

DETERMINATION OF CYPERMETHRIN IN WATER SAMPLES USING GAS CHROMATOGRAPHY WITH MASS SPECTROMETER DETECTOR

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MPOB INFORMATION SERIES • ISSN 1511-7871 • JUNE 2013

MPOB TS No. 121

Insecticides are used in the oil palm plantation to control insect pests. Insecticides such as cypermethrin are commonly used to treat bagworms, nettle caterpillars and rhinoceros beetles. The use of pesticides in oil palm plantations has resulted in the growing concern of the presence and danger of the residues in the environment. A method has to be developed to monitor leaching and the persistence of insecticides such as cypermethrin in the oil palm agroenvironment.

Cypermethrin (Figure 1) is the common name for (RS)- α -cyano-3 phenoxybenzyl (1RS)-*cis,trans*-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate (C₂₂H₁₉Cl₂NO₃). *Aimcoyper*, *Ambush*, *Ammo*, *Cynoff* and *Cypercopal* are some of the trade names of cypermethrin. In its pure form, cypermethrin, is an odourless crystal, while a sample of 93% purity is a viscous semi-solid. Its melting point is in the range of 60°C - 80°C. Cypermethrin is less soluble in water (0.01 mg litre⁻¹). Its molecular weight is 416.3.

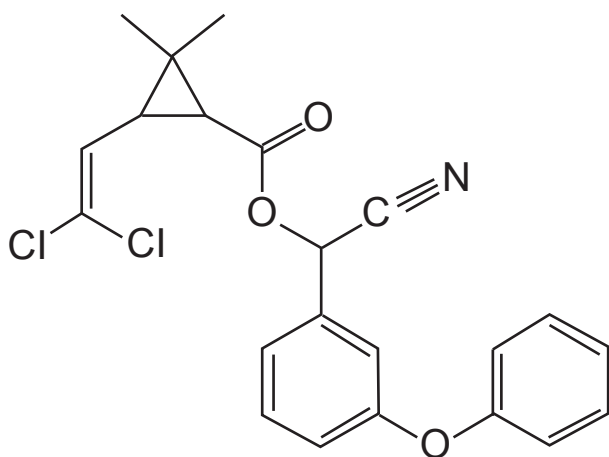


Figure 1. Chemical structure of cypermethrin.

OBJECTIVES

- To detect and quantify residual cypermethrin in water.
- Information on the fate of cypermethrin in the oil palm agroenvironment.

METHODOLOGY

The method involves the extraction of cypermethrin from water by loading the test sample into a SPE C18 cartridge and eluting with acetonitrile. The cartridge was previously conditioned with water and methanol. The detection and quantification of cypermethrin is by gas chromatography with mass spectrometer detector (GC-MSD) (Figure 2).



Figure 2. Gas chromatography with mass spectrometry detector (GC-MSD).



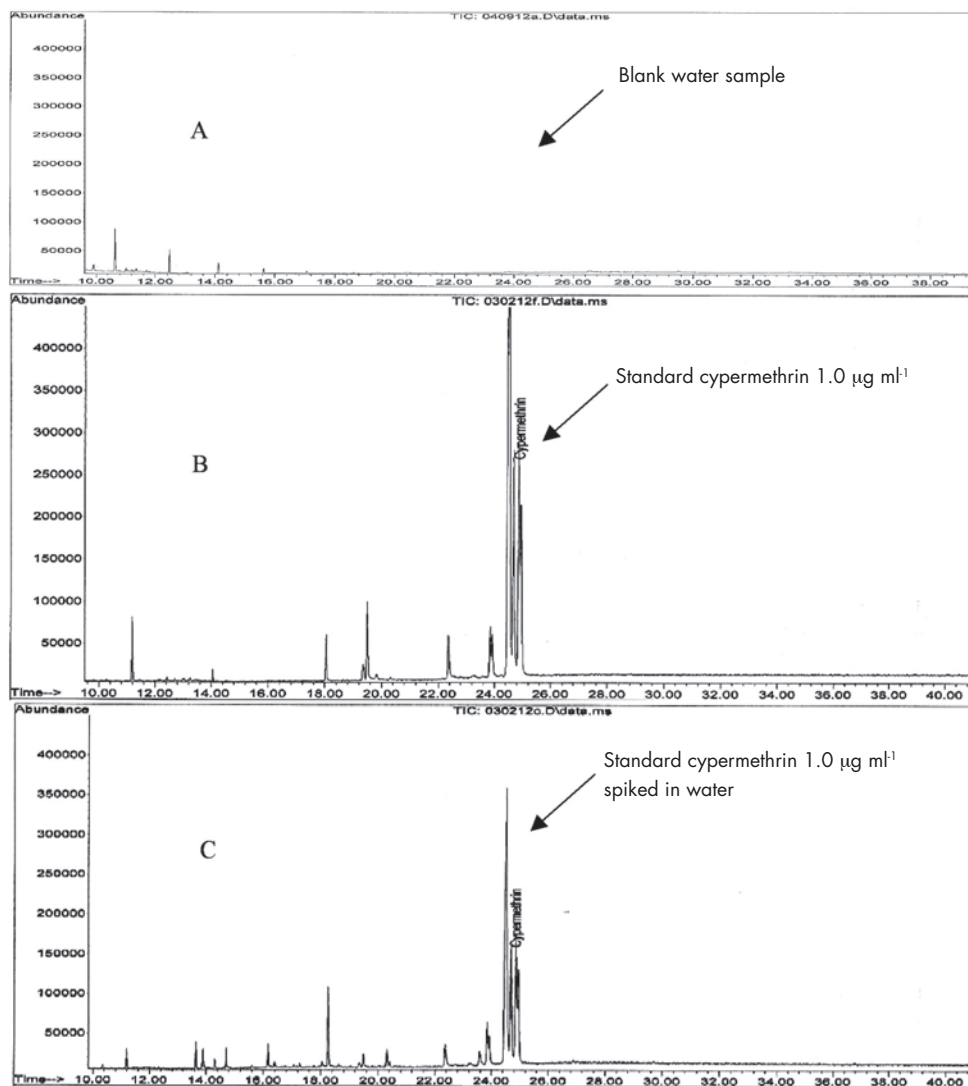


Figure 3. GC-MSD chromatograms of (A) blank water, (B) standard cypermethrin $1.0 \mu\text{g ml}^{-1}$ and (C) water spiked with $1.0 \mu\text{g ml}^{-1}$ cypermethrin standard.

RECOVERY STUDIES

Recoveries of cypermethrin from water samples spiked with $0.1\text{--}5.0 \text{ mg kg}^{-1}$ of standard cypermethrin ranged from $74.3\% - 91.7\%$ with coefficients of variation between $0.0013\% - 0.07\%$. Figure 3 is the GC-MSD chromatograms of (A) blank water, (B) standard cypermethrin, $1.0 \mu\text{g ml}^{-1}$ and (C) water spiked with $1.0 \mu\text{g ml}^{-1}$ cypermethrin standard. The limit of detection of cypermethrin in water is $0.05 \mu\text{g ml}^{-1}$.

BENEFITS

- A precise and reliable method for the detection and quantification of cypermethrin residue in water.
- Generation of environmental data on cypermethrin in water.

TYPE OF SERVICE

Detection and quantification of cypermethrin in water samples.

INDICATIVE COST

The cost for this analysis in 2013 is approximately RM 120 per sample and is subject to change.

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