

US EPA ARCHIVE DOCUMENT



Regional Methods Project Summary

Collection of Pyrethroids in Water and Sediment

USING SCIENCE TO MAKE A DIFFERENCE IN U.S. EPA REGION 9, THE PACIFIC SOUTHWEST REGION

Regional Methods Program Collection of Pyrethroids in Water and Sediment Matrices: Development and Validation of a Standard Operating Procedure

Loss of pyrethroid insecticides onto surfaces during sample collection can confound the interpretation of analytical and toxicity test results. Sample collection devices, container materials, and water matrix composition have a significant influence on the association of pyrethroids to container walls, which can be as high as 50 percent.



pieces of equipment increases the potential for pyrethroid loss. This loose “surface-association” with container walls can be reversed through agitation.

When sampling water matrices with pumps or autosamplers, no pyrethroids were lost as long as the water was moving continuously through the system. When collecting water samples in containers, pyrethroid sorption to glass was less than to plastic, and sorption to Teflon was less than to Teflon (glass < plastic < Teflon). Additionally, pyrethroids were easier to re-suspend from the glass container walls.

Since the amount of surface-association is proportional to the ratio of volume-to-contact-area of the sample, taking larger-volume field samples (greater than 3 liters) reduced

pyrethroid losses to less than 10 percent. The amount of surface-association cannot be predicted easily because of the dependence on water matrix composition; samples with higher dissolved organic carbon or suspended-sediment concentrations were observed to have lower percent loss. Sediment samples were not affected by glass-container sorption (the only containers tested). Standardized sample-collection protocols are critical to yield accurate pyrethroid concentrations for assessment of potential effects (see text box).

Minimizing pyrethroid association to the surfaces of sampling equipment:

- Container composition affects the extent of aqueous pyrethroid loss; pyrethroids associate less to glass containers than to plastic (HDPE or LDPE), and Teflon has the greatest pyrethroid loss caused by association to the container surface.
- Containers should be agitated vigorously for at least 1 minute immediately before transfer to another sample container.
- Maximize the volume-to-contact-area ratio.
- When using a filtration apparatus or autosampler, pump speeds should be at 500 mL/min when pumping aqueous pyrethroids.
- Composition of the water matrix affects the extent of pyrethroid association. Higher amounts of DOC or suspended sediments lessen the amount of pyrethroids associated to the container surfaces.
- Appreciable losses of pyrethroids were not found for sediment samples collected in glass containers.
- When possible, water samples should be analyzed within 3 days of collection. Sediment samples can be frozen for up to 6 months (prior to extraction).

Regional Scientists: Debra Denton and Patti TenBrook
ORD Scientists: John Zimmerman, Brian Schumacher of the U.S. EPA Las Vegas Laboratory
USGS Scientists: Michelle L. Hladik, James L. Orlando, and Kathryn M. Kuivila, U.S. Geological Survey
Summary Report: <http://pubs.usgs.gov/sir/2009/5012/>