US EPA ARCHIVE DOCUMENT

10-15-93

DATA EVALUATION RECORD

STUDY 2

CHEM 118202 Hexaflumuron §162-1, -2

FORMULATION--00--ACTIVE INGREDIENT

STUDY ID 42695901
Racke, K.D. 1993a. Aerobic and anaerobic soil metabolism of hexaflumuron. Laboratory Study ID: GH-C 2970. Unpublished study performed by Huntingdon Research Centre Ltd., Huntingdon, United Kingdom, and DowElanco Europe, Oxon, United Kingdom; and submitted by DowElanco, Indianapolis, IN.

DIRECT REVIEW TIME = 88

REVIEWED BY: R. Morris TITLE: Staff Scientist

EDITED BY: W. Martin TITLE: Asst. Task Leader
K. Ferguson Task Leader

APPROVED BY: W. Spangler TITLE: Project Manager

ORG: Dynamac Corporation
Rockville, MD
TEL: 301-417-9800

APPROVED BY: S. Syslo
TITLE: Environmental Scientist
ORG: EFGWB/EFED/OPP
TEL: 703-305-6355

SIGNATURE: Stephanie Syslo 10/15/93

CONCLUSIONS:

Metabolism - Aerobic Soil

1. This portion of the study cannot be used to fulfill data requirements.

2. Aniline ring-labeled [^{14}C]hexaflumuron [1-(3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenyl)-3-(2,6-difluorobenzoyl)urea] degraded with half-lives of 180 and 260 days in US silt loam and sandy loam soils, respectively, and 110 and 130 days in UK sandy loam and clay loam soils, respectively, that were incubated in the dark at 25°C and 75% of field moisture capacity for 365 days. One degradate, 3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenylamine (M4), was identified in the four soils at maximums of 12-20% of the applied at 30-120 days posttreatment.

3. The portion of this study conducted with aniline ring-labeled [^{14}C]hexaflumuron is scientifically sound, but does not meet Subdivision N guidelines for the following reasons:

   one compound (M8) detected in the soil extracts at a maximum of 11% of the applied (0.11 ppm) was not identified.

   The portion of this study conducted with benzoyl ring-labeled [^{14}C]hexaflumuron is unacceptable for the following reason:

   the material balances were incomplete; up to 55% of the applied radioactivity was not accounted for by the termination of the experiments (365 days posttreatment).

4. In order for the portion of this study conducted with aniline ring-labeled [^{14}C]hexaflumuron to contribute towards the fulfillment of the aerobic soil metabolism data requirement, the registrant must identify the degradate M8. In order for the portion of this study conducted with benzoyl ring-labeled [^{14}C]hexaflumuron to contribute towards the fulfillment of the aerobic soil metabolism data requirement, the registrant must support the claim that [^{14}C]residues not recovered at the termination of the experiment were lost as volatiles by providing additional data on the quantification and characterization of these volatiles.

<u>Metabolism - Anaerobic Soil</u>

1. The portion of this study conducted using aniline ring-labeled [^{14}C]hexaflumuron can be used towards the fulfillment of data requirements. The portion of this study conducted using benzoyl ring-labeled [^{14}C]hexaflumuron cannot be used towards the fulfillment of data requirements.

2. Aniline ring-labeled [^{14}C]hexaflumuron [1-(3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenyl)-3-(2,6-difluorobenzoyl)urea] degraded with half-lives of 40-64 days in US and UK sandy loam, silt loam, and clay loam soils that were incubated under anaerobic conditions (flooded plus nitrogen atmosphere) in the dark at 25°C for 60 days following a 30-day aerobic incubation. One degradate, 3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)-phenylamine (M4), was identified in the four soils at maximums of 15-18% of the applied at 30-60 days postflooding.

3. The portion of this study conducted with aniline ring-labeled [^{14}C]hexaflumuron is acceptable and partially fulfills EPA Data Requirements for Registering Pesticides by providing information on the anaerobic metabolism of aniline ring-labeled [^{14}C]hexaflumuron in four US and UK soils.

   The portion of this study conducted with benzoyl ring-labeled [^{14}C]hexaflumuron is unacceptable for the following reason:

   the material balances were incomplete; up to 60% of the applied radioactivity was not accounted for by the termination of the experiments (90 days posttreatment).

4. No additional information on the anaerobic soil metabolism of aniline ring-labeled [^{14}C]hexaflumuron is needed at this time. In order for the portion of this study conducted with benzoyl ring-labeled [^{14}C]hexaflumuron to contribute towards the fulfillment of the anaerobic soil metabolism data requirement, the registrant must support the claim that [^{14}C]residues not recovered at the termination of the experiment were lost as volatiles by providing additional data on the quantification and characterization of these volatiles.

METHODOLOGY:

Sieved (2 mm) US and UK soils (Table A) were weighed (50 g dry weight) into biometer flasks and treated at 0.98-1.20 ug/g with either uniformly benzoyl or aniline ring-labeled [^{14}C]hexaflumuron [1-(3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)-phenyl)-3-(2,6-difluorobenzoyl)urea; radiochemical purities >98%, specific activities 10-20 and 10.18 uCi/mMol, respectively; DowElanco] dissolved in acetone. The treatment solution was evenly distributed over the soil surface, then the soils were moistened to 75% of 0.33 bar and mixed by shaking. The sample flask sidearms were filled with a 0.1 M NaOH trapping solution (10 mL), and the flasks were flushed with oxygen, closed with ground glass stoppers, and placed in a environmentally controlled room in the dark at 25.3 ± 1.3°C. Single flasks were removed for analysis at 0, 1, 3, 7, 14, 30, 60, 120, 180, 270, and 365 days posttreatment. The NaOH solutions were replaced at each sampling interval.

After 30 days of aerobic incubation, three samples each of the two radiolabels were flooded with distilled water to a depth of 0.5 cm and amended with powdered straw (0.25 g). The flasks were flushed with nitrogen, stoppered, and returned to the incubation chamber. Single flasks were removed for analysis at 30 and 60 days postflooding; the NaOH solutions were replaced at each sampling interval.

After sampling, the flooded soils were centrifuged and the floodwater decanted; aliquots of the floodwater were analyzed for total radioactivity by LSC. The extraction scheme presented in Figure A was then followed. Aerobic and anaerobic soil samples were extracted three times with acetone:acetonitrile (v:v, 1:1) by shaking for 30 minutes per extraction; after each extraction, the samples were centrifuged and the extracts decanted. Aliquots of each extract were analyzed by LSC. The remaining extracts were evaporated to dryness by rotary-evaporation at <37°C, and the resulting residues were redissolved in acetone:acetonitrile (1:1, v:v); recoveries of radioactivity after rotary-evaporation were >90%. Aliquots of the reconstituted extracts were analyzed using one-dimensional TLC on silica gel plates developed in methylene chloride:ethyl acetate (97:3, v:v) or chloroform:methanol:glacial acetic acid (90:10:2, v:v:v), and on reverse-phase plates developed in methanol:water (70:30 or 80:20, v:v). Radioactive areas on the plates were located and quantified using a linear scanner, and identified by comparison to unlabeled reference standards, which were cochromatographed with the extracts and located by UV fluorescence quenching. Subsamples of the extracted soil were analyzed by LSC following combustion.

3

In order to identify the degradate M4, an aliquot of a soil extract (not further defined) was evaporated to dryness, and the resulting residues were redissolved in pyridine and derivatized using "TFAA". The derivitized solution was evaporated to dryness under N_2, and the resulting residues were redissolved in heptane. After washing with an aqueous sodium bicarbonate solution, the heptane was concentrated under N_2 and analyzed by GC/MS.

Aliquots of the sodium hydroxide trapping solutions were analyzed by LSC. The presence of $^{14}CO_2$ was confirmed by barium chloride precipitation.

In order to produce sufficient material for MS analysis, additional subsamples of the soils were treated at 15.92-23.94 ug/g with both labels of [^{14}C]hexaflumuron and incubated under aerobic conditions as previously described for 365 days. The soil samples were extracted with acetone:acetonitrile, and degradates were isolated using column and preparative TLC (not further described). Isolated [^{14}C]compounds that corresponded to hexaflumuron and the degradate 3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenylamine (M4) were derivatized and analyzed by GC/MS to confirm the identification.

DATA SUMMARY:

Metabolism - Aerobic Soil

Uniformly aniline and benzoyl ring-labeled [^{14}C]hexaflumuron [1-(3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenyl)-3-(2,6-difluoro-benzoyl)urea; radiochemical purities >98%], at 1 mg/kg, degraded with registrant-calculated half-lives of 100-280 days in four US and UK soils that were incubated in the dark at 25.3 ± 1.3°C and 75% of 0.33 bar moisture capacity for 365 days.

3,5-Dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenylamine (M4)

was identified in the soils treated with aniline ring-labeled [^{14}C]hexaflumuron at maximums of 12-20% of the applied at 30-120 days posttreatment; an unidentified "polar" compound (designated M8) was also present at maximums of 3-11% of the applied at later sampling intervals.

Carbon dioxide (CO_2)

was the only degradate quantified for the soils treated with benzoyl ring-labeled [^{14}C]hexaflumuron; however, material balances for these samples were incomplete.

The aerobic half-lives for the two radiolabels were comparable for each soil; half-lives were shorter for the high pH, high OM soils.

Aniline ring-labeled [^{14}C]hexaflumuron:

In the **Hanford sandy loam soil** (US soil, designated M233; registrant-calculated half-life of 260 days), [^{14}C]hexaflumuron comprised 99% of the applied radioactivity immediately posttreatment, 63% at 120 days, 50% at

4

270 days, and 36% at 365 days (Table 22). 3,5-Dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenylamine (M4) was a maximum of 12% of the applied at 30 days posttreatment, decreasing to 2% at 365 days; an unidentified [^{14}C]compound ("M8") was a maximum of 3% at 365 days. Uncharacterized extractable [^{14}C]residues ("other") were ≤3% of the applied at all sampling intervals. By 365 days posttreatment, unextracted [^{14}C]residues had increased to a maximum of 55.25% of the applied and $^{14}CO_2$ totaled 3.54% (Table 7). Material balances were 101.63% of the applied immediately posttreatment and 100.79% at 365 days, with no discernable pattern of loss.

In the **Catlin silt loam soil** (US soil, designated M230) registrant-calculated half-life of 180 days), [^{14}C]hexaflumuron comprised 98% of the applied immediately posttreatment, 44% at 120 days, 39% at 180 days, 51% at 270 days, and 26% at 365 days (Table 21). M4 was a maximum of 18% of the applied at 120 days posttreatment, decreasing to 8-9% at 270-365 days; an unidentified [^{14}C]compound ("M8") was a maximum of 5% at 365 days. Uncharacterized extractable [^{14}C]residues ("other") increased to 7% of the applied by 365 days posttreatment. At 365 days posttreatment, unextracted [^{14}C]residues had increased to a maximum of 45.75% of the applied and $^{14}CO_2$ totaled 1.13% (Table 5). Material balances were 99.98% of the applied immediately posttreatment and 93.73% at 365 days, with no discernable pattern of loss.

In the **Alconbury clay loam soil** (UK soil, designated AS1; registrant-calculated half-life of 130 days), [^{14}C]hexaflumuron ranged from 86 to 96% of the applied radioactivity between 0 and 7 days, and was 79% at 14 days, 57% at 60 days, 37-39% at 120 and 180 days, and 12% at 365 days (Table 19). M4 was a maximum of 18% of the applied at 60 days posttreatment, decreasing to 2% at 365 days; an unidentified [^{14}C]compound ("M8") was a maximum of 7% at 365 days. Uncharacterized extractable [^{14}C]residues ("other") were a maximum of 4% of the applied at 120 and 365 days posttreatment. At 365 days posttreatment, unextracted [^{14}C]residues had increased to a maximum of 69.99% of the applied and $^{14}CO_2$ totaled 1.96% (Table 1). Material balances were 88.59% of the applied immediately posttreatment and 96.17% at 365 days, with no discernable pattern of loss.

In the **Castle Rising sandy loam soil** (UK soil, designated CR1; registrant-calculated half-life of 110 days), [^{14}C]hexaflumuron comprised 90% of the applied radioactivity immediately posttreatment, 57% at 60 days, 31% at 120 days, and 10% at 270-365 days (Table 20). M4 was a maximum of 20% of the applied at 120 days posttreatment, decreasing to 4% at 365 days; an unidentified [^{14}C]compound ("M8") was a maximum of 11% at 180 days. Uncharacterized extractable [^{14}C]residues ("other") were a maximum of 7% of the applied at 30 days posttreatment. At 365 days posttreatment, unextracted [^{14}C]residues had increased to a maximum of 59.00% of the applied and $^{14}CO_2$ totaled 2.04% (Table 3). Material balances were 91.68-101.53% of the applied between 0 and 60 days, then decreased to 80.74% at 365 days.

<u>Benzoyl ring-labeled [^{14}C]hexaflumuron</u>:

In the **Hanford sandy loam soil** (registrant-calculated half-life of 200 days), [^{14}C]hexaflumuron ("extracted") comprised 93.82% of the applied radioactivity immediately posttreatment, 53.57% at 180 days, and 34.90% at

365 days (Table 8). At 365 days, unextracted [^{14}C]residues were 13.32% of the applied and $^{14}CO_2$ totaled 17.63%. Material balances were 93.82% of the applied immediately posttreatment and 65.85% at 365 days.

In the **Catlin silt loam soil**, (registrant-calculated half-life of 200 days), [^{14}C]hexaflumuron ("extracted") comprised 89.12% of the applied radioactivity immediately posttreatment, 71.53% at 60 days, 45.31-45.36% at 120 and 180 days, and 24.62% at 365 days (Table 6). At 365 days, unextracted [^{14}C]residues were 16.37% of the applied and $^{14}CO_2$ totaled 21.98%. Material balances were 89.12% of the applied immediately posttreatment and 62.97% at 365 days.

In the **Alconbury clay loam soil** (registrant-calculated half-life of 100 days), [^{14}C]hexaflumuron ("extracted") comprised 97.97% of the applied radioactivity immediately posttreatment, 64.58% at 60 days, 47.32% at 120 days, and 21.83% at 365 days (Table 2). At 365 days, unextracted [^{14}C]residues were 24.63% of the applied and $^{14}CO_2$ totaled 23.38%. Material balances were 99.01% of the applied immediately posttreatment and 69.84% at 365 days.

In the **Castle Rising sandy loam soil** (registrant-calculated half-life of 160 days), [^{14}C]hexaflumuron ("extracted") comprised 91.18% of the applied radioactivity immediately posttreatment, 51.41% at 60 days, 38.15% at 120 days, 29.92% at 180 days, and 7.22% at 365 days (Table 4). At 365 days, unextracted [^{14}C]residues were 21.21% of the applied and $^{14}CO_2$ totaled 16.95%. Material balances were 93.22% of the applied immediately posttreatment and 45.38% at 365 days.

Metabolism - Anaerobic Soil

Uniformly aniline and benzoyl ring-labeled [^{14}C]hexaflumuron [1-(3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenyl)-3-(2,6-difluoro-benzoyl)urea; radiochemical purities >98%], at 1 mg/kg, degraded with registrant-calculated half-lives of 40-72 days in four US and UK soils that were incubated in the dark at 25.3 ± 1.3 C under anaerobic conditions (flooded plus nitrogen atmosphere) for 60 days following 30 days of aerobic incubation. The floodwater contained ≤1% of the applied (≤0.01 ppm) in all samples at all sampling intervals.

3,5-Dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenylamine (M4)

was identified in the soils treated with aniline ring-labeled [^{14}C]hexaflumuron at maximums of 15-18% of the applied at 30-60 days posttreatment; an unidentified "polar" compound (designated M8) was also present at 2-5% at 60 days posttreatment.

Carbon dioxide (CO_2)

was the only degradate quantified for the soils treated with benzoyl ring-labeled [^{14}C]hexaflumuron; however, material balances for these samples were incomplete.

Aniline ring-labeled [^{14}C]hexaflumuron:

In the **Hanford sandy loam soil** (registrant-calculated half-life of 54 days), [^{14}C]hexaflumuron comprised 99% of the applied radioactivity immediately posttreatment, 74% at 30 days (immediately prior to flooding), 49% at 30 days postflooding (60 days posttreatment), and 29% at 60 days postflooding (90 days posttreatment; Tables 22 and 23). 3,5-Dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenylamine (M4) was 12% of the applied at 30 days posttreatment, 16% at 30 days postflooding, and 8% at 60 days postflooding; an unidentified [^{14}C]compound ("M8") was a maximum of 4% at 60 days postflooding. Uncharacterized extractable [^{14}C]residues ("other") were $\leq$5% of the applied at all sampling intervals. By 60 days postflooding, unextracted [^{14}C]residues had increased to a maximum of 42.93% of the applied and $^{14}CO_2$ totaled 0.07% (Table 9). Material balances were 101.63% of the applied immediately posttreatment and 89.54% at 60 days postflooding (Tables 7 and 9).

In the **Catlin silt loam soil** (registrant-calculated half-life of 60 days), [^{14}C]hexaflumuron was 98% of the applied radioactivity immediately posttreatment, 76% at 30 days, 57% at 30 days postflooding, and 35% at 60 days postflooding (Tables 21 and 23). M4 was 10% of the applied at 30 days posttreatment, 15% at 30 days postflooding, and 12% at 60 days postflooding; an unidentified [^{14}C]compound ("M8") was a maximum of 5% at 60 days postflooding. Uncharacterized extractable [^{14}C]residues ("other") were a maximum of 13% of the applied at 60 days postflooding. By 60 days postflooding, unextracted [^{14}C]residues had increased to a maximum of 27.92% of the applied and $^{14}CO_2$ totaled 0.03% (Table 9). Material balances were 99.98% of the applied immediately posttreatment and 91.20% at 60 days postflooding (Tables 5 and 9).

In the **Alconbury clay loam soil** (registrant-calculated half-life of 40 days), [^{14}C]hexaflumuron was 88% of the applied radioactivity immediately posttreatment, 58% at 30 days, 41% at 30 days postflooding, and 20% at 60 days postflooding (Tables 19 and 23). M4 was 13% of the applied at 30 days posttreatment, 17% at 30 days postflooding, and 12% at 60 days postflooding; an unidentified [^{14}C]compound ("M8") was a maximum of 5% at 60 days postflooding. Uncharacterized extractable [^{14}C]residues ("other") were a maximum of 9% of the applied at 60 days postflooding. By 60 days postflooding, unextracted [^{14}C]residues had increased to a maximum of 47.93% of the applied and $^{14}CO_2$ totaled 0.03% (Table 9). Material balances were 88.59% of the applied immediately posttreatment and 96.99% at 60 days postflooding (Tables 1 and 9).

In the **Castle Rising sandy loam soil** (registrant-calculated half-life of 54 days), [^{14}C]hexaflumuron was 90% of the applied radioactivity immediately posttreatment, 62% at 30 days, 50% at 30 days postflooding, and 34% at 60 days postflooding (Tables 20 and 23). M4 was 15% of the applied at 30 days posttreatment, 16% at 30 days postflooding, and 18% at 60 days postflooding; an unidentified [^{14}C]compound ("M8") was 2% at 60 days postflooding. Uncharacterized extractable [^{14}C]residues ("other") were a maximum of 6% of the applied at 60 days postflooding. By 60 days postflooding, unextracted [^{14}C]residues had increased to a maximum of 26.99% of the applied and $^{14}CO_2$ totaled 0.04% (Table 9). Material balances

were 92.72% of the applied immediately posttreatment and 90.01% at 60 days postflooding (Tables 3 and 9).

Benzoyl ring-labeled [^{14}C]hexaflumuron:

In the **Hanford sandy loam soil** (registrant-calculated half-life of 40 days), [^{14}C]hexaflumuron ("extracted") comprised 93.82% of the applied radioactivity immediately posttreatment, 70.13% at 30 days (immediately prior to flooding), 34.30% at 30 days postflooding (60 days posttreatment), and 18.20% at 60 days postflooding (90 days posttreatment; Tables 8 and 10). By 60 days postflooding, unextracted [^{14}C]residues had increased to a maximum of 18.27% of the applied and $^{14}CO_2$ totaled 3.96%. Material balances were 93.82% of the applied immediately posttreatment and 40.43% at 60 days postflooding.

In the **Catlin silty loam soil** (registrant-calculated half-life of 47 days), [^{14}C]hexaflumuron ("extracted") comprised 89.12% of the applied radioactivity immediately posttreatment, 75.93% at 30 days (immediately prior to flooding), 35.74% at 30 days postflooding (60 days posttreatment), and 29.53% at 60 days postflooding (90 days posttreatment; Tables 6 and 10). By 60 days postflooding, unextracted [^{14}C]residues were 20.17% of the applied and $^{14}CO_2$ totaled 1.05%. Material balances were 89.12% of the applied immediately posttreatment and 50.75% at 60 days postflooding.

In the **Alconbury clay loam soil** (registrant-calculated half-life of 47 days), [^{14}C]hexaflumuron ("extracted") comprised 97.97% of the applied radioactivity immediately posttreatment, 68.67% at 30 days (immediately prior to flooding), 48.33% at 30 days postflooding (60 days posttreatment), and 22.56% at 60 days postflooding (90 days posttreatment; Tables 2 and 10). By 60 days postflooding, unextracted [^{14}C]residues had increased to a maximum of 37.30% of the applied and $^{14}CO_2$ totaled 5.01%. Material balances were 99.01% of the applied immediately posttreatment and 64.87% at 60 days postflooding.

In the **Castle Rising sandy loam soil** (registrant-calculated half-life of 72 days), [^{14}C]hexaflumuron ("extracted") comprised 91.18% of the applied radioactivity immediately posttreatment, 90.60% at 30 days (immediately prior to flooding), 50.71% at 30 days postflooding (60 days posttreatment), and 43.89% at 60 days postflooding (90 days posttreatment; Tables 4 and 10). By 60 days postflooding, unextracted [^{14}C]residues had increased to a maximum of 25.39% of the applied and $^{14}CO_2$ totaled 3.32%. Material balances were 93.22% of the applied immediately posttreatment and 72.60% at 60 days postflooding.

COMMENTS:

General

1. In the aerobic experiments conducted using aniline ring-labeled [^{14}C]hexaflumuron, one compound, designated M8, was detected in the soil extracts at a maximum of 11% of the applied (0.11 ppm), but was not identified. The study author described the compound as being "more polar than any of the available reference compounds," but no further

8

characterization was made. As specified in the guidance developed in the Environmental Fate Rejection Rate document, individual compounds which comprise >10% of the applied must be identified. This same degradate was also found in the anaerobic experiments, but at ≤5% of the applied.

In addition, uncharacterized radioactivity during TLC of sample extracts ("other") was present at up to 13% (0.13 ppm) of the applied during the study. Although the tracings of the distribution of the radioactivity on the TLC plates were poorly reproduced, it could be determined that this uncharacterized radioactivity was not composed of a single compound. Therefore, consistent with the guidance developed in the Environmental Fate Rejection Rate document, no further information regarding this uncharacterized material ("other") is required.

2. In the aerobic and anaerobic experiments conducted with benzoyl ring-labeled [^{14}C]hexaflumuron, the material balances were incomplete for all four soils; up to 60% of the applied radioactivity was not accounted for at the final sampling interval (365 days posttreatment). The study author attributed the missing material to the inefficient trapping of volatiles during the study, and (in the anaerobic experiment) to the presence of "non-acidic volatile component(s)". In an attempt to prove that the missing materials were untrapped volatiles, an abbreviated metabolism experiment was conducted using sandy loam soils treated with benzoyl ring-labeled [^{14}C]hexaflumuron. The flask sidearms were filled with a "more concentrated" NaOH solution, and the samples were incubated aerobically for 180 days or anaerobically for 60 days. In the aerobic Hanford and Castle Rising sandy loam soils, the material balances at 180 days posttreatment were 90.09 and 93.20% of the applied, respectively. However, in the anaerobic Hanford and Castle Rising sandy loam soils, the material balances at 60 days postflooding were 54.43 and 74.29% of the applied, respectively (Tables 11 and 12). No additional data were provided.

3. A proposed degradation pathway for hexaflumuron in soil is given in Figure 15.

4. The document reviewed in this DER (MRID 42695901) contains an appendix (Appendix C) which describes an experiment on the mobility of aged hexaflumuron residues. This portion was included as an appendix to both this study and MRID 42648527 (study 3, this report), which describes an experiment on the mobility of unaged hexaflumuron. The aged residue mobility experiment is reviewed as part of Study 3.

Metabolism - Aerobic Soil

1. Further analyses were performed on the acetone:acetonitrile-extracted soil. Subsamples of the extracted soil from the 365-day sampling interval were extracted three times with 0.1 M NaOH followed by refluxing with 1.0 M NaOH for 16-18 hours. Aliquots of the soil extracts and subsamples of the extracted soil were analyzed by LSC and LSC following combustion, respectively (Figure A). Additional radioactivity was extracted from the soil using these methods (Tables 1-8); less radioactivity was extracted from the [^{14}C]aniline-treated soils than from the [^{14}C]benzoyl-treated soils. However, since the procedures were carried out at a single sampling

9

interval, the information provided by these procedures is of very limited use in interpreting the data.

2. An additional experiment (included in the study report as Appendix B) was conducted to determine the effects of different moisture contents and temperatures during incubation. A description of the study and a discussion of the results follows; supporting material is included in Attachment 1 of this DER. Although not conducted according to Subdivision N guidelines (the duration of the study, 84 days, was too short), this study does provide supplemental information on the degradation of aniline-labeled [^{14}C]hexaflumuron in a Castle Rising sandy loam soil adjusted to 50, 75, and 100% of 0.33 bar moisture and incubated at 10, 25, and 35°C.

Synopsis of DowElanco Study ID GH-C 2970 (Appendix B of MRID 42695901)

Methods

Subsamples (50 g o.d. weight) of sieved (2 mm) Castle Rising sandy loam soil (UK, described previously) were placed in biometer flasks, adjusted to 50, 75, or 100% of 0.33 bar moisture, and incubated at 25 ± 1°C for three days. The soils were then treated at 1 ug/g with uniformly aniline ring-labeled [^{14}C]hexaflumuron (radiochemical purity >99%, specific activity 528.4 MBq/mMol, DowElanco) and the flasks were incubated at 10, 25, or 35°C under a slight positive pressure of oxygen, with volatiles trapped in 0.1 M NaOH (Appendix 3 of Attachment 1). Single flasks from each moisture-temperature combination were removed for analysis at 0, 14, 28, 56, and 84 days posttreatment; the trapping solutions were replaced 3, 7, 14, 28, and 56 days posttreatment. At each sampling interval, distilled water (15 mL) was added to each sample, and the soil was mixed thoroughly. Subsamples of the soil were removed for analysis for total radioactivity by LSC following combustion; the remaining soil was extracted three times by shaking with acetone:acetonitrile (1:1, v:v). Aliquots of the extracts were diluted with distilled water and partitioned three times with methylene chloride. The methylene chloride extracts were combined and concentrated under nitrogen; extraction efficiency of the methylene chloride was 86.7-112.9%. Aliquots of the concentrate were analyzed by one-dimensional TLC on silica gel plates developed in toluene:isopropyl alcohol:acetic acid (9:1:1, v:v:v) or toluene:isopropyl alcohol:acetic acid (95:5:1, v:v:v). Additional aliquots were analyzed using reverse-phase TLC on KC-18F plates developed in methanol:water (80:20, v:v). Radioactivity trapped by NaOH was analyzed for total radioactivity by LSC.

Results

The registrant-calculated half-lives of aniline-labeled [^{14}C]hexaflumuron in a Castle Rising sandy loam soil were 159, 90, and 64 days in soil adjusted to 50, 75, and 100% of 0.33 bar moisture and incubated at 25°C. In samples adjusted to 75% of 0.33 bar, the registrant calculated half-lives were 190, 90, and 56 days at 10, 25, and 35°C (Table 3 of Attachment 1). The degradates identified were 3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenylamine (M4) and 3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenylurea; M4 was not observed until 28 days posttreatment in any sample, and the highest levels of both degradates were found in both the higher temperature and higher moisture samples (Table 2

of Attachment 1). In the extracts of the soil adjusted to 75% of 0.33 bar moisture and incubated at 25°C, hexaflumuron was 47.3% of the applied at 84 days posttreatment, M4 was 8.2% and 3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenylurea was 10.5%; unidentified radioactivity in the extracts was 5.1% of the applied (reviewer-calculated from Tables 1 and 2). Total $^{14}CO_2$ was 0.72-2.11% of the applied after 84 days; the material balances were 84.8-96.6%.

Discussion

The study author did not address the discrepancy between the degradate identifications in this study and the definitive study where only 3,5-dichloro-4-(1,1,2,2-tetrafluoroethoxy)phenylamine (M4) and a "more polar" degradate were identified. However, the mobile phases used in the TLC separations in the two studies were different.

11

HEXAFLUMURON

Page_____ is not included in this copy.

Pages 12 through 48 are not included.

The material not included contains the following type of information:

____ Identity of product inert ingredients.

____ Identity of product impurities.

____ Description of the product manufacturing process.

____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

____ A draft product label.

____ The product confidential statement of formula.

____ Information about a pending registration action.

X FIFRA registration data.

____ The document is a duplicate of page(s) _____.

____ The document is not responsive to the request.

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.