FILE #09770/
HUDSON L. BOYD
CHEMIST
EFB - HED - OPTS

MAY 26 '81

METHOMYL

Task 3: Environmental Fate Profile

Contract No. 68-01-5830

Final Report

May 21, 1981

SUBMITTED TO:

Environmental Protection Agency
Arlington, Virginia 22202

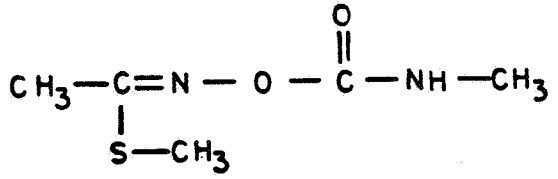
SUBMITTED BY:

Enviro Control, Inc.
One Central Plaza
11300 Rockville Pike
Rockville, Maryland 20852

METHOMYL

TASK 3

METHOMYL, LANNATE, NUDRIN



S-Methyl-N-[(methylcarbamoyl)oxy]thioacetimidate

Environmental Fate Profile

Available data are insufficient to assess fully the environmental fate of methomyl.

Methomyl was more rapidly degraded in a sandy loam and a California soil than in silt loam soils, with 21, 31, and 44-48% of the applied methomyl remaining in the respective soils 42-45 days after treatment. The major degradation product was CO_2, which accounted for 23-47% of the applied methomyl after 42-45 days. A minor degradation product, S-methyl-N-hydroxy-thioacetimidate (a possible hydrolysis product), was also found. Methomyl half-lives were less than 30 days in sandy loam soil, less than 42 days in California soil, and approximately 45 days in muck and silt loam soils. In a sterilized Flanagan silt loam soil 89% of the methomyl remained 45 days after application, thus indicating that methomyl degradation in soil is primarily a microbial process (Harvey, 00008844, 00009325, 00005867, and 00005868).

The nitrogen-fixing ability of Azotobacter vinelandii and a Rhizobium sp. was not altered following treatment with methomyl at 5-250 or 5-50 ppm, respectively (Rodell et al., 05008720). Populations of Anabraena cylindrica were reduced by as much as 54%, and nitrogen fixation was reduced by up to

85%, compared with controls, following treatment with methomyl at 20, 40, 80, or 160 ppm (Huang, 05010223).

At 0.5 ppm, methomyl moderately inhibited nitrification (up to 32%) in silt loam soil for 4 days; recovery occurred in 19 days. At 5.0 ppm nitrification was severely inhibited 33-82% for 4 days and recovered by 28 days after treatment (Han, 00009328). In another study (Peeples, 00008581) methomyl (18 ppm) had no effect on fungal and bacterial population or on CO_2 production in either silt loam or fine sand soils.

In a silt loam soil 71% of the radioactivity and 98% of the methomyl dissipated within 1 month after treatment (Harvey, 00008844). Three months after treatment 90% of the radioactivity had dissipated from a fine sand soil and by 5 months 85% had dissipated from a loamy sand soil (Harvey and Pease, 00009324). No methomyl residues were detected in a muck soil 7-32 days after treatment (E.I. du Pont de Nemours and Co., Inc., 00009326)

Based on the limited data available methomyl does not appear to present a persistence problem in soil and does not adversely affect the general soil microbial population. However, methomyl does severely inhibit nitrification for 4 days. Therefore, repeated applications of methomyl, which are allowed by the use pattern, within a 19-day period may result in a prolonged period of reduced nitrification.

Base on the low degradation rates in sterilized soil, it would appear that the main means of methomyl degradation is microbial metabolism to CO_2, although the fact that a possible hydrolysis product was found would indicate that hydrolysis is at least a minor means of transformation.

Summary of Major Data Gaps

The major data gaps for this chemical are: hydrolysis and photolysis studies; soil metabolism studies - aerobic and anaerobic; leaching, volatility, and adsorption/desorption studies; terrestrial and forestry field dissipation studies; rotational crop and fish accumulation studies; and reentry studies.

Label Restrictions

There are no current label restrictions regarding the environmental chemistry of methomyl.

4

References

E.I. du Pont de Nemours & Company. 1971. Methomyl decomposition in muck soil--a field study. (Unpublished study received May 5, 1977, under 352-342; CDL:229711-F.) (MRID 00009326)

Han, J.C. 19?? Evaluation of possible effects of methomyl on nitrifying bacteria in soil. (Unpublished study received May 5, 1977, under 352-342; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, Del. CDL:229711-H.) (MRID 00009328)

Harvey, J., Jr. 19?? Decomposition of ^{14}C-methomyl in a high organic matter soil in the laboratory. (Unpublished study received May 5, 1977, under 352-342; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, Del. CDL:229711-E.) (MRID 00009325)

Harvey, J. 1964? Exposure of S-methyl N-[(methylcarbamoyl)oxy]thioacetimidate in sunlight, water and soil. (Unpublished study received Dec. 28, 1968, under 8F0671; submitted by E.I. du Pont de Nemours and Co., Inc. Wilmington, Del. CDL:091179-V.) (MRID 00008844)

Harvey, J., Jr. 1977. Decomposition of ^{14}C-methomyl in a sandy loam soil in the greenhouse. (Unpublished study recived Feb. 28, 1977, under 352-342; prepared in cooperation with Univ. of Delaware, Soil Testing Laboratory, submitted by E.I. du Pont de Nemours & Co., Wilmington, Del. CDL:096026-A) (MRID 00008567)

Harvey, J., Jr. 1977. Degradation of ^{14}C-methomyl in Flanagan silt loam in biometer flasks. (Unpublished study received Feb. 28, 1977, under 352-342; prepared in cooperation with Univ. of Delaware, soil testing laboratory; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, Del. CDL:096026-E.) (MRID 00008568)

Harvey, J., Jr., and H.L. Pease. 1971? Decomposition of methomyl in soil. (Unpublished study received May 5, 1977, under 352-342; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, Del. CDL:229711-D.) (MRID 00009324)

Huang, C.Y. 1978. Effects of nitrogen fixing activity of blue-green algae on the yield of rice plants. Botanical Bull. Academia Sinica 19(1):41-52. (MRID 05010223)

Peeples, J.L. 1977. Effect of methomyl on soil microorganisms. (Unpublished study received Mar. 24, 1977, under 352-342; submitted by E.I. du Pont de Nemours & Co., Inc., Wilmington, Del. CDL:228749-A.) (MRID 00008581)

Rodell, S., B.R. Funke, and J.T. Schulz. 1977. Effects of insecticides on acetylene reduction by Azotobacter vinelandii and soybean nodules. Plant and Soil 47(2):375-381. (MRID 05008720)