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DATA EVALUATION RECORD

STUDY 4

CHEM 128847 Difenoconazole §161-3
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STUDY ID 42245129

Spare, W.C. 1988. Soil photolysis of (phenyl-ring-^{14}C)-CGA-169374 by natural sunlight and artificial light. Agrisearch Project No.: 1295. Unpublished study performed by Agrisearch Incorporated, Frederick, MD; and submitted by CIBA-GEIGY Corporation, Greensboro, NC.

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CONCLUSIONS

Degradation - Photodegradation on Soil

1. Both the natural and artificial sunlight studies are not scientifically valid and do not provide useful information on the photodegradation of difenoconazole on sandy loam soil. The experimental methods, specifically the sample preparation, soil moisture content, and incubation conditions, were not valid for the determination of photodegradation of the parent compound on soil. Also, in the artificial sunlight study, replicate samples were not used. As a result of these methods, the registrant-calculated half-lives for the natural and artificial sunlight studies do not agree, nor do they agree with the photolytic half-lives determined in an additional submitted soil photolysis study (MRID 42245130). Additionally, in the natural sunlight study, the data were variable and the registrant-calculated half-life was extrapolated beyond the scope of the observed data.

2. Both studies do not meet Subdivision N Guidelines for the fulfillment of EPA data requirements on photodegradation on soil for the following reasons:

   (i) the soil was too finely sieved (0.25 mm);

   (ii) soil moisture content was not adjusted to or maintained at 75% of 0.33 bar;

   (iii) soil viability was not assured; and

   (iv) the incubation temperature was variable.

3. In the natural sunlight study, uniformly phenyl ring-labeled [^{14}C]difenoconazole, at a nominal application rate of 10 ppm, degraded with a registrant-calculated half-life of 69.8 days ($r^2 = 0.72$) in sandy loam soil maintained at 19-48 °C and irradiated with natural sunlight for up to 30 days. However, data were variable, and the registrant calculated half-life is of questionable validity because it was extrapolated beyond the scope of the observed data. In contrast, the parent was relatively stable in the dark control samples. All data, designated as percentages of the applied radioactivity, represent percentages of the nominal application. Data are the reviewer-calculated mean of two replicates, except where only single replicate data were provided (time 0 and dark control samples). Data were determined using a single TLC system unless otherwise noted. In the irradiated soil, the parent compound was initially 94.9% (single replicate) of the applied radioactivity, was variable at 68.8-80.3% at 4-23 days, and was 66.3% at 30 days posttreatment (two TLC systems). The minor degradate CGA-190978 was initially (time 0) 1.1% (single replicate) of the applied radioactivity and increased with variability to a maximum of 3.3% by 30 days posttreatment. The minor degradate CGA-205375 was initially (time 0) 0.87% (single replicate) of the applied radioactivity, increased with variability to a maximum of 2.8% by 23 days, and was 2.1% at 30 days posttreatment. The minor

degradate CGA-131013 was initially (time 0) 1.4% (single replicate) of the applied radioactivity, increased with variability to a maximum of 2.3% by 23 days, and was not detected at 30 days posttreatment. The minor degradate CGA-205374 was initially (day 4) 4.1% of the applied radioactivity and increased with variability to a maximum of 5.1% of the applied at 30 days posttreatment. The minor degradate CGA-189138 initially (time 0) accounted for 2.9% (single replicate) of the applied radioactivity and increased with variability to a maximum of 8.5% by 30 days posttreatment. Nonextractable [^{14}C]residues were not determined, and [^{14}C]volatiles were not collected.

In the dark control soil (for the natural light study), the parent compound was initially present at 94.9% of the applied radioactivity and was variable at 82.1-91.9% at 4-30 days posttreatment. The minor degradate CGA-190978 was initially (time 0) 1.1% of the applied radioactivity, was variable at 0.76-1.5% at 4-30 days, except was a maximum of 4.4% at 18 days posttreatment. The minor degradate CGA-205375 was initially (time 0) 0.87% of the applied radioactivity, was a maximum of 2.9% at 4 days, and decreased with variability to 1.6% by 30 days posttreatment. The minor degradate CGA-131013 was initially (time 0) 1.4% of the applied radioactivity, was variable at 0.34-0.92% at 4-30 days except for a maximum of 4.2% at 18 days, and was not detected at 23 days posttreatment. The minor degradate CGA-205374 was initially (day 4) 1.8% of the applied radioactivity, increased with variability to a maximum of 2.3% by 23 days, and was 1.2% at 30 days posttreatment. The minor degradate CGA-189138 was initially (time 0) 2.9% of the applied radioactivity, increased with variability to a maximum of 4.2% by 23 days, and was 3.1% at 30 days posttreatment. Nonextractable [^{14}C]residues were not determined, and [^{14}C]volatiles were not collected.

In the artificial light study, uniformly phenyl ring-labeled [^{14}C]difenoconazole, at a nominal application rate of 10 ppm, degraded with a registrant-calculated half-life of 284 hours (r^2 = 0.94) in sandy loam soil maintained at 27-35 °C and irradiated with artificial sunlight for up to 360 hours; the half-life is equivalent to 23.7 days of natural sunlight. However, the registrant-calculated half-life is of questionable accuracy because the half-lives obtained from the natural and artificial light studies do not agree. In contrast, the parent was relatively stable in the dark control samples. All data, designated as percentages of the applied radioactivity, represent percentages of the nominal application. Data are the reviewer-calculated mean of two replicates, except where only single replicate data were provided (dark control and time 0 samples). Data were determined using two TLC solvent systems unless otherwise noted. In the irradiated soil, the parent compound was initially 95.6% (single replicate) of the applied radioactivity, decreased to 86.4% by 48 hours, was 61.2-61.5% at 96-168 hours, decreased to 53.9% by 240 hours, and was 37.6% at 360 hours posttreatment. The minor degradate CGA-190978 was initially (time 0) 0.85% (single replicate) of the applied radioactivity, was a maximum of 4.3% at 240 hours, and was 3.7% at 360 hours. The minor degradate CGA-205375 was initially (time 0) 0.87% (single replicate) of the applied radioactivity, was a maximum of 4.2% at 240 hours, and was 3.9% at 360 hours posttreatment. The minor degradate CGA-

131013 was initially (96 hours) 0.55% of the applied radioactivity and was a maximum of 4.1% at 360 hours posttreatment. The minor degradate CGA-205374 was initially (time 0) 3.0% (single replicate; one TLC system) of the applied radioactivity, was a maximum of 8.8% at 96 hours, and was 7.4% at 360 hours posttreatment. The minor degradate CGA-189138 was initially (time 0) 2.0% (single replicate) of the applied radioactivity and increased with variability to a maximum of 6.5% by 360 hours posttreatment. Nonextractable [^{14}C]residues accounted for ≤2.4% of the applied radioactivity during the incubation period. [^{14}C]Volatiles were not collected.

In the dark control soil (for the artificial light study), the parent compound was initially present at 95.6% (single replicate) of the applied radioactivity, was variable at 88.9-97.8% at 48-240 hours, and was 83.1% at 360 hours posttreatment. The minor degradate CGA-190978 was initially (time 0) 0.85% (single replicate) of the applied radioactivity, increased with variability to a maximum of 1.3% by 168 hours, and was 1.0% at 360 hours posttreatment. The minor degradate CGA-205375 was variable at 0.87-1.5% (single replicate) of the applied radioactivity at 0-360 hours posttreatment. The minor degradate CGA-131013 was initially (240 hours) 0.28% of the applied radioactivity and was a maximum of 1.0% at 360 hours posttreatment (one TLC system). The minor degradate CGA-205374 was initially (time 0) 3.0% (one TLC system) of the applied radioactivity, was a maximum of 3.8% at 168 hours, and was 2.4% at 360 hours posttreatment. The minor degradate CGA-189138 was variable at 1.2-2.0% of the applied radioactivity at 0-360 hours posttreatment. Nonextractable [^{14}C]residues were not determined, and [^{14}C]volatiles were not collected.

METHODOLOGY

The photolysis of uniformly phenyl ring-labeled [^{14}C]difenoconazole {CGA-169374; 1-[[2-[2-chloro-4-(4-chlorophenoxy)phenyl]-4-methyl-1,3-dioxolan-2-yl]methyl]-1H-1,2,4-triazole; radiochemical purity 96.9%, specific activity 48.6 μCi/mg; p. 9; Figure 1, p. 37} on soil was examined under natural sunlight and under artificial light conditions.

For the natural light study, samples (2.0 g) of sieved (60 mesh; see Comment #4), air-dried sandy loam soil (from Kerman, CA; 67% sand, 27% silt, 6% clay, 1.0% organic matter, pH 8.5, CEC 10.4 meq/100 g; p. 10) were moistened with 2 mL deionized water in Pyrex glass Petri dishes and spread evenly on the inside bottom (p. 11). The soil:water slurry (1:1, w:v) was oven dried overnight at 35 ± 1 °C. Soil samples were treated with uniformly phenyl ring-labeled [^{14}C]difenoconazole, dissolved in acetonitrile, at a nominal application rate of 10 ppm (p. 12); the solvent was evaporated at room temperature. Sample dishes were covered with polyethylene film (0.5-mm thick; p. 10) and irradiated with natural sunlight in August (Frederick, MD; 39° N latitude and 77° W longitude) for up to 30 days (Figure 2, p. 38). Total light intensity of natural sunlight was measured using two light meters (Table IV, pp. 24, 25). The temperature of the sample dishes was

not controlled; ambient temperatures varied between 19 °C and 48 °C during the study period. Dark control samples were prepared using the same method, except samples were covered with aluminum foil (p. 12). Volatiles were not measured. Duplicate irradiated and single dark control samples were removed for analysis at 0, 4, 8, 14, 18, 23, and 30 days posttreatment (p. 13).

For the artificial sunlight study, samples were prepared as previously described, except the soil:water slurries (1:1, w:v) were spread at a thickness of 250 μm on glass plates using a TLC spreader (p. 12), and the plates were air dried overnight. Soil samples were divided into 1 x 2 cm sections, treated, and incubated in an air-cooled photolysis chamber (Figure 3, p. 39); the temperature was at 27-35 °C at the soil surface during the incubation period (Table III, p. 23). Samples were continuously irradiated for up to 360 hours using a mercury arc lamp equipped with a Pyrex glass filter (6 mm) to remove wavelengths of <290 nm (p. 11). The light intensity of the mercury arc lamp, measured using a light meter (290-1400 nm), was 2.0-4.2 x 10^{-5} W/cm^2 (p. 12). A comparison graph of artificial light *vs.* global irradiance was presented in Figure 4 (p. 40). Natural sunlight on a clear sunny day was approximately 2.0-2.6 x 10^{-5} W/cm^2 (measured in August in Frederick, MD; 39° N latitude and 77° W longitude; p. 12); one 12-hour period of artificial light was equivalent to one day of natural sunlight (p. 13). Dark controls were prepared using the same method, except samples were covered with aluminum foil. Volatiles were not measured. Single irradiated and single dark control samples were removed for analysis at 0, 48, 96, 168, 240, and 360 hours posttreatment (p. 13; see Comment #3).

At each sampling interval (both studies), samples were scraped into glass vials and extracted by sonicating with methanol:water (8:2; v:v; p. 13). Aliquots of the extracts were analyzed for total radioactivity by LSC. Aliquots were also analyzed by one-dimensional TLC on two silica gel plates, each developed with acetonitrile (twice) OR chloroform:methanol (9:1, v:v). Samples were co-chromatographed with nonradiolabeled reference standards of the parent and potential degradates (degradates not specified; p. 17; see Comment #11) which were visualized with UV (254 nm) light. Areas of radioactivity on the plates were quantified using radioimage scanning. Selected soil samples (days 8-30; natural sunlight study) were further extracted by refluxing with methanol:water (9:1, v:v; p. 13). Selected soil samples (hours 96-360; artificial light study) were further extracted by refluxing with methanol:water (9:1, v:v; pH not specified), followed by methanol:water (9:1, v:v; pH 5), followed by 0.1 M oxalic acid in dimethylformamide:water (1:1, v:v). Aliquots of each extract were analyzed by LSC and by the two TLC systems as described previously (p. 14; Tables VI, XI, XII, pp. 27, 32, 33).

To confirm the identity of the parent compound, aliquots of the sonicated extracts from selected samples (day 30, natural sunlight study; hour 360, artificial light study) were analyzed by two-dimensional TLC on silica gel plates developed with

chloroform:methanol (9:1, v:v) followed by chloroform:methanol:formic acid:water (75:20:4:2, v:v:v:v; p. 14). Areas of radioactivity were located using X-ray film imaging. Areas of radioactivity were scraped from the plates and analyzed by LSC.

Post-extracted soil samples were analyzed for total radioactivity by LSC following combustion (artificial light study only; pp. 14, 15).

DATA SUMMARY

Natural Sunlight

Uniformly phenyl ring-labeled [^{14}C]difenoconazole (radiochemical purity 96.9%), at a nominal application rate of 10 ppm, degraded with a registrant-calculated half-life of 69.8 days ($r^2 = 0.72$) in sandy loam soil maintained at 19-48 °C and irradiated with natural sunlight for up to 30 days (Table VIII, p. 29). However, data were variable, and the registrant calculated half-life is of questionable validity because it was extrapolated beyond the scope of the observed data (see Comments #1 and 2); the parent was 66.3% of the applied radioactivity at 30 days posttreatment (Table VIII, p. 29). In contrast, the parent was relatively stable in the dark control samples (Table IV, p. 27). All data, designated as percentages of the applied radioactivity, represent percentages of the nominal application. Data are the reviewer-calculated mean of two replicates, except where only single replicate data were provided (time 0 and dark control samples). Data were determined using a single TLC system unless otherwise noted (see Comment #8). In the irradiated soil, the parent compound was initially present at 94.9% (single replicate) of the applied radioactivity, was variable at 68.8-80.3% of the applied at 4-23 days posttreatment, and was 66.3% of the applied at 30 days posttreatment (two TLC systems; Table VIII, p. 29). The minor degradate CGA-190978 (designated "reg 1") was initially (time 0) present at 1.1% (single replicate) of the applied radioactivity and increased with variability to a maximum of 3.3% of the applied by 30 days posttreatment (Table VI, p. 27). The minor degradate CGA-205375 (designated "reg 2") was initially (time 0) present at 0.87% (single replicate) of the applied radioactivity, increased with variability to a maximum of 2.8% of the applied by 23 days posttreatment, and was 2.1% of the applied at 30 days posttreatment. The minor degradate CGA-131013 (designated "reg 3") was initially (time 0) present at 1.4% (single replicate) of the applied radioactivity, increased with variability to a maximum of 2.3% of the applied by 23 days posttreatment, and was not detected at 30 days posttreatment. The minor degradate CGA-205374 (designated "reg 4") was initially (day 4) present at 4.1% of the applied radioactivity and increased with variability to a maximum of 5.1% of the applied at 30 days posttreatment. The minor degradate CGA-189138 (designated "remain") initially (time 0) accounted for 2.9% (single replicate) of the applied radioactivity and increased with variability to a maximum of 8.5% of the applied by 30 days posttreatment. Uncharacterized origin material initially (time 0) accounted for 1.3% of the applied

radioactivity and generally increased to a maximum of 15.6% of the applied by 30 days posttreatment. Nonextractable [^{14}C]residues were not determined, and [^{14}C]volatiles were not collected.

In the dark control soil, the parent compound was initially present at 94.9% of the applied radioactivity and was variable at 82.1-91.9% of the applied at 4-30 days posttreatment (Table VI, p. 27). The minor degradate CGA-190978 (designated "reg 1") was initially (time 0) present at 1.1% of the applied radioactivity, was variable at 0.76-1.5% of the applied at 4-30 days posttreatment except for a maximum of 4.4% of the applied at 18 days posttreatment (Table VI, p. 27). The minor degradate CGA-205375 (designated "reg 2") was initially (time 0) present at 0.87% of the applied radioactivity, was a maximum of 2.9% of the applied at 4 days posttreatment, and decreased with variability to 1.6% of the applied by 30 days posttreatment. The minor degradate CGA-131013 (designated "reg 3") was initially (time 0) present at 1.4% of the applied radioactivity, was variable at 0.34-0.92% of the applied at 4-30 days posttreatment, except for a maximum of 4.2% at 18 days posttreatment, and was not detected at 23 days posttreatment. The minor degradate CGA-205374 (designated "reg 4") was initially (day 4) present at 1.8% of the applied radioactivity, increased with variability to a maximum of 2.3% of the applied by 23 days posttreatment, and was 1.2% of the applied at 30 days posttreatment. The minor degradate CGA-189138 (designated "remain") was initially (time 0) present at 2.9% of the applied radioactivity, increased with variability to a maximum of 4.2% of the applied by 23 days posttreatment, and was 3.1% of the applied at 30 days posttreatment. Uncharacterized origin material initially (time 0) accounted for 1.3% of the applied radioactivity, increased with variability to a maximum of 4.2% of the applied by 18 days posttreatment, and was 2.8% of the applied at 30 days posttreatment. Nonextractable [^{14}C]residues were not determined, and [^{14}C]volatiles were not collected.

The material balances (based on LSC analysis of only the extracts from individual replicates) for the irradiated soil were 89.2-102.5% of the applied radioactivity, with no clear pattern of decline (Table V, p. 26). In the dark control soil, material balances were 96.9-102.5% of the applied radioactivity.

Artificial Sunlight

Uniformly phenyl ring-labeled [^{14}C]difenoconazole (radiochemical purity 96.9%), at a nominal application rate of 10 ppm, degraded with a registrant-calculated half-life of 284 hours ($r^2 = 0.94$) in sandy loam soil maintained at 27-35 °C and irradiated with artificial sunlight for up to 360 hours (Table XIII, p. 34); the half-life is equivalent to 23.7 days of natural sunlight. However, the registrant-calculated half-life is of questionable accuracy because the half-lives obtained from the natural and artificial light studies do not agree (see Comment #1). In contrast, the parent was relatively stable in the dark control samples. All data, designated as percentages of the applied radioactivity, represent percentages of the nominal application. Data are the reviewer-calculated mean of two

replicates, except where only single replicate data were provided (dark control and time 0 samples), and were determined using two TLC solvent systems unless otherwise noted (see Comments #8). In the irradiated soil, the parent compound was initially present at 95.6% (single replicate) of the applied radioactivity, decreased to 86.4% of the applied by 48 hours posttreatment, was 61.2-61.5% of the applied at 96-168 hours posttreatment, decreased to 53.9% of the applied by 240 hours posttreatment, and was 37.6% of the applied at 360 hours posttreatment (Table XIII, p. 34). The minor degradate CGA-190978 (designated "reg 1") was initially (time 0) present at 0.85% (single replicate) of the applied radioactivity, was a maximum of 4.3% of the applied at 240 hours posttreatment, and was 3.7% of the applied at 360 hours posttreatment (Tables XI, XII, pp. 32, 33). The minor degradate CGA-205375 (designated "reg 2"; one TLC system; Table XI, p. 32) was initially (time 0) present at 0.87% (single replicate) of the applied radioactivity, was a maximum of 4.2% of the applied radioactivity at 240 hours posttreatment, and was 3.9% of the applied at 360 hours posttreatment. The minor degradate CGA-131013 (designated "reg 4", Table XI, p. 32; "reg 3", Table XII, p. 33) was initially (96 hours) present at 0.55% of the applied radioactivity and was a maximum of 4.1% of the applied at 360 hours posttreatment. The minor degradate CGA-205374 (designated "reg 5", Table XI, p. 32; "reg 4", Table XII, p. 33) was initially (time 0) present at 3.0% (single replicate; one TLC system) of the applied radioactivity, was a maximum of 8.8% of the applied at 96 hours posttreatment, and was 7.4% of the applied at 360 hours posttreatment. The minor degradate CGA-189138 (designated "remain") was initially (time 0) present at 2.0% (single replicate) of the applied radioactivity and increased with variability to a maximum of 6.5% of the applied by 360 hours posttreatment. An unidentified minor degradate (designated "reg 3", Table XI, p. 32; "reg 2", Table XII, p. 33) initially (time 0) accounted for 1.2% (single replicate) of the applied radioactivity and was variable at 1.9-4.4% of the applied at 48-360 hours posttreatment. Uncharacterized origin material initially (time 0) accounted for 0.98% (single replicate) of the applied radioactivity and was variable at 5.2-12.1% of the applied at 48-360 hours posttreatment. Nonextractable [^{14}C]residues accounted for $\leq$2.4% of the applied radioactivity during the incubation period (Table X, p. 31). [^{14}C]Volatiles were not collected.

In the dark control soil, the parent compound was initially present at 95.6% (single replicate) of the applied radioactivity, was variable at 88.9-97.8% of the applied at 48-240 hours posttreatment, and was 83.1% of the applied at 360 hours posttreatment (Tables XI, XII; p. 32, 33). The minor degradate CGA-190978 (designated "reg 1") was initially (time 0) present at 0.85% (single replicate) of the applied radioactivity, increased with variability to a maximum of 1.3% of the applied by 168 hours posttreatment, and was 1.0% of the applied at 360 hours posttreatment (Tables XI, XII, pp. 32, 33). The minor degradate CGA-205375 (designated "reg 2"; one TLC system; Table XI, p. 32) was variable at 0.87-1.5% (single replicate) of the applied radioactivity at 0-360 hours posttreatment. The minor degradate CGA-131013 (designated "reg 4", Table XI, p. 32; "reg 3", Table XII, p. 33) was initially (240 hours) present at 0.28% of the applied

radioactivity and was a maximum of 1.0% of the applied at 360 hours posttreatment (one TLC system; Table XII, p. 33). The minor degradate CGA-205374 (designated "reg 5", Table XI, p. 32; "reg 4", Table XII, p. 33) was initially (time 0) present at 3.0% (one TLC system) of the applied radioactivity, was a maximum of 3.8% of the applied at 168 hours posttreatment, and was 2.4% of the applied at 360 hours posttreatment. The minor degradate CGA-189138 (designated "remain") was variable at 1.2-2.0% of the applied radioactivity at 0-360 hours posttreatment. An unidentified minor degradate (designated "reg 3", Table XI, p. 32; "reg 2", Table XII, p. 33) initially (time 0) accounted for 1.2% of the applied radioactivity and was 0.4-1.1% of the applied at 48-360 hours posttreatment. Uncharacterized origin material initially (time 0) accounted for 0.98% of the applied radioactivity and was variable at from 1.2-2.9% of the applied at 48-360 hours posttreatment. Nonextractable [^{14}C]residues were not determined, and [^{14}C]volatiles were not collected.

The material balances (based on LSC analysis of individual replicates) for the irradiated soil were 90.5-111.4% of the applied radioactivity, with the exception of 75.5% at 360 hours posttreatment; no clear pattern of decline was observed (Table X, p. 31). In the dark control soil, material balances were 91.5-109.5% of the applied radioactivity, with no clear pattern of decline.

COMMENTS

1. The registrant-calculated half-lives are of questionable accuracy because the half-lives for the natural and artificial light studies are not similar. The registrant-calculated half-life was 69.8 days in the natural sunlight study (Table VIII, p. 29), but was the equivalent of 23.7 days of natural sunlight in the artificial light study (Table XIII, p. 34). The registrant did not discuss the difference in results. Moreover, the registrant-calculated half-lives reported in this MRID are not similar to the half-lives reported in an additional submitted soil photolysis study of triazole ring-labeled difenoconazole (MRID 42245130). Both studies used similar test conditions, but in the additional study, the registrant calculated half-lives were 39.4 days in the natural sunlight system and 29.1 in the artificial sunlight system. Of the four half-lives reported, the two half-lives for the artificial light studies were the most similar; however, it is unclear which of the half-lives determined are more accurate. Moreover, problems with experimental methods precluded the determination of accurate half-lives (see Comments #4-6) .

2. In the natural sunlight study, the registrant-calculated half-life is of questionable validity because data were extrapolated beyond the observed scope of the data; the parent compound was 66.3% of the applied at 30 days posttreatment (Table VIII, p. 29). Data which appear linear may become curvilinear over time, and a half-life estimated using such data may be inaccurate. Also, the data were variable between sampling intervals in the natural sunlight study.

3. In the artificial light study, replicate samples were not utilized. The study author reported that "a single series of soil films was exposed in the artificial light study" (p. 13). The study protocol states that only one plate (containing two "spots") was removed for analysis at each sampling interval (Appendix A, p. 55). Duplicate results were provided in the data tables. The use of a single sample is generally not considered to be scientifically sound laboratory practice; at a minimum, duplicate samples should be used.

4. In both studies, the soil was too finely sieved (60 mesh, 0.25 mm; p. 11), so that a significant portion of the sand fraction may have been removed. Removing the sand fraction results in chemical and physical changes in the soil, likely resulting in a different half-life than would occur in soil sieved at 2 mm (as required by Subdivision N Guidelines). Additionally, removing a portion of the sand fraction changes the effective textural class of the soil samples used in the study.

5. In both studies, the moisture content of the soil samples was not adjusted to or maintained at 75% of 0.33 bar during the incubation period. Thin layers of soil (0.25 mm thick, artificial light study; thickness not reported, natural light study) were prepared and oven (natural light study) or air (artificial light) dried prior to treatment and incubation (pp. 11, 12). It was not reported that water was added to the soils after the initial drying. The observed variability over time and the inconsistence in data between labels may have been a result of different moisture levels (and viability) in the soil samples. The reviewer notes that the viability of the soil samples was not assured, and the microbial populations were not enumerated in the test soils at the initiation or completion of the incubation. Subdivision N Guidelines require that the soil moisture content be maintained at 75% of 0.33 bar and that the soil viability be confirmed.

6. In both studies, the experimental temperature was not held constant at 18-30 ± 1 °C, as required by Subdivision N Guidelines. The natural sunlight and artificial light studies were conducted at 19-48 °C and 27-35 °C, respectively (Tables III, IV, pp. 23-25).

7. The limits of detection and quantitation were not reported for LSC or TLC analyses. Both limits of detection and quantitation should be reported to allow the reviewer to assess the adequacy of the methods for the determination of the test compound and its degradates.

8. In the natural sunlight study, data for the TLC chloroform:methanol solvent system analyses were missing from the MRID for both irradiated and dark control samples (Table VII, p. 28). This problem may have been caused by photocopier malfunction prior to review. As a result, data reported for the natural sunlight study were determined using only one of the two TLC analyses (acetonitrile solvent system; Table VI, p. 27), except for the parent data, which were reported for both TLC analyses in Table VIII (p. 29). All data in the artificial sunlight study were analyzed by both TLC analyses (Tables XI, XII, pp. 32, 33); however, some residues were only observed in one of the two analyses.

9. In the natural sunlight study, the study author stated that samples were placed at a 90° angle to the sun (p. 13); however, samples in the diagram were held at a 45° angle to the ground (Figure 2, p. 38). Clarification by the registrant may be necessary.

10. The study author stated that the "full spectrum" of natural sunlight was measured for samples exposed to natural sunlight (Table IV, pp. 24, 25). The reviewer was unable to confirm which wavelengths were measured. Additionally, the average duration of direct sunlight was not reported.

11. The study author did not specify which reference standards of the potential degradates were co-chromatographed with the samples. The study author reported eight potential degradates: CGA-142856, CGA-131013, CGA-143548, CGA-205374, CGA-71019, CGA-205375, CGA-189138, and CGA-190978 (Table I, p. 21); however, the chemical structure was provided for only five of the compounds (Figure 1, p. 37). Additionally, the chemical names of the potential degradates were not reported. In future studies submitted to the EPA, all chemical names and structures should be reported.

12. The same soil was used in the aerobic soil metabolism study (MRID 42245133). The soil series name for the sandy loam soil was not reported in this soil photolysis study, but was reported in the soil metabolism study as the Hesperia series.

13. The light intensity data reported in this DER are from page 12; however, the reviewer noted that the same data were reported in different orders of magnitude in the data tables (Tables III, IV, pp. 23-25). Clarification by the registrant as to the correct values may be necessary.

Solvent system 1

Sample	origin		190978		205375		Unknown		131013		205374		parent		189138	
48	7.5	4.2	1.8	0.8	2.0	1.4	1.5	0.0	ND	ND	3.7	2.5	88.7	85.2	6.1	4.3
96	10.2	13.4	2.1	3.1	1.8	3.4	0.7	2.1	ND	ND	4.4	6.2	58.1	55.3	6.8	8.8
168	12.9	12.8	3.1	2.9	2.8	3.1	1.9	2.0	ND	ND	5.0	5.9	56.3	56.6	8.1	6.9
240	9.4	6.4	4.5	3.9	3.0	3.4	1.1	1.3	2.0	1.6	5.1	4.1	51.3	47.5	7.8	4.9
360	11.3	10.0	4.0	3.4	2.7	3.2	1.4	1.8	ND	1.8	4.6	3.3	37.2	28.7	9.0	7.8

Solvent system 1 averages

Sample	origin	190978	205375	Unknown	131013		205374	parent	189138
48	5.87	1.30	1.70	0.77	ND		3.10	86.95	5.18
96	11.78	2.62	2.62	1.38	ND		5.31	56.72	7.82
168	12.85	2.99	2.93	1.92	ND		5.47	56.45	7.51
240	7.86	4.19	3.16	1.24	1.82		4.60	49.42	6.37
360	10.63	3.70	2.95	1.59	1.82	single rep	3.96	32.94	8.40

Solvent system 2

Sample	origin		190978		205375	Unknown		131013		205374		parent		189138	
48	5.34	3.80	2.60	2.35	ND	3.39	2.97	ND	ND	7.97	6.99	90.87	80.81	1.20	1.45
96	7.53	8.94	4.10	3.23	ND	4.43	4.14	ND	ND	10.12	11.37	55.50	62.17	2.46	2.44
168	9.08	7.86	4.48	3.35	ND	6.49	5.50	ND	ND	11.13	9.67	55.58	61.22	3.37	2.42
240	8.86	7.91	3.75	2.84	ND	3.15	2.32	4.89	2.17	7.21	7.00	54.14	49.05	2.04	2.01
360	6.39	7.77	2.84	3.00	ND	3.19	2.79	4.34	3.91	9.46	8.06	41.52	30.69	2.36	3.77

Solvent system 2 averages

Sample	origin	190978	205375	Unknown	131013	205374	parent	189138
48	4.57	2.48	ND	3.18	ND	7.48	85.84	1.33
96	8.24	3.67	ND	4.29	ND	10.75	58.84	2.45
168	8.47	3.92	ND	6.00	ND	10.40	58.40	2.90
240	8.39	3.30	ND	2.74	3.53	7.11	51.60	2.03
360	7.08	2.92	ND	2.99	4.13	8.76	36.11	3.07

Average of solvent system I and II

Sample	origin	190978	205375		Unknown	131013	205374	parent	189138
48	5.22	1.89	1.70	1 solvent	1.98	ND	5.29	86.39	3.25
96	10.01	3.14	2.62	1 solvent	2.83	ND	8.03	57.78	5.13
168	10.66	3.45	2.93	1 solvent	3.96	ND	7.94	57.43	5.20
240	8.12	3.74	3.16	1 solvent	1.99	2.67	5.85	50.51	4.20
360	8.85	3.31	2.95	1 solvent	2.29	2.97	6.36	34.52	5.73

Reflux solvent system 1

Sample	origin		190978		205375		Unknown		131013		205374		parent		189138	
48																
96	2.61	1.44	0.69	0.17	1.33	0.93	0.39	0.28	0.17	0.35	0.63	0.48	4.31	2.45	1.40	0.58
168	1.57	1.67	0.50	0.05	1.01	1.02	0.21	0.00	0.13	0.00	0.57	0.43	4.52	4.42	0.43	0.67
240	2.22	1.62	0.59	0.55	1.10	0.95	0.56	0.34	0.26	0.43	0.53	0.77	3.30	2.66	1.00	1.04
360	3.13	1.64	0.40	0.07	0.97	0.90	0.55	0.38	0.22	0.13	0.61	0.07	4.69	2.05	0.89	0.59

Reflux solvent system 1 averages

Sample	origin	190978	205375	Unknown	131013	205374	parent	189138
48								
96	2.03	0.43	1.13	0.34	0.26	0.56	3.38	0.99
168	1.62	0.28	1.02	0.11	0.07	0.50	4.47	0.55
240	1.92	0.57	1.03	0.45	0.35	0.65	2.98	1.02
360	2.39	0.24	0.94	0.47	1.82	0.34	3.37	0.74

Reflux solvent system 2

Sample	origin		190978		205375	Unknown		131013		205374		parent		189138	
48															
96	1.81	1.10	0.92	0.33	ND	1.09	0.56	1.21	0.47	1.51	0.66	4.13	2.64	0.89	0.88
168	1.43	1.20	1.10	0.44	ND	0.59	0.78	1.06	0.91	0.75	0.20	3.12	4.15	0.90	0.57
240	2.06	1.38	0.55	0.43	ND	1.57	1.02	0.00	0.40	0.40	0.93	4.31	3.31	0.61	0.81
360	2.56	1.20	0.53	0.40	ND	1.80	1.10	0.46	0.40	1.11	0.47	4.08	1.65	0.91	0.64

Reflux solvent system 2 averages

Sample	origin	190978	205375	Unknown	131013	205374	parent	189138
48								
96	1.46	0.63	ND	0.83	0.84	1.09	3.39	0.89
168	1.32	0.77	ND	0.69	0.99	0.48	3.64	0.74
240	1.72	0.49	ND	1.30	0.20	0.67	3.81	0.71
360	1.88	0.47	ND	1.45	0.43	1.82	2.87	0.78

Average of reflux of solvent systems I and II

Sample	origin	190978	205375	Unknown	131013	205374	parent	189138
48								
96	1.74	0.53	1.13	0.58	0.55	0.82	3.38	0.94
168	1.47	0.52	1.02	0.40	0.53	0.49	4.05	0.64
240	1.82	0.53	1.03	0.87	0.27	0.66	3.40	0.87
360	2.13	0.35	0.94	0.96	1.13	1.08	3.12	0.76

Sum (average of both solvent systems + average of both reflux extracts)

Sample	origin	190978	205375	Unknown	131013	205374	parent	189138
48	5.22	1.89	1.70	1.98	ND	5.29	86.39	3.25
96	11.75	3.67	3.75	3.41	ND	8.85	61.16	6.07
168	12.13	3.97	3.94	4.35	ND	8.42	61.48	5.84
240	9.94	4.27	4.18	2.86	2.95	6.51	53.90	5.06
360	10.99	3.66	3.89	3.25	4.10	7.44	37.64	6.49

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