CASE GS0014 ENDOSULFAN STUDY 88 FM 11C 08/12/79

CHEM C794C1 Endosulfan

BRANCH RCBP DISC C5 TOPIC 10 GUIDELINE 40 CFR 163.61-7

FORMULATION CC - ACTIVE INGREDIENT

FICHE/MASTER ID C5CC2841 CONTENT CAT C1

Archer, T.E.; Nazer, I.K.; Crosby, D.G. (1972) Photodecomposition of endosulfan and related products in thin films by ultraviolet light irradiation. Journal of Agricultural and Food Chemistry 20(5):954-956.

STUDY CLASS = S.

DIRECT RVW TIME = 11 (MH) START-DATE END DATE

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CONCLUSIONS:

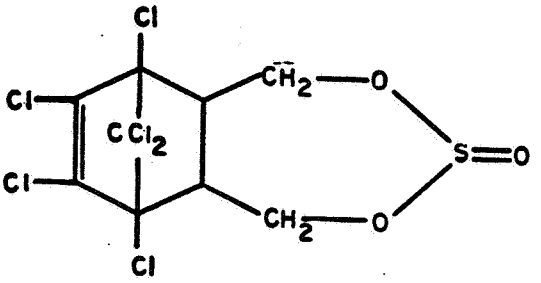
Physico-Chemical Transformation - Photolysis

1. This study is scientifically valid.

2. Ultraviolet irradiation of α- and β-endosulfan standards produced endosulfan diol as a major photoproduct, representing 21.9% (α) and 29.7% (β) of the nonvolatilized initial standard. Minor photoproducts detected included endosulfan ether, endosulfan α-hydroxy ether, endosulfan lactone, and an unidentified photoproduct. Irradiation of pure standards of these photoproducts resulted in various quantities of the endosulfan photoproducts plus two additional unidentified photoproducts.

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

α-Endosulfan (67% α-endosulfan, 30% β-endosulfan, 2.4% endosulfan diol, 0.6% endosulfan ether), β-endosulfan (8.2% α-endosulfan, 83.7% β-endosulfan, 5.3% endosulfan diol, 2.8% endosulfan ether), endosulfan ether (pure), endosulfan α-hydroxy ether (pure), and endosulfan lactone (pure) standards (200 mg each) were individually dissolved in acetone and spread as thin films in borosilicate glass dishes. After evaporation of the acetone, the samples were irradiated for 7 days with UV light (1×10^4 ergs/cm, wavelength not specified). Controls were prepared in a similar manner except for irradiation.

Photolysis products were identified with thin-layer chromatography (TLC) and gas-liquid chromatography (GLC). Endosulfan diol and endosulfan α-hydroxy ether overlapped on the GLC. Therefore, silylation of these standards, which increased the retention time of endosulfan diol, was necessary. This necessitated further separation of the retention times of endosulfan diol and endosulfan lactone, which was accomplished by acetylation. All unknowns were extracted with benzene: isopropyl (1:1) parallel with the standards so that the recovery of the photoproducts could be reported relative to the standards.

All standards were obtained from Niagara Chemical except the endosulfan α-hydroxy ether and endosulfan lactone, which were provided by G.W. Ware of the University of Arizona.

REPORTED RESULTS:

Table 1 shows the detected products resulting from irradiation of endosulfan and its related products. Endosulfan diol, representing 21.9% (α-endosulfan) and 29.7% (β-endosulfan) of the nonvolatilized initial standard, was the major photoproduct of both α- and β-endosulfan. Endosulfan ether (1.76 and 0.94%), α-endosulfan hydroxy ether (2.18 and 8.50%), endosulfan lactone (2.58 and 1.50%), and one unidentified product (1.34 and 2.90%) also resulted from photolysis of the α- and β- isomers of endosulfan. Endosulfan sulfate was not detected as a photoproduct of any of the irradiated products, and no degradation products were detected as a result of its photolysis. Two unidentified products, not detected as endosulfan photoproducts, were detected in endosulfan diol, endosulfan ether, and α-hydroxy ether solutions, one of which was detected in the endosulfan lactone solution. Detectable degradation products were not found in control solutions.

DISCUSSION:

1. Photolysis was studied with undiluted standards of endosulfan and related compounds. Though the data requirements only specify photolysis studies in water, on soil, or in vapor, this study is useful in that it identifies potential endosulfan photoproducts and because it identifies products that result from further photolysis of endosulfan's photoproducts.

2. Table 1 indicates that 43-81% of the applied standards volatilized during the course of the study. No attempts were made to identify the volatilized compounds. Methods used to measure volatilization were not reported.

3. Extraction recoveries for the various compounds were reported to range from 80 to 100%. However, recovery efficiency for specific compounds was not presented.

4. Analysis for photolysis products was conducted only once. Therefore, no conclusions can be drawn on the rate of endosulfan degradation to the compounds detected.