



Application Note AN-RS-019

SERS Detection of Metanil Yellow in Turmeric

Protecting consumer safety with Misa

Metanil yellow (MY) is an azo dye used in the manufacture of external-use products such as textiles; however, it is prohibited from use as a food additive in many countries. Toxicology studies demonstrate that ingestion of MY results in significant neurological and multi-organ damage. Despite these hazards, MY is commonly used as an illicit colorant for enhancing the visual appeal of spices and legumes, most notably turmeric. Given the rising popularity of

turmeric as a dietary supplement promising significant health benefits, routine safety tests must be readily available to ensure the integrity of turmeric-containing products. Ideal tests feature methods that are selective and sensitive, yet portable and convenient.

Misa (Metrohm Instant SERS Analyzer) achieves rapid and accurate detection of MY in a facile assay format.

INTRODUCTION

Misa is a versatile analytical tool for detecting banned colorants in foods. This application note

details a simple, conservative extraction procedure for the detection of MY in turmeric.

REFERENCE MATERIAL AND LIBRARY CREATION

To establish a reference spectrum for MY, a pure standard in 50 mmol/L HCl is analyzed using gold nanoparticles (Au NPs). The unique SERS spectrum presented in **Figure 1** can be used to create a library entry for MY.

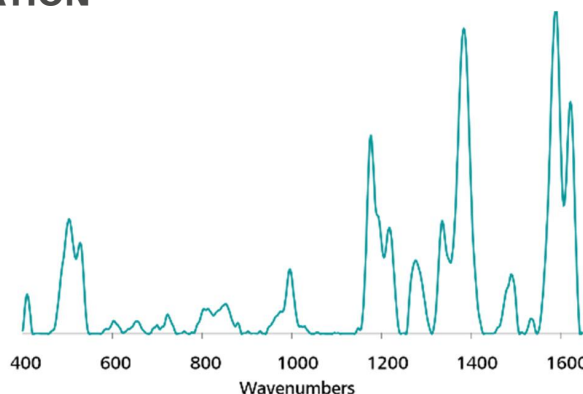


Figure 1. Standard Au NP SERS spectrum of Metanil Yellow.

EXPERIMENT

For simulated testing of MY in turmeric, solid MY was mixed thoroughly with commercially bought turmeric powder to yield a concentration range of spiked samples: 10 and 1 mg/g, 100 and 50 $\mu\text{g/g}$. MY was extracted by the addition of 1 mL 0.5 mol/L HCl to 100 mg of each sample in a glass vial. This suspension was shaken and allowed to settle for 10 minutes. Test samples were prepared by pipetting 100 μL of the HCl extract into vials containing 800 μL of Au NPs and 100 μL of 0.5 mol/L NaCl. Each vial was inverted to combine the components and then inserted into the vial attachment on Misa for analysis.



Table 1. Experimental parameters

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

RESULTS

Overlaid baseline-corrected spectra acquired for the spiked samples demonstrate detection of MY down to 0.1 mg/g (Figure 2). Reliable

detection is based on prominent peaks at 504, 1176, 1383, and 1588 cm^{-1} in the spectrum.

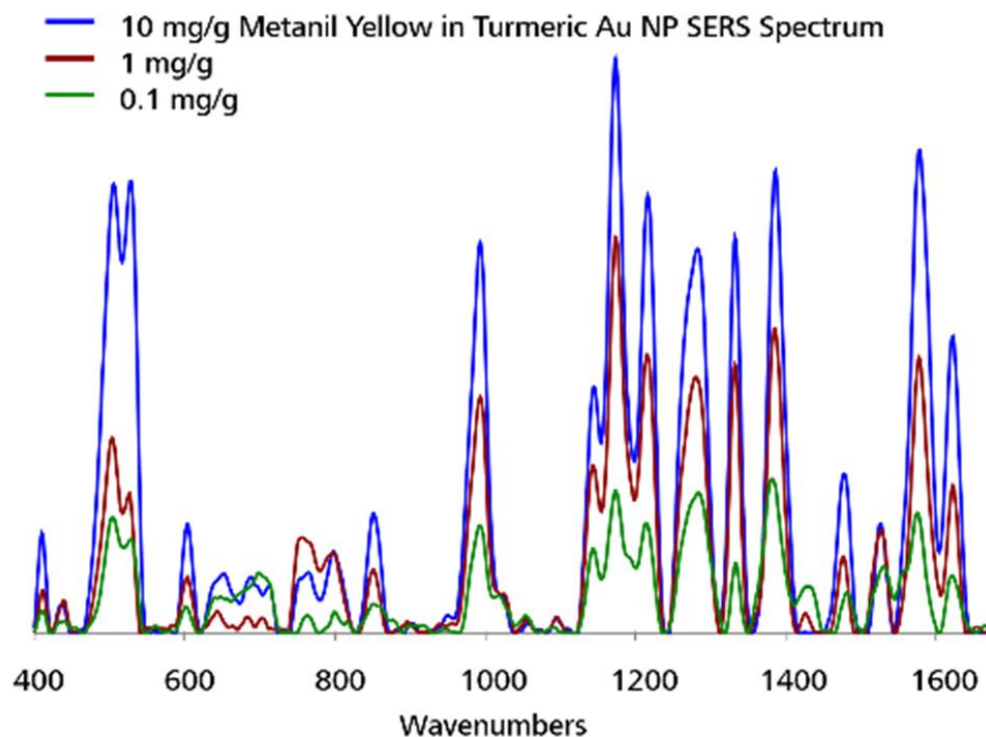


Figure 2. Detection range of MY with Misa and Au NPs.

FIELD TEST PROTOCOL

Detection of Metanil Yellow in the field

Using the large end of the scoop, add 3–4 scoops of sample to a 2 mL vial. Add HCl solution to the vial until halfway full. Cap and shake the vial gently to mix, and let sample rest for 5 minutes. Fill a *clean vial* halfway full with Au NPs.

Using pipettes, add 2 drops each of sample solution and NaCl solution to the Au NPs, then 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	
HCl solution	4 mL HCl in 100 mL water
NaCl solution	3 g NaCl in 100 mL water
Test settings	Use ID Kit OP on MISA

CONCLUSION

The rapid detection of MY in adulterated turmeric is demonstrated using Misa and Au NPs. This assay requires minimal user training, making it ideal for cost-effective, on-site QC testing in large food processing facilities, as well as distribution and receiving centers. Recently, the

sensitive detection of MY in dal, a yellow split pea commonly used in Indian cuisine, with Metrohm Raman's portable Sierra spectrometer suggests potential for using Misa to screen a wide variety of foods prized for their intense yellow coloration.

CONTACT

メトロームジャパン株式会社
143-0006 東京都大田区平
和島6-1-1
null 東京流通センター アネ
ックス9階

metrohm.jp@metrohm.jp

CONFIGURATION



MISA Advanced

Metrohm Instant SERS Analyzer (MISA) は、微量レベルでの違法物質、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です。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。これは省スペースで、より長いバッテリー寿命を持ち、現場やラボでの移動式用途にも完璧に適しています。MISA ではフレキシブルなサンプ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ご利用いただけます。アナライザーはBluetoothまたはUSBコネクタを介して操作可能です。

MISA Advanced ハッチケースは、ユーザーに Metrohmのナノ粒子溶液とP-SERSストリップを用いたSERS分析を可能にするコンフリートハッチケースです。

MISA Advanced ハッチケースには、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ミニケーブル、USB電源装置、ならびにMISA装置を操作するためのMISA Calソフトウェアが含まれます。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ユーザーか金コロイド溶液でSERS分析を行うのに必要なコンポーネントが含まれています。このキットには、使い捨てのへら、滴下ヒェット、サンプルボトル、および金コロイド入りのボトルが含まれています