Application Note AN-RS-022

Trace Detection of Carbendazim on Strawberries

Protecting consumer safety with Misa

Carbendazim (MBC) is a common fungicide approved for regulated use in agriculture globally, outside of the EU. Most MBC is found on fruits as surface contamination, the result of sprays applied prior to harvest. The US EPA has determined that a concentrations below 80 µg/mL in orange juice are not a health risk, while the EU restricts MBC levels to 10 ng/g (from imported produce) in foods intended for baby food production. Outside of this wide range of acceptance, it is agreed that MBC interrupts hormone production and can damage the testes in males. In the US, strawberries are the most common whole fruit to be contaminated with MBC, as determined by the USDA with GC/MS and LC/MS.

This Application Note describes a very simple test for surface MBC and provides library spectra demonstrating the sensitive detection of MBC with Misa (Metrohm Instant SERS Analyzer).

INTRODUCTION

The most common agricultural use of MBC is a 500 µg/mL spray applied in the field, 2–3 weeks preharvest. Detection of surface contamination is a very quick and easy assay, ideal for on-site testing with Misa.

REFERENCE SPECTRUM AND LIBRARY CREATION

To establish a reference spectrum for MBC, a pure standard in methanol is analyzed using gold nanoparticles (Au NPs). The unique SERS spectrum presented in Figure 1 can be used to create a library entry for MBC.

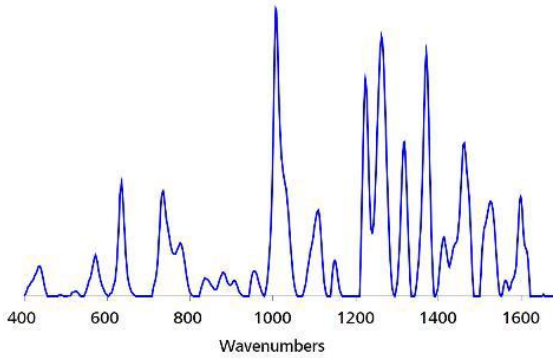

Figure 1. Standard SERS Au NP carbendazim reference spectrum.

EXPERIMENT

Purchased strawberries were washed with water prior to testing. A solution of 100 mg/L MBC in ethanol was sprayed onto whole strawberries to mimic a typical farm application. Once dry, each strawberry was rinsed with 4 mL of ethanol. The rinse volume was collected and concentrated to 1 mL by evaporation of solvent on a lab hot plate. Misa samples were prepared by adding 100 µL of sample to 800 µL of Au NP and 100 µL 500 mmol/L NaCl.

Table 1. Experimental parameters

Instrument		Acquisition	
Firmware	0.9.33	Laser Power	5
Software	Misa Cal V1.0.15	Int. Time	1 s
Misa Vial Attachment	6.07505.040	Averages	10
ID Kit - Au NP	6.07506.440	Raster	ON

RESULTS

A baseline-corrected spectrum acquired from whole strawberries sprayed with a 100 mg/L solution of MBC, then rinsed with ethanol agrees with the obtained MBC standard reference spectrum (Figure 2).

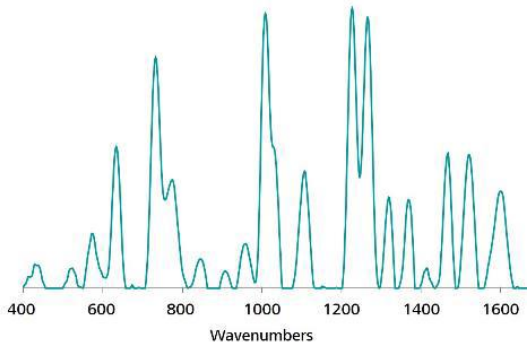

Figure 2. Detection of 100 mg/L MBC with Misa.

FIELD TEST PROTOCOL

Detection of carbendazim in the field

Place a whole fruit (e.g., strawberry, orange) into a glass beaker just large enough to contain it. Rinse with 4–6 pipettes full of ethanol. Remove fruit and reduce ethanol volume, by means of evaporation on a hot plate, to ~1 mL. Fill a *clean vial* halfway full with Au NPs. Using pipettes, add 2 drops each of reduced ethanol solution and NaCl solution to Au NPs, cap and shake the vial gently to mix. Insert into vial attachment on Misa for measurement.

Table 2. Requirements for field test protocol

ID Kit - Au NP	6.07506.440
includes:	Gold nanoparticles (Au NP)
	Scoop
	Disposable pipettes
	2 mL glass vials
Reagents	
Ethanol	
NaCl solution	3 g NaCl in 100 mL water
Glassware	50–250 mL beaker
Test settings	Use **ID Kit OP** on MISA

CONCLUSION

Following adept detection of MBC on whole fruits, it is clear that Misa is an excellent solution for analysis of surface contamination of produce in any setting: at the farm, at the market, or at the processing plant. Want to confirm «organic» status? Pesticides, fungicides, and herbicides are all possible targets for Misa's powerful on-site analysis.

CONTACT

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CONFIGURATION

MISA Advanced

Metrohm Instant SERS Analyzer (MISA) は、微量レヘルての違法物質、食品添加物、および食品汚染物質の迅速な検出 / 同定のための高性能な携帯可能分析システムてす。MISAは、Metrohm 独自の軌道ラスタースキャン技術 (Orbital Raster Scan Technologie, ORS) を備えた高効率の分光器を有しています。これは省スヘースて、より長いハッテリー寿命を持ち、現場やラホての移動式用途にも完璧に適しています。MISA てはフレキシフルなサンフル採取を可能にする、レーサークラス1の様々なアタッチメントをこ利用いたたけます。アナライサーはBluetoothまたはUSBコネクタを介して操作可能てす。

MISA Advanced ハッケーシは、ユーサーにMetrohmのナノ粒子溶液とP-SERSストリッフを用いたSERS分析を可能にするコンフリートハッケーシてす。

MISA Advanced ハッケーシには、MISAハイアルアタッチメント、P-SERSアタッチメント、ASTM校正標準、USBミニケーフル、USB電源装置、ならひにMISA装置を操作するためのMISA Calソフトウェアか含まれます。装置と付属品を安全に保管するための頑丈な保護ケースも同梱されています。

ID - Au NP

IDキット - Au NPには、Mira/Misaユーサーか金コロイト溶液てSERS分析を行うのに必要なコンホーネントか含まれています。このキットには、使い捨てのへら、滴下ヒヘット、サンフルホトル、および金コロイト入りのホトルか含まれています