DATA EVALUATION RECORD

STUDY 10

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CONCLUSIONS

Mobility - Leaching & Adsorption/Desorption

1. This study is scientifically valid and provides useful information on the soil mobility (column leaching) of trifloxystrobin and its degradates in seven soils. However, column leaching periods for duplicate soil columns of two soils were not equal and/or were greater than 2 days. Additionally, mobility determinations were inconclusive for the parent compound in three of the seven soils and for the degradate CGA-357276 in all seven soils due to the low levels of the respective residues observed in the soils columns.

2. This study does not meet Subdivision N Guidelines for the fulfillment of EPA data requirements on soil mobility (column leaching) for the following reason:

   (i) soil columns were leached for excessive periods of time (19-84 days) for the loam and clay loam soils.

3. Based on column leaching studies, uniformly phenyl ring-labeled [^{14}C]trifloxystrobin, applied at a nominal concentration of 0.5 ppm to loamy sand, sandy loam, Gardena loam, silt loam, Lynchburg sand (F; 0- to 6-inch), Lynchburg sand (G; 6- to 12-inch), and Bearden-Perella clay loam soils adjusted to 75% of 0.33 bar soil moisture content and aerobically aged 25 ± 1 °C in darkness for up to 1 day, was observed to be immobile in loamy sand and sandy loam soil columns leached for 1-2 days and to have low mobility in Lynchburg sand (0- to 6-inch and 6- to 12-inch) soil columns which were leached for 1-2 days; mobility of the parent could not be determined in loam, silt loam, and clay loam soil columns which were leached for 25-43, 2-4, and 19-83 days, respectively. The degradate CGA-321113 was observed to be very mobile in loamy sand, sandy loam, and silt loam soil columns which were leached for 1 day, and was observed to be mobile in loam, Lynchburg sand (0- to 6-inch and 6- to 12 inch), and clay loam soil columns which were leached for 46-84, 1, 1, and 36-55 days, respectively. The degradate CGA-357276 was present in quantities too low to assess mobility.

   Of the aged (1 day) pesticide applied to the loamy sand soil columns, 47.4% was parent, 41.9% was CGA-321113, and 2.7% was nonextractable [^{14}C]residues. Based on LSC analysis, the majority of the radiolabeled residues retained in the soil column following leaching were in the 0- to 6-cm depth; however, residues were distributed throughout the column. Following leaching (over 1 or 2 days), the parent compound was present in the 0- to 6-cm depth at 20.2% of the applied radioactivity, was in the 6- to 12-cm depth at 1.1%, and was not detected below the 12-cm depth. The major degradate CGA-321113 was present in the 0- to 6-cm depth at 14.0% of the applied radioactivity; was in the 6- to 12-cm depth, the 18- to 24-cm depth (single column), the 24- to 30-cm depth, and the 30- to 36-cm depth (single column) at 1.7-2.7%; and was not detected at any other depth. The minor degradate CGA-357276 was detected in the 6- to 12-cm, the 24- to 30-cm

depth, and the 30- to 36-cm depth at ≤0.3% of the applied radioactivity, and was <0.1% at other depths. The parent was not detected in the leachate; the degradates CGA-321113 and CGA-357276 were detected at 30.9% and 0.6% of the applied, respectively.

Of the aged (0.5 day) pesticide applied to the sandy loam soil columns, 62.1% was parent, 32.1% was CGA-321113, and 3.5% was nonextractable [^{14}C]residues. Based on LSC analysis, the majority of radiolabeled residues retained in the soil column following leaching were in the 0- to 6-cm depth; however, residues were distributed throughout the column. Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 18.4% of the applied radioactivity; was in the 6- to 12-cm depth (single column), the 12- to 18-cm depth (single column), the 24- to 30-cm depth, 30- to 36-cm depth and the 36- to 42-cm depth (single column) at 0.1- 0.5%; and was <0.1% at other depths. The major degradate CGA-321113 was present in the 0- to 6-cm depth at 27.3% of the applied radioactivity, and was in the 6- to 12-cm depth, the 12- to 18-cm depth (single column), the 18- to 24-cm depth, the 24- to 30-cm depth, the 30- to 36-cm depth, and the 36- to 42-cm depth (single column) at 2.4-5.9%. The minor degradate CGA-357276 was detected in the 0- to 6-cm depth at 0.9% (single column) of the applied radioactivity, was in the 24- to 30-cm and the 30- to 36-cm depths at 0.2% (single column), and was <0.1% at other depths. The parent compound and the degradates CGA-321113 and CGA-357276 were not detected in the leachate.

Of the aged (1 day) pesticide applied to the Gardena loam soil columns, 43.5% was parent, 52.4% was CGA-321113, and 1.6% was nonextractable [^{14}C]residues. Based on LSC analysis, the majority of radiolabeled residues retained in the soil column following leaching remained in the 0- to 6-cm and 6- to 12-cm depths. Following leaching (over 25 or 43 days), the parent compound was present in the 0- to 6-cm depth at 1.4% of the applied radioactivity, and was not detected at any other depth. The major degradate CGA-321113 was present in the 0- to 6-cm depth at 14.2% of the applied radioactivity, the 6- to 12-cm depth at 29.2%, the 12- to 18-cm depth at 2.5%, and was not detected below the 18-cm depth. The minor degradate CGA-357276 was detected in the 0- to 6-cm and the 6- to 12-cm depths at 1.7% of the applied radioactivity, and was not detected at any other depth. The parent compound and the degradates CGA-321113 and CGA-357276 were not detected in the leachate.

Of the aged (0.5 day) pesticide applied to the silt loam soil columns, 50.6% was parent, 51.3% was CGA-321113, 0.3% was CGA-357276, and 6.3% was nonextractable [^{14}C]residues. Based on LSC analysis, radiolabeled residues retained in the soil column following leaching were distributed throughout the column. Following leaching (over 1 or 3 days), the parent compound was present in the 0- to 6-cm depth at 1.3% of the applied radioactivity, and was <0.1% at other depths. The major degradate CGA-321113 was present in the 0- to 6-cm depth at 2.6% of the applied radioactivity, the 6- to 12-cm depth at 6.9%, the 12- to 18-cm depth at 17.4%, the 18- to 24-cm depth at 18.2%, the 24- to 30-cm depth at 10.0%, the 30- to 36-cm depth at 3.4%, and the 36- to 42-cm depth at

1.0% (single column). The minor degradate CGA-357276 was detected in the 12- to 18-cm depth (single column), the 18- to 24-cm depth (single column), the 24- to 30-cm depth (single column), the 30- to 36-cm depth, and the 36- to 42-cm depth (single column) at 0.1-0.7% of the applied radioactivity; data were variable between columns. The parent compound and the degradates CGA-321113 and CGA-357276 were not detected in the leachate.

Of the aged (0.5 day) pesticide applied to the Lynchburg sand soil (F; 0- to 6-inches) columns, 54.4% was parent, 46.4% was CGA-321113, and 2.1% was nonextractable [^{14}C]residue. Based on LSC analysis, radiolabeled residues retained in the soil column following leaching were distributed throughout the column. Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 28.9% of the applied radioactivity, was in the 6- to 12-cm depth at 0.9%, and the 24- to 30-cm depth at 0.2% (single column), and was not detected at any other depth. The major degradate CGA-321113 was present in the 0- to 6-cm depth at 18.0% of the applied radioactivity; was in the 6- to 12-cm depth, the 12- to 18-cm depth, the 18- to 24-cm depth, the 24- to 30-cm depth, and the 30- to 36-cm depth at 5.5-7.6%; and was in the 36- to 42-cm depth at 2.9%. The minor degradate CGA-357276 was detected in the 36- to 42-cm depth at 0.2% of the applied radioactivity and was not detected at any other depth. In the leachate, the parent compound and CGA-357276 were <0.1% of the applied radioactivity and the degradate CGA-321113 was 3.9%.

Of the aged (0.5 day) pesticide applied to the Lynchburg sand soil (G; 6- to 12-inches) columns, 52.8% was parent, 46.4% was CGA-321113, and 2.0% was nonextractable [^{14}C]residues. Based on LSC analysis, the majority of radiolabeled residues retained in the soil column following leaching were in the 0- to 6-cm depth; however, residues were distributed throughout the column. Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 24.6% of the applied radioactivity, the 6- to 12-cm depth at 3.9%, the 12- to 18-cm depth at 1.1% (single column), the 24- to 30-cm depth at 0.1%, and was not detected at any other depth. The major degradate CGA-321113 was present in the 0- to 6-cm depth at 22.6% of the applied radioactivity, and was in the 6- to 12-cm depth, the 12- to 18-cm depth, the 18- to 24-cm depth, the 24- to 30-cm depth, the 30- to 36-cm depth, and the 36- to 42-cm depth at 2.3-3.5%. The minor degradate CGA-357276 was detected in the 12- to 18-cm depth at 1.0% (single column), was in the 18- to 24-cm depth at 0.3% (single column), and was <0.1% at other depths. In the leachate, the degradate CGA-321113 was 12.1% of the applied radioactivity; the parent and the degradate CGA-357276 were not detected.

Of the aged (1 day) pesticide applied to the Bearden-Perella clay loam soil columns, 55.8% was parent, 43.5% was CGA-321113, and 1.8% was nonextractable [^{14}C]residues. Based on LSC analysis, the majority of the radiolabeled residues retained in the soil column following leaching were in the top 12 cm. Following leaching (over 19 or 83 days), the parent compound was present in the 0- to 6-cm depth at 2.3% of the applied

radioactivity, and was <0.1% at other depths. The major degradate CGA-321113 was present in the 0- to 6-cm depth at 26.3% of the applied radioactivity, the 6- to 12-cm depth at 14.3%, the 12- to 18-cm depth at 3.1%, and was not detected at any other depth. The minor degradate CGA-357276 was detected in the 0- to 6-cm depth at 1.6%, was in the 6- to 12-cm depth at 0.5%, and was <0.1% at other depths.

METHODOLOGY

Prior to the aging period, sieved (2 mm) loamy sand, sandy loam, Gardena loam, silt loam, Lynchburg sand (F; 0- to 6-inch), Lynchburg sand (G; 6- to 12-inch), and Bearden-Perella clay loam soils (Tables 2-4, pp. 93-95) were adjusted to 50-75% of the soil moisture content at 0.33 bar and pre-incubated at 23 °C for 7 days (p. 33). Subsamples of the pre-incubated soil were placed in amber bottles and treated with uniformly phenyl ring-labeled [^{14}C]trifloxystrobin {methyl (E,E)-alpha-(methoxyimino)-2-[[[[1-[3-(trifluoromethyl)phenyl]ethylidene]amino]oxy]methyl] benzeneacetate; radiochemical purity 99.1%, specific activity 30.1 μCi/mg; p. 28}, dissolved in acetonitrile, at a nominal concentration of 0.5 μg/g (pp. 29, 33, 34). The acetonitrile was allowed to evaporate, and samples were placed in amber bottles and aged aerobically for up to 1 day OR 46 days in darkness at 25 ± 1 °C (p. 36; Figure 5, p. 177). The moisture content of the treated samples was adjusted to 75% of 0.33 bar and was maintained by passing moist, CO_2-free air through each bottle. [^{14}C]Organic volatiles, $^{14}CO_2$, and water vapor were collected in polyurethane foam plugs, ethylene glycol, Tenax®/charcoal (organics), KOH (two traps), and water vapor traps connected in series (p. 37; Figure 5, p. 177). Duplicate soil samples were removed for analysis at 6 and 12 hours, and at 1, 7, 14, 28, and 45 or 46 days posttreatment; volatile traps were removed for analysis at each sampling interval.

To determine degradation during the aging period, subsamples of soil were extracted twice by vortexing and shaking with acetonitrile:water (8:2, v:v), followed by centrifugation (pp. 31, 32). The extracts were decanted, and duplicate aliquots of each extract were analyzed for total radioactivity by LSC; the limit of detection was 0.0008-0.0012 μg (in parent equivalents; p. 46). The extracts were combined, mixed, and analyzed in triplicate for total radioactivity by LSC. An aliquot of the extract was concentrated by rotary evaporation and analyzed by reverse-phase HPLC (Hibar Lichrosorb RP-18 column) using a mobile phase gradient of aqueous 0.1% formic acid:acetonitrile (100:0 to 35:65 to 0:100, v:v) with UV (250 nm) and radioactive flow detection (pp. 43, 44); the limit of detection was 0.009-0.018 μg/mL (p. 46). Samples were co-chromatographed with nonradiolabeled reference standards. Previously extracted soil samples were extracted using Soxhlet extraction for two hours with acetonitrile:water (9:1, v:v); triplicate aliquots of the extract were analyzed for total radioactivity by LSC. Soxhlet extracts containing radioactivity at ≥5% of the applied were concentrated by rotary evaporation and partitioned three times with ethyl acetate, and the ethyl acetate partitions were combined. Triplicate aliquots were analyzed for total radioactivity by

LSC; the remaining ethyl acetate partition was dried (Na_2SO_4), redissolved in ethyl acetate, and analyzed by HPLC as previously described. Following the acetonitrile:water Soxhlet extraction, soil samples were Soxhlet extracted with methanol for four hours. Triplicate aliquots of the methanol extract were analyzed for total radioactivity by LSC. The identity of the parent and degradate compounds were confirmed in selected extracts by two-dimensional TLC using Kieselgel or silica gel plates developed perpendicularly with toluene:chloroform:ether:formic acid (60:34:5:1, v:v:v:v) and toluene:ethyl acetate:acetic acid (70:30:1.5, v:v:v); areas of radioactivity were visualized by radioimage scanning (pp. 44, 45). Samples were co-chromatographed with nonradiolabeled reference standards which were visualized with UV light (254 nm). To further quantify parent and degradate compounds, TLC plates were divided and scraped into methanol, and analyzed for total radioactivity by LSC. Triplicate subsamples of post-extracted soil were analyzed for total radioactivity by LSC following combustion; the limit of detection was 0.24% of the applied (p. 46).

The polyurethane foam plugs were extracted with methanol, and the Tenax®/charcoal traps were extracted with carbon disulfide:propanol (95:5, v:v); triplicate aliquots of each extract were analyzed for total radioactivity by LSC (p. 37). The volumes of the ethylene glycol, KOH, and water traps were each adjusted to 15 mL with water; triplicate aliquots were analyzed for total radioactivity by LSC. The presence of $^{14}CO_2$ was confirmed in the KOH traps by precipitation with $BaCl_2$; trap solutions were centrifuged and triplicate aliquots of the supernatant were analyzed for total radioactivity by LSC. The precipitated KOH traps were sealed under vacuum and attached to two phenethylamine traps, and concentrated HCl was added to the KOH traps. The KOH-phenethylamine traps were aerated overnight; triplicate aliquots of each phenethylamine trap and the KOH trap were analyzed for total radioactivity by LSC.

To determine the viability of pre-incubated and treated soils, subsamples were plated onto selective media and analyzed by substrate-induced respirometry (p. 30; Appendix III, p. 412). Data indicated that soils were viable at all sampling intervals (Tables 5, 6, pp. 96-98).

To determine pesticide mobility, PVC columns (28; 3.5 cm i.d.) equipped with wire mesh, glass wool, and funnels (Figure 6, p. 178) were packed to a depth of 42.5 cm with untreated, air-dried, sieved (2 mm) loamy sand (bulk density 1.48-1.53 g/cm^3; Table 13, pp. 119, 120), sandy loam (1.26-1.28 g/cm^3), Gardena loam (0.95-1.05 g/cm^3), silt loam (1.12-1.16 g/cm^3), Lynchburg sand (F; 1.51-1.59 g/cm^3), Lynchburg sand (G; 1.47-1.60 g/cm^3), and Bearden-Perella clay loam (1.07-1.11 g/cm^3) soils; columns were saturated with 0.01 *N* $CaCl_2$ solution and equilibrated overnight (pp. 39-41). Volatile traps (as previously described) were attached to the effluent collection containers of the Gardena loam, silt, and Bearden-Perella clay loam soil columns. Subsamples of aged (0.5-1 day or 45-46 days), treated soil were added on top of each soil column (duplicate columns for each aging period), with the exception of the loam and clay loam soil columns. For the

Gardena loam and Bearden-Perella clay loam soils, subsamples of aged, treated soil were mixed with 0.01 *N* $CaCl_2$ solution (2:1, w:v) to form a slurry and the slurries were added to the top of the columns (see Comment #13); additional $CaCl_2$ solution used to rinse slurry beakers was poured onto the top of the respective columns. An additional subsample (10 g) of untreated soil was placed on top of all columns, and the soil columns were covered with a filter (Whatman microfiber GF/F) and leached with 490 mL of 0.01 *N* $CaCl_2$ solution (20 inches) for 1-84 days at 25 ± 1 °C (Table 12, pp. 113-118; light conditions not specified; see Comments #1, #8). [^{14}C]Organic volatiles, $^{14}CO_2$, and water vapor were collected from the loam, silt loam, and clay loam soils in the apparatus described above (Figure 5, p. 177). The leachate was collected in five 100-mL fractions. Following leaching, the columns were frozen and divided into seven 6-cm sections (p. 42). Samples were stored at -10 °C for an unspecified period of time (p. 38).

Triplicate subsamples of thawed, homogenized soil from each depth interval were analyzed for total radioactivity by LSC following combustion (p. 42; Figure 4, p. 176). The remaining soil was Soxhlet extracted with acetonitrile:water (9:1, v:v) for two hours; the extract was decanted, and triplicate aliquots were analyzed for total radioactivity by LSC. The remaining extract was concentrated and analyzed by HPLC as previously described. Column sections, filter paper, and glass wool were rinsed separately with acetonitrile:water (9:1, v:v); triplicate aliquots of each rinsate were analyzed for total radioactivity by LSC. The identity of parent and degradate compounds were confirmed in selected leachate samples that were analyzed by two-dimensional TLC as described previously. Triplicate subsamples of post-extracted soil were analyzed for total radioactivity by LSC following combustion; data were corrected for oxidation efficiency (76.6-95.0%; p. 45).

The leachate from each column was analyzed for total radioactivity by LSC; fractions containing >1% of the applied radioactivity were acidified to pH 2 with HCl, and partitioned twice with ethyl acetate (pp. 41, 42). The ethyl acetate partitions were combined and dried (Na_2SO_4), and triplicate aliquots were analyzed for total radioactivity by LSC. The remaining ethyl acetate partition was concentrated by rotary evaporation and under nitrogen, and analyzed by reverse-phase HPLC as previously described. Volatile traps that were attached to selected soil columns were extracted and analyzed as previously described.

To determine [^{14}C]residues associated with the humic acid, fulvic acid, and humin soil organic matter fractions in the Gardena loam, silt loam, and Bearden-Perella clay loam soils that had been aged for 45-46 days and then leached, subsamples of post-extracted soils were extracted with 3 *N* NaOH; samples were centrifuged and the extracts decanted (Figure 10, p. 184). The extracts were acidified (pH 1) with concentrated HCl to allow humic acids to precipitate. Following centrifugation, the supernatant was analyzed for total radioactivity by LSC to determine the fulvic acid fraction. The precipitate and the

post-extracted soil were analyzed for total radioactivity by LSC following combustion to determine the humic acid and humin fractions, respectively.

In a storage stability study, soil and column leachate samples that were aged for 0.5, 1, or 45 days were extracted and analyzed by HPLC immediately and following up to 11-16 months (soil) or 7-13 months (leachate) of frozen storage (p. 42; Table 25, pp. 165, 166; see Comment #3). The data indicated that the parent compound and the degradate CGA-321113 were stable in loam and silt loam soil stored frozen for up to 14 months; the degradate CGA-321113 was also stable in Lynchburg sand (F and G) soil stored frozen for up to 16 months. The parent degraded in sandy loam and Lynchburg sand (F) soil stored frozen for up to 14 months. The stability of the parent could not be determined in loamy sand and Lynchburg sand (G) soil, and the stability of the degradate CGA-321113 could not be determined in loamy sand and sandy loam soils due to variability in the data. Data indicated that the parent compound and CGA-321113 were stable in column leachates from clay loam soil columns; CGA-321113 was also stable in loamy sand and Lynchburg sand (G) column leachates. In Lynchburg sand (F), the parent compound degraded and the stability of CGA-321113 could not be determined due to variability in the data. The stability of the parent in loamy sand and Lynchburg sand (G) column leachates could not be determined.

DATA SUMMARY

Based on column leaching studies, uniformly phenyl ring-labeled [^{14}C]trifloxystrobin (radiochemical purity 99.1%), applied at a nominal concentration of 0.5 ppm to loamy sand, sandy loam, Gardena loam, silt loam, Lynchburg sand (F; 0- to 6-inch), Lynchburg sand (G; 6- to 12-inch), and Bearden-Perella clay loam soils adjusted to 75% of 0.33 bar soil moisture content and aerobically aged 25 ± 1 °C in darkness for up to 1 day, was observed to be immobile in loamy sand and sandy loam soils leached for 1-2 days and to have low mobility in Lynchburg sand (0- to 6-inch and 6- to 12-inch) soil columns which were leached for 1-2 days; mobility of the parent could not be determined in loam, silt loam, and clay loam soil columns which were leached for 25-43, 2-4, and 19-83 days, respectively (see Comments #1, #2 ; Tables 12, 24a-g, pp. 113-118, 151-164). The degradate CGA-321113 was observed to be very mobile in loamy sand, sandy loam, and silt loam soil columns which were leached for 1 day, and was observed to be mobile in loam, Lynchburg sand (0- to 6-inch and 6- to 12 inch), and clay loam soil columns which were leached for 46-84, 1, 1, and 36-55 days, respectively. The degradate CGA-357276 was present in quantities too low to assess mobility.

Data from the soils aged for 45 or 46 days were not utilized to determine compound mobility, but are reported below for each soil. Nonextractable [^{14}C]residues were not reported as a percentage of the applied radioactivity by depth for the leached soil columns.

Loamy sand soil

Of the aged (1 day) pesticide applied to the loamy sand soil columns, 47.4% was parent, 41.9% was CGA-321113, and 2.7% was nonextractable [^{14}C]residues (Tables 15, 17a, pp. 122, 127). Based on LSC analysis, the majority of the radiolabeled residues retained in the soil column following leaching were in the 0- to 6-cm depth; however, residues were distributed throughout the column (Table 23a, p. 144). Following leaching (over 1 or 2 days), the parent compound was present in the 0- to 6-cm depth at 20.2% of the applied radioactivity, was in the 6- to 12-cm depth at 1.1%, and was not detected below the 12-cm depth (Table 24a, pp. 151, 152). The major degradate

CGA-321113 (chemical name not specified)

was present in the 0- to 6-cm depth at 14.0% of the applied radioactivity, the 6- to 12-cm depth at 2.1%, the 18- to 24-cm depth at 2.7% (single column), the 24- to 30-cm depth at 1.7%, and the 30- to 36-cm depth at 1.8% (single column), and was not detected at any other depth. The minor degradate CGA-357276 (chemical name not specified) was detected in the 6- to 12-cm and 24- to 30-cm depths at 0.3% (single column) of the applied radioactivity, was in the 30- to 36-cm depth at 0.2% (single column), and was <0.1% at other sampling depths. The parent was not detected in the leachate; the degradates CGA-321113 and CGA-357276 were detected at 30.9% and 0.6% of the applied, respectively. Following the aging period and column leaching, respective material balances were 92.2% and 103.3% of the applied radioactivity.

Of the aged (45 days) pesticide applied to the loamy sand soil columns, 2.5% was parent, 74.1% was CGA-321113, 1.9% was CGA-357276 and 10.0% was nonextractable [^{14}C]residues (Tables 15, 17a, pp. 122, 127). Based on LSC analysis, the majority of the radiolabeled residues retained in the soil column following leaching were in the 0- to 6-cm depth; however, residues were distributed throughout the column (Table 23a, p. 144). Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 2.0% of the applied radioactivity, and was <0.1% below the 6-cm depth (Table 24a, pp. 151, 152). The major degradate

CGA-321113

was present in the 0- to 6-cm depth at 13.1% of the applied radioactivity, the 6- to 12-cm depth at 1.7%, the 12- to 18-cm depth at 2.5%, the 18- to 24-cm depth at 3.3%, the 24- to 30-cm depth at 2.5%, the 30- to 36-cm depth at 3.1%, and the 36- to 42-cm depth at 3.3%. The minor degradate CGA-357276 was detected in the 0- to 6-cm depth at 2.1% of the applied radioactivity; was in the 6- to 12-cm (single column), 24- to 30-cm, and the 30- to 36-cm depths at 0.3%; and was <0.1% at other sampling depths. The parent was not detected in the leachate; the degradates CGA-321113 and CGA-357276 were detected

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at 28.4% and <0.1% of the applied, respectively. Following the aging period and column leaching, respective material balances were 99.7% and 96.9% of the applied radioactivity.

Sandy loam soil

Of the aged (0.5 day) pesticide applied to the sandy loam soil columns, 62.1% was parent, 32.1% was CGA-321113, and 3.5% was nonextractable [^{14}C]residues (Tables 15, 17b, pp. 122, 128). Based on LSC analysis, the majority of radiolabeled residues retained in the soil column following leaching were in the 0- to 6-cm depth; however, residues were distributed throughout the column (Table 23b, p. 145). Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 18.4% of the applied radioactivity; the 6- to 12-cm depth at 0.5% (single column); the 12- to 18-cm depth at 0.2% (single column); was in the 24- to 30-cm, 30- to 36-cm and 36- to 42-cm depths at 0.1% (single column); and was <0.1% at other depths (Table 24b, pp. 153, 154). The major degradate

CGA-321113 (chemical name not specified)

was present in the 0- to 6-cm depth at 27.3% of the applied radioactivity, the 6- to 12-cm depth at 5.6%, the 12- to 18-cm depth at 4.6% (single column), the 18- to 24-cm depth at 3.7%, the 24- to 30-cm depth at 5.9%, the 30- to 36-cm depth at 3.7%, and the 36- to 42-cm depth at 2.4% (single column). The minor degradate CGA-357276 (chemical name not specified) was detected in the 0- to 6-cm depth at 0.9% (single column) of the applied radioactivity, the 24- to 30-cm depth at 0.2% (single column), the 30- to 36-cm depth at 0.2% (single column), and was <0.1% at other depths. The parent compound and the degradates CGA-321113 and CGA-357276 were not detected in the leachate. Following the aging period and column leaching, respective material balances were 97.8% and 105.1% of the applied radioactivity.

Of the aged (45 days) pesticide applied to the sandy loam soil columns, 0.4% was parent, 88.3% was CGA-321113, and 3.1% was nonextractable [^{14}C]residues (Tables 15, 17b, pp. 122, 128). Based on LSC analysis, the radiolabeled residues retained in the soil column following leaching were distributed throughout the column (Table 23b, p. 145). Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 0.5% of the applied radioactivity, the 12- to 18-cm depth at 0.3% (single column), the 18- to 24-cm depth at 0.7%, and was <0.1% at other depths (Table 24b, pp. 153, 154). The major degradate

CGA-321113

was present in the 0- to 6-cm depth at 7.0% of the applied radioactivity, the 6- to 12-cm depth at 2.1%, the 12- to 18-cm depth at 3.5%, the 18- to 24-cm depth at 8.1%, the 24- to 30-cm depth at 16.7%, the 30- to 36-cm depth at 10.4%, and the 36- to 42-cm depth at

1.1%. The minor degradate CGA-357276 was detected in the 0- to 6-cm depth at 0.5% of the applied radioactivity, the 18- to 24-cm depth at 0.6% (single column), the 24- to 30-cm depth at 0.4%, the 30- to 36-cm depth at 0.3% (single column), and was <0.1% at other depths. The parent compound and the degradates CGA-321113 and CGA-357276 were not detected in the leachate. Following the aging period and column leaching, respective material balances were 99.2% and 101.7% of the applied radioactivity.

Gardena loam soil

Of the aged (1 day) pesticide applied to the loam soil columns, 43.5% was parent, 52.4% was CGA-321113, and 1.6% was nonextractable [^{14}C]residues (Tables 15, 17c, pp. 123, 129). Based on LSC analysis, the majority of radiolabeled residues retained in the soil column following leaching remained in the 0- to 6-cm and 6- to 12-cm depths (Table 23c, p. 146). Following leaching (over 25 or 43 days), the parent compound was present in the 0- to 6-cm depth at 1.4% of the applied radioactivity, and was not detected at any other depth (Table 24c, pp. 155, 156; see Comment #2). The major degradate

CGA-321113 (chemical name not specified)

was present in the 0- to 6-cm depth at 14.2% of the applied radioactivity, the 6- to 12-cm depth at 29.2%, and the 12- to 18-cm depth at 2.5%, and was not detected below the 18-cm depth. The minor degradate CGA-357276 (chemical name not specified) was detected in the 0- to 6-cm depth at 1.7% of the applied radioactivity, was in the 6- to 12-cm depth at 1.7%, and was not detected at any other depth. The parent compound and the degradates CGA-321113 and CGA-357276 were not detected in the leachate. Following the aging period and column leaching, respective material balances were 99.2% and 92.7% of the applied radioactivity.

Of the aged (46 days) pesticide applied to the loam soil columns, 1.1% was parent, 71.9% was CGA-321113, 2.9% was CGA-357276, and 15.3% was nonextractable [^{14}C]residues (Tables 15, 17c, pp. 123, 129). Based on LSC analysis, the radiolabeled residues retained in the soil column following leaching were present in the top 12 cm of the column (Table 23c, p. 146). Following leaching (over 46 or 84 days), the parent compound was present in the 0- to 6-cm depth at 1.1% of the applied radioactivity, and was not detected at any other depth (Table 24c, pp. 155, 156). The major degradate

CGA-321113

was present in the 0- to 6-cm depth at 26.5% of the applied radioactivity, was in the 6- to 12-cm depth at 10.3%, and was not detected at any other depth. The minor degradate CGA-357276 was detected in the 0- to 6-cm depth at 3.1% (single column) of the applied radioactivity, was in the 6- to 12-cm depth at 1.3%, and was not detected at other depths. The parent compound and the degradates CGA-321113 and CGA-357276 were not

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detected in the leachate. Following leaching, mean radioactivity associated with humic acid, fulvic acid and humin fractions was 1.3%, 3.9% and 9.8% of the applied radioactivity, respectively (Table 18, p. 135). Following the aging period and column leaching, respective material balances were 96.2% and 102.4% of the applied radioactivity.

Silt loam soil

Of the aged (0.5 day) pesticide applied to the silt loam soil columns, 50.6% was parent, 51.3% was CGA-321113, 0.3% was CGA-357276, and 6.3% was nonextractable [^{14}C]residues (Tables 15, 17d, pp. 123, 130). Based on LSC analysis, radiolabeled residues retained in the soil column following leaching were distributed throughout the column (Table 23d, p. 147). Following leaching (over 1 or 3 days), the parent compound was present in the 0- to 6-cm depth at 1.3% of the applied radioactivity, and was <0.1% at other depths (Table 24d, pp. 157, 158; see Comment #2). The major degradate

CGA-321113 (chemical name not specified)

was present in the 0- to 6-cm depth at 2.6% of the applied radioactivity, the 6- to 12-cm depth at 6.9%, the 12- to 18-cm depth at 17.4%, the 18- to 24-cm depth at 18.2%, the 24- to 30-cm depth at 10.0%, the 30- to 36-cm depth at 3.4%, and the 36- to 42-cm depth at 1.0% (single column). The minor degradate CGA-357276 (chemical name not specified) was detected sporadically in the 12- to 18-cm depth at 0.2% (single column) of the applied radioactivity, the 18- to 24-cm depth at 0.7% (single column), the 24- to 30-cm depth at 0.4% (single column), the 30- to 36-cm depth at 0.1%, and the 36- to 42-cm depth at 0.3% (single column); data were variable between columns. The parent compound and the degradates CGA-321113 and CGA-357276 were not detected in the leachate. Following the aging period and column leaching, respective material balances were 108.8% and 102.4% of the applied radioactivity.

Of the aged (45 days) pesticide applied to the silt loam soil columns, 76.2% was CGA-321113, and 9.0% was nonextractable [^{14}C]residues (Tables 15, 17d, pp. 123, 130). Based on LSC analysis, the radiolabeled residues retained in the soil column following leaching were distributed throughout the column (Table 23d, p. 147). Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 0.2% of the applied radioactivity, and was not detected at any other depth (Table 24d, pp. 157, 158). The major degradate

CGA-321113

was present in the 0- to 6-cm depth at 4.2% of the applied, the 6- to 12-cm depth at 3.2%, the 12- to 18-cm depth at 3.3% (single column), the 18- to 24-cm depth at 24.5%, the 24- to 30-cm depth at 21.3%, the 30- to 36-cm depth at 3.9%, and the 36- to 42-cm depth at

1.0% (single column). The minor degradate CGA-357276 was detected in the 0- to 6-cm depth at 0.2% of the applied radioactivity, the 6- to 12-cm depth at 0.1% (single column), the 18- to 24-cm depth at 0.3%, the 24- to 30-cm depth at 0.3%, and was <0.1% at other depths. The parent compound and the degradates CGA-321113 and CGA-357276 were not detected in the leachate. Following leaching, mean radioactivity associated with humic acid, fulvic acid and humin fractions was 1.9%, 1.2% and 3.6% of the applied radioactivity, respectively (Table 18, p. 135). Following the aging period and column leaching, respective material balances were 99.5% and 102.1% of the applied radioactivity.

Lynchburg sand (F; 0- to 6-inches)

Of the aged (0.5 day) pesticide applied to the sand (F) soil columns, 54.4% was parent, 46.4% was CGA-321113, and 2.1% was nonextractable [^{14}C]residue (Tables 15, 17e, pp. 124, 131). Based on LSC analysis, radiolabeled residues retained in the soil column following leaching were distributed throughout the column (Table 23e, p. 148). Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 28.9% of the applied radioactivity, was in the 6- to 12-cm depth at 0.9%, and the 24- to 30-cm depth at 0.2% (single column), and was not detected at any other depth (Table 24e, pp. 159, 160). The major degradate

CGA-321113 (chemical name not specified)

was present in the 0- to 6-cm depth at 18.0% of the applied radioactivity (reviewer-calculated; see Comment #11), the 6- to 12-cm depth at 5.5%, the 12- to 18-cm depth at 6.3%, the 18- to 24-cm depth at 7.8%, the 24- to 30-cm depth at 7.6%, the 30- to 36-cm depth at 6.5%, and the 36- to 42-cm depth at 2.9%. The minor degradate CGA-357276 (chemical name not specified) was detected in the 36- to 42-cm depth at 0.2% of the applied radioactivity, and was not detected at any other depth. In the leachate, the parent compound and CGA-357276 were <0.1% of the applied radioactivity; the degradate CGA-321113 was 3.9%. Following the aging period and column leaching, respective material balances were 102.8% and 102.0% of the applied radioactivity.

Of the aged (45 days) pesticide applied to the sand (F) soil columns, 9.6% was parent, 71.7% was CGA-321113, 3.4% was CGA-357276, and 9.8% was nonextractable [^{14}C]residue (Tables 15, 17e, pp. 124, 131). Based on LSC analysis, the majority of radiolabeled residues retained in the soil column following leaching were in the 0- to 6-cm depth (Table 23e, p. 148); however, residues were distributed throughout the column. Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 6.7% of the applied radioactivity, and was <0.1% at other depths (Table 24e, pp. 159, 160). The major degradate

CGA-321113

was present in the 0- to 6-cm depth at 39.8% of the applied, the 6- to 12-cm depth at 2.0%, the 12- to 18-cm depth at 2.4%, the 18- to 24-cm depth at 2.4%, the 24- to 30-cm depth at 3.0%, the 30- to 36-cm depth at 2.3%, and the 36- to 42-cm depth at 1.4% (single column). The minor degradate CGA-357276 was detected in the 0- to 6-cm depth at 2.4% of the applied radioactivity, the 12- to 18-cm depth at 0.2% (single column), the 24- to 30-cm depth at 0.3% (single column), and the 30- to 36-cm depth at 0.1% (single column), and was <0.1% at other depths. In the leachate, the degradate CGA-321113 was 7.4% of the applied; the parent and CGA-357276 were not detected. Following the aging period and column leaching, respective material balances were 98.0% and 115.0% of the applied radioactivity.

Lynchburg sand soil (G; 6- to 12-inches)

Of the aged (0.5 day) pesticide applied to the sand (G) soil columns, 52.8% was parent, 46.4% was CGA-321113, and 2.0% was nonextractable [^{14}C]residues (Tables 15, 17f, pp. 124, 132). Based on LSC analysis, the majority of radiolabeled residues retained in the soil column following leaching were in the 0- to 6-cm depth; however, residues were distributed throughout the column (Table 23f, p. 149). Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 24.6% of the applied radioactivity, the 6- to 12-cm depth at 3.9%, the 12- to 18-cm depth at 1.1% (single column), and the 24- to 30-cm depth at 0.1%, and was not detected at any other depth (Table 24f, pp. 161, 162). The major degradate

CGA-321113 (chemical name not specified)

was present in the 0- to 6-cm depth at 22.6% of the applied radioactivity, the 6- to 12-cm depth at 2.8%, the 12- to 18-cm depth at 3.1%, the 18- to 24-cm depth at 3.2%, the 24- to 30-cm depth at 3.5%, the 30- to 36-cm depth at 2.6%, and the 36- to 42-cm depth at 2.3%. The minor degradate CGA-357276 (chemical name not specified) was detected in the 12- to 18-cm depth at 1.0% (single column), was in the 18- to 24-cm depth at 0.3% (single column), and was <0.1% at other depths. In the leachate, the degradate CGA-321113 was 12.1% of the applied radioactivity; the parent and the degradate CGA-357276 were not detected. Following the aging period and column leaching, respective material balances were 98.0% and 106.3% of the applied radioactivity.

Of the aged (45 days) pesticide applied to the sand (G) soil columns, 12.4% was parent, 74.0% was CGA-321113, 2.6% was CGA-357276, and 4.7% was nonextractable [^{14}C]residues (Tables 15, 17f, pp. 124, 132). Based on LSC analysis, the majority of radiolabeled residues retained in the soil column following leaching were in the 0- to 6-cm depth; however, residues were distributed throughout the column (Table 23f, p. 149). Following leaching (over 1 day), the parent compound was present in the 0- to 6-cm depth at 7.1% of the applied radioactivity; the 18- to 24-cm depth at 0.2% (single

column); and the 24- to 30-cm, 30- to 36-cm, and 36- to 42-cm depths at 0.1% (single columns; Table 24f, pp. 161, 162). The major degradate

CGA-321113

was present in the 0- to 6-cm depth at 36.3% of the applied, the 6- to 12-cm depth at 2.5%, the 12- to 18-cm depth at 2.9%, the 18- to 24-cm depth at 2.9%, the 24- to 30-cm depth at 2.5%, the 30- to 36-cm depth at 2.0%, and the 36- to 42-cm depth at 1.6%. The minor degradate CGA-357276 was detected in the 0- to 6-cm depth at 2.6% of the applied radioactivity; was in the 24- to 30-cm, 30- to 36-cm, and 36- to 42-cm depths at 0.1% (single columns); and was <0.1% at other depths. In the leachate, the degradate CGA-321113 accounted for 10.7% of the applied radioactivity; the parent and degradate CGA-357276 were not detected. Following the aging period and column leaching, respective material balances were 97.8% and 103.7% of the applied radioactivity.

Bearden-Perella clay loam soil

Of the aged (1 day) pesticide applied to the clay loam soil columns, 55.8% was parent, 43.5% was CGA-321113, and 1.8% was nonextractable [^{14}C]residue (Tables 15, 17g, pp. 125, 133). Based on LSC analysis, the majority of the radiolabeled residues retained in the soil column following leaching were in the top 12 cm (Table 23g, p. 150). Following leaching (over 19 or 83 days), the parent compound was present in the 0- to 6-cm depth at 2.3% of the applied radioactivity, and was <0.1% at other depths (Table 24g, pp. 163, 164; see Comment #2). The major degradate

CGA-321113 (chemical name not specified)

was present in the 0- to 6-cm depth at 26.3% of the applied radioactivity, the 6- to 12-cm depth at 14.3%, the 12- to 18-cm depth at 3.1%, and was not detected at any other depth. The minor degradate CGA-357276 (chemical name not specified) was detected in the 0- to 6-cm depth at 1.6%, was in the 6- to 12-cm depth at 0.5%, and was <0.1% at other depths. Following the aging period and column leaching, respective material balances were 103.0% and 94.7% of the applied radioactivity (Tables 15, 23g, pp. 125, 150).

Of the aged (46 days) pesticide applied to the clay loam soil columns, 6.5% was parent, 74.4% was CGA-321113, 0.7% was CGA-357276, and 11.0% was nonextractable [^{14}C]residues (Tables 15, 17g, pp. 125, 133). Based on LSC analysis, the majority of radiolabeled residues retained in the soil column following leaching were in the top 12 cm (Table 23g, p. 150). Following leaching (over 36 or 55 days), the parent compound was present in the 0- to 6-cm depth at 1.2% of the applied radioactivity, the 6- to 12-cm depth at 0.9%, and the 12- to 18-cm depth at 0.2% (single column), and was not detected below 18 cm (Table 24g, pp. 163, 164). The major degradate

was present in the 0- to 6-cm depth at 23.6% of the applied, the 6- to 12-cm depth at 18.6%, and the 12- to 18-cm depth at 3.0%, and was not detected below 18 cm. The minor degradate CGA-357276 (chemical name not specified) was detected in the 0- to 6-cm depth at 3.6% of the applied radioactivity, the 6- to 12-cm depth at 1.1%, and the 12- to 18-cm depth at 0.2% (single column), and was not detected at any other depth. Following leaching, mean radioactivity associated with the humic acid, fulvic acid and humin fractions was 0.7%, 3.5% and 6.2% of the applied radioactivity, respectively (Table 18, p. 135). Following the aging period and column leaching, respective material balances were 101.0% and 97.3% of the applied radioactivity.

COMMENTS

1. The leaching periods of replicate loam and clay loam soil columns were variable. The replicate loam soil columns were leached for 25 or 43 days (treated soil aged 1 day) and 46 or 84 days (treated soil aged 46 days; reviewer-calculated leaching periods from Table 12, pp. 113-118). The clay loam soil columns were leached for 83 or 19 days (treated soil aged 1 day) and 55 or 36 days (treated soil aged 46 days). It is preferred that replicate columns be leached over an equal period of time, and that the leaching period be of short duration (≤48 hours) in order to minimize the metabolism of parent and degradate compounds during leaching.

2. The mobility of the parent compound was determined from 1 day aged pesticide applied to duplicate columns of each soil. However, the amount of parent present following up to 43, 4, and 83 days of leaching in the Gardena loam, silt loam, and Bearden-Perella clay loam soil columns, respectively, was too low to adequately determine the mobility of the parent in these soils. The parent was present at 1.4%, 1.3%, and 2.3% of the applied radioactivity in the Gardena loam, silt loam, and Bearden-Perella clay loam soil columns, respectively.

3. The storage stability study was inadequate. The study author stated that aliquots of column leachates and samples from the soil metabolism study (0.5, 1, and 45 day) were tested for stability by analyzing samples by HPLC immediately following leaching (leachates) or extraction (soil) and following various storage periods. Samples were not analyzed for the parent and the degradates individually and the degradation of the parent caused increased amounts of degradates in some of the samples; thus, accurate storage stability determinations could not be made. Subdivision N Guidelines require that storage stability studies be conducted with samples which have been fortified separately with the parent compound and its degradates and stored for a duration equal to the longest interval for which the test samples were stored. The length of storage of the test samples

in the current study was not reported. EPA requires storage stability data when samples were stored for greater than thirty days prior to analysis.

4. The pesticide was aged in soil samples for 45-46 days for mobility determinations of the degradates CGA-321113 and CGA-357276; however, because sufficient data for CGA-321113 were available following the column leaching of the 1 day aged pesticide, these data were utilized for the mobility determinations of CGA-321113 in each of the seven soils. The reviewer noted that the CGA-321113 mobility determinations from the 1-day aging period study and the 46-day aging period study differed in one soil. In the Gardena loam soil, CGA-321113 was determined to be mobile following column leaching of 1 day aged pesticide and was determined to have low mobility following column leaching of 46-day aged pesticide.

5. The study author stated that a "method validation" was performed using the extraction and analysis methods previously described for both the aged and leached column soil (pp. 30, 31); however, the study was conducted solely to determine the efficiencies of the acetonitrile:water and Soxhlet extractions at one fortification level. Duplicate subsamples of each soil (excluding the clay loam soil) were adjusted to 75% of 0.33 bar moisture content, treated at 0.5 ppm, and incubated in darkness for four hours at room temperature, or for 24 hours at 25 ± 1°C. Prior to treatment, the clay loam soil was air-dried and treated, and the acetonitrile was evaporated prior to mixing; the soil moisture content was then adjusted to 75% of 0.33 bar. At each sampling interval, samples were extracted using each method described above and analyzed by LSC, reverse-phase HPLC, and two-dimensional TLC. Extraction efficiencies for the acetonitrile:water extraction utilized with aged soil were 101-104% (4-hr incubation) and 96.0-105% (24-hr incubation) of the applied radioactivity; efficiencies for the Soxhlet extraction utilized for leached column soil were 94.8-106% (4-hr incubation) and 95.8-105% (24-hr incubation) of the applied radioactivity (Table 14, p. 121). Generally, method validations studies are conducted to assess the adequacy of the full methodology for the determination of the test compound and are conducted at several fortification levels.

6. The study was conducted using uniformly phenyl ring-labeled [^{14}C]trifloxystrobin (α-ring; Figure 1, p. 172). The compound contained a second phenyl ring structure (β-ring) that was not radiolabeled.

7. Soil series names were not specified for two of the seven soils utilized in the study (Table 2, p. 93). Soil series names were not reported for the sandy loam and silt loam soils.

8. The temperature was not held constant during the column leaching period; the maximum and minimum temperatures recorded were 26.3°C and 16.4°C, respectively (Table 10, pp. 106-108). The minimum temperature was below 24°C (range of 23.2-23.9°C) for five consecutive days, and the temperature was not recorded on three separate occasions.

9. The study author stated in footnotes (Table 3, p. 94) that the loamy sand and loam soils were the same soils used in soil metabolism studies #1781.1295.6520.760 (SLI Report #97-2-6873) and #1781.1295.6518.760 (SLI Report #96-12-6817), respectively. The reviewer confirmed that the loam soil was the same type of soil used in an aerobic soil metabolism study (MRID 44496731).

10. The study author stated that the depth of leaching of the parent in all soils indicated that the parent compound "showed little mobility." It was further stated that CGA-321113 was mobile in loamy sand, Lynchburg sand (F), and Lynchburg sand (G), and that CGA-357276 was mobile in loamy sand and Lynchburg sand (F) soils (pp. 83-84). Based on the depth of leaching reported by the registrant, the reviewer determined the parent compound to be immobile in loamy sand and sandy loam soil columns, and to have low mobility in Lynchburg sand (F and G) soil columns; mobility determinations could not be made for the loam, silt loam, and clay loam soil columns (Tables 24a-24g, pp. 151-164). The reviewer determined the degradate CGA-321113 to be mobile in Gardena loam, Lynchburg sand (F and G), and clay loam soil columns; and to be very mobile in loamy sand, sandy loam, and silt loam soil columns. The degradate CGA-357276 was not present in sufficient quantities to allow a mobility determination. These qualitative classifications of soil mobility (also reported in the data summary) were determined by the reviewer using "Table III: The general relationship between the soil/solution partition coefficient K, R_f, and soil mobility" (*Federal Register*, Vol. 44, No. 53).

11. The reviewer calculated the percentage of parent or degradate compounds within each column depth by adding the first and second Soxhlet extraction percentages together (from a single column), then calculating a mean of these percentages from replicate columns (Tables 24a-24g, pp. 151-164). When residues were detected in only one replicate column, a mean was not utilized.

12. The reviewer noted that the loamy sand and the sand (6- to 12-inch depth) soils had organic matter contents of 0.4% and 0.9%, respectively (Table 3, p. 94).

13. The study author stated that the Gardena loam and Bearden-Perella clay loam soils were "sticky" at 75% of the field moisture content, and thus the transfer from weighing pans onto the column was difficult. Because of the difficulty of the transfer, the soils were made into a slurry for a more efficient application to the columns (pp. 40, 41).

14. Residue data were presented only as percentages; concentration data were not reported. Subdivision N Guidelines require that data be reported as both a percentage of the applied and as a concentration (e.g., ppm).

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