APPENDIX M. Monitoring Data for Methomyl

Ground Water

Pesticides in Ground Water Database. The Pesticides in Ground Water Database (USEPA, 1992) indicates detections of methomyl in three states including Missouri, New York, and New Jersey. According to the database, methomyl has been detected in ground water at concentrations ranging up to 20 µg/L. Methomyl was also detected in a field study conducted by Rhone-Poulenc in Florida at concentrations up to 20 µg/L. The highest value calculated in using SCI-Grow was 15 µg/L for the use of methomyl on alfalfa assuming maximum use patterns. A possible explanation for ground water monitoring data finding higher concentrations of methomyl than estimated may be due to methomyl being a degradation product of thiodicarb. Methomyl formed as a result of the degradation of thiodicarb and potential simultaneous use of methomyl within the same areas as thiodicarb were not considered in the calculations for this assessment.

In 1987, Rhone-Poulenc applied thiodicarb to a small field plot in Florida. Using a 1 µg/L detection limit, methomyl was detected in ground-water samples from the Florida site at concentrations of 2 and 20 µg/L (Jones *et al.*, 1988). The detections occurred one month after the thiodicarb application and, although sampling continued for four months, no further detections were seen.

In June 1986, methomyl was detected in one domestic, well in an alluvial aquifer at a concentration of 8.1 µg/L using a 5.0 µg/L detection limit (Mesko and Carlson, 1988). In July 1987, the same well was found to contain residues of alachlor (0.1 µg/L) and atrazine (0.6 µg/L) but not methomyl. According to the study author[1] (Mesko and Carlson, 1988), there was no proof that the contamination in the well was the result of normal agricultural use or point-source contamination. However, often pesticide containers were located near some of the sampled wells.

Selected domestic, irrigation, and public supply wells in areas susceptible to agricultural contamination were sampled for pesticide residues (Louis and Vowinkel, 1989). This study was designed to relate the presence of agricultural chemicals in ground water to land use, hydrogeologic conditions, and well-construction characteristics. Methomyl was detected in five wells (5 of 120 or 4%) in 1987. Concentrations in the five wells ranged from "trace" to 1.0 µg/L using a detection limit of 0.5 µg/L. The average concentration (assuming trace equals half of the detection limit) was 0.6 µg/L for the wells with detections; this is also the median concentration. According to a study author[2], the methomyl detections appeared to be the result of nonpoint source mechanisms as no point sources were in evidence. The wells used in this study were relatively deep with a median depth of 80 feet.

Methomyl was detected in ground water in Suffolk County in 1982, 1983, 1984, 1985, 1986, 1987, 1989, and 1990. Concentrations in 81 wells (81 of 20955 or <1%) ranged from 1.0 to 20.0 µg/L (Moran, 1991) using a detection limit of 1.0 µg/L. From 1986 through 1994, methomyl concentrations ranged from 1.0 to 20 ppb with an average concentration of 3.0 µg/L and a median value of 2 µg/L for the samples with detections.

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[1] Mesko, T.O. 1995. Personal communication to Estella Waldman.

[2] Vowinkel, E. 1995. Personal communication to Estella Waldman, August 1995.

Palermo, NY Potato Study for Thiodicarb. In 1987, Rhone-Poulenc applied thiodicarb to a small field plot in Palermo, New York. Methomyl was detected in one ground-water samples at the detection limit of 1 µg/L (Jones *et al*., 1988). The detection occurred three months after the thiodicarb application; methomyl was not detected in samples collected during the fourth and final sampling round.

Surface Water

Registrant Submitted Studies:

The registrant aquatic field residue monitoring studies were requested in the Methomyl Registration Standard issued in 1987, to support the reregistration of methomyl. The aquatic residue monitoring studies for various use patterns were conducted in different states. The studies were conducted on sweet corn in Illinois and Georgia, apples in Michigan, lettuce and tomatoes in Florida, and cantaloupe in California. Results of these field studies conducted by the registrant are summarized in **Table 22**.

Illinois Sweet Corn Study. In Illinois, two sites planted to sweet corn were treated with 16 daily aerial applications of 0.45 lbs a.i./A, for a total of 7.2 lb a.i./A (MRID 43708802, 43744402). A foliar dislodgeable residue study indicated that the methomyl easily removable from foliar surfaces decreases rapidly, with 75-78% of the applied dissipating within 7.5 hours after application. Methomyl dissipated in the soil with a half-life of 6.5 days. Samples were collected from two canals and one pond adjacent to the treated fields. The maximum concentrations measured in canal water at the two sites were 5.0 – 26.5 µg/L. The maximum 96-hour and 21-day peak concentrations at the canal sites ranged from 1.5 to 10 µg/L and from 0.8 to 5.8 µg/L, respectively. The median methomyl concentration in the pond was 0.8 µg/L; the maximum concentration was 2.0 µg/L.

Georgia Sweet Corn Study. A Georgia site planted to sweet corn included flumes, diversion walls, and ditches constructed to direct field runoff directly into a pond (MRID 43744401; 43823302). The site was treated with 29 aerial applications of 0.3-0.5 lbs a.i./A, at 1 day intervals, for a total of 11.25 lbs a.i./A. The average half-life of methomyl in soil was 9 days. Pond concentrations peaked 19 days after the first application and were at or near the limit of quantification 16 days after the final application. Samples were collected from two stream stations as well as the pond. Methomyl concentrations in water samples collected from an adjacent stream ranged from 1.1 to 175 µg/L. Median methomyl concentrations during the application period were 5.5, 3.4 and 0.95 µg/L, respectively for the upstream, pond, and downstream stations, respectively. The 96-hour and 21-day average concentrations were 6.7 and 4.2 µg/L, respectively.

Michigan Apple Orchard Study. Two sites were studied in Michigan. At one site, apple orchards surrounded a pond on three sides. At the other site, apple orchards surrounded a pond on all sides. Each orchard received five applications of methomyl at a rate of 1.35 lbs a.i./A, for a total of 6.75 lbs a.i./A at 5-day intervals with an air blast sprayer. Median methomyl concentrations in soil ranged from 0.932 to 12.500 mg/kg (MRID 43708801; 43823303). The half-life of methomyl in soil was 26 days during a dry period, decreasing to 8 days after rainfall events. The half-life of methomyl residues on apple foliage was 4 days. Only 19% to 50% of the total methomyl applied actually reached spray drift cards on-site. The most noticeable increase in methomyl concentration in pond water was associated with the application day which had the highest wind speeds. Deposition cards placed on the surface of the pond showed that the pond received from 0.2% to 0.44% of the application rate. Methomyl concentrations in runoff water ranged from 300 to 1320 µg/L during the application period and <20 µg/L 2-3 weeks later. Median methomyl concentrations in the pond water ranged from 0.16 to 13.3 µg/L during the application period. Concentrations dropped below the quantification limit of 0.2 µg/L within 9 to 30 days after the final application. The registrant concluded that spray drift was the primary source of methomyl in the pond. PRZM/EXAMS simulations run on the same sites served as good predictors of the environmental fate of methomyl.

Florida Lettuce Study. Two fields planted to lettuce in Florida in the Lake Apopka area were treated with ten aerial applications of 0.9 lbs a.i./A at 2-day intervals for a total of 9.0 lbs a.i./A (MRID 43708804). Methomyl dissipated rapidly from the surface layer with a half-life of between 4 and 5 days and slower from deeper soil layers with half-lives between 8 and 10 days. Median methomyl concentrations were 16 and 47 ppb in the lateral canals; 3 and 6 ppb in the main canals. The peak 96-hour and 21-day average concentrations reaching Lake Apopka were 0.8 and 0.3 µg/L, respectively. The highest measured concentration entering the lake was 1.7 µg/L measured immediately after the canals draining the fields were pumped down in expectation of a rain storm; concentrations fell below the limit of quantification within six days. Concentrations in the lake were generally two orders of magnitude less than those of the canals.

Florida Tomato Study. A study was conducted on tomatoes grown using plastic cover to reduce weed competition to determine the amount of methomyl run-off likely to occur under this cultivation practice (MRID 43708804). A total of five foliar applications were made over two months (0.81 lbs a.i./A for applications 1 and 5, and 0.45 lbs a.i./A for applications 2, 3, and 4). The calculated half-life of methomyl on the plastic mulches was approximately 6 hours. The short half-life suggests that the potential for accumulation on plastic ground cover or runoff is low.

California Cantaloupe Study. Two cantaloupe fields in Fresno were treated with six aerial applications of methomyl at 0.90 lbs a.i./A each (MRID 43708803; 43823304). One field was irrigated five times and the other four times. The half-life of methomyl in the soil was between 12 and 21 days in the period after the last application. The mean methomyl concentration measured in the surface waters receiving irrigation runoff was 0.86 to 4.6 µg/L. Maximum concentrations leaving the two sites were 71 and 96 µg/L. The total amount leaving the field as runoff was less than 0.2% of the amount applied.

Summary of Surface Water Field Studies. Methomyl was found in aquatic environments adjacent to treated fields in all five studies at maximum concentrations ranging from 1.7 up 175 µg/L. Runoff water entering the pond had concentrations as high as 1,320 µg/L. In at least one study, the dissipation rate increased greatly after rainfall events, suggesting that runoff and leaching may be a major route of dissipation. Foliar dissipation half-lives ranged from a few hours (on corn) to 4 days (on apples). Such variations would be expected because of differences in site characteristics, weather conditions, cropping practices, and water body geometry and chemistry. Runoff may be more of a contributing factor under site, soil, and weather characteristics that favor runoff.

Table 22 Summary of Results of Monitoring Studies Conducted by DuPont for Methomyl.

Site/Use (MRID)	App. Rate x No. (Interval/Method)	Water Body	Peak Conc. (µg/L)	4-day Mean Conc. (µg/L)	21-day Mean Conc. (µg/L)	Median Conc. (µg/L)
IL Sweet Corn (43744402)	0.45 lb/A x 16 1 d / aerial	irrig. canal, pond	5-26.5 2.0	1.5-10	0.5-5.8	0.8
GA Sweet Corn (43744401, 43823302)	0.3-0.5 x 29 1 d / aerial	stream/pond upstream downstream	175	6.7	4.2	5.5 0.95 3.4
MI Apple (43708801, 43823303)	1.35 lb/A x 5 5 d / air-blast	runoff pond	300-1320[A]		<20	0.16-13.3
FL Lettuce (43708804)	0.9 lb/A x 10 10 d / aerial	in-field & adjac. canals Lake Apopka	1.7	0.8	0.3	16-47 3-6
CA Cantaloupe (43708803, 43823304)	0.9 lb/A x 6 ? d / aerial	surface water receiving irrigation runoff	71-96			

A. The reported runoff concentrations are from runoff collected at the field edge before entering the pond.