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Dislodgeable Diazinon Residues from Treated Soil and Turf

by

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Executive Summary

This study was conducted to measure the potential dislodgeable residues of diazinon on surface soil and turf. The California Medfly Eradication Project uses soil drenching to kill medfly larvae that drop into the soil to complete their life cycle. Diazinon is applied via hand-held sprayer and can be delivered by either a hand pump ("Hudson"), gas-powered ("Bean") pressurizing system or CO_2 sprayer. The Worker Health and Safety Branch measured the potential dislodgeable residues using the roller method of Ross et al. (1991) and the shuffle method of Thompson et al. (1984). Additionally six-centimeter diameter core samples were taken of turf and soil.

The application rate followed the Special Local Need (SLN) #830017, Department of Pesticide Regulation, September 21, 1992. The rate specified 3.67 ounces of product (48 percent active ingredient) in three gallons of water per 1000 square feet. Treatments were watered in after application. Three types of sampling were conducted; the taking of cores using a six centimeter steel cylinder, using a 12-kg roller and a piece of cloth to dislodge residues from the lawn surface and cheesecloth wrapped over shoes was used to shuffle over a one meter square area. Core samples of turf following application averaged 7 ± 5 µg/cm^2 for the turf and decreased by almost half the following day. Cores of bare soil were taken only once following application and averaged 7 ± 2 µg/cm^2. When using the 12-kg roller to dislodge and transfer residues on grass to the sample cloth results averaged 0.031 ± 0.022 µg/cm^2 and decreased by half the day after application. No sampling of bare soil was performed using the roller. The residues dislodged to the cheesecloth when shuffling over one square meter of grass averaged 180 ± 162 µg/m^2 two hours post application and also decreased by half the following day. Soil residues showed a similar drop over a 24 hour period with an average of 281 ± 229 µg/m^2 dropping to 109 ± 93 µg/m^2 24 hours later. The data obtained by the shuffling method on grass was similar to that found in the literature. The process of watering in the diazinon pesticide shows value in reducing the available dislodgeable residues and can reduce exposure to individuals who will be entering the treated area.

Introduction

Diazinon (O,O-diethyl O-[6-methyl-2-(1-methylethyl)-4-pyrimidinyl] phosphorothioate) is an organophosphate insecticide having registered uses to control a variety of insect pests in the lawn and soil. Diazinon is applied to turf and barren soil to kill medfly (Ceratitis capitata) larvae. Residents are advised to avoid the treated area for four to six hours after application, to allow the spray to dry. The transfer of diazinon residues on turf or soil following a drench treatment has not been determined. Although measurements of the available dislodgeable residues have been taken, the methods used were not comparable to information available in the published literature on transfer to humans.

Methods

Sites were treated with diazinon following the procedures of the Special Local Need (SLN) #830017, Department of Pesticide Regulation, September 21, 1992, for the target pests of the fruit fly family (Tephritidae). Diazinon was applied using a CO_2 sprayer at the rate specified on the SLN of 3.67 ounces of product in three gallons of water per 1000 square feet (108 mL of product (51.84 mL active ingredient) in 11.4 L of water per 93 m^2). The applied material was *Clean Crop Diazinon AG500 Insecticide* (EPA Reg. #34704-41 AA) 48 percent active ingredient at four pounds per gallon. The pH of the water was adjusted to 6.5 or less by adding Knapp Buffer (EPA Reg. # 5065-50005) and checking the pH with indicator paper. After application the treated area was watered in using unmodified municipal water from a garden hose. The water was applied by hand using a spray nozzle. The volume of water applied was recorded using a flow meter and averaged 46 ± 7 gallons per unit area. Site six was watered in using an in ground sprinkler system. After the spray was watered in and allowed to dry for approximately two hours sampling was conducted using the following methods.

A 12-kg roller was used as a sampling device to dislodge residues from the lawn surface according to the method used by Ross et al. (1991). Two layers of sampling media (SPARTEX® fabric, 50% cotton/50% polyester, 180 thread count, 1818 cm^2 $\pm$21 cm^2, prewashed) were placed on the treated ground. A sheet of plastic (GLAD® Brand Tall Trash Bag, white) was then placed over the sampling media to prevent cross-contamination of the roller. The roller was rolled over the plastic with the cloth media beneath ten times. One forward push and one rearward pull constituted one roll cycle. No downward pressure was applied to the roller to avoid exerting additional, unmeasured weight. After ten roll cycles, the plastic coversheet was discarded and the cloth layers were placed into a labeled one pint glass jar. Due to limited availability of resources this sampling method was discontinued after four treatments.

The method of Thompson et al. (1984) required a one meter square area per sample. A pair of size nine running shoes, worn by the investigator, were covered with disposable one gallon plastic bags (GLAD® storage bags), one on each foot. Cheesecloth (bleached, 100% cotton, grade 12B, weave 20/12 supplied by Western Textile Mfg. Co. 51 Joseph Ct., San Rafael, Ca.) was pulled directly from the box and cut to 23x50 cm^2 then wrapped and secured over each shoe. The investigator methodically shuffled around the defined one meter area, contacting all

areas of the plot, for one minute wearing the cheesecloth sampling media over the covered shoes. Cheesecloth was then removed from the shoes and the sample was placed in labeled one quart wide-mouth glass jars. Cheesecloth and SPARTEX® fabric were stored on dry ice for delivery to the laboratory the same day or the following morning. Additional treatments were conducted using this method because data on diazinon dislodgeable residues was reported in the literature by Sears et al. (1987). Also a transfer factor to which these data can be applied is available in Harris and Solomon (1992). Six turf sites and two soil sites were monitored using this method.

Samples using the core method required the use of a steel cylinder six centimeters in diameter that was pounded into the ground to a depth of 6-10 centimeters. The cylinder was removed and the core was pushed up through the cylinder. For the turf sample grass and thatch were cut off into a one pint glass jar. Soil samples were taken in a similar manner but the top one centimeter was sliced off into the jar. The soil core samples were taken only once following each application. Jars were sealed with foil and stored on ice until taken to the lab that day or the following morning. The soil and root matter left in the cylinder after taking the sample was discarded.

A total of eight sites were monitored, with six being turf sites and two soil sites. One to three treatments were applied at each site. Three replicate samples were taken at each sampling interval. For bare soil sites core samples were taken following the application with no follow-up sampling. Table 1 is a summary of the number of samples taken for diazinon residues by the three methods at each site. Appendix 1 provides detailed information on sampling intervals and dates the samples were drawn.

Table 1
Number of samples taken at each site.

		Number of total samples		
Site ID*	Treatments	Shuffle	Roller	Cores
1	1	12	9	9
2	1	15	9	9
3	2	24	18	18
4	1	15	0	3
5	1	15	0	3
6	3	18	0	9
7	1	15	0	3
8	3	48	0	9

* Sites 1-6 were mature lawns and sites 7 and 8 were bare soil.

During the first three days of sampling the sites were not irrigated after treatment except for the watering in of the diazinon. Site two was irrigated on day 8, site 3 on day 5 and other sites were not irrigated until sampling was completed.

Samples were analyzed by the California Department of Food and Agriculture (CDFA) Chemistry Laboratory Services, Sacramento. For SPARTEX® and cheesecloth samples, ethyl

acetate was added to the jar and rotated for one hour. For turf, samples were rotated with sodium dioctyl sulfosuccinate solution, decanted into bottles, and centrifuged 10 minutes. The solution was then extracted with ethyl acetate. For soil, samples were agitated with anhydrous sodium sulfate and ethyl acetate on a gyratory shaker and filtered. All samples were brought to final volume, and if necessary, concentrated for the diazinon OA and diluted for diazinon. The samples were analyzed on a Hewlett Packard 5890 II GC equipped with a Flame Photometric Detector. Chromatographic conditions were: column 10m x 0.53mm x 2.65 µm 100% dimethyl polysiloxane, carrier gas (He), 10mL/min, H_2, 73 mL/min; air, 100mL/min; injector 220°C; detector 250°C; temperature program 150°C for 1 minute, program rate 10°C/min, final temperature 200°C for 2 minutes. Retention times were 4.53 minutes for the OA and 4.83 minutes for diazinon. Standards were introduced periodically during the analysis. Laboratory recoveries for diazinon were 81% in soil, 88% on Spartex®, 97% on cheesecloth and 97% for turf, results were not adjusted for recoveries. Minimum quantification limits for diazinon were 0.31 micrograms/sample and for the oxon 0.35 micrograms/sample. No field fortification samples were performed. Analytical method validation was performed on spartex and cheesecloth for diazinon following CDFA, Chemistry Laboratory Services, SOP WHS-QA-2, dated 07/16/93. Five replicates of each matrix were evaluated for diazinon recovery at five levels: limit of detection, 5 x LOD, 10 x LOD, 15x LOD and 20 x LOD. Both matrices showed acceptable recoveries at all levels. Analytical standards were also evaluated at the LOD, 10 x LOD and 100 x LOD levels. Method validation for diazinon OA on spartex and cheesecloth was not completed according to SOP WHS-QA-2, dated 07/16/93. Diazinon and Diazinon OA on turf and soil followed a method developed by the Environmental Monitoring Laboratory and was partially non-compliant with SOP WHS-QA-2. One blank accompanied each field shipment for each sampling medium. Blanks were to assess handling and shipping conditions. The blanks were prepared in the field at the end of the sampling day and before transporting to the lab. Their results revealed some cross contamination at low levels.

Moisture content of turf and soil was calculated by taking the known weight of a pan and recording the weight from approximately 5 grams of sample placed in the pan. The sample was placed in an oven at 100° C for a minimum of six hours, cooled in a desiccator and weighed. Percent moisture is calculated by subtracting the dried weight from the weight before drying and dividing by the weight before drying minus the pan weight and multiplying by 100.

The shuffle method reports the data in µg/sample over the one square meter sampled. Core sample results in µg/sample were divided by the weight of the sample to get µg/gram. For $\mu g/cm^2$ the sample was divided by the surface area of the total number of core samples taken. Transfer results for the roller method reported as $\mu g/cm^2$ were calculated by dividing the cloth surface area into the µg/sample. Diazinon oxon data was summed with the parent compound because the oxon levels were very low or not detected. A 0.35 micrograms per sample limit of quantification was used for the oxon level when no residue was detected. Descriptive statistics were used to summarize the data. Descriptive statistics were calculated using Microsoft® Excel™.

Not all necessary standard operating procedures were in existence at the time this study was conducted. This study did not meet Good Laboratory Practice Standards. No personnel logs

for each study day were kept according to WHS FO07.01. SOPs for critical events were not on site per 40 CFR 160.81c. On August 12, 1993 the study director was notified that CDFA Standards Repository had informed the Worker Health and Safety Laboratory that the diazinon standard issued to them was incorrectly labeled. The correct concentration was 0.8905 mg/mL and not 1.0000 mg/mL. Study data received up to that time was corrected by multiplying by a factor of 0.8905. This correction is reflected in the data presented in the Appendix. The study protocol was audited on 8/14/93 and the field monitoring was audited on 9/14/93 with the study director being notified at these times. The data was audited as part of the final review.

RESULTS AND DISCUSSION

Data is summarized in Tables 2 through 6 by the method of sampling used and whether the site was turf or soil. Sample data is reported in Appendix 1. The results of core samples in Tables 2 and 3 are reported on a weight per weight basis and by calculating the area sampled (number of cores per sample times the area per core) and dividing the result into the µg per sample.

Table 2
Diazinon levels using the core method on turf*

	results in µg/gram			results in µg/cm^2 of core area		
Day	0.02 - 0.14	1	2	0.02 - 0.14	1	2
Mean	45	34	36	7	4	5
Median	44	26	24	6	3	2
sd	31	24	30	5	4	5
min	2	8	11	1	1	1
max	123	91	118	23	12	17
N	27	12	12	27	12	12

* Includes grass and thatch

Table 3
Diazinon levels using the core method on soil*

	µg/gram	µg/cm^2 of core area
Mean	11	7
Median	11	7
sd	4	2
min	3	2
max	16	10
N	12	12

*Top 1 cm of soil and sampled only once following application.

Table 4
Diazinon results using cheesecloth and shuffling over 1 m^2 of turf
$\mu g/m^2$

Day	0.1-0.13	0.17-0.25	1	2	3	5 & 7	10 & 14
Mean	180	64	94	54	30	12	4
Median	107	50	46	16	29	11	3
sd	162	46	143	95	14	6	2
min	24	17	9	10	15	5	2
max	533	194	580	315	45	27	8
N	15	15	24	18	6	15	6

Table 5
Diazinon results using cheesecloth and shuffling over 1 m^2 of soil
$\mu g/m^2$

Day	0.15-0.31	1	2	4	7 & 8
Mean	281	109	40	38	13
Median	276	80	33	32	8
sd	229	93	23	24	12
min	41	22	18	8	1
max	768	363	104	79	30
N	15	12	12	12	12

Table 6
Diazinon transfer results using the roller method on turf
$\mu g/cm^2$*

Day	<0.12	1	2
Mean	0.032	0.014	0.017
Median	0.029	0.008	0.007
sd	0.022	0.014	0.023
min	0.007	0.005	0.003
max	0.087	0.052	0.070
N	12	12	12

*sample area was 1818 cm^2

Core samples of turf following application averaged 7 ± 5 $\mu g/cm^2$ for the turf and decreased by almost half the following day. Cores of bare soil were taken only once following application and averaged 7 ± 2 $\mu g/cm^2$. When using the 12-kg roller to dislodge and transfer residues on grass to the sample cloth results averaged 0.031 ± 0.022 $\mu g/cm^2$ and decreased by half the day after application. No sampling of bare soil was performed using the roller. The residues dislodged to the cheesecloth when shuffling over one square meter of grass averaged 180 ± 162 $\mu g/m^2$ two hours post application and also decreased by half the following day. Cheesecloth dislodgeable soil residues showed a similar drop over a 24 hour period with an average of 281 ± 229 $\mu g/m^2$ dropping to 109 ± 93 $\mu g/m^2$ 24 hours later.

From the data of Sears et al. (1987), dislodgeable residue levels of diazinon on turf using the shuffle method averaged 4.4 mg/m^2 immediately following application. Sears et al. also showed that dislodgeable residues were reduced ≥ 9 fold at day one after rainfall. In our study, after watering in and at an application rate 19% higher, dislodgeable residues were 4% of the levels found by Sears. The data are comparable when we consider the two factors of watering in following application and the differences in initial sampling time between the two studies with our waiting an average of two hours before sampling. If the percentage difference in application rates is factored into the initial dislodgeable residues found in Sears et al. and a 9 fold reduction is used for the watering in procedure, the dislodgeable residues would be 0.596 mg/m^2 within the range of our soil and turf results. During some of the sampling, following the watering in, it was noted that the cheesecloth was very damp. This occurred at site one, site three after the second treatment and soil site seven. In these instances dislodgeable residues were slightly higher ranging up to 0.8 mg/m^2. Site six used a sprinkler for the watering and available dislodgeable residues were consistently lower than the average for grass, never being above 0.05 mg/m^2. The process of watering in the diazinon pesticide shows value in reducing the available dislodgeable residues and can reduce exposure to individuals who will be entering the treated area. This procedure should be considered when it is consistent with the objectives of insecticide treatment.

References:

40 CFR Part 160 Good Laboratory Practice Standards, July 1, 1992 Edition

Harris, SA and Solomon, KR. Human exposure to 2,4-D following controlled activities on recently sprayed turf. J. Environ. Sci. Health, B27(1), 9-22(1992)

Ross, J, Fong, H, Thongsinthusak, T, Margetich, S, and Krieger, R. Measuring potential dermal transfer of surface pesticide residue generated from indoor fogger use. Chemospere, 22, 975-984(1991).

Sears, MK, Bowhey, C, Braun, H, and Stephenson, GR. Dislodgeable residues and persistence of diazinon, chlorpyrifos and isofenphos following their application to turfgrass. Pestic. Sci. 20, 223-231(1987).

Thompson, DG, Stephenson, GR and Sears, MK. Persistence, distribution and dislodgeable residues of 2,4-D following its application to turfgrass. Pestic. Sci. 15, 353-360 (1984).

Appendix 1 results in micrograms per sample

Sample #	Date	Type	Day	Diazinon	OA	Grams	Moisture	Site
FS01-101	07/21/93	grass	0.1	1397.19	7.82	25.59	80	3
FS01-102	07/21/93	grass	0.1	995.58	5.09	27.14	80	3
FS01-103	07/21/93	grass	0.1	1165.66	6.07	26.47	77	3
FS01-104	07/21/93	spartex	0.1	158.28	ND[1]			3
FS01-105	07/21/93	spartex	0.1	85.93	ND			3
FS01-106	07/21/93	spartex	0.1	91.20	ND			3
FS01-107	07/21/93	cheesecloth	0.1	23.39	ND			3
FS01-108	07/21/93	cheesecloth	0.1	81.85	ND			3
FS01-109	07/21/93	cheesecloth	0.1	82.30	ND			3
FS01-110	07/22/93	grass	1	590.58	3.84	26.10	82	3
FS01-111	07/22/93	grass	1	626.20	4.00	28.10	78	3
FS01-112	07/22/93	grass	1	524.95	3.92	27.23	80	3
FS01-116	07/22/93	spartex	1	14.70	ND			3
FS01-117	07/22/93	spartex	1	9.50	ND			3
FS01-118	07/22/93	spartex	1	12.79	ND			3
FS01-119	07/22/93	cheesecloth	1	47.40	ND			3
FS01-120	07/22/93	cheesecloth	1	119.54	ND			3
FS01-121	07/22/93	cheesecloth	1	75.38	ND			3
FS01-122	07/23/93	grass	2	356.20	2.70	32.21	79	3
FS01-123	07/23/93	grass	2	609.10	4.13	46.96	77	3
FS01-124	07/23/93	grass	2	583.28	4.31	33.56	78	3
FS01-125	07/23/93	spartex	2	18.90	ND			3
FS01-126	07/23/93	spartex	2	11.57	ND			3
FS01-127	07/23/93	spartex	2	14.56	ND			3
FS01-128	07/23/93	cheesecloth	2	25.01	ND			3
FS01-129	07/23/93	cheesecloth	2	14.45	ND			3
FS01-130	07/23/93	cheesecloth	2	12.72	ND			3
FS01-135	07/26/93	grass	0.04	2226.25	17.20	24.90	73	1
FS01-136	07/26/93	grass	0.04	2671.50	11.40	25.70	74	1
FS01-137	07/26/93	grass	0.04	2493.40	14.10	20.40	63	1
FS01-140	07/27/93	grass	1	1264.51	12.70	18.70	63	1
FS01-141	07/27/93	grass	1	1870.05	19.00	20.80	73	1
FS01-142	07/27/93	grass	1	979.55	12.40	23.20	57	1
FS01-143	07/28/93	grass	2	1206.63	8.64	10.29	49	1
FS01-144	07/28/93	grass	2	967.08	11.49	15.03	63	1
FS01-145	07/28/93	grass	2	721.31	4.96	16.38	50	1
FS01-148	07/26/93	spartex	0.1	29.17	ND			1
FS01-149	07/26/93	spartex	0.1	59.46	ND			1
FS01-150	07/26/93	spartex	0.1	61.25	ND			1
FS01-151	07/27/93	spartex	1	11.96	ND			1
FS01-152	07/27/93	spartex	1	9.73	ND			1
FS01-153	07/27/93	spartex	1	8.88	ND			1
FS01-154	07/28/93	spartex	2	11.45	ND			1
FS01-155	07/28/93	spartex	2	5.61	ND			1
FS01-156	07/28/93	spartex	2	8.30	ND			1
FS01-158	07/26/93	cheesecloth	0.1	533.00	ND			1
FS01-159	07/26/93	cheesecloth	0.1	508.00	ND			1
FS01-160	07/26/93	cheesecloth	0.1	83.50	ND			1
FS01-161	07/27/93	cheesecloth	1	51.54	ND			1
FS01-162	07/27/93	cheesecloth	1	30.55	ND			1
FS01-163	07/27/93	cheesecloth	1	30.55	ND			1
FS01-164	07/28/93	cheesecloth	2	17.81	ND			1
FS01-165	07/28/93	cheesecloth	2	11.87	ND			1
FS01-166	07/28/93	cheesecloth	2	15.03	ND			1
FS01-171	07/28/93	grass	0.1	1320.61	9.25	24.70	60	2
FS01-172	07/28/93	grass	0.1	973.32	5.83	18.94	59	2

Sample #	Date	Type	Day	Diazinon	OA	Grams	Moisture	Site
FS01-173	07/28/93	grass	0.1	1320.61	7.87	21.85	52	2
FS01-176	07/28/93	spartex	0.1	11.76	ND			2
FS01-177	07/28/93	spartex	0.1	15.12	ND			2
FS01-178	07/28/93	spartex	0.1	26.89	ND			2
FS01-179	07/28/93	cheesecloth	0.2	56.42	ND			2
FS01-180	07/28/93	cheesecloth	0.2	55.63	ND			2
FS01-181	07/28/93	cheesecloth	0.2	50.13	ND			2
FS01-182	07/29/93	spartex	1	27.28	ND			2
FS01-183	07/29/93	spartex	1	25.21	ND			2
FS01-184	07/29/93	spartex	1	25.21	ND			2
FS01-185	07/29/93	cheesecloth	1	60.65	ND			2
FS01-186	07/29/93	cheesecloth	1	21.20	ND			2
FS01-187	07/29/93	cheesecloth	1	18.60	ND			2
FS01-188	07/29/93	grass	1	601.09	5.71	26.60	59	2
FS01-189	07/29/93	grass	1	319.69	3.73	27.00	53	2
FS01-190	07/29/93	grass	1	195.02	2.30	26.10	47	2
FS01-193	07/30/93	grass	2	380.24	5.76	21.00	65	2
FS01-194	07/30/93	grass	2	414.97	5.81	20.40	60	2
FS01-195	07/30/93	grass	2	606.43	9.03	21.80	62	2
FS01-196	07/30/93	spartex	2	6.82	ND			2
FS01-197	07/30/93	spartex	2	7.60	ND			2
FS01-198	07/30/93	spartex	2	4.35	ND			2
FS01-199	07/30/93	cheesecloth	2	13.40	ND			2
FS01-200	07/30/93	cheesecloth	2	28.90	ND			2
FS01-201	07/30/93	cheesecloth	2	16.40	ND			2
FS01-206	07/31/93	cheesecloth	5	26.60	ND			1
FS01-207	07/31/93	cheesecloth	5	13.50	ND			1
FS01-208	07/31/93	cheesecloth	5	15.48	ND			1
FS01-209	08/02/93	cheesecloth	5	9.54	ND			2
FS01-210	08/02/93	cheesecloth	5	13.86	ND			2
FS01-211	08/02/93	cheesecloth	5	11.34	ND			2
FS01-212	08/09/93	cheesecloth	10	4.86	ND			2
FS01-213	08/09/93	cheesecloth	10	3.30	ND			2
FS01-214	08/09/93	cheesecloth	10	2.90	ND			2
FS01-214	09/14/93	grass	0.1	2609.00	12.75	49.88	79	3
FS01-215	09/14/93	grass	0.1	1263.00	7.88	31.91	lost[2]	3
FS01-216	09/14/93	grass	0.1	1737.00	10.36	28.79	80	3
FS01-217	09/14/93	spartex	0.12	36.67	0.41			3
FS01-218	09/14/93	spartex	0.12	46.77	0.48			3
FS01-219	09/14/93	spartex	0.12	63.57	0.38			3
FS01-222	09/14/93	cheesecloth	0.1	165.07	ND			3
FS01-223	09/14/93	cheesecloth	0.1	83.47	ND			3
FS01-224	09/14/93	cheesecloth	0.1	89.49	ND			3
FS01-227	09/15/93	cheesecloth	1	560.86	18.69			3
FS01-228	09/15/93	cheesecloth	1	181.22	7.80			3
FS01-229	09/15/93	cheesecloth	1	454.95	24.93			3
FS01-230	09/15/93	spartex	1	49.00	0.93			3
FS01-231	09/15/93	spartex	1	92.66	2.11			3
FS01-232	09/15/93	spartex	1	13.53	0.69			3
FS01-233	09/15/93	grass	1	1140.00	11.49	39.77	82	3
FS01-234	09/15/93	grass	1	1246.00	9.01	39.57	83	3
FS01-235	09/15/93	grass	1	1353.00	8.36	33.29	83	3
FS01-236	09/16/93	cheesecloth	2	276.64	17.64			3
FS01-237	09/16/93	cheesecloth	2	111.25	8.91			3
FS01-238	09/16/93	cheesecloth	2	286.61	28.24			3
FS01-239	09/16/93	spartex	2	102.89	5.46			3

Sample #	Date	Type	Day	Diazinon	OA	Grams	Moisture	Site
FS01-240	09/16/93	spartex	2	44.40	1.76			3
FS01-241	09/16/93	spartex	2	123.14	4.19			3
FS01-244	09/16/93	grass	2	1375.00	8.24	52.51	82	3
FS01-245	09/16/93	grass	2	1980.00	7.01	44.45	83	3
FS01-246	09/16/93	grass	2	1109.00	10.34	53.22	78	3
FS01-247	09/21/93	cheesecloth	7	18.45	ND			3
FS01-248	09/21/93	cheesecloth	7	4.93	ND			3
FS01-249	09/21/93	cheesecloth	7	7.97	ND			3
FS01-250	09/28/93	cheesecloth	14	2.26	ND			3
FS01-251	09/28/93	cheesecloth	14	7.49	ND			3
FS01-252	09/28/93	cheesecloth	14	1.19	ND			3
FS01-260	09/27/93	soil	0.1	536.68	0.57	49.32	20	7
FS01-261	09/27/93	soil	0.1	552.85	0.60	50.85	19	7
FS01-262	09/27/93	soil	0.1	152.24	ND	50.09	18	7
FS01-263	09/27/93	grass	0.14	632.21	3.53	estimate[2]		6
FS01-264	09/27/93	grass	0.14	751.69	4.28	estimate		6
FS01-265	09/27/93	grass	0.14	649.14	3.66	estimate		6
FS01-266	09/27/93	cheesecloth	0.15	479.96	0.80			7
FS01-267	09/27/93	cheesecloth	0.15	649.85	0.76			7
FS01-268	09/27/93	cheesecloth	0.15	767.49	0.91			7
FS01-277	09/28/93	cheesecloth	1	131.16	ND			7
FS01-278	09/28/93	cheesecloth	1	362.48	ND			7
FS01-279	09/28/93	cheesecloth	1	168.27	ND			7
FS01-280	09/28/93	cheesecloth	0.13	64.31	ND			5
FS01-281	09/28/93	cheesecloth	0.13	161.99	0.60			5
FS01-282	09/28/93	cheesecloth	0.13	106.94	0.39			5
FS01-283	09/28/93	cheesecloth	0.13	215.89	0.53			4
FS01-284	09/28/93	cheesecloth	0.13	376.76	0.96			4
FS01-285	09/28/93	cheesecloth	0.13	117.55	0.58			4
FS01-286	09/28/93	grass	0.13	459.16	ND	17.48	62	5
FS01-287	09/28/93	grass	0.13	1094.02	ND	36.90	69	5
FS01-288	09/28/93	grass	0.13	396.59	ND	21.53	55	5
FS01-289	09/28/93	grass	0.13	682.31	7.36	19.21	58	4
FS01-290	09/28/93	grass	0.13	690.85	7.53	25.29	57	4
FS01-291	09/28/93	grass	0.13	947.93	7.45	21.08	59	4
FS01-296	09/28/93	cheesecloth	0.25	129.71	0.85			5
FS01-297	09/28/93	cheesecloth	0.25	72.86	0.65			5
FS01-298	09/28/93	cheesecloth	0.25	16.15	ND			5
FS01-299	09/28/93	cheesecloth	0.25	53.15	0.40			4
FS01-300	09/28/93	cheesecloth	0.25	193.23	0.97			4
FS01-301	09/28/93	cheesecloth	0.25	98.48	0.52			4
FS01-304	09/29/93	cheesecloth	1	20.94	ND			5
FS01-305	09/29/93	cheesecloth	1	43.95	0.45			5
FS01-306	09/29/93	cheesecloth	1	75.49	0.48			5
FS01-307	09/29/93	cheesecloth	1	122.91	0.71			4
FS01-308	09/29/93	cheesecloth	1	69.64	0.49			4
FS01-309	09/29/93	cheesecloth	1	132.08	0.67			4
FS01-310	09/29/93	cheesecloth	2	44.63	ND			7
FS01-311	09/29/93	cheesecloth	2	48.34	ND			7
FS01-312	09/29/93	cheesecloth	2	55.19	ND			7
FS01-316	10/01/93	cheesecloth	3	14.66	ND			5
FS01-317	10/01/93	cheesecloth	3	20.36	0.38			5
FS01-318	10/01/93	cheesecloth	3	35.86	0.58			5
FS01-319	10/01/93	cheesecloth	3	43.68	0.51			4
FS01-320	10/01/93	cheesecloth	3	44.63	0.56			4
FS01-321	10/01/93	cheesecloth	3	17.95	ND			4

Sample #	Date	Type	Day	Diazinon	OA	Grams	Moisture	Site
FS01-322	10/01/93	cheesecloth	4	53.41	ND			7
FS01-323	10/01/93	cheesecloth	4	53.89	ND			7
FS01-324	10/01/93	cheesecloth	4	58.31	ND			7
FS01-331	10/05/93	cheesecloth	8	20.55	ND			7
FS01-332	10/05/93	cheesecloth	8	25.55	ND			7
FS01-333	10/05/93	cheesecloth	8	21.67	ND			7
FS01-334	10/05/93	cheesecloth	7	4.36	ND			5
FS01-335	10/05/93	cheesecloth	7	6.42	ND			5
FS01-336	10/05/93	cheesecloth	7	9.93	ND			5
FS01-337	10/05/93	cheesecloth	7	17.01	0.47			4
FS01-338	10/05/93	cheesecloth	7	8.42	0.31			4
FS01-339	10/05/93	cheesecloth	7	10.55	0.44			4
FS01-344	10/11/93	grass	0.02	235.28	2.15	44.03	48	6
FS01-345	10/11/93	grass	0.02	152.69	2.72	62.86	47	6
FS01-346	10/11/93	grass	0.02	197.74	3.40	47.95	59	6
FS01-349	10/11/93	soil	0.02	565.43	0.62	50.35	20	8
FS01-350	10/11/93	soil	0.02	596.45	0.67	50.43	20	8
FS01-351	10/11/93	soil	0.02	814.80	0.88	50.68	23	8
FS01-352	10/11/93	cheesecloth	0.17	25.87	ND			6
FS01-353	10/11/93	cheesecloth	0.17	45.91	ND			6
FS01-354	10/11/93	cheesecloth	0.17	30.55	ND			6
FS01-355	10/11/93	cheesecloth	0.15	356.18	0.44			8
FS01-356	10/11/93	cheesecloth	0.15	275.68	0.45			8
FS01-357	10/11/93	cheesecloth	0.15	343.03	0.47			8
FS01-360	10/11/93	cheesecloth	0.31	371.42	0.47			8
FS01-361	10/11/93	cheesecloth	0.31	383.35	0.59			8
FS01-362	10/11/93	cheesecloth	0.31	184.87	0.37			8
FS01-363	10/12/93	cheesecloth	1	71.88	ND			8
FS01-364	10/12/93	cheesecloth	1	148.52	ND			8
FS01-365	10/12/93	cheesecloth	1	117.74	ND			8
FS01-366	10/12/93	cheesecloth	1	16.21	ND			6
FS01-367	10/12/93	cheesecloth	1	10.65	ND			6
FS01-368	10/12/93	cheesecloth	1	14.57	ND			6
FS01-369	10/13/93	cheesecloth	2	16.79	1.62			6
FS01-370	10/13/93	cheesecloth	2	15.02	ND			6
FS01-371	10/13/93	cheesecloth	2	9.79	ND			6
FS01-372	10/13/93	cheesecloth	2	33.72	ND			8
FS01-373	10/13/93	cheesecloth	2	103.73	ND			8
FS01-374	10/13/93	cheesecloth	2	31.38	ND			8
FS01-377	10/15/93	cheesecloth	4	30.59	ND			8
FS01-378	10/15/93	cheesecloth	4	23.47	ND			8
FS01-379	10/15/93	cheesecloth	4	7.65	ND			8
FS01-380	10/19/93	cheesecloth	8	1.48	ND			8
FS01-381	10/19/93	cheesecloth	8	1.14	ND			8
FS01-382	10/19/93	cheesecloth	8	0.93	ND			8
FS01-387	10/25/93	grass	0.02	451.86	4.12	35.03	49	6
FS01-388	10/25/93	grass	0.02	492.99	4.77	26.96	50	6
FS01-389	10/25/93	grass	0.02	474.08	10.60	36.97	50	6
FS01-392	10/25/93	soil	0.02	430.13	0.40	50.31	6	8
FS01-393	10/25/93	soil	0.02	444.88	0.45	50.44	6	8
FS01-394	10/25/93	soil	0.02	729.98	0.72	50.50	6	8
FS01-395	10/25/93	cheesecloth	0.17	47.88	ND			6
FS01-396	10/25/93	cheesecloth	0.17	45.95	ND			6
FS01-397	10/25/93	cheesecloth	0.17	36.68	ND			6
FS01-400	10/25/93	cheesecloth	0.17	40.86	ND			8
FS01-401	10/25/93	cheesecloth	0.17	46.52	ND			8

Sample #	Date	Type	Day	Diazinon	OA	Grams	Moisture	Site
FS01-402	10/25/93	cheesecloth	0.17	48.44	ND			8
FS01-403	10/26/93	cheesecloth	1	40.83	ND			8
FS01-404	10/26/93	cheesecloth	1	22.11	ND			8
FS01-405	10/26/93	cheesecloth	1	23.93	ND			8
FS01-406	10/26/93	cheesecloth	1	21.25	ND			6
FS01-407	10/26/93	cheesecloth	1	8.54	ND			6
FS01-408	10/26/93	cheesecloth	1	11.32	ND			6
FS01-409	10/27/93	cheesecloth	2	9.60	0.42			6
FS01-410	10/27/93	cheesecloth	2	23.15	0.53			6
FS01-411	10/27/93	cheesecloth	2	9.21	ND			6
FS01-412	10/27/93	cheesecloth	2	20.11	ND			8
FS01-413	10/27/93	cheesecloth	2	29.75	ND			8
FS01-414	10/27/93	cheesecloth	2	25.27	ND			8
FS01-415	10/29/93	cheesecloth	4	78.77	ND			8
FS01-416	10/29/93	cheesecloth	4	33.26	ND			8
FS01-417	10/29/93	cheesecloth	4	69.64	ND			8
FS01-418	11/01/93	cheesecloth	7	29.86	ND			8
FS01-419	11/01/93	cheesecloth	7	26.41	ND			8
FS01-420	11/01/93	cheesecloth	7	10.28	ND			8
FS01-425	11/07/93	soil	0.02	790.98	0.72	50.56	5	8
FS01-426	11/07/93	soil	0.02	456.11	ND	50.57	8	8
FS01-427	11/07/93	soil	0.02	719.71	0.51	50.78	6	8
FS01-428	11/08/93	cheesecloth	0.17	91.79	ND			8
FS01-429	11/08/93	cheesecloth	0.17	87.88	ND			8
FS01-430	11/08/93	cheesecloth	0.17	79.83	ND			8
FS01-431	11/09/93	cheesecloth	1	86.14	ND			8
FS01-432	11/09/93	cheesecloth	1	73.55	ND			8
FS01-433	11/09/93	cheesecloth	1	52.26	ND			8
FS01-434	11/10/93	cheesecloth	2	43.24	ND			8
FS01-435	11/10/93	cheesecloth	2	23.01	ND			8
FS01-436	11/10/93	cheesecloth	2	18.02	ND			8
FS01-437	11/12/93	cheesecloth	4	9.92	ND			8
FS01-438	11/12/93	cheesecloth	4	16.12	ND			8
FS01-439	11/12/93	cheesecloth	4	15.29	ND			8
FS01-440	11/15/93	cheesecloth	7	4.54	ND			8
FS01-441	11/15/93	cheesecloth	7	1.81	ND			8
FS01-442	11/15/93	cheesecloth	7	1.96	ND			8

1 ND = none detected, below limit of quantification.
2 estimate = Samples were destroyed prior to drying and obtaining moisture. An average of previous samples was subtracted from the total weight of jar with label and sample.

Results of sample blanks in micrograms

Sample #	Date	Type	Diazinon	OA	grams	moisture	cores	Site #
FS01-113	7/22/93	grass	ND[1]	ND	26.96	82	7	2
FS01-115	7/22/93	grass	ND	ND	26.68	81		2
FS01-131	7/22/93	spartex	ND	ND				3
FS01-204	7/30/93	spartex	5.74	ND				2
FS01-212	9/14/93	grass	ND	ND	31.76	80		2
FS01-220	9/14/93	spartex	4.32	ND				3
FS01-225	9/14/93	gauze	ND	ND				3
FS01-242	9/16/93	grass	ND	ND	38.13	82	4	2
FS01-269	9/27/93	soil	1.45	ND	50.11	5.35	3	7
FS01-271	9/27/93	grass	ND	ND	est.[2] 17.34	63.8	4	2
FS01-274	9/27/93	gauze	1.74	ND				7
FS01-347	10/11/93	soil	5.33	ND	50.14	19	3	8
FS01-358	10/11/93	gauze	ND	ND				6
FS01-375	10/13/93	gauze	ND	ND				8
FS01-383	10/19/93	gauze	ND	ND				8
FS01-385	10/25/93	grass	ND	ND	16.02	65	4	2
FS01-398	10/25/93	gauze	ND	ND				8
FS01-421	11/8/93	gauze	0.71	ND				8
FS01-424	11/7/93	soil	ND	ND			3	8
FSO1-138	7/26/93	grass	3.562	ND	23.8	48	14	2
FSO1-174	7/28/93	grass	ND	ND	22.47	49		5
FSO1-191	7/30/93	grass	ND	ND	59.6	60		5
FSO1-292	9/28/93	grass	ND	ND	26.79	45.8	4	2
FSO1-294	9/28/93	gauze	0.879	ND				5
FSO1-302	9/28/93	gauze	4.35	ND				5
FSO1-315	10/1/93	gauze	7.06	ND				5
FSO1-340	10/5/93	gauze	ND	ND				5

[1] ND = none detected

[2] est. = Sample thrown out prior to drying and obtaining moisture. An average of previous samples was subtracted from the total weight of jar with label and sample.