DETERMINATION OF BENOMYL IN WATER USING HIGH PERFORMANCE LIQUID CHROMATOGRAPHY AND ULTRA VIOLET DETECTION

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MPOB INFORMATION SERIES • ISSN 1511-7871 • JUNE 2013 MPOB TS No. 122

The use of pesticides in agriculture has resulted in the growing concern on the presence and danger of residues in the environment. One of these is fungicide benomyl. Benomyl is an accepted common name for methyl N-(l-butylcarbamoyl) benzimidazol-2-yl carbamate, a systemic fungicide used to control a wide range of fungal diseases of fruits, nuts, vegetables, field crops, turf and ornamentals. Formulations include wettable powder, dry flowable powder and dispersible granules. Benomyl is strongly bound to soil and is highly persistent. However, benomyl is less soluble in water, about 2 mg litre^{-1} at 25°C. Other commercial names for products containing benomyl include *Agrodit, Benex, Benlate, Benosan, Fundazol, Fungidice 1991* and *Tersan*. Since the use of benomyl in oil palm plantations causes concerns of its negative impact on the environment, it is therefore necessary to develop an analytical method to detect, quantify and monitor benomyl (or carbendazim) residue in water samples from the oil palm agroenvironment. Benomyl is a very unstable compound and its principal degradation product is carbendazim. Therefore, the analysis of benomyl will be expressed as carbendazim. *Figure 1* shows the chemical structure of benomyl and its degradation product, carbendazim.

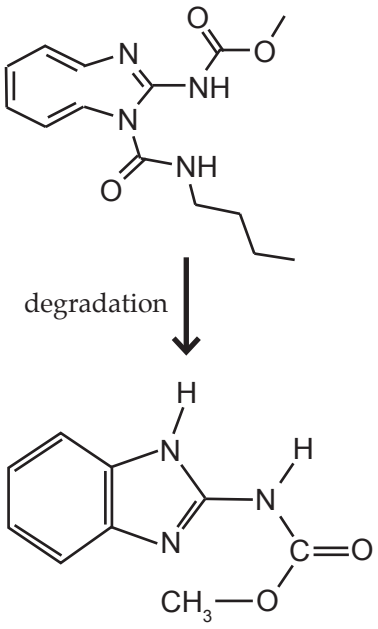

Figure 1. Chemical structure of benomyl and its degradation product, carbendazim.

OBJECTIVES

- To detect and quantify carbendazim residue in oil palm agroenvironment water samples.
- Information on the fate of carbendazim in the oil palm agroenvironment.

METHODOLOGY

This method involves a liquid-liquid extraction of carbendazim in water samples using ethyl acetate. The removal of the solvent is achieved by using the rotary evaporator, followed by evaporation-to-dryness using nitrogen. The residue is then re-dissolved in acetonitrile: water (30:70, v/v) solution. The detection and quantification of carbendazim is carried out using a high pressure liquid chromatographic system equipped with an ultra violet detector (HPLC-UV), shown in *Figure 2*.

Figure 2. High performance liquid chromatography–ultra violet (HPLC-UV) system.

ISSN 1511-7871
9 771511 787001

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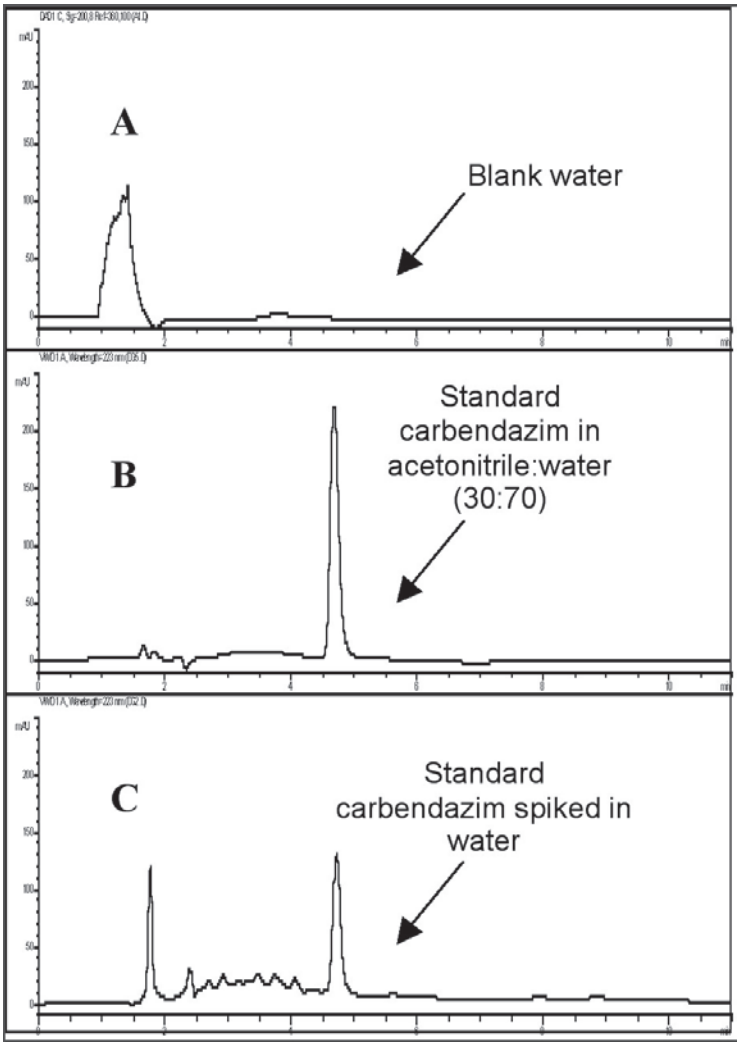

Figure 3. HPLC-UV chromatograms of (A) blank water, (B) standard carbendazim 1.0 µg ml^{-1} and (C) water spiked with 1.0 µg ml^{-1} carbendazim standard.

RECOVERY STUDIES

The recovery of carbendazim from water samples spiked with 0.1 – 50.0 µg litre^{-1} standard carbendazim ranged from 80.0% – 95.0% with coefficients of variation between 0.6% – 7.6%. *Figure 3* is the HPLC-UV chromatograms of (A) blank water, (B) standard carbendazim, 1.0 µg ml^{-1} and (C) water spiked with 1.0 µg ml^{-1} carbendazim standard. The limit of detection for carbendazim in water is 0.05 µg litre^{-1}.

BENEFITS

- A precise and reliable method for detection and quantification of carbendazim residue in water samples.
- Generation of environmental data of carbendazim.

TYPE OF SERVICE

Detection and quantification of carbendazim in water samples.

INDICATIVE COST

The cost for this analysis in 2013 is approximately RM 110 per sample and subject to change.

For more information, kindly contact:

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