CASE GS0153 METHYL PARATHION STUDY 14 PM --

CHEM 053501 Methyl Parathion

BRANCH EFB DISC 30 TOPIC GUIDELINE 40 CFR 165-0

FORMULATION 01 - TECHNICAL CHEMICAL (TECH)

FICHE/MASTER ID 00066341 CONTENT CAT 01

U.S. Environmental Protection Agency, Environmental Research Laboratory. 1981. Acephate, aldicarb, carbophenothion, DEF, EPN, ethoprop, methyl parathion, and phorate: their acute and chronic toxicity, bioconcentration potential, and persistence as related to marine environments: EPA-600/4-81-023. Unpublished study.

SUBST. CLASS = S.

DIRECT RVW TIME = (MH) START-DATE END DATE

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CONCLUSIONS:

Metabolism - Aerobic Aquatic

This portion of the study cannot be validated because insufficient data were generated to assess methyl parathion metabolism or the relative contributions of biological and nonbiological processes in the seawater/sediment system. In addition, this portion of the study would not fulfill EPA Data Requirements for Registering Pesticides because sediment and seawater characeristics were not provided.

Degradation - Photodegradation in Water

1. This portion of the study is scientifically valid.

2. Methyl parathion (TECH, 99% pure) at 10 ppm degraded in seawater with 43% of applied remaining after 6 days of exposure to sunlight. Approximately 73% of the applied methyl parathion remained in the dark control after 6 days.

3. This portion of the study does not fulfill EPA Data Requirements for Registering Pesticides because the incubation temperature was not 25 ± 1 C, the test solutions were not buffered, the seawater was uncharacterized, the intensity of the sunlight was not reported, degradates were not identified, and a material balance was not provided.

MATERIALS AND METHODS:

Metabolism - Aerobic Aquatic

Centrifuge bottles containing seawater, sterilized sediment and seawater, or unsterilized sediment and seawater were treated with 10µg of methyl parathion (TECH, 99% pure, Chem. Services) in acetone, stoppered, and aerated. Systems contained ~10 g (wet weight) of sediment obtained from a salt marsh adjacent to Santa Rosa Sound. Air exiting each experimental system was passed through a resin column to trap vaporized methyl parathion. Systems were incubated for 7 days at 25 C with a 12-hour photoperiod under white fluorescent lights. Duplicate sediment and seawater samples were taken on days 0, 5, and 7 (Table 1). Seawater samples were extracted twice with petroleum ether, the extracts combined, evaporated, and quantified by GC. Sediment samples were extracted four times with acetonitrile, the combined extracts diluted with seawater, and extracted according to the seawater procedure described above. The detection limit for methyl parathion in seawater and sediment was 0.02 µg/l. Recovery values were >85%.

Degradation - Photodegradation in Water

Methyl parathion (TECH, 99% pure, Chem. Services, 350 µg) in acetone was placed in a 4-l amber bottle, the acetone purged with nitrogen gas, and 3.5 l of seawater (water uncharacterized) were added for a final methyl parathion concentration of 10 ppm. The bottle was shaken overnight at 25 C. Aliquots (100 ml) were placed in stoppered flasks, half of which were covered with aluminium foil, and half were exposed to sunlight (light uncharacterized). Temperatures in the flasks ranged from 20 to 46 C during the exposure period. Duplicate samples were taken on days 0, 3, and 6 of exposure. Sample water was extracted twice with petroleum ether, the extracts combined, evaporated, and quantified by GC. The detection limit was 0.02 µg/l, and recovery values were >85%.

REPORTED RESULTS:

Metabolism - Aerobic Aquatic

Methyl parathion concentrations in seawater and sediment are shown Table 1.

Degradation - Photodegradation in Water

Methyl parathion degraded in seawater with 100, 75, and 43% of applied remaining after 0, 3 and 6 days, respectively, of exposure to sunlight (Table 2). In the dark, 73% of the applied methyl parathion remained after 6 days.

DISCUSSION:

Metabolism - Aerobic Aquatic

1. Sampling intervals for this portion of the study were insufficient to establsh decline curves for methyl parathion or to allow an assessment of the contribution of biological and nonbiological processes in seawater/sediment systems: the interval between the time of treatment and day 0 sampling was not provided, the nonsterile system was sampled only on days 0 and 5 and the sterile system was sampled only once, on day 7.

2. Sediment and seawater characteristics were incompletely reported.

Degradation - Photogradation in Water

1. The incubation temperature was not 25 ± 1 C. Additionally, it could not be determined whether the temperature reported was the same for both irradiated and dark control flasks.

2. The test solutions were not buffered, and the seawater was not characterized.

3. The intensity of the sunlight, the time of year, and atmospheric cover were not reported.

4. Degradates were not identified.

5. A material balance was not provided.

6. No attempt was made to control sterility during the study.

Table 1. Methyl parathion concentrations in seawater (µg/l) and sediment (µg/g) systems treated with methyl parathion at 10 µg, and incubated for 7 days at 25 C.

System	Component	Sampling interval (days) 0	5	7
Nonsterile	Seawater	8.8	0.11	ND[a]
	Sediment	0.9	0.19	ND
	Total	97%[b]	3%	--
Sterile	Seawater	--	--	6.5
	Sediment	--	--	3.9
	Total	--	--	104%
Seawater	Seawater	9.9	--	7.5
	Resin	ND	--	ND
	Total	99%	--	75%

[a] Not detectable; detection limit 0.02 µg/l for seawater, and 0.02 µg/g for sediment and resin.

[b] Percent of applied.

Table 2. Methyl parathion concentrations (µg/l)[a] in seawater treated with methyl parathion at 10 µg/l and exposed to sunlight for 6 days.

	Sampling interval (days)		
	0	3	6
Light	8.8	6.6	3.8
Total	100%[b]	75%	43%
Dark	8.8	7.5	6.5
Total	100%	85%	73%

[a] Detection limit 0.02 µg/l.

[b] Percent of applied.