Common Issues in Food Fraud & Adulteration

Authenticating Products and Ingredients through Analysis

Ramin Jahromi

Eurofins Nutrition Analysis Center

Des Moines, IA

Key Message

Through testing you cannot prove authenticity – you can only look for indicators of adulteration.

Please Note

- Most suppliers are honest and will supply you with what you ordered, however, not ALL are!
- If possible only use suppliers that you have visited and audited or have been approved by a third party (such SGF IRMA scheme for fruit juices)
  - http://www.sgf.org/en/home/fks/halbwarenkontrolle/
- This should not preclude **you** from testing these suppliers also (VERIFICATION)
- Everything has a price and if the price is TOO good there maybe a very good reason why!

What are the driving forces for adulteration?

1) **The opportunity to make an elicit profit**
   - Presence of cheaper adulterants
2) **Premium foodstuff in short supply**
   - Lack of raw material (fruit/honey/agave) to fulfil an existing contract
   - High commodity prices
3) **Companies buying from unknown suppliers**
4) **Likely to be more issues if there is a looooooong supply chain!**
   - **Horse meat in ground Beef is a classic example!!**
5) **Companies not testing their incoming raw materials**
6) **Supplier attitudes**
   - "There are no good methods out there so we won't get caught"
   - "Other people are doing it, so why shouldn't we"!
   - **"What is wrong with a little bit of sugar"**
7) **The opportunity to make an elicit profit**

Analysis of Product for Indicators of Adulteration.

Principal tools:

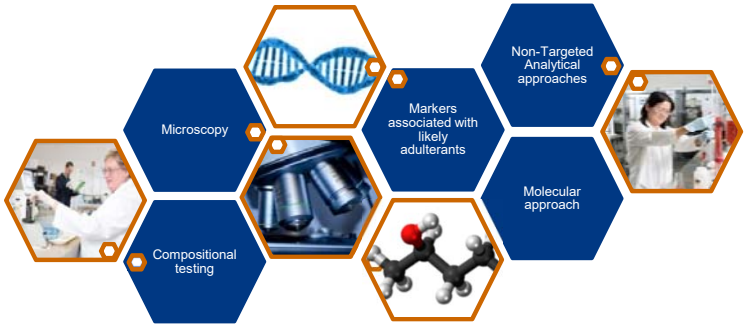
Microscopy

Compositional testing

Molecular approach (Chirality and Isotopic Enrichment levels)

Markers associated with likely adulterants

Non-Targeted Analytical approaches



Microscopy.

Target:

Does the material look like it is supposed to?

Advantages:

Fast, Rugged

Disadvantages:

Difficult to locate trained people

Does not work well on further processed products

Compositional testing

Target:

Are the components present in the right proportions

Examples :

Turmeric, Fruit juices

Advantages

- Deals well with processed products
- Classical approach – Easy to explain

Disadvantages

- Requires laboratory facilities
- Challenge to account for natural variability

Molecular Approach

Target:

Special characteristics associated with target molecules

Examples:

D & L enantiomers of flavorings, organic acids

Average Isotope distribution(honey, vitamin C)

Isotope distribution within molecule (e.g., SNIF NMR) (Chaptalization, Vanilla)

Advantages	Disadvantages
• Harder to fake	• Complex analytical technique • Difficult to quantify

Specific Markers

Target:

- **Molecules not likely to be there**

Examples:

- **Foreign materials (DNA, Protein)**
- **Specific molecules (naringin, Isomaltose)**

Advantages	Disadvantages
• Good approach for verifying the absence of commonly used adulterants	• Difficult to quantify

Non-Targeted Analytical Approaches

Target:

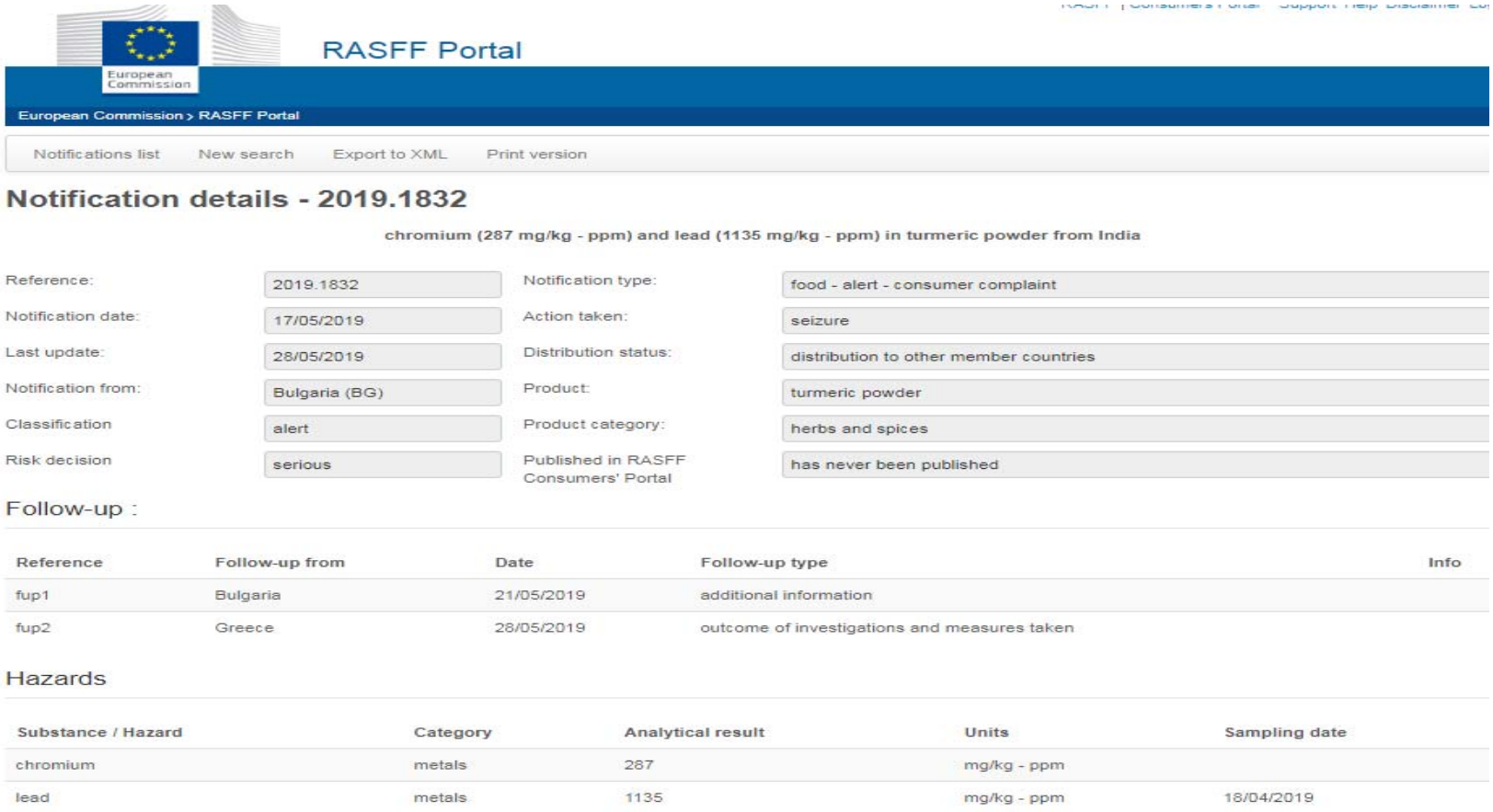
- **No specific target. Looking at the sample as a "whole"**

Examples:

- **NIR, MIR, Hi-Res NMR**

Advantages	Disadvantages
• Fast • Data can often provide an est. conc. of multiple components	• Mainly secondary technique

Recent Turmeric Issue



RASFF Portal

European Commission

European Commission › RASFF Portal

Notifications list | New search | Export to XML | Print version

Notification details - 2019.1832

chromium (287 mg/kg - ppm) and lead (1135 mg/kg - ppm) in turmeric powder from India

Reference:	2019.1832	Notification type:	food - alert - consumer complaint
Notification date:	17/05/2019	Action taken:	seizure
Last update:	28/05/2019	Distribution status:	distribution to other member countries
Notification from:	Bulgaria (BG)	Product:	turmeric powder
Classification	alert	Product category:	herbs and spices
Risk decision	serious	Published in RASFF Consumers' Portal	has never been published

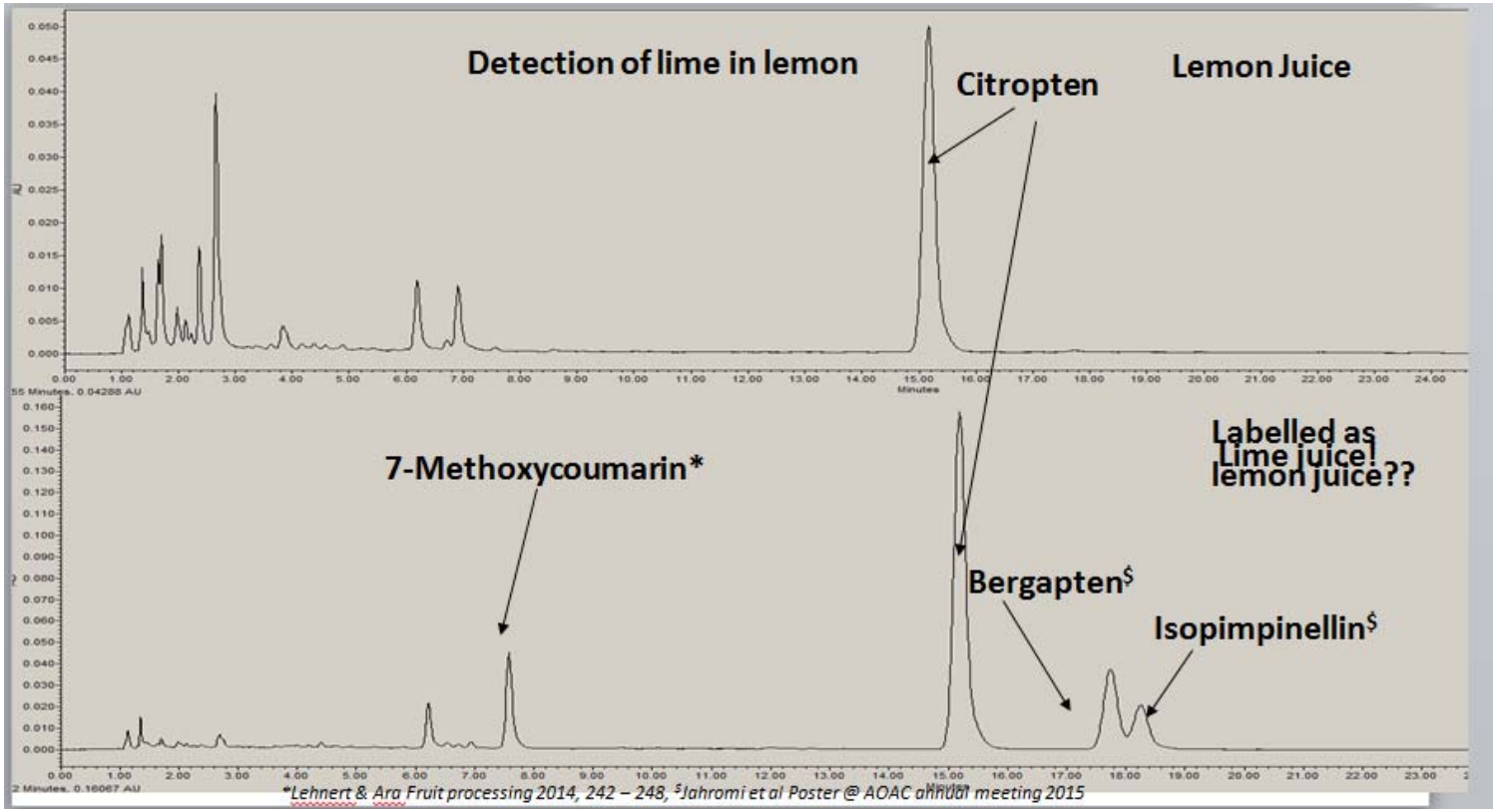
Follow-up :

Reference	Follow-up from	Date	Follow-up type	Info
fup1	Bulgaria	21/05/2019	additional information	
fup2	Greece	28/05/2019	outcome of investigations and measures taken	

Hazards

Substance / Hazard	Category	Analytical result	Units	Sampling date
chromium	metals	287	mg/kg - ppm	
lead	metals	1135	mg/kg - ppm	18/04/2019

Addition of Lime to Lemon



Cumin Adulteration Notice-ASTA July 15 2019

Indian Cumin Allegedly Adulterated

According to news reports from India, some exporters are adulterating cumin with grass seeds, dill seeds, and charcoal prior to shipping, despite stringent measures put in place by the Spices Board India to combat this practice. Sources claim about one fourth of the Indian cumin crop is adulterated and has already been exported around the world, mainly to Brazil, Mexico, Egypt, Dubai and South America. Since 2017, the Spices Board India has worked to stop adulteration in spices, and Officials of Spices Board India and Food & Drugs Control Administration previously seized cumin with levels of adulterated substances higher than the 3% permissible limit.

ASTA continues to work to drive greater awareness, influence and guidance to empower members to detect, mitigate and prevent fraud in the spice supply chain. The recently launched ASTA Spice Integrity Council, comprised of leaders in the industry appointed by the ASTA Board of Directors, will officially kick off this initiative with its inaugural teleconference later this week.

IN THIS ISSUE
July 15, 2019

Indian Cumin Allegedly Adulterated

Trade Update

Majority of Food Within Pesticide Residue Limits

EU Pesticide Rules Criticized

New Prop 65 Exposure Calculation Proposal Mor Practical for Manufacture

Codex Requests Comments on Draft

New Species-Not Adulterated

Anthocyanins and Assessment of Authenticity of Red/Black Juices

Authors: Ramin Jahromi, Hayley Pratt, Yang Zhou, Lars Reimann: Eurofins Nutrition Analysis Center, 2200 Rittenhouse St, Suite 150, Des Moines, IA 50321, USA RaminJahromi@eurofinsus.com)
Dr. David A. Hammond : Eurofins Scientific Analytics, Rue Pierre Adolphe Bobierre, F-44323, Nantes, France.

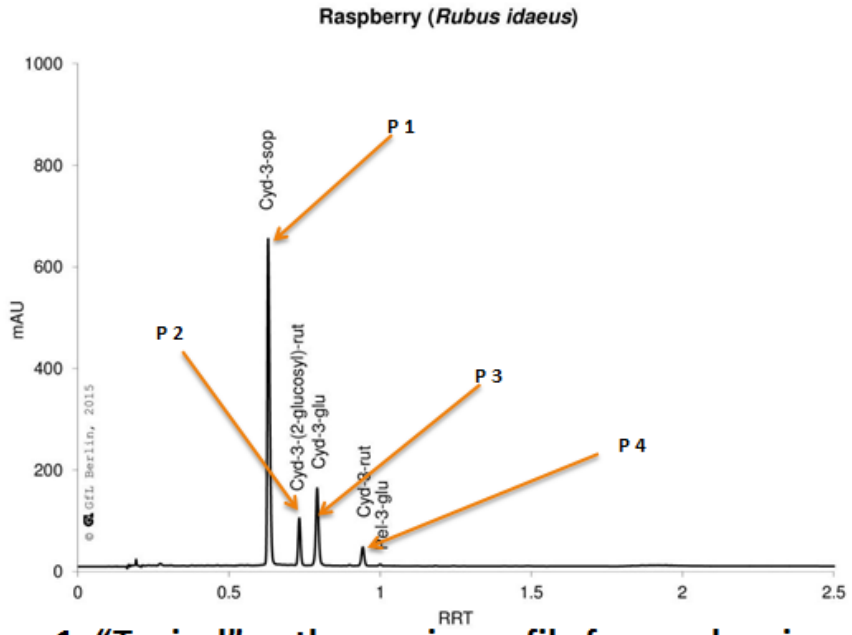


Figure 1: "Typical" anthocyanin profile for raspberries © IFU 2015

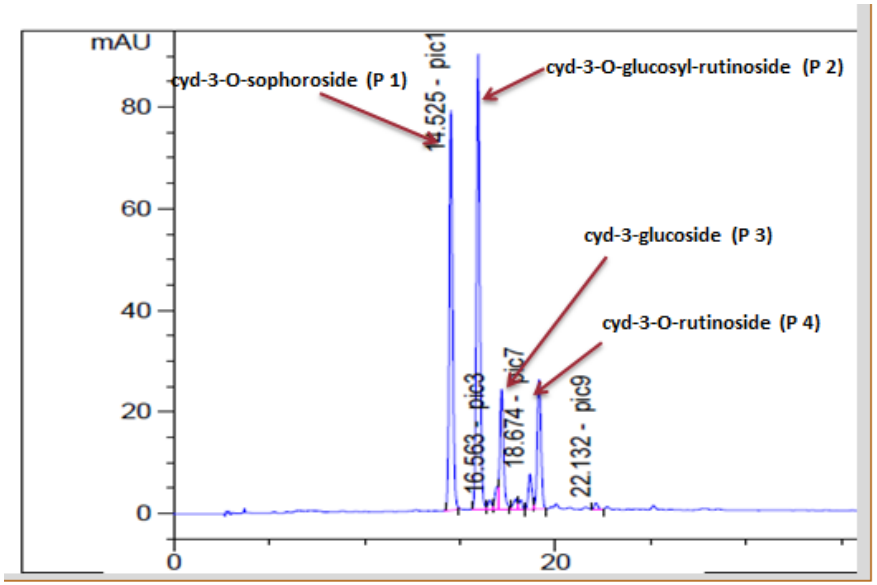


Figure 2: Anthocyanin profile for Maravilla showing higher levels of peaks 2 and 4 than "normal" for raspberries

Key Takeaways

- Very seldom you can be sure that a product is authentic
- Multiple approaches are required if you want a relative high degree of certainty
- Always ask yourself: “To what extent is the sample evaluated representative of the load”.

Ramin Jahromi@EurofinsUS.com
(515)265-1461

Eurofins-Nutrition Analysis Center

Des Moines, IA 50321