NEDSPICE

Pepper – From Standardisation to Adulteration

Sunday, April 15, 2018

ASTA Preconference Workshop

Steve Clemenson

Group Quality Assurance & Regulatory Manager

Contents

Standardisation or Adulteration

Is there a difference?

- **Standardisation** - is the process where a single spice can be blended to achieve certain desired characteristics and this process is **declared** to the buyer.

- **Adulteration** – “is the deliberate and intentional inclusion in spices of substances whose presence is **not legally declared**, is not permitted or is present in a form which might mislead or confuse the consumer, leading to an imitated food and/or a product of reduced value, as well as the deliberate and intentional removal of any valuable constituent from a spice or herb”.

http://www.astaspice.org/food-safety/identification-prevention-adulteration-guidance-document/

Standardisation

What do we mean?

- Standardisation is the process by which various component parts of the same **botanical species** are separated and then blended back together in a different ratio, to give the desired physical characteristics (colour/flavour/aroma).

- VO or Piperine control to ensure standardised aroma/flavour delivery

- Black pepper component parts:

  Light berries
  Pinheads

- Process component parts:

  Skins (outer pericarp - decortication by-product)
  Fraction by-products (dust from cracking, sieve tailings)

Adulteration

What are the “low-tech” agricultural ingredients?

- Buckwheat

- papaya seeds

- silk cotton tree seeds

Millet seeds

Coffee husks

Long pepper (*Piper longum*)

]

Adulteration

What are the “high-tech” processor ingredients?

- Spent, de-fatted or de-oiled pepper (extraction by-product)
- Rice flour
- Starches (potato)
- Maltodextrin
- Mineral oil (to disguise mould spoilage)
- Bleaching aids – Hydrogen Peroxide or Sulphur Dioxide (white pepper production)

Adulteration

Are there detection methods?

ESA recommends the following methods:

- *Piper longum* - ISO 3061
- Spent – ASTA 26.1
- SO2 – AOAC 990.28 (Monier-Williams)
- Sensoric methods (trained panel)

Others:

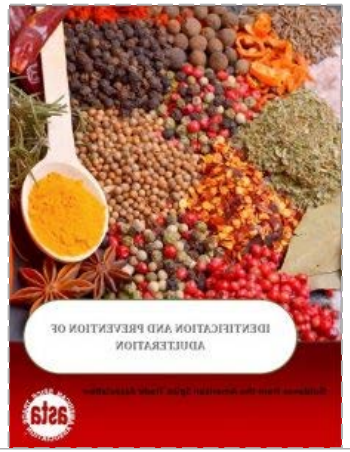
- Microscopy (rice flour, starch & sugars)
- Indian Spices Board – Mineral Oil detection method

Conclusions

- Adulteration is the single largest threat to the credibility of the global spice market.

- Difference between standardisation and adulteration is very important, especially with the current development of analytical methods that “fingerprint” spices.

- ASTA Identification and Prevention of Adulteration Guidance Document.
  The ASTA guidance is based on a publication developed by the British Retail Consortium, the Food and Drink Federation and the Seasoning and Spice Association.



Thank you for listening

Adulteration in Paprika powder

Guillermo Molina

Ramon Sabater, S.A.U. – Sabater Spices

2018 ANNUAL MEETING AND EXHIBITS
April 15-18, 2018
The Ritz-Carlton Golf Resort
Naples, FL

Introduction

- Paprika and Chilli powders are the products obtained by milling of **dried fruits of *Capsicum spp***.
- Are **one of the most consumed spices worldwide** because the widespread scope of uses in the culinary traditions of several countries
- Originally **introduced in Spain from South and Central America** in the XVI Century, culture and process was first exported to Hungary and then **spread worldwide**
- **Essential ingredient** in many foods because capacity of giving a unique **taste**, **flavour** and **color** in different presentations.

Product definitions

- **Paprika**: Ground, red and, usually, non pungent powder used primarily for its colour and flavour in processed foods
- **Ground Chillies** / **Chili Pepper** / **Cayenne**: Any pungent variety of *Capsicum* spices.
- **Chilli Blend** (Tex-Mex Types): A blend of hot capsicums with other spices

Industrial Process

- **Paprika pods** are basically composed by **pericarp** and **seeds**.
- Dried whole pods or their parts are **milled** to get the powder that is the basis of the product.
- Commercial presentations of paprika are subject to specifications that define different **parameters of the product**, of which main one is **ASTA color** (extractable color)
- To meet specification, product must be **standarised by means of combination** of batches with different ASTA colour, tones, flavour, etc.

Paprika adulteration

- **Adulteration** has a legal meaning that a food fails to meet legal standards.
- **Economically motivated adulteration (food fraud)** is the **deliberate** and **intentional** alteration of a food product (by substitution, adding, etc.) for economic gain, that ***is not legally declared***, is ***not permitted*** or ***can create confusion*** to the consumer.
- In paprika, main adulterations are focused in:
  - Increasing of **color**
    - Synthetic dyes
    - Annatto (bixin)
  - Increasing of product **volume** or **weight**
    - Almond or peanut shells
    - Paprika spent
    - Vegetable flours

Paprika adulteration

- Beyond economic implications, **safety** of the product can be compromised by some adulterants, which increase the focus of markets and authorities:

  - Proteins from almond and peanut can be a risk for persons **allergic** to these species

  - Some synthetic dyes can also be **toxic**

  - Unknown content of the products is a continuous **uncertainty for consumers**

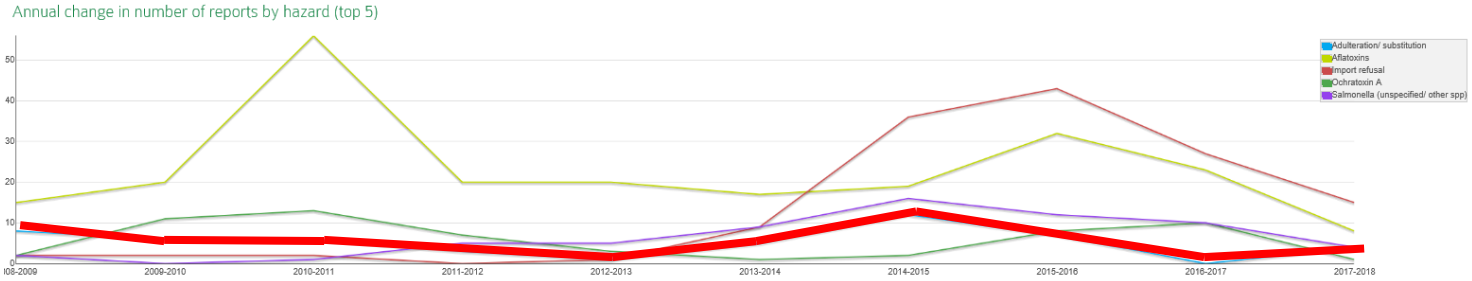
- **Recent adulterations** found in paprika and chillies are:

  - Illegal **dyes**: mainly Sudan dyes, but also allura, sunset, and others, in pure or blend products
  - **Almond** protein because adding of ground shells
  - **Peanut** traces coming from shells
  - Clay **brick** rests investigated by FDA in 2017

Paprika adulteration - Trends

- In Paprika, adulteration is the **2nd reason of legal alerts** worldwide…

… and this trend does not reduces in the last years



Paprika adulteration -Detection

- **Methods traditionally used to detect** paprika adulteration:
  - Detection of **illegal dyes** by chromatography – spectrometry
  - Detection of solvents from **spent**
  - Study of alteration of **physical-chemical** characteristics

- **Analytical improvements** permit now new approaches to the adulteration research by new methods as:
  - **Searching** and quantification of **specific molecules**
    - Specific from the product
    - Specific from know adulterants
  - **Non-targeted** analysis of product
  - **Fingerprinting** of authentic products
  - **DNA identification** of varieties, origins and adulterants

Summary – Conclusion

- Food-Fraud is a issue with **increasing concern** for the **market** **and** **authorities**
- Beyond economics, can have **safety implications** because health hazards (*examples*):
    - **Allergens** from almond and peanut
    - **Toxicity** of some synthetic dyes
- **Defense** against food-fraud requires:
    - **Supply chain knowledge** and vertical integration
    - Deep **control of critical steps**
    - Continuous updating of **analytical techniques**

Thank you!

Q & A

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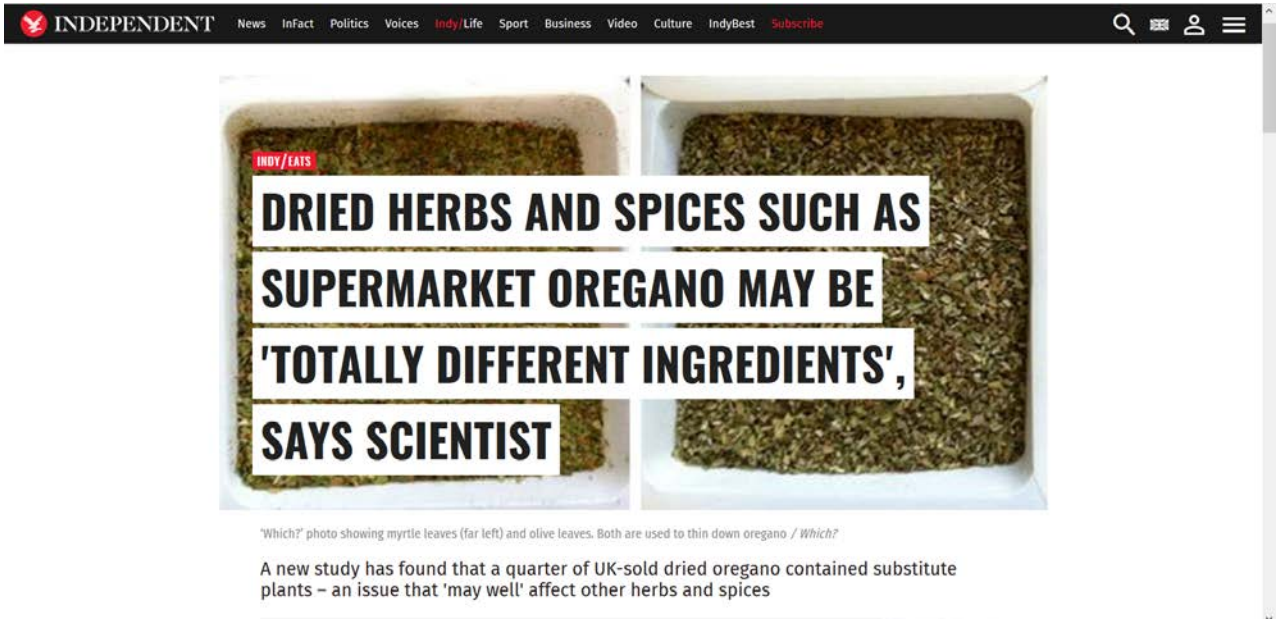
Economic Adulteration in Herbs, Oregano Example

UCAR SAYIL GUNDEM
KUTAS GROUP

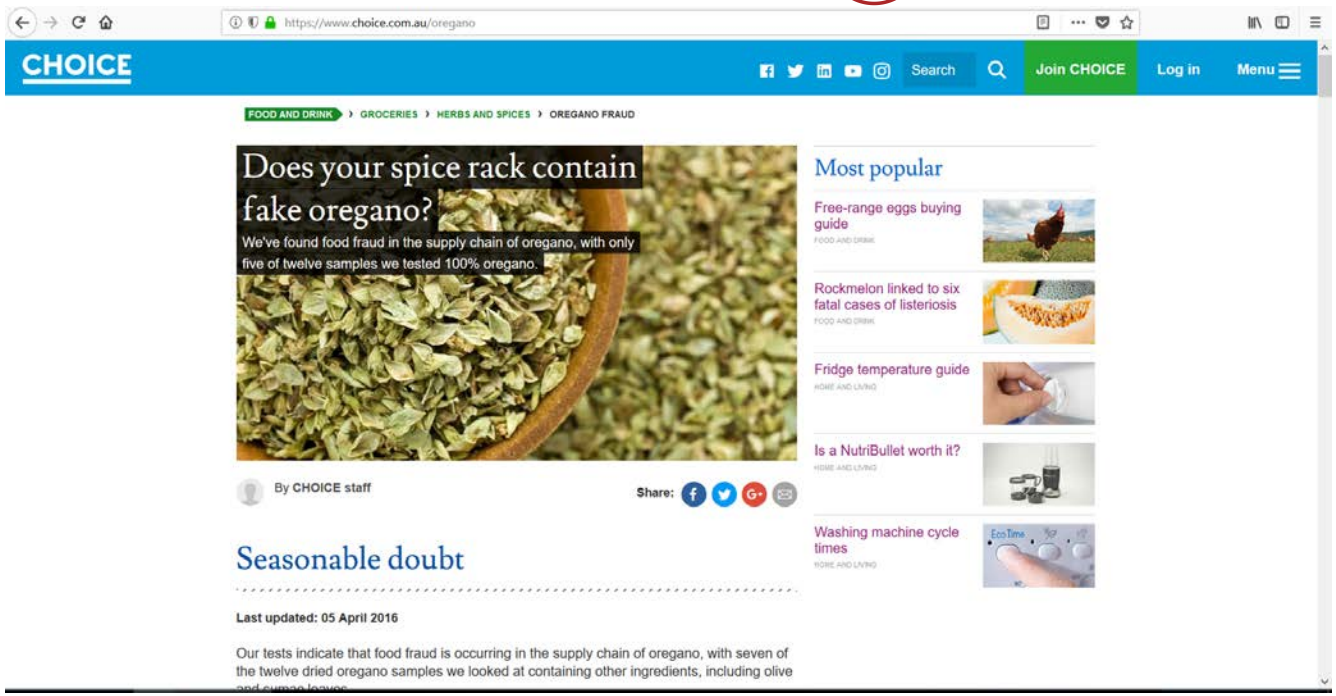
A Brief Introduction - UK



- 22 July 2015, Adulteration in Oregano becomes a headline in the UK

- «The study, published by the consumer group Which?, tested 78 samples of dried oregano purchased from 50 major supermarkets, smaller shops and online retailers in the UK and Ireland. It found that 19 of the samples, or around 25 per cent, contained other ingredients such as olive and myrtle leaves.»

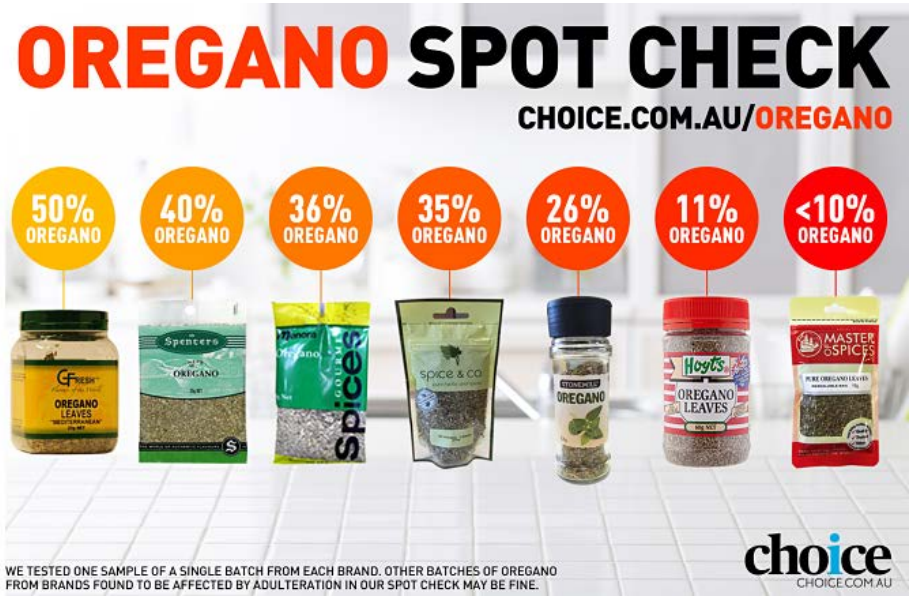
A Brief Introduction - AU



- 05 April 2016, building on UK example, Australia launches its own version of Oregano purity campaign study

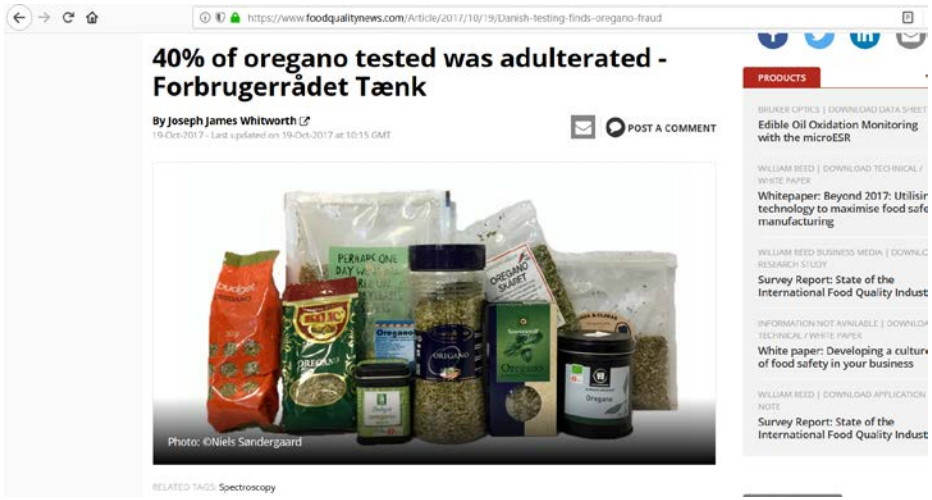
- Brands are publicly named!

A Brief Introduction - AU



«…of the 12 samples, only five were 100% oregano. The other seven -…-contained ingredients other than oregano, including olive leaves (in all seven samples) and sumac leaves (in two samples). Ingredients other than oregano made up between 50% and 90% of the adulterated samples.

A Brief Introduction - DK



- 19 October 2017, Denmark launches its own version of Oregano purity investigation

"[The results are] four too many, consumers should be able to trust they are getting what is on the label.

"All products were imported and we have followed-up with authorities and they will handle it."

Oregano of the brands Änglamark, Robero Krydderier Oregano and Kilic Oregano contained between 50 and 70% of the herb. Oregano of the Budget brand contained only about 70%.

Product from Santa Maria, Sonnentor, Urtekram, Krydderispecialisten, Flying Tiger and Anna & Claras specialiteter was clear of adulteration.

DVFA: We may look at oregano again

Fødevarestyrelsen (the Danish Veterinary and Food Administration) told us it has contacted Forbrugerrådet Tænk regarding the results.

Efforts Underway – FSMA & Codex

❑ FSMA

- A shift of focus from reaction to prevention including preventing intentional contamination.
- More authority to inspect and assure compliance with inspection frequencies based on risk.
- Mandatory recall authority.
- Authorities to strengthen import safety to assure that US food safety standards are met.
- Stronger partnerships with other government agencies and private entities.

❑ CODEX

- Draft proposal includes specific section for purity and will state **«Dried culinary herbs shall be free from any economic adulteration.» (Section 3.2.2 on Adulteration)**

Why do People Adulterate?

Economic Gains - Food for Thought

Adulterant	VO Level	Oregano Base Price	Adulterant Base Price	Final Product Cost
0%	3,10%	100	60	100
10%	2,79%	100	60	94
20%	2,48%	100	60	88
30%	2,17%	100	60	83
35%	2,02%	100	60	79
40%	1,86%	100	60	76
50%	1,55%	100	60	70
60%	1,24%	100	60	65
70%	0,93%	100	60	59
80%	0,62%	100	60	53
90%	0,31%	100	60	47
100%	0,00%	100	60	41

Origanum Onites
- Hairy look
- Oil droplets

Origanum Vulgare
- Hairy look
- Oil droplets

Common Adulterants

Mrytle Leaves:
* Wafer-like structure
* Oil droplets
* No hairs

Olive Leaves:
* Hairy structure
* No oil droplets
* Pesticide issue

Cistus Leaves:
* Hairy and woody structure
* No oil droplets

Sumac Leaves:
* Hairy and woody structure
* No oil droplets

How to Identify Adulterants?

GC Analysis

Essential Oil Compoun	Origanum Onites	Myrt Leaves	Origanum Onits/ yrtle Leaves Blend (5 50)	Cistus	Orig um Onits/Cistus Leaves Blend (50:50)	Sumac Leaves	Origanum Onites/Sumac Blend (50:50)
α-Thujene	0,40	0,00	0,00	0,00	0,00	0,00	0,00
α-Pinene	0,00	***34,02***	***5,14***	0	0,00	1,75	0,00
Myrcene (β-Myrcene)	0,52	0,00	0,00	0,00	0,00	0,00	0,00
α-Terpinene	0,55	0,00	0,00	0,00	0,36	0,00	0,44
p-Cymene	1,85	0,00	1,06	0,00	1,72	1,31	1,22
Limonene (DL-Limonene)	0,00	***6,46***	0,00	0,00	0,00	0,00	0,00
1,8-Cineole	0,00	***17,32***	***12,60***	0,00	0,00	***9,66***	0,81
γ-Terpinene (gamma-Terpinene)	3,18	0,00	1,28	0,00	1,67	0,00	2,06
Linalool	2,61	***8,28***	3,26	0,00	1,80	3,37	2,59
α-Thujone	0,00	0,00	0,00	0,00	0,00	1,36	0,00
Camphor	0,00	0,00	0,00	0,00	0,00	1,66	0,00
Borneol	1,28	0,00	1,01	0,00	1,52	***9,32***	1,53
Terpinen-4-ol	0,77	0,00	0,66	0,00	0,73	1,31	0,85
α-Terpineol	0,00	3,58	1,55	0,00	0,00	***5,48***	0,00
Linalyl acetate	0,00	4,02	0,00	0,00	0,00	0,00	0,00
Thymol	1,84	0,00	0,63	2,23	3,41	***9,86***	1,17
Carvacrol	***84,82***	0,00	***71,02***	0,00	***86,58***	***36,00***	***87,56***
Myrtenyl acetate	0,00	***10,93***	0,00	0,00	0,00	0,00	0,00
α-Terpinenyl acetate	0,00	1,05	0,00	0,00	0,00	1,29	0,00
Nerol acetate	0,00	1,13	0,00	0,00	0,00	0,00	0,00
Caryophyllene	0,85	0,00	0,43	0,00	0,53	4,08	0,64
Humulene (α-Humulene)	0,00	1,01	0,00	0,00	0,00	1,11	0,00
β-Bisabolene	1,35	0,00	0,76	0,00	0,88	1,25	1,13
L-calamenene	0,00	0,00	0,00	1,49	0,00	0,00	0,00
α-Caryophyllenol	0,00	0,00	0,00	0,00	0,00	1,62	0,00
Cadine-1,4-diene	0,00	0,00	0,00	1,20	0,00	0,00	0,00
2-Pentadecanone, 6,10,14-trimeth	0,00	0,00	0,00	0	0,00	0,00	0,00
Sclareoloxide	0,00	0,00	0,00	1,16	0,00	0,00	0,00
Cembrene	0,00	0,00	0,00	0,00	0,00	1,09	0,00
Epimanoyl oxide	0,00	0,00	0,00	***28,83***	0,24	0,00	0,00
Manoyl oxide	0,00	0,00	0,00	***37,23***	0,27	0,00	0,00
1-Naphthalenol, 5,7-dimethoxy-	0,00	0,00	0,00	4,14	0,00	0,00	0,00

- Limited value with some fillers
- Needs extensive reference library, training and investment

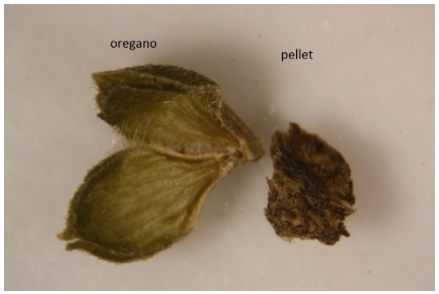
How to Identify Adulterants?

DNA Analysis

- Gaining rapid ground in US market. Multinationals adopting daily use for raw material acceptance and cross referencing.
- Still in its early days due to lack of catalogue and reference material for plants
- Labiatae genus (flowering and aromatic plants) analysis is very accurate, wild result variation in other plants.
- Serious mismatch between testing sensitivity and industrial cleaning standards. 1/1,000,000,000,000 strain detection sensitivity vs. 0.5% Extraneous Matter guideline
- Serious problems in quantification, resulting in errenous customer report evaluation

Latest Oregano Adulteration «Trend»

Oregano & Dirt Cocktail (a.k.a Pellets)



- ❑ Fines, stems, sort outs, dust, grit, sand, dirt compressed with water
- ❑ High health risks, water used in production untested, machine oil contamination, dust/sand/soil/dirt in pellets possible
- ❑ Technically «oregano», DNA or Chemical analysis ineffective
- ❑ Used for economic gains and BI adjustment for «perfect fill weight»
- ❑ Trained personnel and microscopic inspection only valid methods of identification

Final Words

- FSMA regulations AND World Food Codex discussions are bringing in «purity» as a primary criteria
- DNA analysis is becoming more widespread, quantification needs adjustment to comply with industry
- Visual identification by trained technicians is still the most accurate, albeit time-consuming method for identification of adulterants
- Brand owners at potential risk, naming campaigns underway!

Thank You !