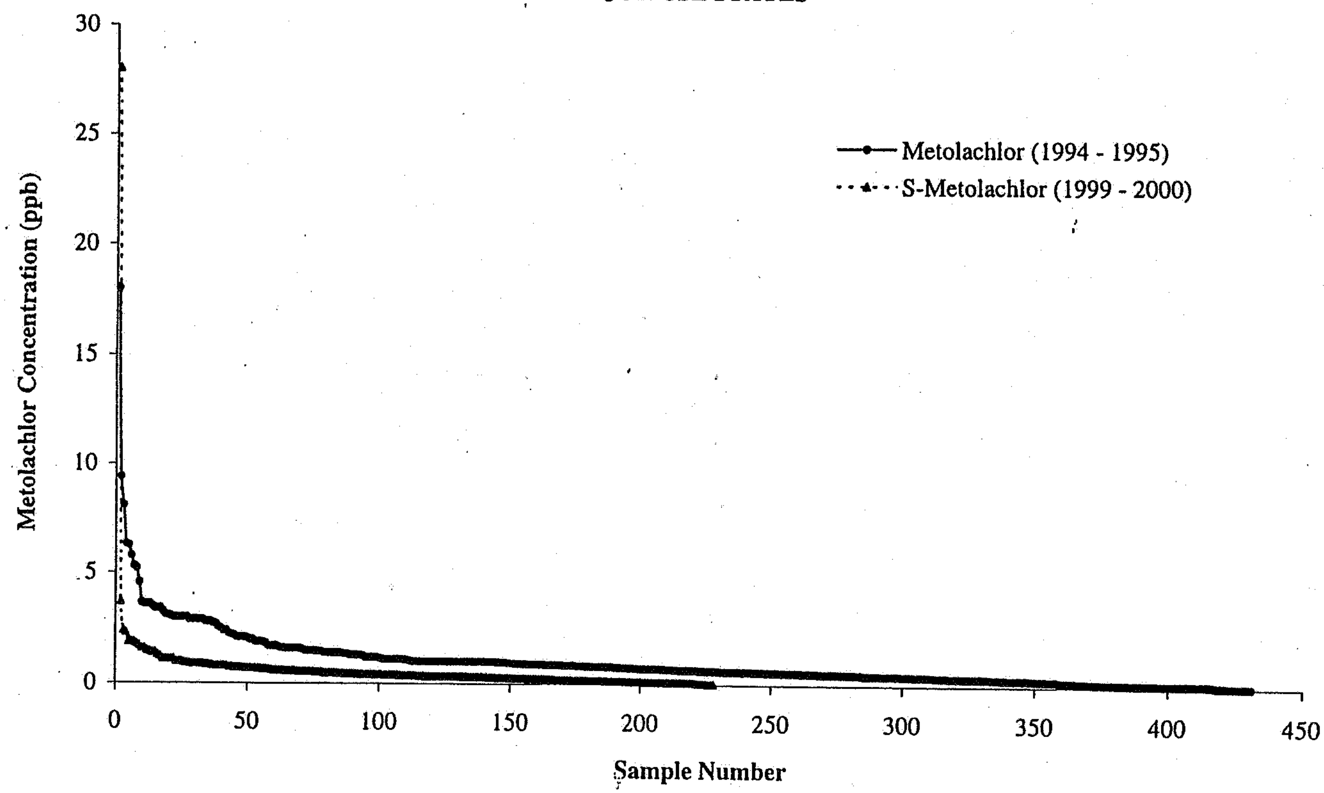

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FIGURE 4

DISTRIBUTION PATTERN FOR DETECTIONS OF METOLACHLOR (1994-1995) AND S-METOLACHLOR (1999-2000) FOR CWS ON SURFACE WATER IN THE 27 MAJOR USE STATES

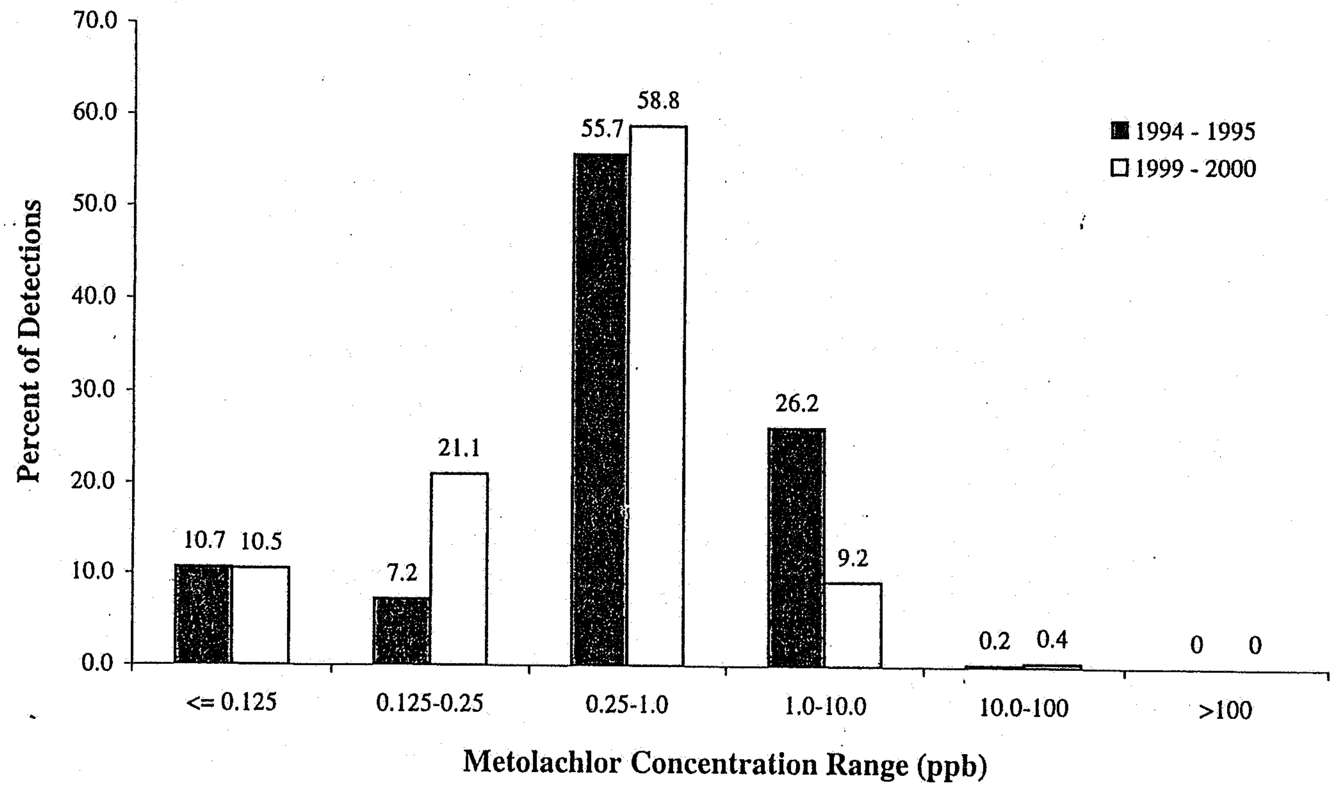

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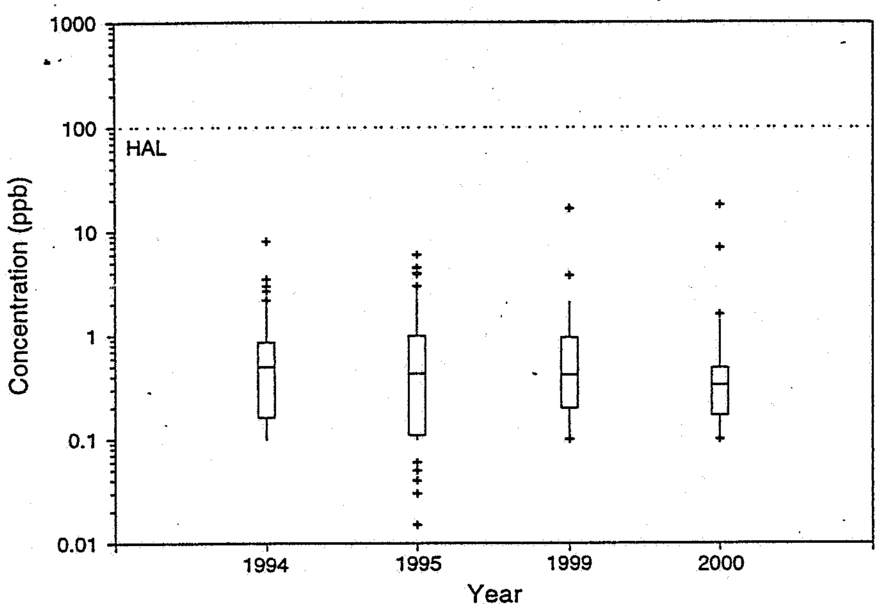
FIGURE 5

METOLACHLOR (1994-1995) AND S-METOLACHLOR (1999-2000) CONCENTRATION DISTRIBUTION PERCENTILES FOR CWS ON GROUNDWATER IN THE 27 MAJOR USE STATES

(Box Plot: Maximum, 75th, Median, 25th, and Minimum)



Detected ConcentrationS	1994	1995	1999	2000
Maximum	8.1	6.0	16.7	18.0
95th Percentile	2.7	3.0	3.8	1.6
75th Percentile	0.89	1.0	0.96	0.49
Median	0.5	0.431	0.43	0.335
25th Percentile	0.17	0.11	0.2	0.17
Minimum	0.1	0.015	0.1	0.1

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FIGURE 6

METOLACHLOR (1994-1995) AND S-METOLACHLOR (1999-2000) DISTRIBUTION OF DETECTIONS FROM CWS ON GROUNDWATER IN THE 27 MAJOR USE STATES

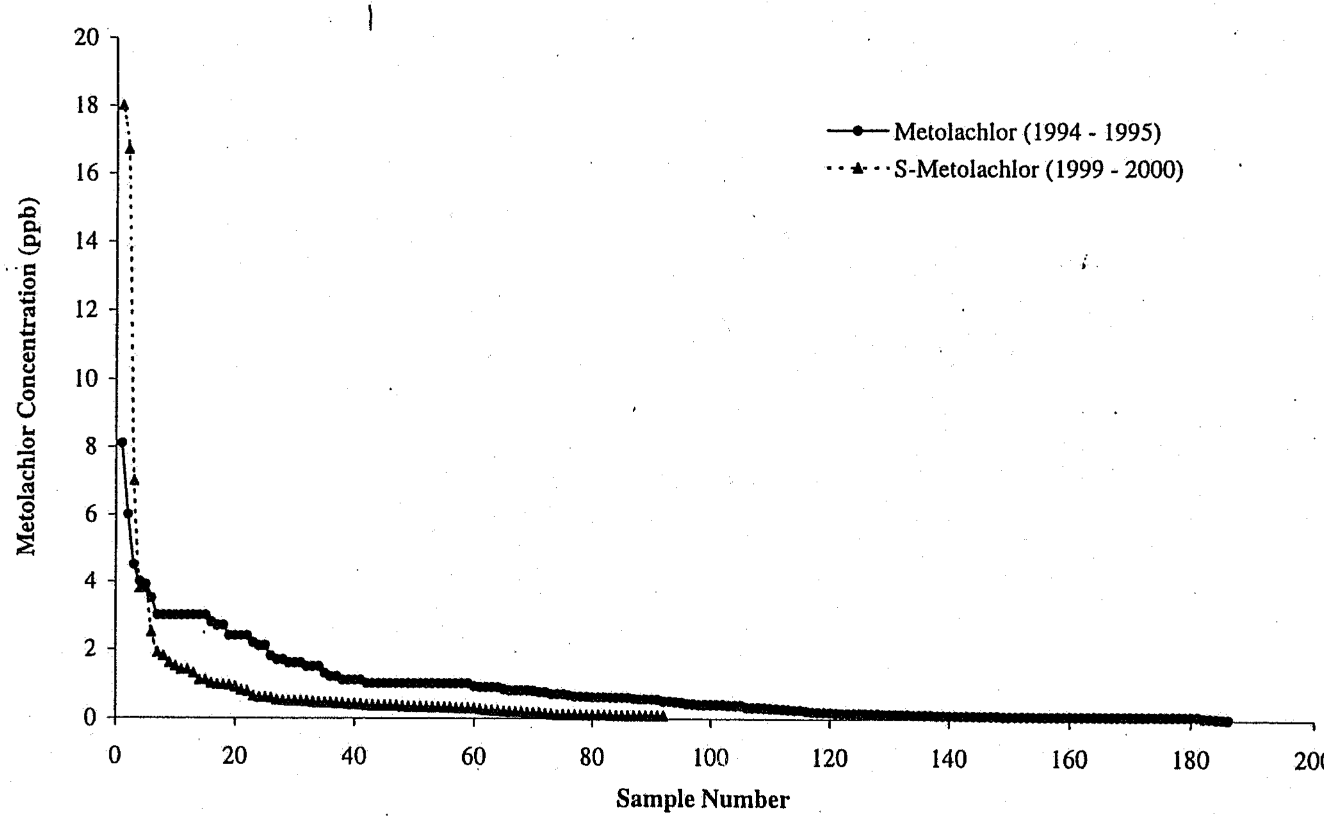

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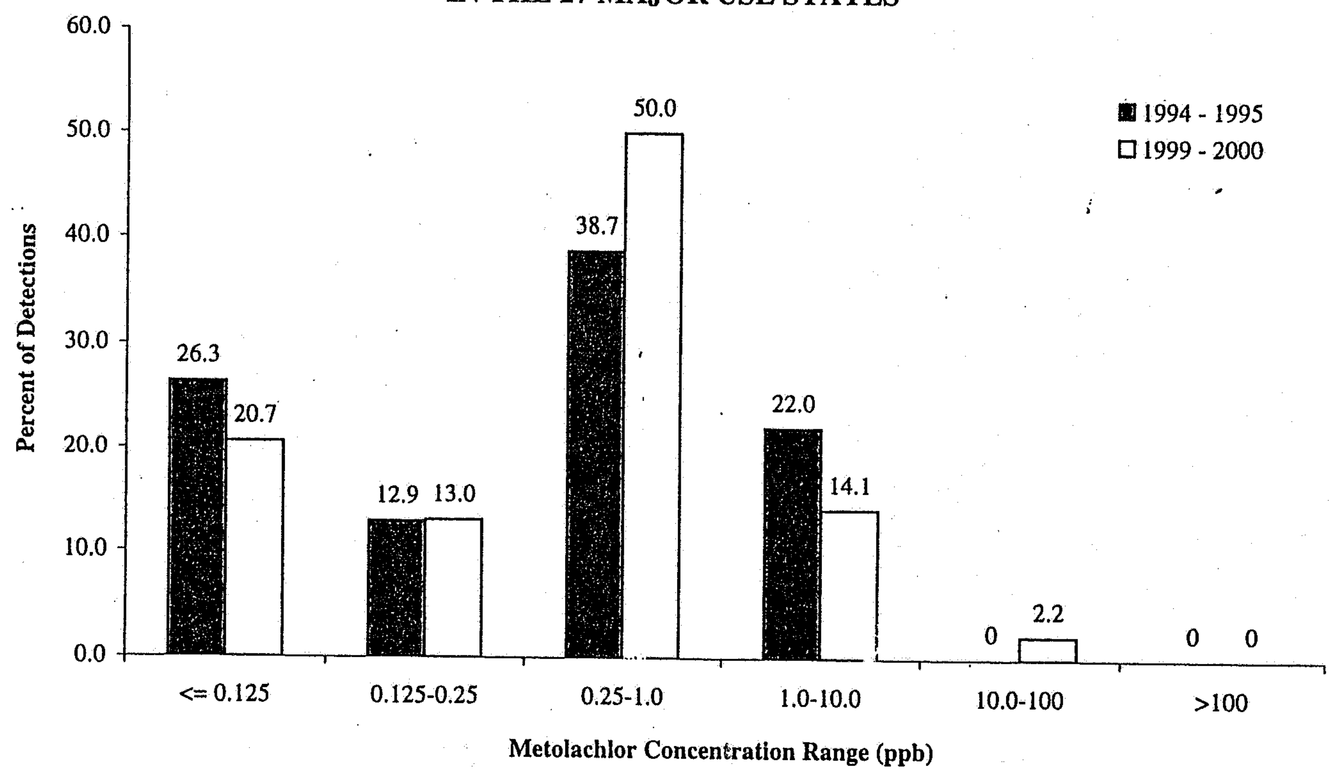
FIGURE 7

DISTRIBUTION PATTERN FOR DETECTIONS OF METOLACHLOR (1994-1995) AND S-METOLACHLOR (1999-2000) FOR CWS IN GROUNDWATER IN THE 27 MAJOR USE STATES



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DATA EVALUATION RECORD

PC No. 108801 Metolachlor
DP Barcode D278934
FORMULATION-00-ACTIVE INGREDIENT
STUDY ID 45527502

Tierney, D.P., et al, 2001. Occurrence of Metolachlor (1994-1995) Compared to S-Metolachlor (1999-2000) in Drinking Water From Community Water Systems in 27 Major Use States. Syngenta Crop Protection Report No. 2455-01. Unpublished study performed and submitted by Syngenta Crop Protection, Inc., Greensboro, NC and En fate, LLC, Plymouth, MN..

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SIGNATURE: James A. Hetrick DATE: 2/28/02

ABSTRACT

This study is a non-guideline study and therefore does not satisfy any of the requirements of Subdivision N. The study author has completed a comparative analysis of surface and ground water monitoring data collected in 27 high metolachlor use states collected and analyzed by individual Community Water Systems (CWS) to assess the impact of the replacement of metolachlor with s-metolachlor. The study authors compared the frequency of occurrence and concentration profile of metolachlor from the years 1994-1995 with similar data from 1999-2000. Several important points to note about this study follow:

1. Data aggregation presents a national picture of exposure to metolachlor in drinking water. However, metolachlor exposure in drinking water is expected to be more dependent on regional issues (i.e. climate, pesticide usage, agricultural patterns).

2. The study does not address the potential impact of other factors such as variations in metolachlor use, climatic, hydrologic, and agricultural practices on the data. It is impossible to correlate the reported decrease in frequency of detections and concentration profile with the replacement of racemic metolachlor with s-metolachlor without evaluating other factors which may have influence on the data. Without detailed information on the usage history of metolachlor and the potential impact of other factors EFED cannot confirm the conclusions of the study.

3. The analytical data from both periods does not distinguish between racemic metolachlor and s-metolachlor. No enantioselective monitoring data are available to document the effect on loadings of the transition from racemic metolachlor to s-metolachlor.

4. No degradates of metolachlor were analyzed in the CWS data. Degradates have been found at higher concentrations and frequencies than parent metolachlor in ground water.

5. The number of states and CWS reporting data varies between 1993 and 2000. Comparative analysis should be performed on the same states and CWS data from both periods. An additional confounding factor for this analysis is that different states will collect quarterly samples at different times within the quarter. Consistency in sample population is critical to comparing data.

The study author reports that the frequency of metolachlor/s-metolachlor detections in surface water decreased from 9.4% in 1994-1995 to 3.5% in 1999-2000. A comparison of percentiles for detections from surface water showed that the 95th, 75th, median, and 25th percentiles of surface water concentrations were reduced by approximately 50% in the 1999-2000 data relative to the 1994-1995 data. Finally, the data show that only 9.2% of samples with detections were between 1.0 and 10 ppb in the 1999-2000 data compared with 26.2% of the detections in 1994-1995 data. Overall, the data suggest that the overall distribution of metolachlor detections is lower in the 1999-2000 data relative to the 1994-1995 data.

The study author reports that for ground water there is little difference in the frequency of detection of metolachlor between 1994-1995 and 1999-2000. Visually, the concentration profile for metolachlor in ground water shows an overall lower concentration. Finally, the data show that only 14.1% of samples with detections were between 1.0 and 10 ppb in the 1999-2000 data compared with 22.0% of the detections in 1994-1995 data. The study authors deduce from this data that the occurrence of metolachlor has been reduced in the 1999-2000 data relative to the 1994-1995 data.

MATERIALS AND METHODS

State by state agricultural use data was used by the study author to rank the top 32 states (representing 97% of metolachlor use) in 1996 (providing use information for the 1994-1995 data) and 1999 (providing use information for the 1999-2000 data). The analysis indicated that the top metolachlor use states had not changed over the time interval. Using this information, the study authors requested data from the 32 top metolachlor use states collected by CWS under the

Safe Drinking Water Act (SDWA). Data was received from 27 of the 32 states and compiled by the authors for analysis.

CWS surface water data was available from 810 locations in 1994, 766 locations in 1995, 1067 locations in 1999, and 1048 locations in 2000. CWS ground water data was available from 4360 locations in 1994, 4680 locations in 1995, 3893 locations in 1999, and 4057 locations in 2000. The study authors analyzed the data from surface water and ground water CWS sources separately. Sources that used blended surface water and ground water were not used in the analysis. Only quantifiable detections were used in the preparation of concentration profiles.

RESULTS/DISCUSSION

The study author reports that the frequency of metolachlor/s-metolachlor detections in surface water decreased from 9.4% in 1994-1995 to 3.5% in 1999-2000. A comparison of percentiles for detections from surface water showed that the 95th, 75th, median, and 25th percentiles of surface water concentrations were reduced by approximately 50% in the 1999-2000 data relative to the 1994-1995 data. Finally, the data show that only 9.2% of samples with detections were between 1.0 and 10 ppb in the 1999-2000 data compared with 26.2% of the detections in 1994-1995 data. Overall, the data suggest that the overall distribution of metolachlor detections is lower in the 1999-2000 data relative to the 1994-1995 data.

It is also worth noting that while the surface water data suggests that the concentrations from 1999-2000 are lower overall, the single highest concentration reported in this study (28 ppb) was detected in 1999.

The study author reports that for ground water there is little difference in the frequency of detection of metolachlor between 1994-1995 and 1999-2000. Visually, the concentration profile for metolachlor in ground water shows an overall lower concentration. Finally, the data show that only 14.1% of samples with detections were between 1.0 and 10 ppb in the 1999-2000 data compared with 22.0% of the detections in 1994-1995 data. The study authors deduce from this data that the occurrence of metolachlor has been reduced in the 1999-2000 data relative to the 1994-1995 data.

DEFICIENCIES/DEVIATIONS

1. The study does not address the potential impact of other factors such as variations in metolachlor use, climatic, hydrologic, and agricultural practices on the data. It is impossible to correlate the reported decrease in frequency of detections and concentration profile with the replacement of racemic metolachlor with s-metolachlor without evaluating other factors which may have influence on the data.

2. The number of states and CWS reporting data varies between 1993 and 2000. As a result, there was an increase in the total number of surface water samples and a decrease in the total number of ground water samples between the two periods compared. Comparative analysis should be performed on the same states and CWS data from both periods. An additional confounding factor for this analysis is that different states will collect quarterly

samples at different times within the quarter. Consistency in sample population is critical to comparing data.

3. EFED notes that the authors have focused the analysis on the top 27 use states without explaining how this number of states is preferable to say top ten or top five use states. In a review of MRID 45527501, EFED noted that the percentage of population exposed is highly dependent on the population being evaluated (for the top state of Iowa, nearly 33% of the population (797,773 people) are exposed to concentrations of metolachlor above the LOQ). Without the usage information for metolachlor (which was summarized in the study but not provided), it is impossible to determine the distribution of metolachlor use within the 27 states analyzed by the study authors.

4. It is important to note that the analysis is based on quarterly samples and does not represent a targeted sampling program. Typically, a targeted sampling program would be focused on more samples collected within a seasonal or agricultural window in order to capture as much of the peak runoff associated with pesticide usage. CWS data is not targeted in this manner and is likely to miss the peak concentrations and to under predict the long term (chronic) exposure.

5. It is also important to note that the data does not include degradate analysis. This is particularly important for the ground water portion of the study. Data from other monitoring studies (NAWQA) and the two PGW studies suggest that degradates occur in ground water at a much higher concentration and frequency than parent Metolachlor.

6. Finally, the analytical data for metolachlor does not distinguish between racemic metolachlor and s-metolachlor. Without data which distinguishes between the enantiomers, it is impossible to say with any confidence that the concentrations in surface water are reflective of s-metolachlor use.

FIGURE 1

STATES INCLUDED IN THE METOLACHLOR POPULATION LINKED EXPOSURE ASSESSMENT

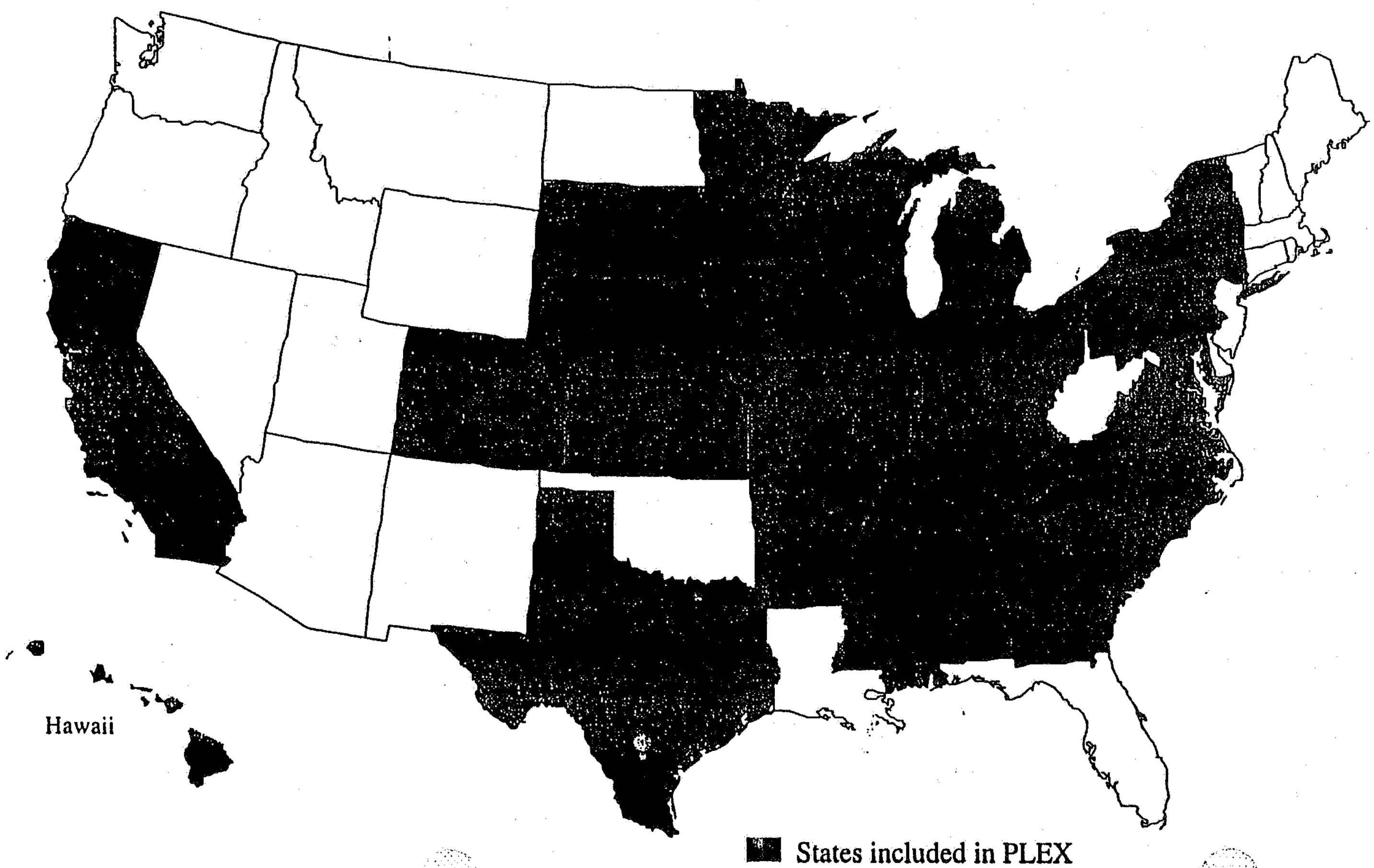

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TABLE 2

THIRTY-TWO METOLACHLOR AND S-MTOLACHLOR USE STATES RANKED BY ACRES TREATED, 1999

State	Rank[1]	State	Rank[1]
Iowa	1	South Dakota	17
Illinois	2	Mississippi	18
Nebraska	3	Virginia	19
Kansas	4	Tennessee	20
Indiana	5	Maryland	21
Ohio	6	Delaware[2]	23
Missouri	7	Georgia	24
Wisconsin	8	Louisiana[2]	25
Minnesota	9	South Carolina	26
Michigan	10	Alabama	28
Texas	11	Colorado	29
Pennsylvania	12	California	30
Arkansas	13	Florida[2]	32
Kentucky	14	New Jersey[2]	33
New York	15	North Dakota[2]	37
North Carolina	16	Hawaii	—

— Not surveyed for metolachlor

[1] Ranking provided by Syngenta Crop Protection, 2001

[2] CWS monitoring data not available

TABLE 3

METOLACHLOR LIMITS OF QUANTIFICATION REPORTED BY 27 USE STATES WITH DATA, 1993-2000

State	Limit of Quantification (ppb)	Range (ppb)
Alabama	10.0 [a]	0.1 - 10.0
Arkansas	0.2	0.2
California	0.5 [a]	0.05 - 5.0
Colorado	0.1 [a]	0.1 - 3.0
Georgia	0.4 [a]	0.15 - 10.0
Hawaii	0.05	0.05
Illinois	0.25 [a]	0.2 - 1.0
Indiana	0.1 [a]	0.1 - 5.0
Iowa	0.1 [a]	0.1 - 1.0
Kansas	0.25 [a]	0.25 - 0.3
Kentucky	0.1 [a]	0.01 - 2.5
Maryland	2.0 [a]	0.005 - 52.0
Michigan	1.0	1.0
Minnesota	0.5 [a]	0.5 - 0.7
Mississippi	0.16 [a]	0.1 - 1.0
Missouri	0.5	0.5
Nebraska	0.1 [a]	0.001 - 0.1
New York	1.0 [a]	0.0005 - 50.0
North Carolina	0.36 [a]	0.06 - 5.0
Ohio	5.0 [a]	0.01 - 50.0
Pennsylvania	0.054 [a]	0.054 - 0.19
South Carolina	0.1	0.1
South Dakota	0.5	0.5
Tennessee	0.5 [a]	0.1 - 6.2
Texas	0.2 [a]	0.105 - 1.0
Virginia	0.9 [a]	0.1 - 0.9
Wisconsin	0.1 [a]	0.1 - 0.5

[a] Data from the state had several quantification limits. The value listed is the most frequently reported number

TABLE 4

METOLACHLOR IN 27 USE STATES: NUMBER OF CWS AND POPULATION

State	State Population	Surface Water CWS Number in Group	Surface Water CWS Total Population	Groundwater CWS Number in Group	Groundwater CWS Total Population	Other CWS Number in Group	Other CWS Total Population	Total CWS Number in Group	Total CWS Total Population	Population Not Served by CWS
Alabama	4,447,100	154	2,290,269	315	1,392,632	103	1,278,236	572	4,961,137	--
Arkansas	2,673,400	246	2,322,708	442	955,887	38	148,886	726	3,427,481	--
California	33,871,648	387	8,560,606	2,445	7,209,475	524	18,543,785	3,356	34,313,866	--
Colorado	4,301,261	263	3,423,806	565	424,375	1	90	829	3,848,271	452,990
Georgia	8,186,453	194	5,072,469	1,474	1,488,840	0	0	1,668	6,561,309	1,625,144
Hawaii	1,211,537	8	51,236	105	1,169,068	5	57,862	118	1,278,166	--
Illinois	12,419,293	495	7,574,912	1,245	2,751,539	54	520,635	1,794	10,847,086	1,572,207
Indiana	6,080,485	41	1,047,788	708	2,049,115	8	943,658	757	4,040,561	2,039,924
Iowa	2,926,324	107	793,604	1,021	1,663,260	25	32,533	1,153	2,489,397	436,927
Kansas	2,688,418	276	655,798	556	687,141	90	1,089,960	922	2,432,899	255,519
Kentucky	4,041,769	310	3,005,056	91	287,618	53	1,034,807	454	4,327,481	--
Maryland	5,296,486	44	3,493,167	450	543,956	17	576,663	511	4,613,786	682,700
Michigan	9,938,444	274	5,286,059	1,122	1,627,620	15	299,269	1,411	7,212,948	2,725,496
Minnesota	4,919,479	24	715,354	913	2,410,843	17	696,817	954	3,823,014	1,096,465
Mississippi	2,844,658	12	324,877	1,309	2,702,410	0	0	1,321	3,027,287	--
Missouri	5,595,211	173	1,873,842	1,201	1,666,885	77	1,260,418	1,451	4,801,145	794,066
Nebraska	1,711,263	6	11,888	603	863,515	8	520,237	617	1,395,640	315,623
New York	18,976,457	766	12,468,112	1,894	4,113,438	192	1,112,559	2,852	17,694,109	1,282,348
North Carolina	8,049,313	342	4,130,629	1,850	1,295,186	62	296,107	2,254	5,721,922	2,327,391
Ohio	11,353,140	285	6,070,556	1,105	3,723,701	20	58,696	1,410	9,852,953	1,500,187
Pennsylvania	12,281,054	249	5,817,601	1,689	1,358,304	252	3,210,732	2,190	10,386,637	1,894,417
South Carolina	4,012,012	168	2,530,277	508	658,205	15	139,769	691	3,328,251	683,761
South Dakota	754,844	112	152,724	349	250,442	12	237,584	473	640,750	114,094
Tennessee	5,689,283	316	2,850,290	253	1,487,281	59	725,451	628	5,063,022	626,261
Texas	20,851,820	792	9,015,804	3,519	6,392,418	224	5,470,619	4,535	20,878,841	--
Virginia	7,078,515	302	5,787,063	1,012	422,371	7	68,706	1,321	6,278,740	799,775
Wisconsin	5,363,675	40	1,503,806	1,080	1,966,832	8	187,202	1,128	3,657,840	1,705,835
Total	207,563,342	6,386	96,830,301	27,824	51,562,957	1,886	38,511,281	36,096	186,904,539	20,658,803

-- Indicates that population not served by CWS could not be determined because population on CWS was greater than the state census population.

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TABLE 5

METOLACHLOR IN 27 USE STATES:
SUMMARY OF CWS AND POPULATIONS IN PLEX

State	Surface Water		Groundwater		Other		Totals	
	Number in Group	Total Population	Number in Group	Total Population	Number in Group	Total Population	Number in Group	Total Population
Alabama	130	2,166,930	299	1,336,243	89	1,193,697	518	4,696,870
Arkansas	238	2,274,855	440	951,586	37	148,365	715	3,374,806
California	92	3,346,531	446	5,505,381	266	17,106,729	804	25,958,641
Colorado	249	3,276,580	396	375,827	1	90	646	3,652,497
Georgia	189	5,042,395	1,394	1,477,208	0	0	1,583	6,519,603
Hawaii	8	51,236	105	1,169,068	5	57,862	118	1,278,166
Illinois	494	7,574,112	1,214	2,666,738	54	520,635	1,762	10,761,485
Indiana	21	894,179	328	1,308,074	6	928,658	355	3,130,911
Iowa	97	775,354	741	1,617,675	23	32,378	861	2,425,407
Kansas	255	640,297	315	515,275	86	753,942	656	1,909,514
Kentucky	289	2,872,262	88	282,762	50	1,023,030	427	4,178,054
Maryland	44	3,493,167	341	484,135	16	401,663	401	4,378,965
Michigan	270	5,260,539	1,092	1,605,824	15	299,269	1,377	7,165,632
Minnesota	24	715,354	905	2,408,554	16	696,717	945	3,820,625
Mississippi	12	324,877	14	107,028	0	0	26	431,905
Missouri	142	364,670	1,149	1,643,812	60	1,111,929	1,351	3,120,411
Nebraska	6	11,888	561	853,254	8	520,237	575	1,385,379
New York	471	2,540,509	607	2,166,888	144	652,567	1,222	5,359,964
North Carolina	331	4,091,278	1,791	1,286,637	62	296,107	2,184	5,674,022
Ohio	270	6,058,253	1,086	3,715,994	20	58,696	1,376	9,832,943
Pennsylvania	151	4,972,390	201	341,206	93	1,276,061	445	6,589,657
South Carolina	166	2,523,375	498	657,105	15	139,769	679	3,320,249
South Dakota	68	120,851	192	199,850	11	233,709	271	554,410
Tennessee	50	619,582	33	887,403	20	302,396	103	1,809,381
Texas	772	8,959,644	743	2,637,772	215	5,437,225	1,730	17,034,641
Virginia	7	43,014	19	23,406	0	0	26	66,420
Wisconsin	39	1,503,694	775	1,621,349	6	176,532	820	3,301,575
Total	4,885	70,517,816	15,773	37,846,054	1,318	33,368,263	21,976	141,732,133

TABLE 6

METOLACHLOR MONITORING DATA IN PLEX:
TOTAL SAMPLES, DETECTIONS, AND MINIMUM AND MAXIMUM CONCENTRATIONS

State	Surface Water		Groundwater		Other		Total		Detected Concentrations	
	No. Samples	No. Detections	No. Samples	No. Detections	No. Samples	No. Detections	No. Samples	No. Detections	Minimum (ppb)	Maximum (ppb)
Alabama	496	0	3,056	0	869	0	4,421	0	--	--
Arkansas	314	0	1,819	0	165	0	2,298	0	--	--
California	286	0	3,482	4	3,339	9	7,107	13	0.10	1.00
Colorado	507	1	1,094	0	1	0	1,602	1	0.60	0.60
Georgia	909	0	6,878	2	0	0	7,787	2	1.00	2.40
Hawaii	75	0	1,293	0	92	0	1,460	0	--	--
Illinois	2,768	420	7,838	32	536	50	11,142	502	0.22	15.00
Indiana	139	16	991	6	114	4	1,244	26	0.10	5.20
Iowa	404	170	1,482	223	36	13	1,922	406	0.10	18.00
Kansas	358	115	515	33	186	58	1,059	206	0.20	6.80
Kentucky	1,128	36	348	2	227	5	1,703	43	0.005	0.80
Maryland	652	41	1,104	9	178	1	1,934	51	0.05	13.00
Michigan	435	4	3,268	1	85	2	3,788	7	1.00	6.00
Minnesota	175	0	4,513	11	248	4	4,936	15	0.50	1.30
Mississippi	16	0	35	0	0	0	51	0	--	--
Missouri	2,650	95	3,992	1	549	11	7,191	107	0.50	28.00
Nebraska	34	2	2,401	39	158	3	2,593	44	0.05	16.70
New York	328	5	1,901	2	512	0	2,741	7	0.15	10.00
North Carolina	1,375	6	10,752	3	617	0	12,744	9	0.24	0.68
Ohio	2,351	485	3,531	1	104	16	5,986	502	0.23	17.07
Pennsylvania	451	43	986	32	556	41	1,993	116	0.03	6.00
South Carolina	633	6	5,100	29	266	0	5,999	35	0.10	0.14
South Dakota	162	0	830	0	93	0	1,085	0	--	--
Tennessee	99	0	121	0	52	0	272	0	--	--
Texas	1,863	105	1,210	0	522	10	3,595	115	0.10	7.10
Virginia	3	0	15	0	0	0	18	0	--	--
Wisconsin	68	0	1,920	16	31	0	2,019	16	0.10	0.90
Total	18,679	1,550	70,475	446	9,536	227	98,690	2,223		

-- Indicates no data

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TABLE 7

PLEX DATA FOR METOLACHLOR
JANUARY 1993 - DECEMBER 2000

	Totals	Groundwater	Surface Water	Other
Data				
Number of Samples	98,690	70,475	18,679	9,536
Number of Detections	2,223	446	1,550	227
Percent of Detections	2.25	0.63	8.30	2.38
Number of Detections > 100 ppb	0	0	0	0
Percent of Detections > 100 ppb	0	0	0	0
Percent of Samples > 100 ppb	0	0	0	0
Concentrations (ppb)				
Minimum Detected Concentration	0.005	0.015	0.005	0.10
Maximum Detected Concentration	28.0	18.0	28.0	12.57
Population-Weighted Exposure Concentrations[1]	0.46	0.51	0.46	0.39
CWS				
Number of CWS	36,096	27,824	6,386	1,886
Number of CWS with Data	21,976	15,773	4,885	1,318
Percent CWS with Data	60.88	56.69	76.50	69.88
Number of CWS with No Detections	20,720	15,609	3,935	1,176
Number of CWS with Detections	1,256	164	950	142
Number of CWS with Detections > 100 ppb	0	0	0	0
Number of CWS with Annual Means > 100 ppb	0	0	0	0
Number of CWS with Period Means > 100 ppb	0	0	0	0
Percent of CWS with No Detections[2]	94.28	98.96	80.55	89.23
Percent of CWS with Detections	5.72	1.04	19.45	10.77
Percent of CWS with Detections > 100 ppb	0	0	0	0
Percent of CWS with Annual Means > 100 ppb	0	0	0	0
Percent of CWS with Period Means > 100 ppb	0	0	0	0
Populations				
Use State Population	207,563,342			
Population on CWS	186,904,539	51,562,957	96,830,301	38,511,281
Population Served by CWS with Data	141,732,133	37,846,054	70,517,816	33,368,263
Percent Population Assessed	68.28	18.23	33.97	16.08
Percent CWS Population Assessed	75.83	73.40	72.83	86.65
Population with No Detections[2]	124,150,188	36,817,781	58,101,110	29,231,297
Population with Detections	17,581,945	1,028,273	12,416,706	4,136,966
Population with Detections > 100 ppb	0	0	0	0
Populations with Annual Means > 100 ppb	0	0	0	0
Populations with Period Means > 100 ppb	0	0	0	0
Percent of population with No Detections	87.59	97.28	82.39	87.60
Percent of population with Detections	12.41	2.72	17.61	12.40
Percent of population with Detections > 100 ppb	0	0	0	0
Percent of population with Annual Means > 100 ppb	0	0	0	0
Percent of population with Period Means > 100 ppb	0	0	0	0

[1] Simple substitution method

[2] Percent CWS and populations with or without detects are based on the number of assessed CWS and populations, respectively.

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TABLE 8

METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]	Percent of Group	Without Detections CWS	Without Detections Population
Surface Water							
Surface Water >100.0 ppb	0	0				0	0
Surface Water >10.0 to ≤100.0	7	16,040	12.50	100.0	0.02	7	16,040
Surface Water >1.0 to ≤10.0	396	7,449,434	2.37	99.98	10.6	305	6,269,973
Surface Water >0.25 to ≤1.0	1,189	17,377,410	0.53	89.4	24.6	828	14,132,560
Surface Water >0.125 to ≤0.25	1,128	15,582,123	0.19	64.8	22.1	744	11,954,241
Surface Water ≤0.125	2,165	30,092,809	0.09	42.7	42.7	2,051	25,728,296
Subtotal	4,885	70,517,816				3,935	58,101,110
Groundwater							
Groundwater >100.0 ppb	0	0				0	0
Groundwater >10.0 to ≤100.0	27	65,823	12.58	100.0	0.2	27	65,823
Groundwater >1.0 to ≤10.0	1,062	3,771,095	2.55	99.8	10.0	1,041	3,406,670
Groundwater >0.25 to ≤1.0	3,114	12,599,711	0.47	89.9	33.3	3,070	12,483,238
Groundwater >0.125 to ≤0.25	4,927	8,946,205	0.23	56.6	23.6	4,889	8,759,403
Groundwater ≤0.125	6,643	12,463,220	0.08	32.9	32.9	6,582	12,102,647
Subtotal	15,773	37,846,054				15,609	36,[illegible]
Other							
Other >100.0 ppb	0	0				0	0
Other >10.0 to ≤100.0	2	2,200	12.50	100.0	0.01	2	2,200
Other >1.0 to ≤10.0	100	998,995	3.48	99.99	2.99	82	864,080
Other >0.25 to ≤1.0	455	13,906,932	0.52	97.0	41.7	396	12,355,291
Other >0.125 to ≤0.25	228	6,251,353	0.20	55.3	18.7	181	4,624,468
Other ≤0.125	533	12,208,783	0.08	36.6	36.6	515	11,385,258
Subtotal	1,318	33,368,263				1,176	29,231,297
Total Assessed	21,976	141,732,133				20,720	124,150,188

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	4,885	70,517,816
Groundwater CWS	15,773	37,846,054
Other CWS	1,318	33,368,263
Subtotal	21,976	141,732,133
CWS Not in PLEX:[4]		
Surface Water CWS	1,501	26,312,485
Groundwater CWS	12,051	13,716,903
Other CWS	568	5,143,018
Subtotal	14,120	45,172,406
Total CWS and Population on CWS	36,096	186,904,539
Use State Population (Census, 2000)		207,563,342
Population Not Served by CWS		20,658,803

[1] Metolachlor exposure distribution for 21,976 community water systems with data in 27 use states. This database is used to estimate population exposure and is dominated by nondetections, 97.7% of 98,690 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.

TABLE 9

METOLACHLOR IN USE STATES: CWS WITH DATA, DETECTIONS, ANNUAL AND PERIOD METOLACHLOR MEAN CONCENTRATIONS >100 PPB

State	No. CWS in State	No. CWS with Data	No. CWS with Detections	No. CWS with Annual Means >100 ppb	No. CWS with Period Means >100 ppb
Alabama	572	518	0	0	0
Arkansas	726	715	0	0	0
California	3,356	804	5	0	0
Colorado	829	646	1	0	0
Georgia	1,668	1,583	2	0	0
Hawaii	118	118	0	0	0
Illinois	1,794	1,762	281	0	0
Indiana	757	355	13	0	0
Iowa	1,153	861	128	0	0
Kansas	922	656	189	0	0
Kentucky	454	427	58	0	0
Maryland	511	401	14	0	0
Michigan	1,411	1,377	4	0	0
Minnesota	954	945	3	0	0
Mississippi	1,321	26	0	0	0
Missouri	1,451	1,351	79	0	0
Nebraska	617	575	22	0	0
New York	2,852	1,222	8	0	0
North Carolina	2,254	2,184	11	0	0
Ohio	1,410	1,376	72	0	0
Pennsylvania	2,190	445	86	0	0
South Carolina	691	679	34	0	0
South Dakota	473	271	0	0	0
Tennessee	628	103	0	0	0
Texas	4,535	1,730	236	0	0
Virginia	1,321	26	0	0	0
Wisconsin	1,128	820	10	0	0
Total	36,096	21,976	1,256	0	0
% of CWS with detections			5.72%	0.0%	0.0%

FIGURE 2

DISTRIBUTION OF METOLACHLOR EXPOSURE CONCENTRATIONS FOR CWS IN PLEX DATABASE

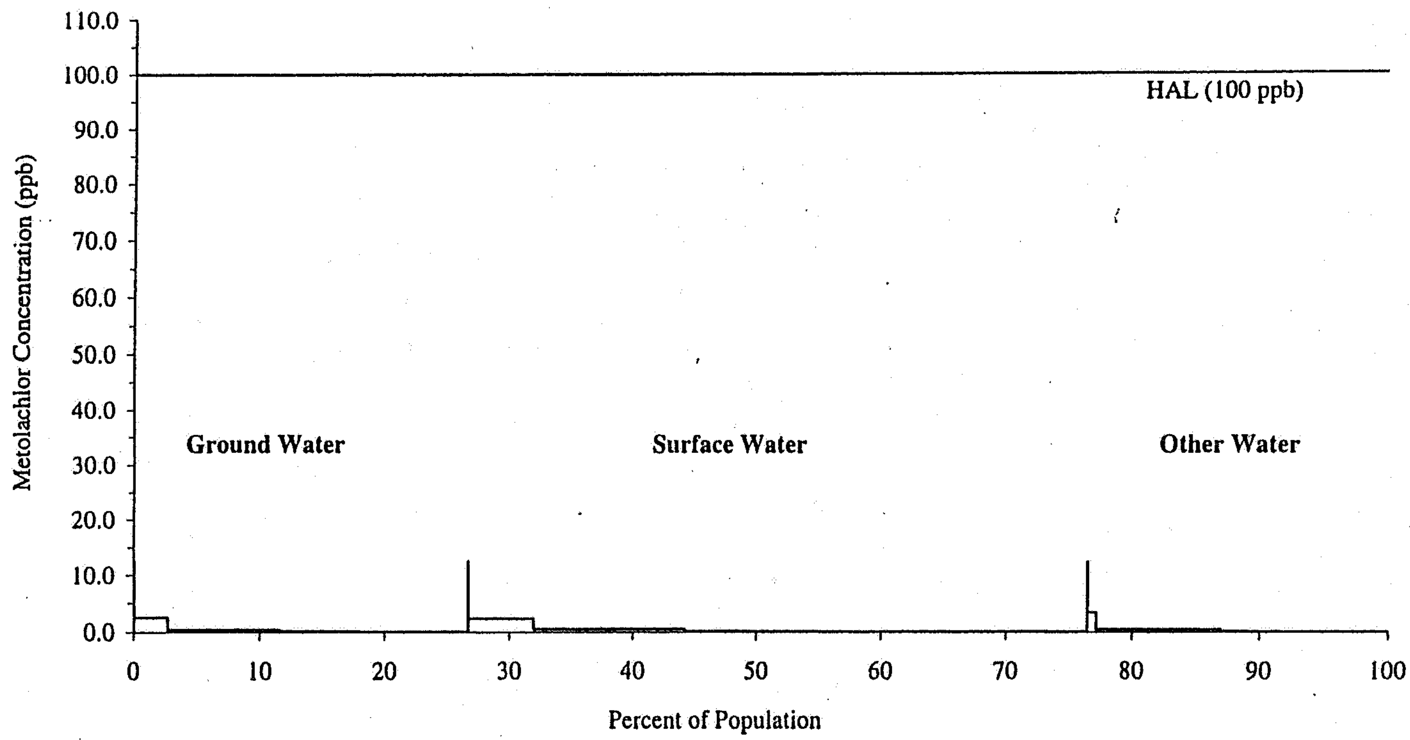

TABLE 10

CWS ON SURFACE WATER AND NUMBER OF YEARS WITH METOLACHLOR DATA IN PLEX, 1993-2000

Number of Years with Data	Number of CWS	Population
1	602	4,861,619
2	1,248	13,961,535
3	924	12,507,874
4	667	9,214,279
5	304	7,106,557
6	534	13,543,538
7	320	6,659,811
8	286	2,662,603

TABLE 13

PLEX DATA FOR METOLACHLOR IN ILLINOIS
JANUARY 1993 - DECEMBER 2000

	Totals	Groundwater	Surface Water	Other
<u>Data</u>				
Number of Samples	11,142	7,838	2,768	536
Number of Detections	502	32	420	50
Percent of Detections	4.51	0.41	15.17	9.33
Number of Detections > 100 ppb	0	0	0	0
Percent of Detections > 100 ppb	0	0	0	0
Percent of Samples > 100 ppb	0	0	0	0
<u>Concentrations (ppb)</u>				
Minimum Detected Concentration	0.22	0.26	0.22	0.25
Maximum Detected Concentration	15.00	3.80	15.00	5.10
Population-Weighted Exposure Concentrations[1]	0.17	0.16	0.16	0.23
<u>CWS</u>				
Number of CWS	1,794	1,245	495	54
Number of CWS with Data	1,762	1,214	494	54
Percent CWS with Data	98.22	97.51	99.80	100
Number of CWS with No Detections	1,481	1,197	251	33
Number of CWS with Detections	281	17	243	21
Number of CWS with Detections > 100 ppb	0	0	0	0
Number of CWS with Annual Means > 100 ppb	0	0	0	0
Number of CWS with Period Means > 100 ppb	0	0	0	0
Percent of CWS with No Detections[2]	84.05	98.6	50.81	61.11
Percent of CWS with Detections	15.95	1.40	49.19	38.89
Percent of CWS with Detections > 100 ppb	0	0	0	0
Percent of CWS with Annual Means > 100 ppb	0	0	0	0
Percent of CWS with Period Means > 100 ppb	0	0	0	0
<u>Populations</u>				
Illinois Population	12,419,293			
Population on CWS	10,847,086	2,751,539	7,574,912	520,635
Population Served by CWS with Data	10,761,485	2,666,738	7,574,112	520,635
Percent State Population Assessed	86.65	21.47	60.99	4.19
Percent CWS Population Assessed	99.21	96.92	99.99	100
Population with No Detections[2]	9,624,014	2,615,966	6,549,083	458,965
Population with Detections	1,137,471	50,772	1,025,029	61,670
Population with Detections > 100 ppb	0	0	0	0
Populations with Annual Means > 100 ppb	0	0	0	0
Populations with Period Means > 100 ppb	0	0	0	0
Percent of population with No Detections	89.43	98.10	86.47	88.15
Percent of population with Detections	10.57	1.90	13.53	11.85
Percent of population with Detections > 100 ppb	0	0	0	0
Percent of population with Annual Means > 100 ppb	0	0	0	0
Percent of population with Period Means > 100 ppb	0	0	0	0

[1] Simple substitution method

[2] Percent CWS and populations with or without detects are based on the number of assessed CWS and populations, respectively.

TABLE 16

INDIANA METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]
Surface Water				
Surface Water > 100.0 ppb	0	0		
Surface Water > 10.0 to ≤ 100.0	0	0		
Surface Water > 1.0 to ≤ 10.0	5	274,743	1.50	100.0
Surface Water > 0.25 to ≤ 1.0	5	271,980	0.40	69.3
Surface Water > 0.125 to ≤ 0.25	4	30,052	0.20	38.9
Surface Water ≤ 0.125	7	317,404	0.08	35.5
Groundwater				
Groundwater > 100.0 ppb	0	0		
Groundwater > 10.0 to ≤ 100.0	0	0		
Groundwater > 1.0 to ≤ 10.0	58	87,941	2.40	100.0
Groundwater > 0.25 to ≤ 1.0	14	333,720	0.43	93.3
Groundwater > 0.125 to ≤ 0.25	15	102,316	0.20	67.8
Groundwater ≤ 0.125	241	784,097	0.05	59.9
Other				
Other > 100.0 ppb	0	0		
Other > 10.0 to ≤ 100.0	0	0		
Other > 1.0 to ≤ 10.0	0	0		
Other > 0.25 to ≤ 1.0	2	881,633	0.98	100.0
Other > 0.125 to ≤ 0.25	1	10,538	0.18	5.1
Other ≤ 0.125	3	36,487	0.05	3.9

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	21	894,179
Groundwater CWS	328	1,308,074
Other CWS	6	928,658
Subtotal	355	3,130,911
CWS Not in PLEX:[4]		
Surface Water CWS	20	153,609
Groundwater CWS	380	741,041
Other CWS	2	15,000
Subtotal	402	909,650
Total CWS and Population on CWS	757	4,040,561
Indiana Population (Census, 2000)		6,080,485
Population Not Served by CWS		2,039,924

[1] Metolachlor exposure distribution for 355 community water systems with data in Indiana. This database is used to estimate population exposure and is dominated by nondetections, 97.9% of 1,244 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.

TABLE 14

ILLINOIS METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]
Surface Water				
Surface Water > 100.0 ppb	0	0		
Surface Water > 10.0 to ≤ 100.0	0	0		
Surface Water > 1.0 to ≤ 10.0	2	1,275	1.27	100.0
Surface Water > 0.25 to ≤ 1.0	152	1,156,935	0.36	99.98
Surface Water > 0.125 to ≤ 0.25	146	510,716	0.17	84.7
Surface Water ≤ 0.125	194	5,905,186	0.13	78.0
Groundwater				
Groundwater > 100.0 ppb	0	0		
Groundwater > 10.0 to ≤ 100.0	0	0		
Groundwater > 1.0 to ≤ 10.0	0	0		
Groundwater > 0.25 to ≤ 1.0	72	405,482	0.35	100.0
Groundwater > 0.125 to ≤ 0.25	47	121,218	0.18	84.8
Groundwater ≤ 0.125	1,095	2,140,038	0.13	80.2
Other				
Other > 100.0 ppb	0	0		
Other > 10.0 to ≤ 100.0	0	0		
Other > 1.0 to ≤ 10.0	0	0		
Other > 0.25 to ≤ 1.0	13	179,919	0.41	100.0
Other > 0.125 to ≤ 0.25	17	82,413	0.18	65.4
Other ≤ 0.125	24	258,303	0.13	49.6

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	494	7,574,112
Groundwater CWS	1,214	2,666,738
Other CWS	54	520,635
Subtotal	1,762	10,761,485
CWS Not in PLEX:[4]		
Surface Water CWS	1	800
Groundwater CWS	31	84,801
Other CWS	0	0
Subtotal	32	85,601
Total CWS and Population on CWS	1,794	10,847,086
Illinois Population (Census, 2000)		12,419,293
Population Not Served by CWS		1,572,207

[1] Metolachlor exposure distribution for 1,762 community water systems with data in Illinois. This database is used to estimate population exposure and is dominated by nondetections, 95.5% of 11,142 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.

TABLE 18

IOWA METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]
Surface Water				
Surface Water > 100.0 ppb	0	0		
Surface Water > 10.0 to ≤ 100.0	0	0		
Surface Water > 1.0 to ≤ 10.0	1	1,822	1.06	100.0
Surface Water > 0.25 to ≤ 1.0	15	188,279	0.38	99.8
Surface Water > 0.125 to ≤ 0.25	54	507,579	0.17	75.5
Surface Water ≤ 0.125	27	77,674	0.08	10.0
Groundwater				
Groundwater > 100.0 ppb	0	0		
Groundwater > 10.0 to ≤ 100.0	0	0		
Groundwater > 1.0 to ≤ 10.0	7	5,718	2.17	100.0
Groundwater > 0.25 to ≤ 1.0	16	47,116	0.40	99.6
Groundwater > 0.125 to ≤ 0.25	247	592,666	0.24	96.7
Groundwater ≤ 0.125	471	972,175	0.06	60.1
Other				
Other > 100.0 ppb	0	0		
Other > 10.0 to ≤ 100.0	0	0		
Other > 1.0 to ≤ 10.0	0	0		
Other > 0.25 to ≤ 1.0	3	9,038	0.37	100.0
Other > 0.125 to ≤ 0.25	5	5,010	0.24	72.1
Other ≤ 0.125	15	18,330	0.06	56.6

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	97	775,354
Groundwater CWS	741	1,617,675
Other CWS	23	32,378
Subtotal	861	2,425,407
CWS Not in PLEX:[4]		
Surface Water CWS	10	18,250
Groundwater CWS	280	45,585
Other CWS	2	155
Subtotal	292	63,990
Total CWS and Population on CWS	1,153	2,489,397
Iowa Population (Census, 2000)		2,926,324
Population Not Served by CWS		436,927

[1] Metolachlor exposure distribution for 861 community water systems with data in Iowa. This database is used to estimate population exposure and is dominated by nondetections, 78.9% of 1,922 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.

TABLE 17

PLEX DATA FOR METOLACHLOR IN IOWA
JANUARY 1993 - DECEMBER 2000

	Totals	Groundwater	Surface Water	Other
Data				
Number of Samples	1,922	1,482	404	36
Number of Detections	406	223	170	13
Percent of Detections	21.12	15.05	42.08	36.11
Number of Detections > 100 ppb	0	0	0	0
Percent of Detections > 100 ppb	0	0	0	0
Percent of Samples > 100 ppb	0	0	0	0
Concentrations (ppb)				
Minimum Detected Concentration	0.10	0.10	0.10	0.11
Maximum Detected Concentration	18.00	18.00	9.40	0.73
Population-Weighted Exposure Concentrations[1]	0.16	0.14	0.21	0.18
CWS				
Number of CWS	1,153	1,021	107	25
Number of CWS with Data	861	741	97	23
Percent CWS with Data	74.67	72.58	90.65	92.00
Number of CWS with No Detections	733	701	19	13
Number of CWS with Detections	128	40	78	10
Number of CWS with Detections > 100 ppb	0	0	0	0
Number of CWS with Annual Means > 100 ppb	0	0	0	0
Number of CWS with Period Means > 100 ppb	0	0	0	0
Percent of CWS with No Detections[2]	85.13	94.60	19.59	56.52
Percent of CWS with Detections	14.87	5.40	80.41	43.48
Percent of CWS with Detections > 100 ppb	0	0	0	0
Percent of CWS with Annual Means > 100 ppb	0	0	0	0
Percent of CWS with Period Means > 100 ppb	0	0	0	0
Populations				
Iowa Population	2,926,324			
Population on CWS	2,489,397	1,663,260	793,604	32,533
Population Served by CWS with Data	2,425,407	1,617,675	775,354	32,378
Percent State Population Assessed	82.88	55.28	26.50	1.11
Percent CWS Population Assessed	97.43	97.26	97.70	99.52
Population with No Detections[2]	1,627,634	1,432,462	184,090	11,082
Population with Detections	797,773	185,213	591,264	21,296
Population with Detections > 100 ppb	0	0	0	0
Populations with Annual Means > 100 ppb	0	0	0	0
Populations with Period Means > 100 ppb	0	0	0	0
Percent of population with No Detections	67.11	88.55	23.74	34.23
Percent of population with Detections	32.89	11.45	76.26	65.77
Percent of population with Detections > 100 ppb	0	0	0	0
Percent of population with Annual Means > 100 ppb	0	0	0	0
Percent of population with Period Means > 100 ppb	0	0	0	0

[1] Simple substitution method

[2] Percent CWS and populations with or without detects are based on the number of assessed CWS and populations, respectively.

TABLE 19

PLEX DATA FOR METOLACHLOR IN KANSAS
JANUARY 1993 - DECEMBER 2000

	Totals	Groundwater	Surface Water	Other
<u>Data</u>				
Number of Samples	1,059	515	358	186
Number of Detections	206	33	115	58
Percent of Detections	19.45	6.41	32.12	31.18
Number of Detections > 100 ppb	0	0	0	0
Percent of Detections > 100 ppb	0	0	0	0
Percent of Samples > 100 ppb	0	0	0	0
<u>Concentrations (ppb)</u>				
Minimum Detected Concentration	0.20	0.25	0.20	0.25
Maximum Detected Concentration	6.80	5.70	3.90	6.80
Population-Weighted Exposure Concentrations[1]	0.45	0.16	0.82	0.33
<u>CWS</u>				
Number of CWS	922	556	276	90
Number of CWS with Data	656	315	255	86
Percent CWS with Data	71.15	56.65	92.39	95.56
Number of CWS with No Detections	467	303	109	55
Number of CWS with Detections	189	12	146	31
Number of CWS with Detections > 100 ppb	0	0	0	0
Number of CWS with Annual Means > 100 ppb	0	0	0	0
Number of CWS with Period Means > 100 ppb	0	0	0	0
Percent of CWS with No Detections[2]	71.19	96.19	42.75	63.95
Percent of CWS with Detections	28.81	3.81	57.25	36.05
Percent of CWS with Detections > 100 ppb	0	0	0	0
Percent of CWS with Annual Means > 100 ppb	0	0	0	0
Percent of CWS with Period Means > 100 ppb	0	0	0	0
<u>Populations</u>				
Kansas Population	2,688,418			
Population on CWS	2,432,899	687,141	655,798	1,089,960
Population Served by CWS with Data	1,909,514	515,275	640,297	753,942
Percent State Population Assessed	71.03	19.17	23.82	28.04
Percent CWS Population Assessed	78.49	74.99	97.64	69.17
Population with No Detections[2]	1,146,089	425,520	156,749	563,820
Population with Detections	763,425	89,755	483,548	190,122
Population with Detections > 100 ppb	0	0	0	0
Populations with Annual Means > 100 ppb	0	0	0	0
Populations with Period Means > 100 ppb	0	0	0	0
Percent of population with No Detections	60.02	82.58	24.48	74.78
Percent of population with Detections	39.98	17.42	75.52	25.22
Percent of population with Detections > 100 ppb	0	0	0	0
Percent of population with Annual Means > 100 ppb	0	0	0	0
Percent of population with Period Means > 100 ppb	0	0	0	0

[1] Simple substitution method

[2] Percent CWS and populations with or without detects are based on the number of assessed CWS and populations, respectively.

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TABLE 20

KANSAS METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]
Surface Water				
Surface Water > 100.0 ppb	0	0		
Surface Water > 10.0 to ≤ 100.0	0	0		
Surface Water > 1.0 to ≤ 10.0	30	330,674	1.37	100.0
Surface Water > 0.25 to ≤ 1.0	64	82,756	0.44	48.4
Surface Water > 0.125 to ≤ 0.25	52	70,118	0.19	35.4
Surface Water ≤ 0.125	109	156,749	0.13	24.5
Groundwater				
Groundwater > 100.0 ppb	0	0		
Groundwater > 10.0 to ≤ 100.0	0	0		
Groundwater > 1.0 to ≤ 10.0	3	5,162	2.05	100.0
Groundwater > 0.25 to ≤ 1.0	5	3,067	0.59	99.0
Groundwater > 0.125 to ≤ 0.25	5	81,826	0.20	98.4
Groundwater ≤ 0.125	302	425,220	0.13	82.5
Other				
Other > 100.0 ppb	0	0		
Other > 10.0 to ≤ 100.0	0	0		
Other > 1.0 to ≤ 10.0	3	90,893	1.33	100.0
Other > 0.25 to ≤ 1.0	21	83,997	0.63	87.9
Other > 0.125 to ≤ 0.25	7	15,232	0.18	76.8
Other ≤ 0.125	55	563,820	0.13	74.8

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	255	640,297
Groundwater CWS	315	515,275
Other CWS	86	753,942
Subtotal	656	1,909,514
CWS Not in PLEX:[4]		
Surface Water CWS	21	15,501
Groundwater CWS	241	171,866
Other CWS	4	336,018
Subtotal	266	523,385
Total CWS and Population on CWS	922	2,432,899
Kansas Population (Census, 2000)		2,688,418
Population Not Served by CWS		255,519

[1] Metolachlor exposure distribution for 656 community water systems with data in Kansas. This database is used to estimate population exposure and is dominated by nondetections, 80.5% of 1,059 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.

TABLE 25

PLEX DATA FOR METOLACHLOR IN MICHIGAN
JANUARY 1993 - DECEMBER 2000

	Totals	Groundwater	Surface Water	Other
Data				
Number of Samples	3,788	3,268	435	85
Number of Detections	7	1	4	2
Percent of Detections	0.18	0.03	0.92	2.35
Number of Detections > 100 ppb	0	0	0	0
Percent of Detections > 100 ppb	0	0	0	0
Percent of Samples > 100 ppb	0	0	0	0
Concentrations (ppb)				
Minimum Detected Concentration	1.00	6.00	1.00	1.00
Maximum Detected Concentration	6.00	6.00	2.00	2.00
Population-Weighted Exposure Concentrations[1]	0.50	0.51	0.50	0.50
CWS				
Number of CWS	1,411	1,122	274	15
Number of CWS with Data	1,377	1,092	270	15
Percent CWS with Data	97.59	97.33	98.54	100
Number of CWS with No Detections	1,373	1,091	268	14
Number of CWS with Detections	4	1	2	1
Number of CWS with Detections > 100 ppb	0	0	0	0
Number of CWS with Annual Means > 100 ppb	0	0	0	0
Number of CWS with Period Means > 100 ppb	0	0	0	0
Percent of CWS with No Detections[2]	99.71	99.91	99.26	93.33
Percent of CWS with Detections	0.29	0.09	0.74	6.67
Percent of CWS with Detections > 100 ppb	0	0	0	0
Percent of CWS with Annual Means > 100 ppb	0	0	0	0
Percent of CWS with Period Means > 100 ppb	0	0	0	0
Populations				
Michigan Population	9,938,444			
Population on CWS	7,212,948	1,627,620	5,286,059	299,269
Population Served by CWS with Data	7,165,632	1,605,824	5,260,539	299,269
Percent State Population Assessed	72.10	16.16	52.93	3.01
Percent CWS Population Assessed	99.34	98.66	99.52	100
Population with No Detections[2]	7,114,113	1,581,074	5,255,942	277,097
Population with Detections	51,519	24,750	4,597	22,172
Population with Detections > 100 ppb	0	0	0	0
Populations with Annual Means > 100 ppb	0	0	0	0
Populations with Period Means > 100 ppb	0	0	0	0
Percent of population with No Detections	99.28	98.46	99.91	92.59
Percent of population with Detections	0.72	1.54	0.09	7.41
Percent of population with Detections > 100 ppb	0	0	0	0
Percent of population with Annual Means > 100 ppb	0	0	0	0
Percent of population with Period Means > 100 ppb	0	0	0	0

[1] Simple substitution method

[2] Percent CWS and populations with or without detects are based on the number of assessed CWS and populations, respectively.

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TABLE 26

MICHIGAN METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]
Surface Water				
Surface Water > 100.0 ppb	0	0		
Surface Water > 10.0 to ≤ 100.0	0	0		
Surface Water > 1.0 to ≤ 10.0	0	0		
Surface Water > 0.25 to ≤ 1.0	270	5,260,539	0.50	100.0
Surface Water > 0.125 to ≤ 0.25	0	0		
Surface Water ≤ 0.125	0	0		
Groundwater				
Groundwater > 100.0 ppb	0	0		
Groundwater > 10.0 to ≤ 100.0	0	0		
Groundwater > 1.0 to ≤ 10.0	1	24,750	1.42	100.0
Groundwater > 0.25 to ≤ 1.0	1,091	1,581,074	0.50	98.5
Groundwater > 0.125 to ≤ 0.25	0	0		
Groundwater ≤ 0.125	0	0		
Other				
Other > 100.0 ppb	0	0		
Other > 10.0 to ≤ 100.0	0	0		
Other > 1.0 to ≤ 10.0	0	0		
Other > 0.25 to ≤ 1.0	15	299,269	0.50	100.0
Other > 0.125 to ≤ 0.25	0	0		
Other ≤ 0.125	0	0		

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	270	5,260,539
Groundwater CWS	1,092	1,605,824
Other CWS	15	299,269
Subtotal	1,377	7,165,632
CWS Not in PLEX:[4]		
Surface Water CWS	4	25,520
Groundwater CWS	30	21,796
Other CWS	0	0
Subtotal	34	47,316
Total CWS and Population on CWS	1,411	7,212,948
Michigan Population (Census, 2000)		9,938,444
Population Not Served by CWS		2,725,496

[1] Metolachlor exposure distribution for 1,377 community water systems with data in Michigan. This database is used to estimate population exposure and is dominated by nondetections, 99.8% of 3,788 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.

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TABLE 27

PLEX DATA FOR METOLACHLOR IN MINNESOTA
JANUARY 1993 - DECEMBER 2000

	Totals	Groundwater	Surface Water	Other
Data				
Number of Samples	4,936	4,513	175	248
Number of Detections	15	11	0	4
Percent of Detections	0.30	0.24	0	1.61
Number of Detections > 100 ppb	0	0	0	0
Percent of Detections > 100 ppb	0	0	0	0
Percent of Samples > 100 ppb	0	0	0	0
Concentrations (ppb)				
Minimum Detected Concentration	0.50	0.50	--	0.60
Maximum Detected Concentration	1.30	1.30	--	1.00
Population-Weighted Exposure Concentrations[1]	0.25	0.25	0.25	0.25
CWS				
Number of CWS	954	913	24	17
Number of CWS with Data	945	905	24	16
Percent CWS with Data	99.06	99.12	100	94.12
Number of CWS with No Detections	942	903	24	15
Number of CWS with Detections	3	2	0	1
Number of CWS with Detections > 100 ppb	0	0	0	0
Number of CWS with Annual Means > 100 ppb	0	0	0	0
Number of CWS with Period Means > 100 ppb	0	0	0	0
Percent of CWS with No Detections[2]	99.68	99.78	100	93.75
Percent of CWS with Detections	0.32	0.22	0	6.25
Percent of CWS with Detections > 100 ppb	0	0	0	0
Percent of CWS with Annual Means > 100 ppb	0	0	0	0
Percent of CWS with Period Means > 100 ppb	0	0	0	0
Populations				
Minnesota Population	4,919,479			
Population on CWS	3,823,014	2,410,843	715,354	696,817
Population Served by CWS with Data	3,820,625	2,408,554	715,354	696,717
Percent State Population Assessed	77.66	48.96	14.54	14.16
Percent CWS Population Assessed	99.94	99.91	100	99.99
Population with No Detections[2]	3,808,053	2,407,488	715,354	685,211
Population with Detections	12,572	1,066	0	11,506
Population with Detections > 100 ppb	0	0	0	0
Populations with Annual Means > 100 ppb	0	0	0	0
Populations with Period Means > 100 ppb	0	0	0	0
Percent of population with No Detections	99.67	99.96	100	98.35
Percent of population with Detections	0.33	0.04	0	1.65
Percent of population with Detections > 100 ppb	0	0	0	0
Percent of population with Annual Means > 100 ppb	0	0	0	0
Percent of population with Period Means > 100 ppb	0	0	0	0

Dashed lines signify "Not Applicable"

[1] Simple substitution method

[2] Percent CWS and populations with or without detects are based on the number of assessed CWS and populations, respectively.

TABLE 28

MINNESOTA METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]
Surface Water				
Surface Water > 100.0 ppb	0	0		
Surface Water > 10.0 to ≤ 100.0	0	0		
Surface Water > 1.0 to ≤ 10.0	0	0		
Surface Water > 0.25 to ≤ 1.0	1	3,982	0.27	100.0
Surface Water > 0.125 to ≤ 0.25	23	711,372	0.25	99.4
Surface Water ≤ 0.125	0	0		
Groundwater				
Groundwater > 100.0 ppb	0	0		
Groundwater > 10.0 to ≤ 100.0	0	0		
Groundwater > 1.0 to ≤ 10.0	0	0		
Groundwater > 0.25 to ≤ 1.0	2	1,066	0.40	100.0
Groundwater > 0.125 to ≤ 0.25	903	2,407,488	0.25	99.96
Groundwater ≤ 0.125	0	0		
Other				
Other > 100.0 ppb	0	0		
Other > 10.0 to ≤ 100.0	0	0		
Other > 1.0 to ≤ 10.0	0	0		
Other > 0.25 to ≤ 1.0	1	11,506	0.30	100.0
Other > 0.125 to ≤ 0.25	15	685,211	0.25	98.3
Other ≤ 0.125	0	0		

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	24	715,354
Groundwater CWS	905	2,408,554
Other CWS	16	696,717
Subtotal	945	3,820,625
CWS Not in PLEX:[4]		
Surface Water CWS	0	0
Groundwater CWS	8	2,289
Other CWS	1	100
Subtotal	9	2,389
Total CWS and Population on CWS	954	3,823,014
Minnesota Population (Census, 2000)		4,919,479
Population Not Served by CWS		1,096,465

[1] Metolachlor exposure distribution for 945 community water systems with data in Minnesota. This database is used to estimate population exposure and is dominated by nondetections. 99.7% of 4,936 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.

TABLE 31

PLEX DATA FOR METOLACHLOR IN MISSOURI
JANUARY 1993 - DECEMBER 2000

	Totals	Groundwater	Surface Water	Other
Data				
Number of Samples	7,191	3,992	2,650	549
Number of Detections	107	1	95	11
Percent of Detections	1.49	0.03	3.58	2.00
Number of Detections > 100 ppb	0	0	0	0
Percent of Detections > 100 ppb	0	0	0	0
Percent of Samples > 100 ppb	0	0	0	0
Concentrations (ppb)				
Minimum Detected Concentration	0.50	0.80	0.50	0.59
Maximum Detected Concentration	28.00	0.80	28.00	2.30
Population-Weighted Exposure Concentrations[1]	0.26	0.25	0.29	0.26
CWS				
Number of CWS	1,451	1,201	173	77
Number of CWS with Data	1,351	1,149	142	60
Percent CWS with Data	93.11	95.67	82.08	77.92
Number of CWS with No Detections	1,272	1,148	82	42
Number of CWS with Detections	79	1	60	18
Number of CWS with Detections > 100 ppb	0	0	0	0
Number of CWS with Annual Means > 100 ppb	0	0	0	0
Number of CWS with Period Means > 100 ppb	0	0	0	0
Percent of CWS with No Detections[2]	94.15	99.91	57.75	70.00
Percent of CWS with Detections	5.85	0.09	42.25	30.00
Percent of CWS with Detections > 100 ppb	0	0	0	0
Percent of CWS with Annual Means > 100 ppb	0	0	0	0
Percent of CWS with Period Means > 100 ppb	0	0	0	0
Populations				
Missouri Population	5,595,211			
Population on CWS	4,801,145	1,666,885	1,873,842	1,260,418
Population Served by CWS with Data	3,120,411	1,643,812	364,670	1,111,929
Percent State Population Assessed	55.77	29.38	6.52	19.87
Percent CWS Population Assessed	64.99	98.62	19.46	88.22
Population with No Detections[2]	2,821,224	1,642,612	223,708	954,904
Population with Detections	299,187	1,200	140,962	157,025
Population with Detections > 100 ppb	0	0	0	0
Populations with Annual Means > 100 ppb	0	0	0	0
Populations with Period Means > 100 ppb	0	0	0	0
Percent of population with No Detections	90.41	99.93	61.35	85.88
Percent of population with Detections	9.59	0.07	38.65	14.12
Percent of population with Detections > 100 ppb	0	0	0	0
Percent of population with Annual Means > 100 ppb	0	0	0	0
Percent of population with Period Means > 100 ppb	0	0	0	0

[1] Simple substitution method

[2] Percent CWS and populations with or without detects are based on the number of assessed CWS and populations, respectively.

TABLE 32

MISSOURI METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]
Surface Water				
Surface Water > 100.0 ppb	0	0		
Surface Water > 10.0 to ≤ 100.0	0	0		
Surface Water > 1.0 to ≤ 10.0	2	1,800	1.49	100.0
Surface Water > 0.25 to ≤ 1.0	58	139,162	0.35	99.5
Surface Water > 0.125 to ≤ 0.25	82	223,708	0.25	61.3
Surface Water ≤ 0.125	0	0		
Groundwater				
Groundwater > 100.0 ppb	0	0		
Groundwater > 10.0 to ≤ 100.0	0	0		
Groundwater > 1.0 to ≤ 10.0	0	0		
Groundwater > 0.25 to ≤ 1.0	1	1,200	0.30	100.0
Groundwater > 0.125 to ≤ 0.25	1,148	1,642,612	0.25	99.9
Groundwater ≤ 0.125	0	0		
Other				
Other > 100.0 ppb	0	0		
Other > 10.0 to ≤ 100.0	0	0		
Other > 1.0 to ≤ 10.0	0	0		
Other > 0.25 to ≤ 1.0	18	157,025	0.32	100.0
Other > 0.125 to ≤ 0.25	42	954,904	0.25	85.9
Other ≤ 0.125	0	0		

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	142	364,670
Groundwater CWS	1,149	1,643,812
Other CWS	60	1,111,929
Subtotal	1,351	3,120,411
CWS Not in PLEX:[4]		
Surface Water CWS	31	1,509,172
Groundwater CWS	52	23,073
Other CWS	17	148,489
Subtotal	100	1,680,734
Total CWS and Population on CWS	1,451	4,801,145
Missouri Population (Census, 2000)		5,595,211
Population Not Served by CWS		794,066

[1] Metolachlor exposure distribution for 1,351 community water systems with data in Missouri. This database is used to estimate population exposure and is dominated by nondetections, 98.5% of 7,191 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.

TABLE 33

PLEX DATA FOR METOLACHLOR IN NEBRASKA
JANUARY 1993 - DECEMBER 2000

	Totals	Groundwater	Surface Water	Other
<u>Data</u>				
Number of Samples	2,593	2,401	34	158
Number of Detections	44	39	2	3
Percent of Detections	1.70	1.62	5.88	1.90
Number of Detections > 100 ppb	0	0	0	0
Percent of Detections > 100 ppb	0	0	0	0
Percent of Samples > 100 ppb	0	0	0	0
<u>Concentrations (ppb)</u>				
Minimum Detected Concentration	0.05	0.05	0.05	0.22
Maximum Detected Concentration	16.70	16.70	0.83	0.29
Population-Weighted Exposure Concentrations[1]	0.07	0.07	0.11	0.05
<u>CWS</u>				
Number of CWS	617	603	6	8
Number of CWS with Data	575	561	6	8
Percent CWS with Data	93.19	93.03	100	100
Number of CWS with No Detections	553	544	5	4
Number of CWS with Detections	22	17	1	4
Number of CWS with Detections > 100 ppb	0	0	0	0
Number of CWS with Annual Means > 100 ppb	0	0	0	0
Number of CWS with Period Means > 100 ppb	0	0	0	0
Percent of CWS with No Detections[2]	96.17	96.97	83.33	50.00
Percent of CWS with Detections	3.83	3.03	16.67	50.00
Percent of CWS with Detections > 100 ppb	0	0	0	0
Percent of CWS with Annual Means > 100 ppb	0	0	0	0
Percent of CWS with Period Means > 100 ppb	0	0	0	0
<u>Populations</u>				
Nebraska Population	1,711,263			
Population on CWS	1,395,640	863,515	11,888	520,237
Population Served by CWS with Data	1,385,379	853,254	11,888	520,237
Percent State Population Assessed	80.96	49.86	0.69	30.40
Percent CWS Population Assessed	99.26	98.81	100	100
Population with No Detections[2]	732,311	716,086	5,028	11,197
Population with Detections	653,068	137,168	6,860	509,040
Population with Detections > 100 ppb	0	0	0	0
Populations with Annual Means > 100 ppb	0	0	0	0
Populations with Period Means > 100 ppb	0	0	0	0
Percent of population with No Detections	52.86	83.92	42.29	2.15
Percent of population with Detections	47.14	16.08	57.71	97.85
Percent of population with Detections > 100 ppb	0	0	0	0
Percent of population with Annual Means > 100 ppb	0	0	0	0
Percent of population with Period Means > 100 ppb	0	0	0	0

[1] Simple substitution method

[2] Percent CWS and populations with or without detects are based on the number of assessed CWS and populations, respectively.

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TABLE 34

NEBRASKA METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]
Surface Water				
Surface Water > 100.0 ppb	0	0		
Surface Water > 10.0 to ≤ 100.0	0	0		
Surface Water > 1.0 to ≤ 10.0	0	0		
Surface Water > 0.25 to ≤ 1.0	0	0		
Surface Water > 0.125 to ≤ 0.25	1	6,860	0.16	100.0
Surface Water ≤ 0.125	5	5,028	0.05	42.3
Groundwater				
Groundwater > 100.0 ppb	0	0		
Groundwater > 10.0 to ≤ 100.0	0	0		
Groundwater > 1.0 to ≤ 10.0	0	0		
Groundwater > 0.25 to ≤ 1.0	1	24,889	0.78	100.0
Groundwater > 0.125 to ≤ 0.25	3	1,582	0.19	97.1
Groundwater ≤ 0.125	557	826,783	0.05	96.9
Other				
Other > 100.0 ppb	0	0		
Other > 10.0 to ≤ 100.0	0	0		
Other > 1.0 to ≤ 10.0	0	0		
Other > 0.25 to ≤ 1.0	0	0		
Other > 0.125 to ≤ 0.25	0	0		
Other ≤ 0.125	8	520,237	0.05	100.0

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	6	11,888
Groundwater CWS	561	853,254
Other CWS	8	520,237
Subtotal	575	1,385,379
CWS Not in PLEX:[4]		
Surface Water CWS	0	0
Groundwater CWS	42	10,261
Other CWS	0	0
Subtotal	42	10,261
Total CWS and Population on CWS	617	1,395,640
Nebraska Population (Census, 2000)		1,711,263
Population Not Served by CWS		315,623

[1] Metolachlor exposure distribution for 575 community water systems with data in Nebraska. This database is used to estimate population exposure and is dominated by nondetections, 98.3% of 2,593 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.

TABLE 39

PLEX DATA FOR METOLACHLOR IN OHIO
JANUARY 1993 - DECEMBER 2000

	Totals	Groundwater	Surface Water	Other
Data				
Number of Samples	5,986	3,531	2,351	104
Number of Detections	502	1	485	16
Percent of Detections	8.39	0.03	20.63	15.38
Number of Detections > 100 ppb	0	0	0	0
Percent of Detections > 100 ppb	0	0	0	0
Percent of Samples > 100 ppb	0	0	0	0
Concentrations (ppb)				
Minimum Detected Concentration	0.23	4.60	0.23	0.32
Maximum Detected Concentration	17.07	4.60	17.07	12.57
Population-Weighted Exposure Concentrations[1]	1.70	1.70	1.70	1.49
CWS				
Number of CWS	1,410	1,105	285	20
Number of CWS with Data	1,376	1,086	270	20
Percent CWS with Data	97.59	98.28	94.74	100
Number of CWS with No Detections	1,304	1,079	206	19
Number of CWS with Detections	72	7	64	1
Number of CWS with Detections > 100 ppb	0	0	0	0
Number of CWS with Annual Means > 100 ppb	0	0	0	0
Number of CWS with Period Means > 100 ppb	0	0	0	0
Percent of CWS with No Detections[2]	95.54	100	76.71	95.00
Percent of CWS with Detections	4.46	0	23.29	5.00
Percent of CWS with Detections > 100 ppb	0	0	0	0
Percent of CWS with Annual Means > 100 ppb	0	0	0	0
Percent of CWS with Period Means > 100 ppb	0	0	0	0
Populations				
Ohio Population	11,353,140			
Population on CWS	9,852,953	3,723,701	6,070,556	58,696
Population Served by CWS with Data	9,832,943	3,715,994	6,058,253	58,696
Percent State Population Assessed	86.61	32.73	53.36	0.52
Percent CWS Population Assessed	99.80	99.79	99.80	100
Population with No Detections[2]	7,904,898	3,391,838	4,455,304	57,756
Population with Detections	1,928,045	324,156	1,602,949	940
Population with Detections > 100 ppb	0	0	0	0
Populations with Annual Means > 100 ppb	0	0	0	0
Populations with Period Means > 100 ppb	0	0	0	0
Percent of population with No Detections	80.39	91.28	73.54	98.40
Percent of population with Detections	19.61	8.72	26.46	1.60
Percent of population with Detections > 100 ppb	0	0	0	0
Percent of population with Annual Means > 100 ppb	0	0	0	0
Percent of population with Period Means > 100 ppb	0	0	0	0

[1] Simple substitution method

[2] Percent CWS and populations with or without detects are based on the number of assessed CWS and populations, respectively.

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TABLE 40

OHIO METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]
Surface Water				
Surface Water > 100.0 ppb	0	0		
Surface Water > 10.0 to ≤ 100.0	0	0		
Surface Water > 1.0 to ≤ 10.0	194	4,796,706	1.96	100.0
Surface Water > 0.25 to ≤ 1.0	62	1,200,892	0.77	20.8
Surface Water > 0.125 to ≤ 0.25	3	9,590	0.17	1.0
Surface Water ≤ 0.125	11	51,065	0.09	0.8
Groundwater				
Groundwater > 100.0 ppb	0	0		
Groundwater > 10.0 to ≤ 100.0	0	0		
Groundwater > 1.0 to ≤ 10.0	711	2,760,002	2.06	100.0
Groundwater > 0.25 to ≤ 1.0	311	699,358	0.87	25.7
Groundwater > 0.125 to ≤ 0.25	53	121,139	0.15	6.9
Groundwater ≤ 0.125	11	135,495	0.12	3.6
Other				
Other > 100.0 ppb	0	0		
Other > 10.0 to ≤ 100.0	0	0		
Other > 1.0 to ≤ 10.0	13	44,355	1.83	100.0
Other > 0.25 to ≤ 1.0	5	4,996	0.98	24.4
Other > 0.125 to ≤ 0.25	2	9,345	0.15	15.9
Other ≤ 0.125	0	0		

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	270	6,058,253
Groundwater CWS	1,086	3,715,994
Other CWS	20	58,696
Subtotal	1,376	9,832,943
CWS Not in PLEX:[4]		
Surface Water CWS	15	12,303
Groundwater CWS	19	7,707
Other CWS	0	0
Subtotal	34	20,010
Total CWS and Population on CWS	1,410	9,852,953
Ohio Population (Census, 2000)		11,353,140
Population Not Served by CWS		1,500,187

[1] Metolachlor exposure distribution for 1,376 community water systems with data in Ohio. This database is used to estimate population exposure and is dominated by nondetections, 91.6% of 5,986 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.

TABLE 53

PLEX DATA FOR METOLACHLOR IN WISCONSIN
JANUARY 1993 - DECEMBER 2000

	Totals	Groundwater	Surface Water	Other
Data				
Number of Samples	2,019	1,920	68	31
Number of Detections	16	16	0	0
Percent of Detections	0.79	0.83	0	0
Number of Detections > 100 ppb	0	0	0	0
Percent of Detections > 100 ppb	0	0	0	0
Percent of Samples > 100 ppb	0	0	0	0
Concentrations (ppb)				
Minimum Detected Concentration	0.10	0.10	–	–
Maximum Detected Concentration	0.90	0.90	–	–
Population-Weighted Exposure Concentrations[1]	0.05	0.05	0.05	0.05
CWS				
Number of CWS	1,128	1,080	40	8
Number of CWS with Data	820	775	39	6
Percent CWS with Data	72.70	71.76	97.50	75.00
Number of CWS with No Detections	810	765	39	6
Number of CWS with Detections	10	10	0	0
Number of CWS with Detections > 100 ppb	0	0	0	0
Number of CWS with Annual Means > 100 ppb	0	0	0	0
Number of CWS with Period Means > 100 ppb	0	0	0	0
Percent of CWS with No Detections[2]	98.78	98.71	100	100
Percent of CWS with Detections	1.22	1.29	0	0
Percent of CWS with Detections > 100 ppb	0	0	0	0
Percent of CWS with Annual Means > 100 ppb	0	0	0	0
Percent of CWS with Period Means > 100 ppb	0	0	0	0
Populations				
Wisconsin Population	5,363,675			
Population on CWS	3,657,840	1,966,832	1,503,806	187,202
Population Served by CWS with Data	3,301,575	1,621,349	1,503,694	176,532
Percent State Population Assessed	61.55	30.23	28.03	3.29
Percent CWS Population Assessed	90.26	82.43	99.99	94.30
Population with No Detections[2]	3,284,320	1,604,094	1,503,694	176,532
Population with Detections	17,255	17,255	0	0
Population with Detections > 100 ppb	0	0	0	0
Populations with Annual Means > 100 ppb	0	0	0	0
Populations with Period Means > 100 ppb	0	0	0	0
Percent of population with No Detections	99.48	98.94	100	100
Percent of population with Detections	0.52	1.06	0	0
Percent of population with Detections > 100 ppb	0	0	0	0
Percent of population with Annual Means > 100 ppb	0	0	0	0
Percent of population with Period Means > 100 ppb	0	0	0	0

Dashed lines signify "Not Applicable"

[1] Simple substitution method

[2] Percent CWS and populations with or without detects are based on the number of assessed CWS and populations, respectively.

TABLE 54

WISCONSIN METOLACHLOR EXPOSURE CONCENTRATIONS AND POPULATIONS[1]

Group	Number in Group	Population Served	Average Concentration[2] (ppb)	Cumulative Percent of Population[3]
Surface Water				
Surface Water > 100.0 ppb	0	0		
Surface Water > 10.0 to ≤ 100.0	0	0		
Surface Water > 1.0 to ≤ 10.0	0	0		
Surface Water > 0.25 to ≤ 1.0	0	0		
Surface Water > 0.125 to ≤ 0.25	0	0		
Surface Water ≤ 0.125	39	1,503,694	0.05	100.0
Groundwater				
Groundwater > 100.0 ppb	0	0		
Groundwater > 10.0 to ≤ 100.0	0	0		
Groundwater > 1.0 to ≤ 10.0	0	0		
Groundwater > 0.25 to ≤ 1.0	1	2,844	0.34	100.0
Groundwater > 0.125 to ≤ 0.25	2	1,275	0.14	99.8
Groundwater ≤ 0.125	772	1,617,230	0.05	99.7
Other				
Other > 100.0 ppb	0	0		
Other > 10.0 to ≤ 100.0	0	0		
Other > 1.0 to ≤ 10.0	0	0		
Other > 0.25 to ≤ 1.0	0	0		
Other > 0.125 to ≤ 0.25	0	0		
Other ≤ 0.125	6	176,532	0.05	100.0

Group	Number in Group	Population Served
Summary		
CWS in PLEX:		
Surface Water CWS	39	1,503,694
Groundwater CWS	775	1,621,349
Other CWS	6	176,532
Subtotal	820	3,301,575
CWS Not in PLEX:[4]		
Surface Water CWS	1	112
Groundwater CWS	305	345,483
Other CWS	2	10,670
Subtotal	308	356,265
Total CWS and Population on CWS	1,128	3,657,840
Wisconsin Population (Census, 2000)		5,363,675
Population Not Served by CWS		1,705,835

[1] Metolachlor exposure distribution for 820 community water systems with data in Wisconsin. This database is used to estimate population exposure and is dominated by nondetections, 99.2% of 2,019 samples were nondetections.

[2] Period Means: the population-weighted average of the concentrations for each group of water supplies.

[3] Cumulative percent is calculated as the sum of the population in that concentration range and below divided by the total population served by that source type (Surface Water, Groundwater, Other).

[4] CWS Not in PLEX: CWS for which no data were provided by the state and no usable data were found in the literature.