

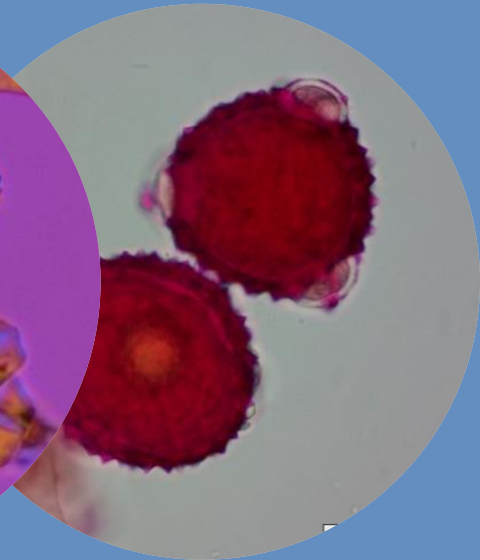
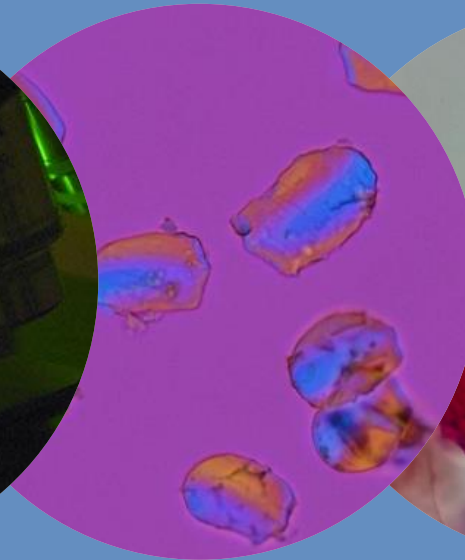
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# Microscopy for fraud detection

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L.W.D. van Raamsdonk, RIKILT Wageningen

SPICED workshop, 8 July 2015, Wageningen

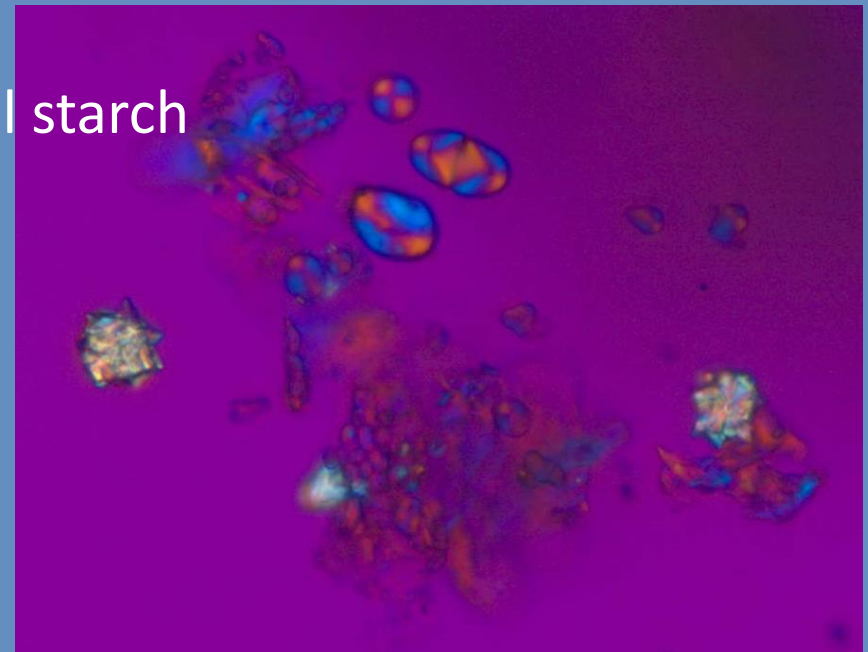


# Microscopy

- SPICED aims and principles
  - Combined attention to natural, accidental or intentional contaminations
  - Biological and chemical hazards
  - Non-targeted methods
- Microscopy is a specific approach of visual examination
  - Broad visual screening can be used as an non-targeted approach
  - Biological parameters are examined visually *par excellence*

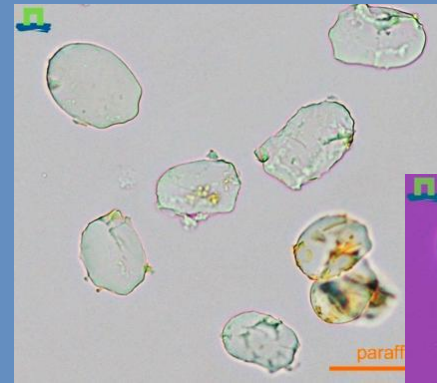
# Microscopy: marsh mallow root slices

- Herbal medicine, treatment for the irritation of mucous membranes
- Health incidence
- Visual screening : mix
- Chemical analysis: atropine
- Microscopic analysis: 60-70% Radix Belladonnae
  - Combination of typical starch and oxalate crystals

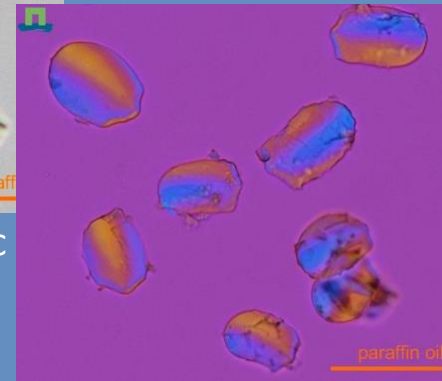


# Microscopy: turmeric

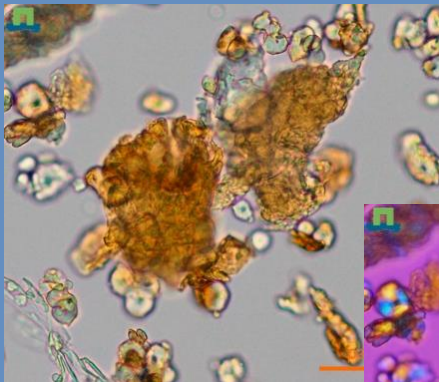
- Spice, usually processed
- Typical starch pattern
- Adulteration with corn starch



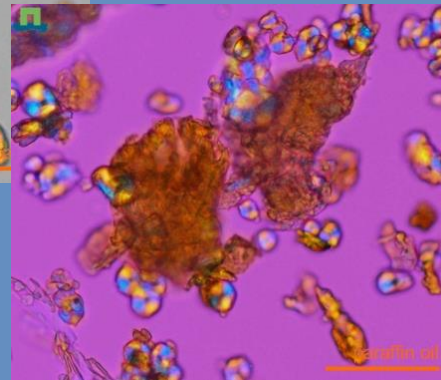
unprocessed turmeric



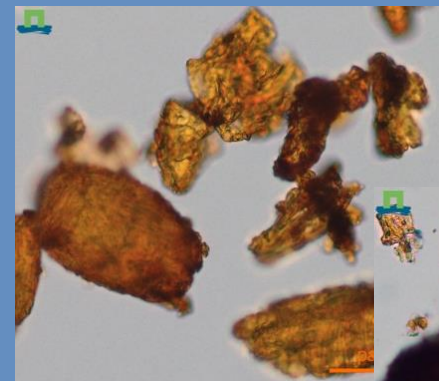
polarized light



processed turmeric,  
adulterated with  
corn starch



polarized light



processed turmeric

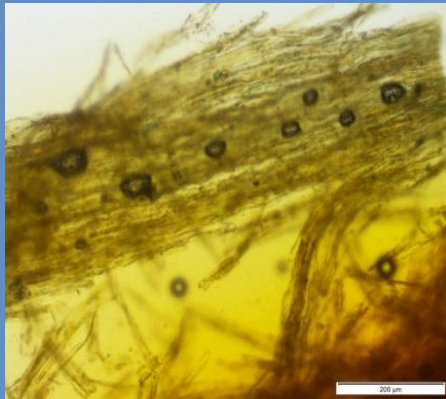


lugol staining

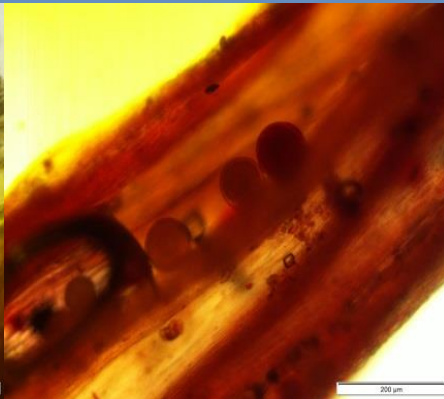


# Microscopy: saffron

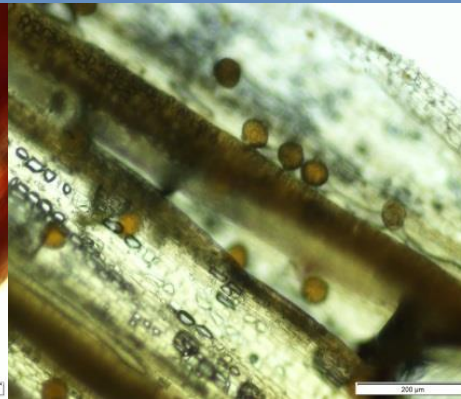
- One of the top 5 most expensive food stuffs globally
- Standard for quality assurance: ISO 3632-2 , both chemical and visual parameters
- Possibilities for fraud control by visual inspection:
  - Parts of other plants are added: fertile crocus (pollen) or *Carthamus* (safflower)
  - Adulteration with curcuma (starch) or *Capsicum* powder



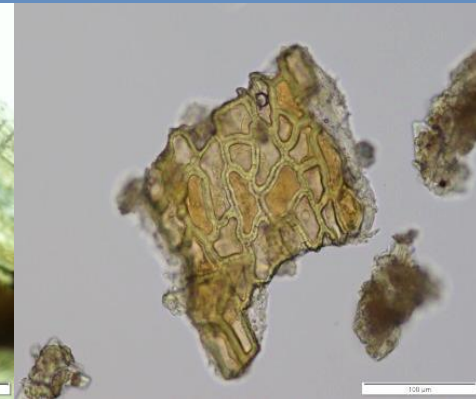
Saffron



fertile crocus stamen



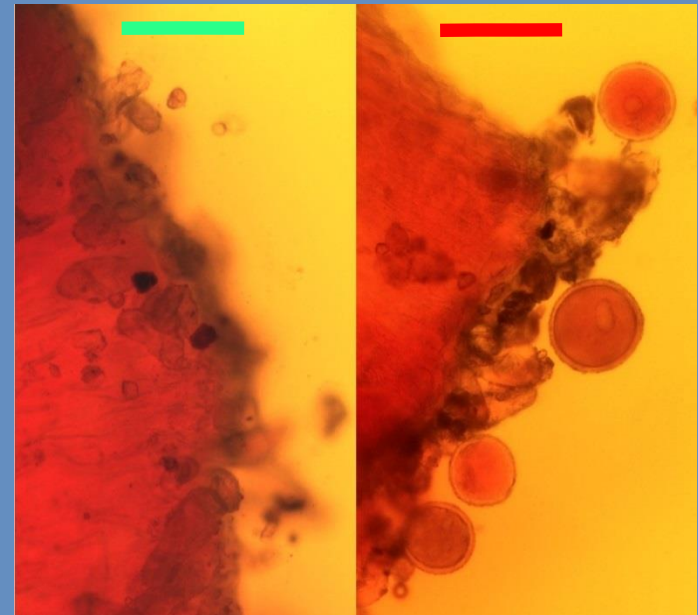
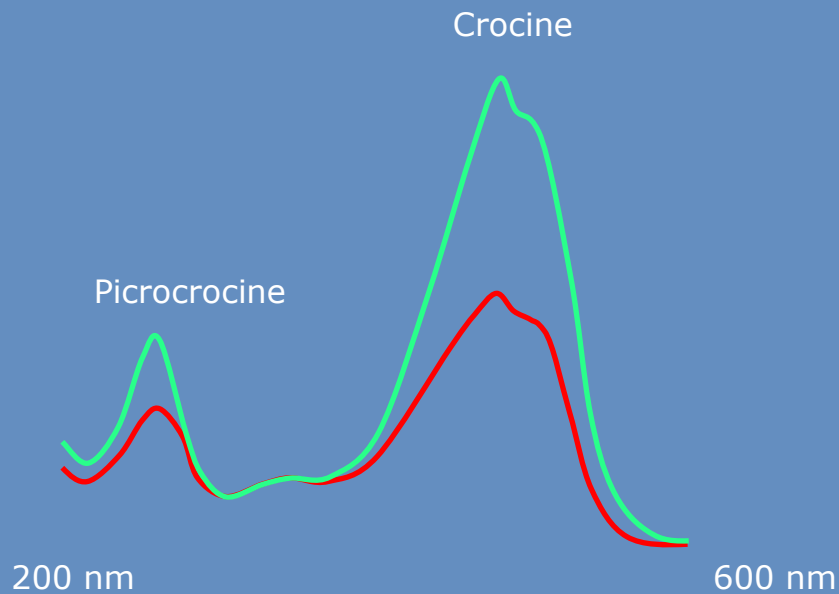
safflower stamen



capsicum fragments

# Microscopy: saffron

- Chemical analysis revealed differences among samples
- Visual inspection showed background of differences:
  - fertile crocus (pollen) was added



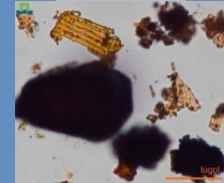
# Microscopy

- Several strategies for combining techniques

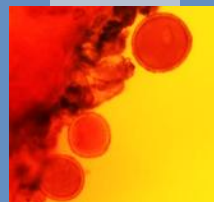
Initial visual screening



Major or principal analyses

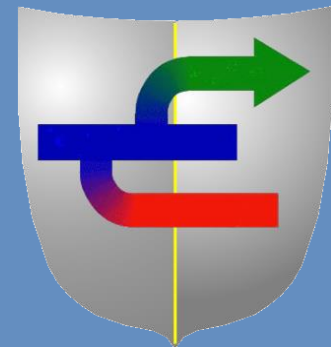


Targeted visual analysis



# Microscopy

- The combination of microscopy / visual analysis and chemical analysis is beneficial for monitoring of fraud or authenticity issues
- Expert systems, existing or in development, supports visual identification
- Determinator as platform for developing systems
- Current modules:
  - Starch
  - Pollen
  - Ragwort plants



[www.determinator.wur.nl](http://www.determinator.wur.nl)



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# THANK YOU

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RIKILT

WAGENINGEN **UR**