CHEM 079401 Endosulfan

BRANCH EFB DISC 20 TOPIC 0510 GUIDELINE 40 CFR 163.62-842

FORMULATION 00 = ACTIVE INGREDIENT

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Martens, R. (1972) Der Abbau von Endosulfan durch Mikroorganismen des Bodens. [Degradation of endosulfan by soil microorganisms.] Schriftenreihe des Vereins fuer Wasser-, Boden-, und Lufthygiene, Berlin-Dahlem (37):167-173.

SUBST. CLASS = S.

OTHER SUBJECT DESCRIPTORS
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REVIEWED BY: R. Hebert
TITLE: Staff Scientist
ORG: Enviro Control, Inc., Rockville, MD
LOC/TEL: 468-2500

SIGNATURE: Richard L Hebert DATE: Feb. 19, 1980

APPROVED BY:
TITLE:
ORG:
LOC/TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Metabolism - Effects of Microbes on Pesticides

1. Results of this portion of the study are scientifically valid.

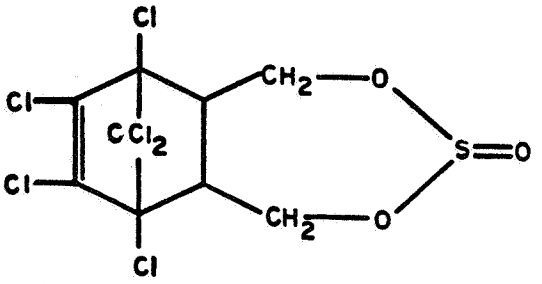
2. Investigation of the metabolism of endosulfan by soil microorganisms provided preliminary evidence of a preferential degradation of the parent compound to either endosulfan diol or endosulfan sulfate in the bacterial and fungal species tested. In contrast, the actinomycetes produced a wider range of metabolite types and amounts. Analysis of control experiments indicated that once the pH of the medium became alkaline, biological conversion was no longer the major mechanism for endosulfan hydrolysis.

Metabolism - Aerobic Soil

The data in this section of this study were reviewed in Study 4 (MRID 05005047); therefore a full review was not conducted.

MATERIALS AND METHODS:

ENDOSULFAN, BENZOEPIN, BEOSIT, CHLORTIEPIN, CYCLODAN, INSECTOPHENE, MALIX, THIFOR, THIMUL, THIODAN, THIONEX, THIOSULFAN, TIONEL, TIOVEL



6,7,8,9,10,10-Hexachloro-1,5,5a,6, 9,9a-hexahydro-6,9-methano-2,4, 3-benzodioxathiepin-3-oxide

Metabolism - Effects of Microbes on Pesticides

Various acidic soil deposits were placed into undefined nutrient solutions containing endosulfan (Thiodan; source and purity unspecified) at a final concentration of 1,000 ppm. From the mixed microbial population obtained, various fungi were isolated in pure culture. Over the following 6 weeks, the fungi were successively passed from an enriched culture medium to a deficient medium containing [^{14}C]endosulfan at 1 ppm. The bacteria and actinomycetes employed in the study were previously isolated and characterized strains. Immediately following inoculation of culture medium with organisms [^{14}C]endosulfan was added at 1 ppm, and incubation with shaking was carried out for 10 days. The identities (i.e., genus and species) of the organisms tested were not specified. Radioactive $^{14}CO_2$ release was measured from all cultures by "airing" four times daily for 1 hour and subsequent trapping in 1 N NaOH. Following incubation, the organisms were separated from the growth media and extracted with benzyl alcohol: methanol (1:1); the culture medium was extracted with benzyl alcohol only. Thin-layer chromatography (TLC) was then performed (system not described) and areas containing radioactivity were detected with a TLC scanner. Metabolites were quantitated by scraping sections from the silica gel plates and counting the radioactivity eluted. Control samples without organisms were also analyzed.

REPORTED RESULTS:

Metabolism - Effects of Microbes on Pesticides

The results of the survey of microorganisms are presented in Table 1 (no materials balances were reported). In uninoculated control solutions, <1,2, and 8% of the endosulfan was hydrolyzed to endosulfan diol at pH 4.3, 5.5, and 6.3, respectively. Endosulfan was completely hydrolyzed at pH 8 or greater. The amount of evolved $^{14}CO_2$ was <0.1% for all cultures except for one with a $^{14}CO_2$ evolution of 1%.

DISCUSSION:

Metabolism - Effects of Microbes on Pesticides

1. The discussion on the methods used to culture the organisms did not include a description of the media. Whether the endosulfan was present as the sole source of carbon or whether it was merely an additional component for cometabolism could not be determined.

2. The source and purity of the endosulfan and endosulfan metabolites were not provided.

3. The procedure utilized for thin-layer chromatography was presented in very sketchy detail with no mention of the solvent system used to develop the chromatogram. However, the author stated that the standard compounds were chromatographed with the sample extracts for each plate. The reviewer could not determine if this lack of detail was due to a poor description by the author or the poor translation of the paper.

4. The "airing" process and subsequent trapping of $^{14}CO_2$ in NaOH were not described in sufficient detail to permit the reviewer to understand exactly how the procedure was performed. However, this type of procedure is commonly used.

5. The author did not present a mass balance for the experiment. Therefore, this study is useful mainly for qualitative identification of endosulfan metabolites. No detailed rate and pattern of endosulfan degradation or metabolite formation were reported.

6. Control samples were run at varying pH values in order to account for the influence of pH on endosulfan degradation because the culture pH values were not controlled.

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Metabolism - Aerobic Soil

1. No controls were used in the study.

2. The method for pesticide application was not described.

3. Methods for extraction were not adequate and no descriptions for methods of pesticide analysis were included.

4. The description of the soils employed was inappropriate.

5. No attempt was made to determine the fate of the applied radioactivity that remained unaccounted for.

Table 1. Results of a survey of microorganisms for their ability to degrade endosulfan.

Number of organisms tested	Number of organisms responding in specified manner	Metabolites formed and their amounts as a percentage of applied endosulfan
28 Fungi	13	Endosulfan sulfate, 25-75%; endosulfan diol, <10%
	4	Endosulfan diol, 23-35%; endosulfan sulfate, <10%; traces of endosulfan hydroxyether
50 Bacteria	13	Endosulfan diol, 20-80%; traces of endosulfan sulfate and endosulfan ether
	5	Endosulfan sulfate, 30-55%; traces of endosulfan diol
10 Actinomycetes	4	Endosulfan diol, 20-30%; "lesser amounts" of endosulfan sulfate and endosulfan hydroxyether