California Department of Food and Agriculture
Environmental Monitoring and Pest Management
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Protocol To Sample Bensulfuron Methyl (Londax®) In Water From The Sacramento River and Associated Agricultural Drains, and Commercial Rice Fields

I. INTRODUCTION

Since 1980, the Department of Fish and Game (DFG) has conducted yearly sampling for pesticides used in rice fields as part of a program to protect the quality of water in the Sacramento River and associated drains. If registration is approved in the spring of 1989, the herbicide, Londax® (active ingredient is bensulfuron methyl), will be available for use in California rice fields. The Environmental Hazards Assessment Program (EHAP) of the California Department of Food and Agriculture (CDFA)will then conduct a sampling program for bensulfuron methyl in the Sacramento River and agricultural drains in conjunction with the DFG as part of their continuing program. In addition, the EHAP will quantify levels of bensulfuron methyl in paddy water of commercial rice fields.

Technical bensulfuron methyl is an odorless, white to pale yellow solid with a vapor pressure of 1.8×10^{-11} mm Hg at 20 °C and water solubility ranging from 2.9 (pH 4.8) to 1200 mg/L (pH 7.8) at 25 °C. Bensulfuron methyl is absorbed by leaf tissues and roots of plants and acts to inhibit cell division and cell growth by blocking synthesis of the essential amino acids valine and isoleucine. The product is formulated as dry flowable granules with 60 percent active ingredient. Its use is recommended for control of most broadleaf and sedge weeds in continuously flooded rice. Applications are made

by aircraft to standing water which should be held on the field for at least 5 days prior to release.

II. OBJECTIVES

The objectives of this study are:

1. To quantify concentrations of bensulfuron methyl found in the Sacramento River and associated agricultural drains.

2. To quantify concentrations of bensulfuron methyl found in paddy water of commercial rice fields.

III. PERSONNEL

This study will be conducted by EHAP personnel under the overall supervision of Kean Goh, Senior EHS. Other key personnel include:

Project Leader/Data Analysis- Susan Nicosia

Senior Staff Scientist- Heinz Biermann

Field Operations- Chris Collison

Lab Liaison/Quality Control- Nancy Miller

Agency and Public Contact- Madeline Ames ((916) 324-8916)

IV. STUDY PLAN

OBJECTIVE 1:

<u>River and Agricultural Drain Water:</u>

All field sampling for this portion of the study will be conducted by the DFG in conjunction with their ongoing monitoring of rice pesticides in the Sacramento River and agricultural drain water.

The following three locations will be sampled on 14 dates covering the expected period of bensulfuron methyl discharge from rice fields, beginning the last week in April and continuing through June, 1989:

CBD1- Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County,

SS1- Sacramento Slough at the Department of Water Resources' gauge station in Sutter County,

SR1- Sacramento River at Village Marina, approximately 1.5 km upstream from the confluence with the American River, in Sacramento County.

Two samples will be collected at each location on each of the following dates: 4/24, 5/1, 5/8, 5/15, 5/18, 5/22, 5/25, 5/29, 6/1, 6/5, 6/8, 6/12, 6/19 and 6/26 in 1989. One sample will be analysed for bensulfuron methyl and the other will be stored as a backup.

OBJECTIVE 2:

Field Sites:

Three rice fields will be selected from the Sacramento Valley rice growing region. Criteria used to select fields will include similarity in size of fields, holding time for rice herbicides used, and growers' water management practices. Bensulfuron methyl will be applied by aircraft at the recommended label rate of 70 g ai/ha (1 oz ai/acre) for all fields. Application rates will not be measured in the field and will be assumed to equal the label rate.

Sampling:

Inlet water will be sampled from source canals at the entry points to the rice fields on 0 and 8 days after application and analysed for residues of bensulfuron methyl in the irrigation water. One background water sample will be collected in the last pad of each field prior to application of bensulfuron

methyl. A total of 6 water samples will be collected in the last pad of each field and analysed for concentrations of bensulfuron methyl on 0, 1, 3 and 8 days after application. Each sample will be a composite of 4 randomly collected subsamples. The following additional measurements will be made in the last pad of each field on each sampling day: water depth (cm) at 4 locations, water pH (corrected for temperature) at 6 locations and water temperature at 6 locations. Applications of Londax® are expected to take place in early May.

Data Analysis:

Objective 1:

Concentrations of bensulfuron methyl in river and drain water will be tabulated and charted for the study period.

Objective 2:

Average concentrations of bensulfuron methyl will be tabulated and charted for each rice field on each of the three sample days. Analysis of variance, with days after application as a repeated factor and fields as experimental units, will be used to examine the change in concentrations of bensulfuron methyl over time in the three fields. The following sources of variation will be considered:

Source of Variation	Degrees of Freedom
Fields	F - 1
Days	D - 1
Fields × Days	(F-1)(D-1)
Residual	F×D(S - 1)
Corrected Total	F×D×S - 1

(S = number of samples)

V. SAMPLING METHODS

Water will be collected in 1-liter polypropylene bottles at all locations (Sacramento River, agricultural drains and rice fields). Immediately after collection, samples will be placed on dry ice and will remain frozen until they are analysed.

VI. ANALYTICAL METHODS/QUALITY CONTROL

Analytical methods are currently being developed by the CDFA laboratory, for the detection of bensulfuron methyl. Water samples will be analysed for bensulfuron methyl with results reported in ppb.

Method Validation:

Method validation will be conducted separately by each of the laboratories (CDFA and QC). Five replicate spiked samples at five concentrations will be analysed for bensulfuron methyl in water and used to determine the mean percent recovery and standard deviation. As an initial check on the method, a total of nine blind blank-matrix spike samples will be split and analysed by each laboratory before the first field samples are submitted.

Storage Stability:

A storage stability study will be conducted for bensulfuron methyl in agricultural drain water. Fourteen water samples will be fortified with bensulfuron methyl (at 5 ppb), frozen and stored. Duplicate samples will be analysed after 1, 4, 8 and 16 weeks. The remaining 6 samples will be stored with backup field samples and analysed as needed.

Continuing Quality Control:

One solvent blank and 1 matrix spike will be analysed with each set of five samples. All samples collected will be split and sent to the main laboratory

(CDFA) and the QC laboratory for analysis. For 2 positive samples from each set of river and drain water samples, and 1 positive from each set of rice paddy water samples, 2 replicate injections will be made per sample.

The following table presents the potential number of samples to be analysed during the course of this study.

Table 1. Approximate number of samples to be analysed during bensulfuron methyl study.

		Number of Samples	
Category	Description	CDFA Lab	QC Lab
Field Samples	River and Drain Water	44	
	Rice Paddy Water	75	
	Inlet Rice Paddy Water	6	
Method Validation	Determine Recoveries	25	25
	Blind Split-Spikes	9	9
Storage Stability		14	
Continuing Quality Control	Matrix Spikes and Blanks	44	44
	Split Samples:		
	River and Drain Water	--*	44
	Rice Paddy Water	--*	75
	Inlet Rice Paddy Water	--*	6
	TOTAL:	247	203

*River and drain, rice paddy and inlet water samples will be split; therefore, results from analyses conducted by the main lab (CDFA) for field concentrations will be compared to results from the QC laboratory.

VII. TIMETABLE

Field site selection	March 6 - March 31
Sampling period	April 24 - June 30
Chemical analysis	April 24 - August 31
Data Analysis	September 1 - September 30
Memorandum preparation	October 1 - November 15
Final draft	December 1

VIII. BUDGET

Personnel	$ 12,500
Operating expenses	$ 69,800
TOTAL	**$ 82,300**