FENTHION DISTRIBUTION AND PERSISTENCE FOR BIOMONITORING OF XANTHID POPULATION DYNAMICS in Rookery Bay National Estuarine Research Reserve

For the Period of April 1, through December 31, 1996

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May 29, 1997
Mote Marine Laboratory Technical Report Number #525

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I. INTRODUCTION

The purpose of this study is to assess potential impact from Baytex drift into the Rookery Bay Estuarine Research Reserve. Baytex (fenthion) is applied by aerial Ultra Low Volume (ULV), by the Collier Mosquito Control District over land adjacent to the Reserve at a theoretical rate of 0.75 fl oz per acre (93 % A.I.) or 6345 µg/M². This application technique is designed to keep the pesticide airborne as long as possible allowing for maximum impact with flying adult mosquitoes. First and second year studies indicated that wind direction and speed during and after application had an effect on the impact to the Reserve. This report contains results from the third and final year study, encompassing the pre-season field samples (4/26/96), and ten subsequent application monitoring episodes. All ten monitoring episodes utilized filter pads placed at specific study sites to observe Baytex drift. Five of these sampling episodes included Baytex analysis of adult fiddler crabs.

II. METHODS

Four sites were monitored following Baytex applications during 1996 (Figure 1). The site labeled “Appl-Site” was positioned directly under the path of the aircraft applying Baytex, to determine the amount settling directly under the application area. Site-1 was located at a mangrove restoration site about 1 km into the reserve from the application route, and Site-2 was a mature mangrove forest about 0.3 km to the west of Site-1. Site-3 was located 4.5 km into the reserve from the application route.

Glass Fiber Filter Collection
Triplicate sets of two 8x10 inch glass fiber pads were tacked to a Styrofoam tray and placed at ground level at each monitoring area. Following application the filters were placed in glass jars with aluminum foil lined lids. Samples transported to the DEP Rookery Bay Lab were processed for the addition of CPS followed by DCM. Samples were placed on ice and returned to MML.

Crab Collection
Fifteen large crabs were collected from each site by hand, 4 to 6 hours after application (30 crabs from Site-3) and placed into a clean glass jar. A fresh pair of latex gloves were worn at each site. Collection jars were labeled and placed in a cooler for transport back to the Rookery Bay Lab.

To distinguish external from internal Baytex, six 120 ml glass jars were filled 2/3 full of dichloromethane (DCM) and five crabs were removed from the jar and dipped individually using forceps into the external jar and then placed into the internal jar. This procedure was repeated for two more sets of 5 crabs providing triplicate internal and external samples at each sites. For Site-3 crabs, 12 jars were prepared. The above procedure repeated for 6 sets of 5 crabs. 3 sets were spiked with fenthion for percent recovery determinations and 3 sets were used for Site-3 analyses.
ROOKERY BAY NATIONAL ESTUARINE RESEARCH RESERVE

Figure 1. Location of Test Sites.

Gulf of Mexico
All samples received 500 µl of 10 µg/ml chlorophenylsulfone in methanol (an addition of 5 µg CPS). Spiked samples received 500 µl of 20 µg/ml fenthion in methanol (an addition of 10 µg fenthion). Three blank samples were prepared per sampling episode by addition of DCM only to the 120 ml jars.

**Sample Storage and Transportation**

Samples were stored refrigerated at Rookery Bay until shipment. Samples were transported to Mote Marine Laboratory (usually the next day) by a Rookery Bay employee.

**Filter Extraction**

Filters were extracted at MML by soxhlet using 250 ml of 1:1 DCM/Acetone for a minimum of four hours. Samples were rote-evaporated to dryness and dissolved in methanol for gas chromatography/mass spectrophotometry (GC/MS) analysis.

**Crab Extraction**

External crab samples were transferred to round bottom flasks and evaporated to dryness using the rote-evaporator. Samples were then dissolved in methanol for GC/MS analysis. Internal crab samples were first homogenized using a Tekmar tissue homogenizer. Samples were homogenized in DCM with sodium sulfate, filtered, and the filter cake was extracted two more times. Internal crab samples were then run through a silica gel clean-up column. The column consisted of 6 cm of 20% deactivated silica topped with 2 cm of sodium sulfate. The first fraction consisted of 20 ml of hexane and was discarded. The second fraction was 20 ml of 4:1 hexane/ethyl ether. This fraction was evaporated to dryness and dissolved in methanol for GC/MS analysis.

**Fenthion Analysis**

All samples were analyzed by a Varian Saturn II capillary gas chromatograph, ion-trap mass spectrometer detector (GC/MS). The column was a J&W DB-5 MS, 30 m x 0.25 mm ID.

**Results**

Fenthion drift into the Rookery Bay Estuarine Research Reserve was monitored during ten aerial applications during 1996. The concentrations collected as fall out onto filter pads placed at each of the three sites within the Reserve, as well as one site directly under the application path are given in Table 1. The results show that in all instances when the wind was from the easterly quadrant (about 30 to 50 degrees) fenthion drift was observed into the Reserve. At low wind speeds (1.8 and 2.2 mph) fenthion was observed only at Sites-1 and -2. Higher wind speeds transported fenthion all the way to Site-3, with less falling on Sites-1 and -2. These results show the importance of wind speed and direction for fenthion drift and impact into the Reserve.

Fenthion contamination in fiddler crabs was observed during the two highest dosings of fenthion; studies #10 and 14 (Table 2). During study #10, fenthion was recovered from the internal organs of crabs at Site-1 only, with no external fenthion detected. Fenthion was observed on external surfaces of crabs during Study #14, at both Sites-1 and -2, however no internal fenthion was observed. These results are not consistent and may reflect different tidal influence on crabs between their exposure and time of collection.
<table>
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<th>Study #</th>
<th>Date</th>
<th>Appl.</th>
<th>Site-1</th>
<th>Site-2</th>
<th>Site-3</th>
<th>Reagent Blank</th>
<th>Spike²</th>
<th>Wind speed (mph)</th>
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<td>3 ± 5</td>
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<td>1.8 130°</td>
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1 Collecting filter placed directly in the path of the fenthion application
2 Percent recovery of fenthion added to filters
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