



Application Note AN-RS-027

# Trace Detection of Thiram on Apples

## Protecting consumer safety with Misa

Thiram is used extensively as a fungicide and parasiticide to prevent disease in crops and as an animal repellent to protect trees and ornamental plants. However, extensive toxicological studies conclude that chronic, high-level exposure can cause considerable organ damage to land and aquatic species. While only moderately toxic to humans through skin exposure and ingestion, thiram is highly toxic if inhaled. To reduce its negative effects on health and the environment, the US defines maximum residue limits that vary for different food crops. In contrast, the EU recently banned thiram and is

moving to use pesticides that carry reduced health risks.

Using Misa (Metrohm Instant SERS Analyzer), low level detection of thiram on apples is achieved with guided workflows adapted for use by diverse testers. Misa Cal software automatically processes results and achieves chemical identification by matching to either proprietary, user-created, or commercially available spectral libraries. Results can be geotagged and shared immediately with the accompanying chemical hazard information.

## INTRODUCTION

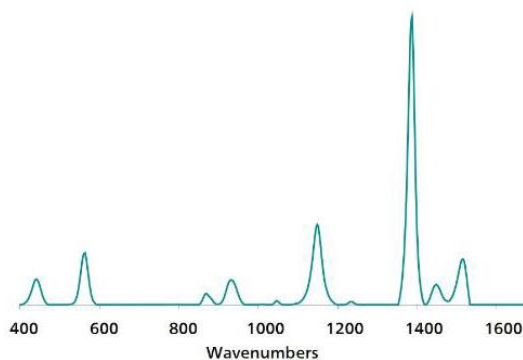
This application note describes a simulated test procedure for detecting thiram residue on apple skin. The assay is based on the acquisition of

SERS-specific spectra for thiram using Misa and Metrohm Raman's proprietary silver P-SERS substrates.

## REFERENCE SPECTRUM AND LIBRARY CREATION

To establish a reference spectrum, a pure thiram standard at a concentration of 500  $\mu\text{g/mL}$  in ethanol was analyzed using silver (Ag) P-SERS

strips. The unique SERS spectrum shown in **Figure 1** can be used to create a library entry for thiram.



**Figure 1.** Standard SERS reference spectrum of thiram.

## EXPERIMENT

To simulate rapid testing, 25  $\mu\text{L}$  aliquots of 1000, 100, and 10  $\mu\text{g/mL}$  thiram in ethanol were applied to 2  $\text{cm}^2$  sections of apple skins washed with water and dried. After thorough drying of the test sections, Au P-SERS test strips were dipped in ethanol and immediately swabbed in a circular motion within treated sections on the apple skin. Each strip was dried for 5 minutes and then placed in the P-SERS attachment on Misa for measurement.



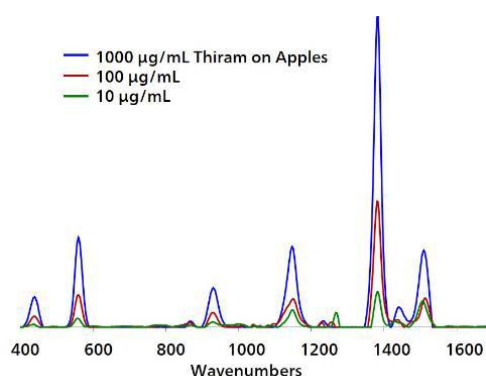
**Table 1.** Experimental parameters

Instrument		Acquisition	
Firmware	0.9.33	Laser Power	5
Software	Misa Cal V1.0.15	Int. Time	5 s
Misa Vial Attachment	6.07505.030	Averages	10
ID Kit - Ag P-SERS	6.07506.470	Raster	ON

## RESULTS

Overlaid and baseline-corrected spectra acquired for swabs of an apple skin treated with

different concentrations of thiram show detection down to 10 µg/mL (Figure 2).



**Figure 2.** Overlaid baseline-corrected spectra acquired from Ag P-SERS swabs show detection of thiram on apple skins to 10 µg/mL.

## FIELD TEST PROTOCOL

### Detection of thiram in the field

Dip the printed end of a P-SERS strip into ethanol. *Touch only the unprinted back side of the swab with your gloved hands.* Use the moistened, printed side of the strip to swab the peel of an apple. Rub the strip in a circular

motion. After drying for 5 minutes, insert the Ag P-SERS strip, with the printed portion facing down and toward the instrument, into the P-SERS attachment for measurement.

**Table 2.** Requirements for field test protocol

ID Kit - Ag P-SERS	6.07506.470
includes:	Silver P-SERS
	Scoop
	Disposable pipettes
	2 mL glass vials
Reagents	Ethanol
Test settings	Use ID Kit OP on MISA

## CONCLUSION

Misa is a highly sensitive, cost-effective system for the unambiguous identification of pesticide residue on fruit. Its user-friendly analyses paired

with smart software in a compact, portable format make it a powerful solution for field detection of food adulterants.

## CONTACT

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## CONFIGURATION



### MISA Advanced

Metrohm Instant SERS Analyzer (MISA) 是一款高性能、便携式分析系,可快速/定非法物、食品添加和微量食品染物。MISA 的特点是配了 Metrohm 独特的道光栅描 (ORS) 技的高效光。其空需求最小和并且池寿命有所延,是或移室用的理想。MISA 提供各 1 激光附件,可活取。分析可通 BlueTooth 或 USB 接行。MISA Advanced 套件是一个完整套件,其作用是用能用 Metrohms 米粒溶液和 P-SERS 条行 SERS 分析。MISA Advanced 套件包含了一个 MISA 小管附件、一个 P-SERS-附件、一个 ASTM 校正准件、一个 USB 迷、一个 USB 供元和用于行 MISA 器的 MISA Cal 件。随供了一个用来安全保管器和附件的固保箱。



### ID - -P-SERS (Ag P-SERS)

ID 套件 - Ag P-SERS 包含了 Mira/Misa 用使用-P-SERS 基材行 SERS 分析所需的件。套件包含了一个一次性抹刀、一个移液管、品小瓶和 2 个-P-SERS 条。