Department of Pesticide Regulation
Environmental Monitoring and Pest Management
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PROTOCOL FOR MONITORING METHYL BROMIDE CONCENTRATIONS IN AIR ADJACENT TO A FIELD APPLICATION

I. INTRODUCTION

Methyl bromide is used extensively in California, totaling over 18,000,000 lbs in 1988. Methyl bromide is used as a soil fumigant to control nematodes, soil-borne diseases, insects, and weeds. It is also used as a fumigant for harvested grains and nuts. The major use of methyl bromide is as a preplant soil-fumigant on strawberry fields (over 6,000,000 lbs) and for structural pest control (over 3,000,000 lbs).

As a preplant soil-fumigant in strawberries, it is typically injected 6 to 8 inches deep and immmediately covered with a plastic tarp. Tarps are left in place a minimum of 24-48 hours. Application rates vary from 180 to 240 lbs/acre depending on soil type, conditions, and type of pest control.

A prior field study conducted with methyl bromide indicated that even with immediate tarp placement, methyl bromide concentrations 67 meters off-site reached a maximum of 900 ppb (3500 ug/m^3) on the day of application (Seiber et al. 1987). Concentrations at 275 meters from the treated field reached a maximum of 210 ppb (800 ug/m^3) on the day of application. About six days after application, methyl bromide concentrations dropped below the detection limit of 1 ppb (4 ug/m^3). No burst in air concentrations

was seen after tarp removal, which occurred about 72 hours after application.

In addition, with the suspension of products containing 1,3 dichloropropene, the use of methyl bromide under tarpless conditions has been growing. Section 18s have been issued for carrots, potatoes, and sweet potatoes. Application depths range from 6 to 24 inches and application rates from 150 to 400 lbs of methyl bromide per treated acre. The volatilization flux of methyl bromide and concomitant air measurements taken off-site have not been measured under these application conditions.

New toxicological data on the health effects of methyl bromide indicates there may be an inadequate margin of safety associated with its use as a soil fumigant. Consequently, the Environmental Hazards Assessment Program (EHAP) of the Department of Pesticide Regulation (DPR) is collaborating with scientists at the University of California at Davis (UCD) on a study of methyl bromide in air. Scientists at UCD will measure the volatilization rate (flux) of methyl bromide, while EHAP will simultaneously measure off-site air concentrations. A separate protocol titled "Determination of methyl bromide flux from a treated strawberry field" (Seiber, et al. 1992), describes the UCD portion of the study. Off-site air sampling conducted by EHAP (described below) will be timed to match the flux sampling schedule established by UCD.

Data produced by EHAP in this study will be used by DPR to assess human exposure levels. In addition, the volatilization rate and off-site air concentrations will be used by EHAP to evaluate the Industrial Source Complex Short Term model, an air dispersion model. If the model reliably

predicts air concentrations, it will be used to determine potential exposure levels at various distances off-site.

II. OBJECTIVE

To measure the concentrations of methyl bromide in air around a treated field. Both tarped and untarped applications will be monitored for 5 days.

III. PERSONNEL

This study will be conducted by EHAP personnel as follows:

Project Leader:	Lisa Ross
Field Coordinator:	David Kim
Senior Review:	Bruce Johnson
Chemistry Analysis:	Jean Hsu
Laboratory Liaison:	Nancy Miller
Agency and Public Contact:	Madeline Ames

ALL QUESTIONS CONCERNING THIS STUDY SHOULD BE DIRECTED TO MADELINE AMES AT: (916) 654-1141.

IV. STUDY DESIGN

Field Sites

Two fields in Monterey County will be located by EHAP for this study; one field for a tarped, the other for an untarped application of methyl bromide. These fields should be about 20-30 acres in size (about 325 x 325 m) within which a 10 acre sub-plot (about 200 x 200 m) will be treated with methyl bromide (Figure 1). Each field should be fallow and free of any obstructions which might interfere with flux or off-site air sampling.

Finally, the two fields should be located about one mile apart and treated on sequential days, if possible.

On the tarped field, methyl bromide will be applied 8 inches deep, at a rate of 240 lbs/acre. This is the shallowest and highest rate of application allowed in strawberries. On the untarped plot, the injection depth will be 12 inches and the application rate 300 lbs/acre. This is the shallowest and highest rate of application allowed in carrots under the current section 18.

Air Sampling

Air will be sampled with SKC® personal air sampling pumps. Methyl bromide will be trapped using commercially available glass tubes filled with charcoal. Sampling tubes will be stacked, two in a series, constituting a primary and a backup sample. Flow rates will be adjusted such that the total volume of air sampled during any individual sampling period equals approximately 11 liters. For example, during 4 hour sampling intervals, the flow rate will be about 45 ml/min and for eight hour sampling intervals, about 23 ml/min. Flow rates will be checked before and after sample collection using soap film calibrators. After collection, samples will be stored on dry ice and kept frozen until analyzed.

Ten air samplers will be located off-site from each field at a height of approximately 4 ft (1.2 m). Four will be located 33 ft (10 m) from the edge of the treated field, 90° apart (Figure 1). Another four will be located 164 ft (50 m) from the field, 45° offset from the samplers at 33 ft (see Figure 1). The final two will be collocated with two of the above

samplers during each sampling period, as a check on sampling and analytical variability, combined.

Prior to application on each field, two background air samples will be collected. During application, all air samplers will run for the duration of the application. From 0 to 24 hours after application, air samplers will run for four-hour periods. From 24 hours (day two) to five days after application, samplers will run for eight-hour periods. All air sample changes will coincide with sample changes performed by UCD.

Total number of air samples for methyl bromide analysis:

Background: (2 samplers x 2 fields)	= 4
During application: (10 samplers x 2 fields)	= 20
0 - 24 hours: (10 samplers x 6 sampling periods/day x 2 fields)	= 120
Day 2 to 5: (10 samplers x 4 days x 3 sampling periods/ day x 2 fields)	= 240
TOTAL	= 384

Meteorological and Soil Data

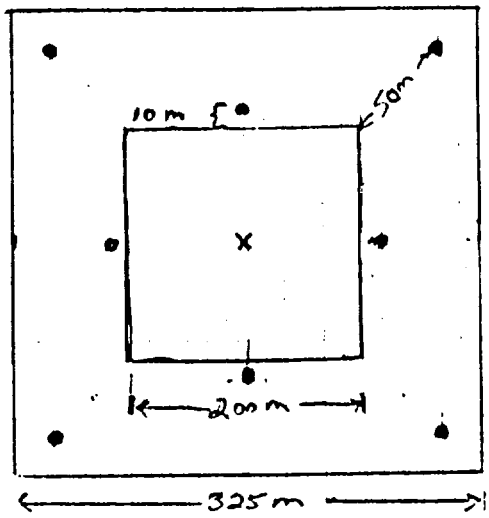
Meteorological data measured on site will include wind speed and direction, air temperature, and relative humidity. Meteorological data will be summarized over 5 or 15 minute intervals. In addition, the atmospheric stability class during the study will be gathered from the nearest source or calculated from wind data.

Soil temperature measurements will be made by UCD. In addition, EHAP will measure soil moisture and soil bulk density. Soil moisture measurements

VII. REFERENCES

Seiber, J.N, M.M. McChesney, J.E. Woodrow, and T.S. Shibamoto. 1987. Pilot analysis of methyl bromide in air. Final Report to the Air Resources Board. In: Memorandum to Jack Parnell, Dept. of Food and Agriculture. From James Boyd, Air Resources Board. Sept. 3, 1987.

Seiber, J.N., J.E. Woodrow, and M.M. McChesney. 1992. Determination of methyl bromide flux from a treated strawberry field. Proposal submitted to the Pesticide Impact Assessment Program of the U.S.D.A. June 12, 1992.



• = AIR SAMPLER

X = FLUX SAMPLING MAST

Figure 1. Diagram of proposed methyl bromide field layout. The inner 150 m x 150 m plot will be treated with methyl bromide. The outer 300m x 300m plot will be bare soil.