California Environmental Protection Agency
Department of Pesticide Regulation
Environmental Monitoring and Pest Management
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PROTOCOL FOR MONITORING MALATHION IN THE FRUIT FLY AERIAL TREATMENT PROGRAMS

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I. INTRODUCTION

Aerial treatment programs with malathion have been used previously to eradicate Mediterranean and Mexican fruit fly infestations within California. In the current eradication protocol, malathion will be mixed with a bait, applied at a rate of 1.2 fluid ounces of Malathion ULV® in 10.8 fluid ounces of Nu-Lure® per acre, and sprayed during the night from an altitude of 300 feet above ground level. Multiple applications, if necessary, are made at 1-4 week intervals.

The Environmental Hazards Assessment Program (EHAP) of the Department of Pesticide Regulation (DPR) provides monitoring data for emergency eradication projects to assure the effectiveness of applications and protection of public health and the environment. In the spring of 1994, EHAP monitored an aerial treatment program of malathion bait spray used in the Mediterranean fruit fly (Medfly) Eradication Program by the California Department of Food and Agriculture (CDFA) in Riverside County. A total of eight aerial malathion applications were made over a period of 14 weeks. Mass deposition of malathion and malaoxon, a breakdown product, was monitored during the first three applications at a minimum of 30 sites. The 1.2 fluid ounces per acre target application rate is equivalent to 952 micrograms per square foot ($\mu g/ft^2$). The results of monitoring showed that aerial application deposited an average of 803.2 $\mu g/ft^2$ and ranged from no detectable amount ($<1 \mu g/ft^2$) to 2154 $\mu g/ft^2$ (84% of target rate) (DPR 1994). Malaoxon was not detected on any of the mass deposition cards. Average malathion air concentrations ranged from 1.4 to 3.6 parts per trillion (ppt) with maximum concentrations occurring during the 24-hour period immediately following application. Average malaoxon air concentrations ranged from no detectable amount to 2.3 ppt.

Water samples from a creek flowing through the treatment area were collected to determine possible contamination from the application. Malathion concentrations in the outflow from the area ranged from 1.0 to 24.4 parts per billion (ppb), and malathion in water sampled from a private lake located within the spray zone following the application ranged from 0.3 to 3.6 ppb.

Malaoxon was not detected at either of these monitoring sites. Heavy rainfall which followed four of the spray events allowed for collection of water samples of storm drainage runoff into the creek. Rain runoff concentrations detected in the creek ranged from no detectable amounts to 203 ppb of malathion and no detectable amount to 4 ppb for malaoxon.

In comparison, during the 1989-90 emergency eradication programs in Southern California and San Diego when the target rate was 2,212 $\mu g/ft^2$, malathion concentrations on deposition cards averaged 2028 $\mu g/ft^2$ (86% of target rate) and 1904 $\mu g/ft^2$ (92% of target rate), respectively (Segawa, et al., 1991; Turner et al., 1991). During the 1981 eradication program the average malathion deposition was 75% of the theoretical target rate (Oshima, et al. 1982). In 1981, a concentration of 170 ppb of malathion was detected in water sampled from a golf course water hazard and 23 ppb of malathion detected in water from a swimming pool. Maximum malathion water concentration in 1989-90 monitoring was 89.7 ppb in a swimming pool sample and 46.1 ppb in a pond sample. The maximum level found for rain runoff was during 1981 monitoring when 361 ppb malathion and 231 ppb malaoxon were collected downstream from drainage outlets.

II. PERSONNEL

This study will be conducted by EHAP, under the general direction of Kean S. Goh (Program Supervisor). Key personnel are listed below.

Senior Field Supervisor - Roger Sava
Project Leader - Pam Wofford
Senior Staff Scientist - John Troiano
Field Operations - Adrian Bradley
Lab Liaison/Quality Assurance - Nancy Miller
Chemical Analysis - Paul Lee
Data Analysis - Rosie Gallavan
Public and Agency Contact - Madeline Brattesani

Questions concerning this monitoring program should be directed to Madeline Brattesani at : (916) 324-4100, FAX (916) 324-4088.

III. MONITORING PLAN

The objectives of this monitoring are to: 1) provide quality control for the applications; 2) measure concentrations in air and compare with ranges previously documented;

and 3) determine concentrations in runoff water. This plan will be followed for each application per corridor in the aerial treatment program for which monitoring is conducted. The number of corridors and applications to be monitored will be decided when the extent of the aerial treatment program is known. This plan assumes that the application parameters previously described will be unchanged. If parameters change, additional sampling may be necessary.

OBJECTIVE 1): To measure the amount of malathion and its degradation product, malaoxon, reaching the ground (mass deposition).

Mass Deposition - Deposition cards (plastic-backed absorbent material, measuring 0.093 m^2) will be set out prior to application at each of 30 sites within the treatment area. The cards will be collected 30 minutes following application and will be used to determine the amount of malathion and malaoxon reaching the ground. The treatment area will be assumed to be rectangular or square and will be partitioned into smaller areas, across which sites will be randomly selected. Final site selection will be reviewed to avoid locations on the edges of the treatment area and multiple sites located on the same flight lines.

30 sites X 1 sample/site = 30 samples

OBJECTIVE 2): To measure the amount of malathion and its degradation product, malaoxon, in ambient air collected outdoors.

Air- Five sites within a half-mile diameter region centrally located in the treatment area will be sampled to measure outdoor ambient air concentrations of malathion and malaoxon. Anderson model SE-114 sampling pumps mounted with XAD resin tubes as trapping medium and calibrated to 15 liters/min will be used at each site. The samples will be collected for a 24-hour period before spray (background), during application, 24 hours post spray, and a final 24-hour sample from 24 to 48 hours after application.

5 sites X 4 sample periods X 1 sample/site = 20 samples

OBJECTIVE 3): To measure the amount of malathion and its degradation product, malaoxon, in runoff water.

Surface Water Runoff - Storm drain sites, if accessible, will be monitored during rain runoff to determine malathion and malaoxon concentrations due to wash off from

exposed surfaces. The number and frequency of samples collected will depend on intensity and duration of the runoff. Samples will be collected at points of discharge and/or at areas of concern for aquatic organisms. If the treatment area includes natural or man-made bodies of water (lakes, ponds, reservoirs, creeks, etc.), selected sites will be sampled for malathion and malaoxon concentrations following application and/or rain runoff. DPR will be assisted in selection of sites by the Department of Fish and Game. All samples will be analyzed for malathion and malaoxon.

50 samples (estimated)

IV. CHEMICAL ANALYSIS/QUALITY CONTROL

Analysis for malathion and malaoxon will be performed by the California Department of Food and Agriculture's Chemistry Laboratory Services Branch. The methods and quality control measures described in Segawa et al., (1991), will be followed.

V. DATA ANALYSIS

Mass deposition on deposition cards will be presented as micrograms of malathion and malaoxon per area ($\mu g/m^2$); concentrations of malathion and malaoxon in air will be reported as microgram per cubic meter ($\mu g/m^3$), and water concentrations will be reported as raw data ($\mu g/L$). When sample size permits, means, percentiles and frequency histograms will be presented. A comparison of the distributions for mass deposition results relative to target application rate for the current and previous eradication programs will be made using a non-parametric statistical procedure.

VI. REFERENCES

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