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PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

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Preliminary Drinking Water Assessment

SUBJECT: Tier I Estimated Environmental Concentrations of Cloquintocet mexyl (Chemical: 700099)

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This memo presents Tier I Estimated Environmental Concentrations (EECs) for Cloquintocet mexyl in surface and ground water for use in the human health risk assessment. Surface and ground water EECs were estimated using the GENEEC and SCI-GROW models, respectively.

Cloquintocet mexyl (Safener):

Cloquintocet mexyl (also known as CGA - 185072) is a safening agent that protects wheat against the phytotoxic effects of the herbicide clodinafop propargyl. Other chemical names are: IUPAC: 2–heptyl-5-chloro-8-quinolynoxy- acetate **and** 5-chloro-8-quinolonoxyacetate acid-1-methyl-hexylester. The safener is incorporated in the formulation and is included as part of the "inerts" (77.7%). When a label application of 4 fluid ounces of Horizon herbicide per acre is applied, 0.0157 lbs./ac of safener is also applied, and when 3.2 fluid ounces, per acre, of herbicide is applied, 0.0125 lbs./ac. of safener is applied. Therefore, the c.mexyl (safener) application rates range from 0.0125 to 0.0157 lbs./ac.

Background on EFED Drinking Water Models:

The GENEEC (GENeric Estimated Environmental Concentration) screening model (version 1.2, dated 05/03/1995) is used to estimate pesticide concentrations in surface water for up to 56 days after one runoff event. It also provides an upper-bound concentration value. GENEEC is a single runoff event model, but accounts for spray drift from single or multiple applications. GENEEC represents a 10-hectare field immediately adjacent to a 1-hectare pond that is 2-meter deep with no outlet.

The pond receives a pesticide load from spray drift for each application plus loading from a single runoff event, in this case, two days after the last application. The runoff event transports 10% of the pesticide remaining in the top 2.5-cm of soil. This amount can be reduced with increasing adsorption to soil. The amount of pesticide remaining on the field in the top 2.5-cm of soil depends on the application rate, the number of applications, the interval between applications, the incorporation depth, and the degradation rate in the soil. Assumed spray drift is determined by the method of application (5% drift for aerial spray and airblast, 1% for ground spray, and 0% for soil incorporation).

The SCI-GROW (Screening Concentration in Ground Water) screening model (version 1.0, dated 11/12/1997) developed in EFED is a regression model based upon actual groundwater monitoring data collected for the registration of a number of pesticides. The current version of SCI-GROW appears to provide realistic estimates of pesticide concentrations in shallow, highly vulnerable ground water sites (i.e., sites with sandy soils and depth to ground water of 10 to 20 feet).

Cloquintocet Mexyl - Environmental Fate Summary

The mobility of cloquintocet mexyl (as measured by its binding to soils) varies from low in a moderate organic soil to essentially immobile in a high organic soil. Most of the soils in major wheat growing areas have organic matters lower than the experimental foreign soils used in the adsorption/desorption study. However, based upon the available data, it is likely that cloquintocet mexyl would exhibit low mobility even in soils with lower organic matter than the experimental foreign soils. The persistence of cloquintocet mexyl in soil is also very low. Therefore, based upon the its low persistence and low mobility, the leaching potential of cloquintocet mexyl should be negligible. As previously discussed, the rapid degradation of most of the cloquintocet mexyl in surface soil indicates that significant fractions of any cloquintocet mexyl reaching the soil may only be available for runoff for several hours to several days post-application or post-washoff. However, runoff events occurring shortly after application or during washoff could transport significant quantities of cloquintocet mexyl to surface water via adsorption to eroding soil. High soil/water partitioning such as that exhibited by cloquintocet mexyl does not preclude substantial runoff transport to surface water via adsorption to eroding soil. However, because runoff water masses are generally much greater than eroding soil masses, the mass of pesticide transported to surface water generally decreases with increasing soil/water partitioning. Therefore, the overall runoff potential of cloquintocet mexyl should be relatively low in most cases.

The results of the aerobic aquatic metabolism studies indicate that cloquintocet mexyl will rapidly degrade in aerobic ground and surface waters that have adequate microbial activity. The results of the direct photolysis (DT50 of several hours) indicate that cloquintocet mexyl is also susceptible to rapid rates of direct photolysis in clear shallow water. However, based on the results of the abiotic hydrolysis study (half-lives of 4.4 yr. at pH 5, 134 days at pH 7 and 6.6 days at pH 9), it may be substantially more persistent in aerobic waters with low microbial activity. Data are not currently available to assess its persistence in anaerobic waters.

Please see the attachment for a detailed Environmental Fate Assessment.

The cloquintocet mexyl inputs to SCI-GROW (version 1.0) and GENEEC (version 1.2) and the resulting estimated screening concentrations for ground and surface water are as follows:

Cloquintocet Mexyl	**SCI-GROW Run 1**	**GEN-EEC Run 1**	**GEN-EEC Run 2**	**GEN-EEC Run 3**	**GEN-EEC Run 4**	**GEN-EEC Run 5**	**GEN-EEC Run 6**
Apprate	0.00140[1]	0.0157[2]	0.0157[2]	0.0157[2]	0.0157[2]	0.0157[2]	0.0157[2]
Apptype	NA	Aerial	Ground	Aerial	Ground	Aerial	Ground
Incorp.	NA	NA	0.0	NA	0.0	NA	0.0
Soil t1/2	213 d[3]	2.75 d[4]	2.75 d[4]	2.75 d[4]	2.75 d[4]	2.75 d[4]	2.75 d[4]
Koc(L/kg	13700[5]	13700[5]	13700[5]	13700[5]	13700[5]	13700[5]	13700[5]
Aq. t1/2	NA	0.50 d[6]	0.50 d[6]	3.32 d[7]	3.32 d[7]	-[8]	-[8]
Hyd. t1/2	NA	-[9]	-[9]	-[9]	-[9]	134 d[8]	134 d[8]
Pho t1/2	NA	0.31 d[10]	0.31 d[10]	0.31 d[10]	0.31 d[10]	0.31 d[10]	0.31 d[10]
Sol(mg/L	NA	0.80[11]	0.80[11]	0.80[11]	0.80[11]	0.80[11]	0.80[11]
GW[12]	6.0	NA	NA	NA	NA	NA	NA
Peak[13]	NA	19.1	19.7	29.2	21.7	38.0	23.4
4-Day[13]	NA	6.01	6.12	18.8	12.9	29.8	17.4
21-day[13]	NA	1.15	1.17	4.47	3.06	10.8	6.42
56-Day[13]	NA	0.43	0.44	1.68	1.15	5.25	3.18

(1) Because the second phase half-life and duration for cloquintocet mexyl are much greater than the first phase half-life and duration, it was decided to develop inputs to SCI-GROW model ground water as follows:

(a) The first phase median half-life and duration of 2.01 days and 7 days, respectively were used to decrease the nominal application rate of 0.0157 lbs/ac to an effective application rate. A first phase median half-life of 2.01 days corresponds to a rate constant of 0.693/2.01 = 0.345 1/day. Using that rate constant, the ratio of the remaining concentration to the initial concentration after the 7 day duration of the first phase would be C/C_0 = exp [-(0.345)(7 days)] = 0.089. Therefore the effective application rate = (0.089)(nominal application rate) = (0.089)(0.0157) = 0.00140 lbs safener/ac.

(b) After an effective application rate was computed, it was used as input into SCI-GROW along with the second phase median half-life of 213 days.

(2) Nominal app. rate = (4 fl.oz prod/ac)(7.81 x 10^{-3} gal/fl.oz.)(8.96 lbs/gal)(0.056 lb safener/lb of product) = 0.0157 lbs safener/ac

(3) As previously indicated in footnote 1b, the second phase median half-life of 213 days was used as input to SCI-GROW along with the effective application rate of 1.58 x 10^{-3} lbs/ac.

(4) Because GENEEC assumes loading occurs 2 days after a single application and the first phase of degradation lasts for approximately 7 days, it was decided to base the soil t1/2 input to GENEEC on the first phase half-lives.

The average of the first phase half-lives of 3.63 d, 2.09 d, 2.01 d, 1.86 d, and 1.43 d = 2.20 ± 0.83. For n = 5, the one tail $t_{0.1}$ = 1.476. Therefore, soil input t1/2 = 2.20 + (1.476)(0.83/√5) = 2.75 days.
(5) Koc = median of 192000, 15300, 13700, 9460, and 6500 = 13700.
(6) For the first and second GENEEC runs, the aquatic t1/2 input was based on first phase aquatic metabolism half-lives. The average of the first phase half-lives of 0.46 days and 0.39 days = 0.43 ± 0.049. For n = 2, the one tail $t_{0.1}$ = 1.886. Therefore, the aquatic input t1/2 = 0.43 + (1.886)(0.049/√2) = 0.50 days.
(7) For the third and fourth GENEEC runs, the aquatic t1/2 input was based on overall aquatic metabolism half-lives. The average of the overall half-lives of 2.81 days and 1.08 days = 2.24 ± 0.81. For n = 2, the one tail $t_{0.1}$ = 1.886. Therefore, the aquatic input t1/2 = 2.24 + (1.886)(0.81/√2) = 3.32 days.
(8) To also simulate surface waters with low microbial activities, the abiotic hydrolysis half-life at pH 7 of 134 days was used in place of the aquatic t1/2 in GENEEC runs 5 and 6.
(9) Inputs based on initial phase or overall aquatic metabolism half-lives were used instead of the abiotic hydrolysis half-life at PH 7 for GENEEC runs 1 through 4.
(10) The direct photolysis half-life extrapolated to sunlight exposure was 7.4 hours = 0.31 days.
(11) The reported aqueous solubility of cloquintocet mexyl is 0.8 mg/L.
(12) The estimated ground water concentration is in units of ng/L to be consistent with the estimated surface water concentrations.
(13) The estimated surface water concentrations are all in units of ng/L.

CGA-153433

CGA-153433 rapidly formed during the first day post-application will be available for runoff and leaching for several months post-application. However, despite substantial persistence in soils, the leaching potential of CGA-153433 is probably low in most cases due to its low mobility. As previously discussed, the relatively slow dissipation of CGA-153433 in surface soil indicates that significant fractions of any CGA-153443 reaching or formed in the soil may be available for runoff for several months. In some cases, runoff events could transport significant quantities of CGA-153443 to surface water via adsorption to eroding soil. High soil/water partitioning such as that exhibited by CGA-153433 does not preclude substantial runoff transport to surface water via adsorption to eroding soil. However, because runoff water masses are generally much greater than eroding soil masses, the mass of pesticide transported to surface water generally decreases with increasing soil/water partitioning. Therefore, the overall runoff potential of CGA-153433 should be relatively low in most cases.

The half-lives for CGA-153433 in aerobic aquatic metabolism for the water/sediment system combined indicate that CGA-193469 may be relatively persistent in aerobic surface water/sediment systems. EFED calculated a half-life of 105 days (for 28-238 days; n = 5; r2 = 0.981; Figure 12) for CGA-153433 in anaerobic aquatic metabolism study 443874-48 for the water/sediment system as a whole. That indicates any CGA-153433 reaching the more anaerobic portions of deep water columns or typically anaerobic sediment may also be relatively persistent. The persistence of CGA-153433 in ground water may generally be somewhat longer than in surface water due to generally lower microbial activity in ground water.

The CGA-153433 inputs to SCI-GROW (version 1.0) and GENEEC (version 1.2) and the resulting estimated screening concentrations for ground and surface water are as follows:

CGA-153433	**SCI-GROW**	**GENEEC RUN 1**	**GENEEC RUN 2**	**GENEEC RUN 3**	**GENEEC RUN 4**
App. rate[1]	0.00284 lbs/a	0.00284 lbs/a	0.00284 lbs/a	0.00284 lbs/a	0.00284 lbs/a
App. type	NA	Aerial	Ground	Aerial	Ground
Incorp.	NA	NA	0.0	NA	0.0
Soil t1/2	119 d[2]	210 d[3]	210 d[3]	210 d[3]	210 d[3]
Koc (L/kg)	1570[4]	1570[4]	1570[4]	1570[4]	1570[4]
Aquatic t1/2	NA	17.6 d[5]	17.6 d[5]	129 d[6]	129 d[6]
Photo t1/2	NA	0.0	0.0	0.0	0.0
Sol. (mg/L)	0.8[7]	0.8[7]	0.8[7]	0.8[7]	0.8[7]
GW (ng/L)	0.166	NA	NA	NA	NA
Peak (ng/L)	NA	30.6	26.4	31.3	26.6
4-Day (ng/L)	NA	28.1	24.1	30.0	25.4
21Day(ng/L)	NA	17.6	15.1	23.8	20.2
56Day(ng/L)	NA	9.09	7.82	17.1	14.6

(1) CGA-153433 accounted for a maximum of 5.6%, 15.9%, 9.76%, 15.0%, 24.5%, and 37.9% of applied in the aerobic soil metabolism studies. The average is 18.1%. The assumed application rate for the CGA-153433 degradate was (0.181)(application rate of the safener) = (0.181)(0.0157) = 0.00284 lbs/ac.

(2) SCI-GROW soil t1/2 input = median of 363 d, 174 d, 135 d, 102 d, 99.9 d, and 98.3 d = (135 + 102)/2 = 119 days.

(3) GENEEC soil t1/2: Average of 363 d, 174 d, 135 d, 102 d, 99.9 d, and 98.3 d = 137 ± 125. For n = 6, one tail $t_{0.1} = 1.44$. Therefore, the soil t1/2 input is $137 + (1.44)(125/\sqrt{6}) = 210$ days

(4) Koc = median of 3 values = 1570 L/kg

(5) The aquatic t1/2 inputs for GENEEC runs 1 and 2 were based on initial phase aquatic metabolism half-lives. The average of the first phase half-lives of 9.64 days and 15.2 days = 12.4 ± 3.93. For n = 2, the one tail $t_{0.1} = 1.886$. Therefore, the aquatic input t1/2 = $12.4 + (1.886)(3.93/\sqrt{2}) = 17.6$ days.

(6) The aquatic t1/2 inputs for GENEEC runs 3 and 4 were based on overall aquatic metabolism half-lives. The average of the overall half-lives of 89.1 days and 117 days = 103 ± 19.7. For n = 2, the one tail $t_{0.1} = 1.886$. Therefore, the aquatic input t1/2 = $103 + (1.886)(19.7/\sqrt{2}) = 129$ days.

(7) The aqueous solubility of CGA-153433 was not reported, but should be greater than the reported aqueous solubility of cloquintocet mexyl of 0.8 mg/L. Because the GENEEC estimated concentrations of CGA-153433 are well below 0.8 mg/L, the use of the 0.8 mg/L solubility value for cloquintocet mexyl as a default value for the CGA-153433 solubility value did not affect the results.

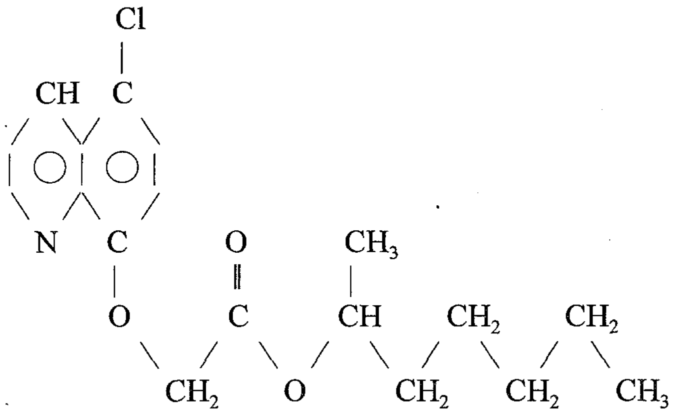
ATTACHMENT TO THE

CLOQUINTOCET MEXYL DRINKING WATER ASSESSMENT MEMORANDUM

Environmental Fate of Cloquintocet Mexyl and its Major Degradate

Cloquintocet Mexyl

Cloquintocet mexyl is a safener that is applied along with the herbicide clodinafop propargyl to mitigate the herbicide's toxicity to wheat. Its chemical structure is as follows:



During application, some of the applied cloquintocet mexyl will drift off-target, some will be intercepted by the targeted plants, and some will reach the soil of the targeted field.

The cloquintocet mexyl that drifts offsite may contaminate nearby surface water, terrestrial habitats, or other agricultural fields. Such drift would generally be expected to be far greater (with respect to the % of applied drifting offsite and distance drifted) for aerial than ground applications. In general, drift increases with increasing application height, increasing wind speed, and decreasing droplet size distribution.

During application, the % of onsite cloquintocet mexyl that is intercepted by foliage will depend in part on the extent of canopy coverage, which depends upon the leaf/plant structure, the maturity of the plant, and the planting density. The foliar dissipation half-lives of pesticides tend to be substantially shorter than those in soil or at worst, somewhat comparable to those in soil. That suggests that the foliar half-lives of cloquintocet mexyl may be substantially less than and probably no worse than comparable to the for cloquintocet mexyl in several aerobic soil metabolism studies. Although the decline of cloquintocet mexyl in aerobic soil metabolism studies appears to fit a biphasic regression model better than a monophasic regression model, much of the decline of cloquintocet mexyl occurs during the first week where decline rates correspond to half-lives of 1.43 to 3.63 days. Processes such as volatilization, photolysis, and/or hydrolysis often contribute significantly to the overall foliar dissipation rate of pesticides in general.

However, the registrant reported negligible volatilization of cloquintocet mexyl from wheat plants over a 24 hour laboratory study. Also, abiotic hydrolysis (half-lives of 4.4 yr at pH 5, 134 days at pH 7, and 6.6 days at pH 9) is unlikely to contribute significantly to the foliar dissipation of cloquintocet mexyl. Nevertheless, initial half-lives of < 1 day to 3.63 days during the first week of the aerobic soil and aquatic metabolism studies indicate that microbial mediated hydrolysis could possibly contribute significantly to its foliar dissipation. In addition, a DT50 of several hours in the aqueous photolysis study indicates that photolysis may also play a major role in the foliar dissipation of c. mexyl.

The % of onsite cloquintocet mexyl reaching the soil during application will obviously be equal to (100% - the % intercepted by the foliage). Therefore, the same factors affecting the % intercepted will affect the % reaching the soil during application. In addition, some of the cloquintocet mexyl intercepted by foliage could later reach the soil during washoff by rain. However, washoff should be limited by the strong adsorption of cloquintocet mexyl to high organic matrices as evidenced by Freundlich binding constants of 642 and 1860 reported for its adsorption to high organic soils containing organic matters of 7.2% and 33.8%, respectively. Also, a reported log K_{ow} of 5.3 also indicates that cloquintocet mexyl tends to exhibit high organic phase to water partitioning. Finally, if its foliar dissipation rate is rapid as suggested by its rapid dissipation rate in soil, significant fractions of the cloquintocet mexyl intercepted by plants may only be available for washoff for several hours to days post-application.

Data on the decline of cloquintocet mexyl in aerobic soil metabolism studies fit a biphasic pseudo first order or a non-first order regression model better than a single phase first order regression model (Figures 1, 4, 5, 8, and 9). EFED calculated initial and second phase half-lives for various aerobic soil metabolism studies as follows:

<u>(1) Study 443874-45 (German Neuhofen Sandy Loam; Figure 1)</u>
(a) initial phase t1/2 = 3.63 d (for 0-14 d; n = 3; r2 = 0.902)
(b) second phase t1/2 = 193 d (for 14-336 d; n = 7; r2 = 0.691)
<u>(2) Study 443874-46 (Swiss Stein Sandy Loam; 1 ppm nominal initial concentration; Figure 4)</u>
(a) initial phase t1/2 = 2.09 d (for 0-14 d; n = 3; r2 = 0.947)
(b) second phase t1/2 = 29.9 d (for 14-56 d; n = 3; r2 = 0.897)
<u>(3) Study 443874-46 (Swiss Stein Sandy Loam; 10 ppm nominal initial concentration; Figure 5)</u>
(a) initial phase t1/2 = 1.43 d (for 0-7 d; n = 2)
(b) second phase t1/2 = 27.6 d (for 7-84 d; n = 5; r2 = 0.931)
<u>(4) Study 443874-47 (Collombey Sand Soil; Figure 8)</u>
(a) initial phase t1/2 = 1.86 d (for 0-7 d; n = 3; r2 = 0.974)
(b) second phase t1/2 = 385 d (for 7-350 d; n = 7; r2 = 0.190).
<u>(5) Study 443874-47 (Les Evouettes Loam Soil; Figure 9)</u>
(a) initial phase t1/2 = 2.01 d (for 0-7 d; n = 3; r2 = 0.927)
(b) second phase t1/2 = 213 d (for 7-350 d; n = 7; r2 = 0.807)

Although the second phase half-lives of cloquintocet mexyl in aerobic soil metabolism studies are much longer than the initial phase half-lives and range from 27.6 to 385 days, most of the cloquintocet mexyl reaching the surface soil during application and subsequent washoff is predicted to undergo rapid degradation under aerobic conditions. The reason is that the initial half-lives of 1.43 to 3.63 days are much shorter than the 1 to 2 week durations of the first phase. Therefore, by the time the second slower phase is reached, much of the cloquintocet mexyl has already degraded.

Although incorporation into non-extractable fractions may have contributed to the DT50s of cloquintocet mexyl, the relative stability of the chemical in sterilized soils suggests that degradation was the major contributor to the low DT50s. Therefore, significant fractions of any cloquintocet mexyl reaching the soil may only be available for runoff or leaching for several hours post-application or post-washoff. Of course, any cloquintocet mexyl washing off could be immediately available for leaching or runoff. However, as discussed below, its rapid degradation in soil coupled with in high soil/water partitioning should greatly limit its leaching as well as runoff potential.

The reported Freundlich adsorption binding constants for cloquintocet mexyl vary substantially depending to a substantial extent on the organic content of the soil. However, they indicate that cloquintocet mexyl exhibits high soil/water partitioning even in soils with moderate organic matter. Freundlich binding constants (and exponents in parentheses) were 62.6 (0.809), 135 (0.918), 190 (0.854), 642 (0.885), and 1860 (0.973) for a Switzerland Collombey loamy sand (pH 7.2, om 1.66%), a Florida Lakeland sand (pH 6.7, om 1.21%), a Switzerland Les Evouettes silty loam (pH 6.5, om 2.4%), a Switzerland Vetroz silty loam (pH 7.1, om 7.24%), and a Switzerland Illarsaz organic soil (pH 6.2, om 33.8%), respectively.

As shown in the previous paragraph, the mobility of cloquintocet mexyl (as measured by its binding to soils) varies from low in a moderate organic soil to essentially immobile in a high organic soil. Most of the soils in major wheat growing areas have organic matters lower than the experimental foreign soils used in the adsorption/desorption study. However, based upon the available data, it is likely that cloquintocet mexyl would exhibit low mobility even in soils with lower organic matter than the experimental foreign soils. Therefore, based upon the its low persistence and low mobility, the leaching potential of cloquintocet mexyl should be negligible.

As previously discussed, the rapid degradation of most of the cloquntocet mexyl in surface soil indicates that significant fractions of any cloquintocet mexyl reaching the soil may only be available for runoff for several hours to several days post-application or post-washoff. However, runoff events occurring shortly after application or during washoff could transport significant quantities of cloquintocet mexyl to surface water via adsorption to eroding soil. High soil/water partitioning such as that exhibited by cloquintocet mexyl does not preclude substantial runoff transport to surface water via adsorption to eroding soil. However, because runoff water masses are generally much greater than eroding soil masses, the mass of pesticide transported to surface water generally decreases with increasing soil/water partitioning. Therefore, the overall runoff potential of cloquintocet mexyl should be relatively low in most cases.

Data on the decline of cloquintocet mexyl in aerobic aquatic metabolism studies also fit a biphasic pseudo first order or a non-first order regression model better than a single phase first order regression model (Figures 13and 15). EFED calculated initial and second phase half-lives for cloqintocet mexyl in two aerobic aquatic metabolism studies as follows:

(1) Study 443874-48 (Swiss Pond Water/Sediment; Figure 13)
(a) initial phase t1/2 = 0.46 d (for 0-2 d; n = 3; r2 = 0.997)
(b) second phase t1/2 = 3.67 d (for 2-28 d; n = 5; r2 = 0.992)
(c) overall t1/2 = 2.81 d for 0-28 d; n = 5; r2 = 0.853)
(2) Study 443874-49 (Rhine River Water/Sediment; Figure 15)
(a) initial phase t1/2 = 0.39 d (for 0-2 d; n = 3; r2 = 0.996)
(b) second phase t1/2 = 11.6 d (for 2-7 d; n = 3; r2 = 0.453)
(c) overall t1/2 = 1.67 d (for 0-7 d; n = 5; r2 = 0.501)

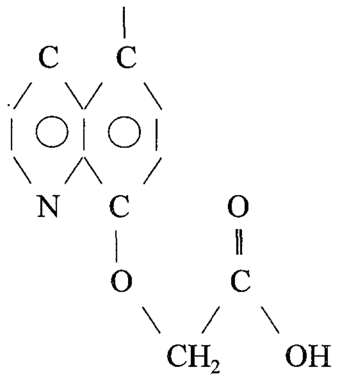
Although the second phase half-lives of cloquintocet mexyl in aerobic aquatic metabolism studies (3.67 and 11.6 days) are longer than the initial phase half-lives (0.46 and 0.39 days), most of the cloquintocet mexyl reaching the surface water application and subsequent runoff is predicted to undergo rapid degradation under aerobic conditions. The reason is that the initial half-lives of 0.46 to 0.39 days are much shorter than the 2 day durations of the first phase. Therefore, by the time the second slower phase is reached, much of the cloquintocet mexyl has already degraded.

The results of the aerobic aquatic metabolism studies indicate that cloquintocet mexyl will rapidly degrade in aerobic ground and surface waters that have adequate microbial activity. The results of the direct photolysis (DT50 of several hours) indicate that cloquintocet mexyl is also susceptible to rapid rates of direct photolysis in clear shallow water. However, based on the results of the abiotic hydrolysis study (half-lives of 4.4 yr. at pH 5, 134 days at pH 7 and 6.6 days at pH 9), it may be substantially more persistent in aerobic waters with low microbial activity. Data are not currently available to assess its persistence in anaerobic waters.

Based upon the previous discussion on the adsorption of cloquintocet mexyl to soil, the ratios of cloquintocet mexyl concentrations in surface sediment to those in the near sediment water column may vary from < 100 to > 1000 increasing with the organic content of the sediment.

CGA-153433

The only major degradate reported in any of the fate studies on cloquintocet mexyl was CGA-153433 which is formed from the hydrolytic cleavage of the ester linkage in cloquintocet mexyl.
The chemical structure of CGA-153433 is as follows:



In aerobic surface soil, substantial quantities of CGA-153433 are rapidly formed from the hydrolysis of cloquintocet mexyl. For example, in aerobic soil metabolism studies 47 and 46, CGA-153433 reached maximums of 37.9% of applied at day 0.5, 24.5% at day 0.5, 15% at day 7, and 9.8% just after application.

In contrast to cloquintocet mexyl, data on the decline of CGA-153433 in some of the aerobic soil metabolism studies fit a single phase first order regression model reasonably well (Figures 2, 3, 6, and 7). EFED calculated overall half-lives for CGA-153433 in those aerobic soil metabolism studies as follows:

<u>(1) Study 443874-45 (German Neuhofen Sandy Loam; Figure 2)</u>
overall t1/2 = 363 d (for 14-336 d; n = 7; r2 = 0.883)
<u>(2) Study 443874-45 (Swiss Mosimannacker Sandy Loam; Figure 3)</u>
overall t1/2 = 99.9 d (for 7-336 d; n = 8; r2 = 0.996

(3) Study 443874-46 (Swiss Stein Sandy Loam; 1 ppm nominal initial concentration; Figure 6)
overall t1/2 = 136 d (for 7-329 d; n = 8; r2 = 0.988)
(4) Study 443874-46 (Swiss Stein Sandy Loam; 10 ppm nominal initial concentration; Figure 7)
overall t1/2 = 174 d (for 0-329 d; n = 9; r2 = 0.965)

However, in two of the aerobic soil metabolism studies, data on the decline of CGA-153433 in aerobic aquatic metabolism studies did fit a biphasic pseudo first order or a non-first order regression model better than a single phase first order regression model (Figures 10 and 11). EFED calculated initial phase, second phase and overall half-lives for CGA-153433 in two aerobic soil metabolism studies as follows:

(1) Study 443874-47 (Collombey Sandy Soil; Figure 10)
(a) initial phase t1/2 = 29.4 d (for 0.5-56 d; n = 5; r2 = 0.910)
(b) second phase t1/2 = 152 d (for 56-350 d; n = 4; r2 = 0.936)
(c) overall t1/2 = 98.3 d for 0.5-350 d; n = 4; r2 = 0.936)
(2) Study 443874-47 (Les Evouettes Loam Soil; Figure 11)
(a) initial phase t1/2 = 19.4 d (for 0.5-56 d; n = 5; r2 = 0.785)
(b) second phase t1/2 = 271 d (for 56-350 d; n = 4; r2 = 0.918)
(c) overall t1/2 = 102 d (for 0.5-350 d; n = 8; r2 = 0.581)

The results of the aerobic soil metabolism studies indicate that substantial quantities of the CGA-153433 rapidly formed during the first day post-application will be available for runoff and leaching for several months post-application.

CGA-153433 appears to be relatively immobile even in soils with low to moderate organic contents. The experimental soils in adsorption/desorption study 888888-03 were a Switzerland Collombey loamy sand (pH 7.2, om 1.66%), a Switzerland Les Evouettes silty loam (pH 6.5, om 2.40%), and a Switzerland Vetroz silty loam (pH 7.1, om 7.24%). The Freundlich adsorption binding constants and exponents (in parentheses) for CGA-153433 on those 3 experimental soils were respectively, 55.4 (0.80), 21.8 (0.76), and 24.9 (0.73).

The results of the soil column leaching studies 443874-51 and 52 also indicate that CGA-153433 has low mobility. Mobility was tested on 2-4 of the following experimental soils: a Switzerland Collombey loamy sand (pH 7.2, om 1.66%), a Florida Lakeland sand (pH 6.7, om 1.21%), a Switzerland Les Evouettes silty loam (pH 6.5, om 2.40%), and a Switzerland Vetroz silty loam (pH 7.1, om 7.24%). In study MRID 443874-51, there was no aging period and all four soils were eluted with 200 mm of water (which is less than 50% of the EPA recommended elution volume of 500 mm). In study MRID 443874-52, there was a 28 day aging period, only 2 of the soils were studied (the Collombey loamy sand and the Les Evouettes silty loam), and the soils were eluted with 500 mm of water. The major degradate of the cloquintocet mexyl safener is CGA-153433. The column distribution profile and the leachate analysis indicated immobility for both the safener and the metabolite. The leachate contained only 0.01 to 0.07% of the total radioactivity using from 200 to 500 ml of water to eluate the columns. Despite substantial persistence in soils, the leaching potential of CGA-153433 is probably low in most cases due to its low mobility.

As previously discussed, the relatively slow dissipation of CGA-153433 in surface soil indicates that significant fractions of any CGA-153443 reaching or formed in the soil may be available for runoff for several months. In some cases, runoff events could transport significant quantities of CGA-153443 to surface water via adsorption to eroding soil. High soil/water partitioning such as that exhibited by CGA-153433 does not preclude substantial runoff transport to surface water via adsorption to eroding soil. However, because runoff water masses are generally much greater than eroding soil masses, the mass of pesticide transported to surface water generally decreases with increasing soil/water partitioning. Therefore, the overall runoff potential of CGA-153433 should be relatively low in most cases.

Data on the decline of CGA-153433 in aerobic aquatic metabolism studies fit both a biphasic pseudo first order and a single phase first order regression model reasonably well (Figures 14 and 16). EFED calculated initial phase, second phase, and overall half-lives for CGA-153433 in two aerobic aquatic metabolism studies as follows:

<u>(1) Study 443874-48 (Swiss Pond Water/Sediment; Figure 14)</u>
(a) initial phase t1/2 = 9.64 d (for 1-7 d; n = 4; r2 = 0.902)
(b) second phase t1/2 = 99.9 d (for 7-280 d; n = 6; r2 = 0.983)
(c) overall t1/2 = 89.1 d for 1-280 d; n = 10; r2 = 0.941)
<u>(2) Study 443874-49 (Rhine River Water/Sediment; Figure 16)</u>
(a) initial phase t1/2 = 15.2 d (for 2-7 d; n = 3; r2 = 0.980)
(b) second phase t1/2 = 117 d (for 7-125 d; n = 6; r2 = 0.939)
(c) overall t1/2 = 103 d (for 2-125 d; n = 8; r2 = 0.922)

The half-lives for CGA-153433 in aerobic aquatic metabolism for the water/sediment system combined indicate that CGA-193469 may be relatively persistent in aerobic surface water/sediment systems. EFED calculated a half-life of 105 days (for 28-238 days; n = 5; r2 = 0.981; Figure 12) for CGA-153433 in anaerobic aquatic metabolism study 443874-48 for the water/sediment system as a whole. That indicates any CGA-153433 reaching the more anaerobic portions of deep water columns or typically anaerobic sediment may also be relatively persistent. The persistence of CGA-153433 in ground water may generally be somewhat longer than in surface water due to generally lower microbial activity in ground water.