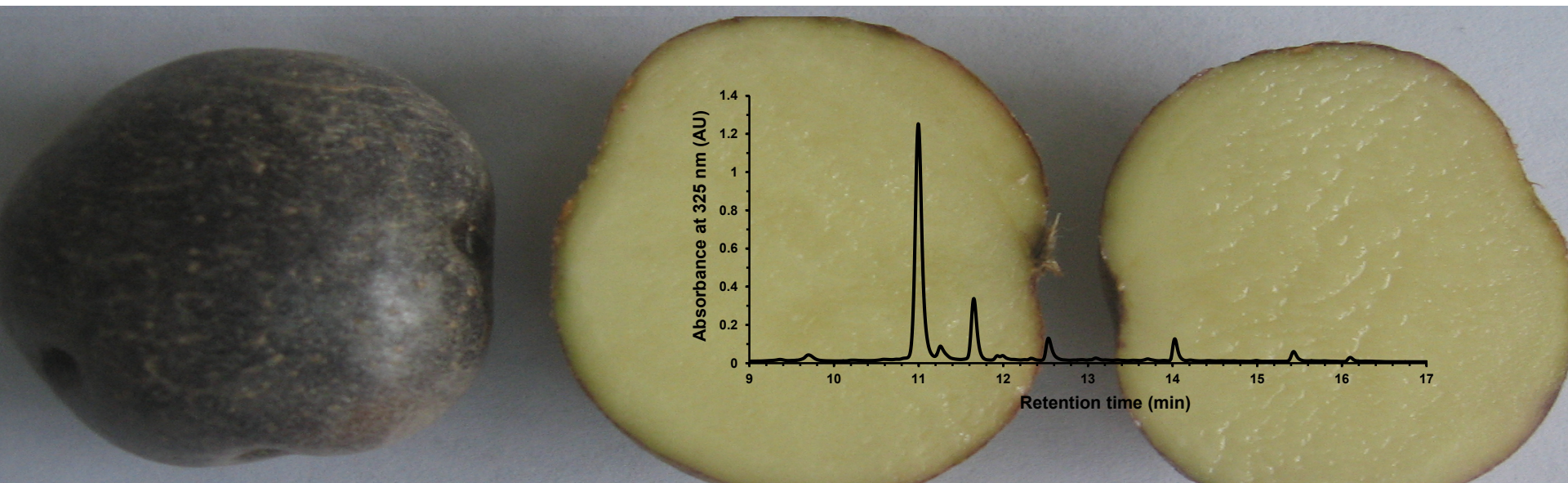
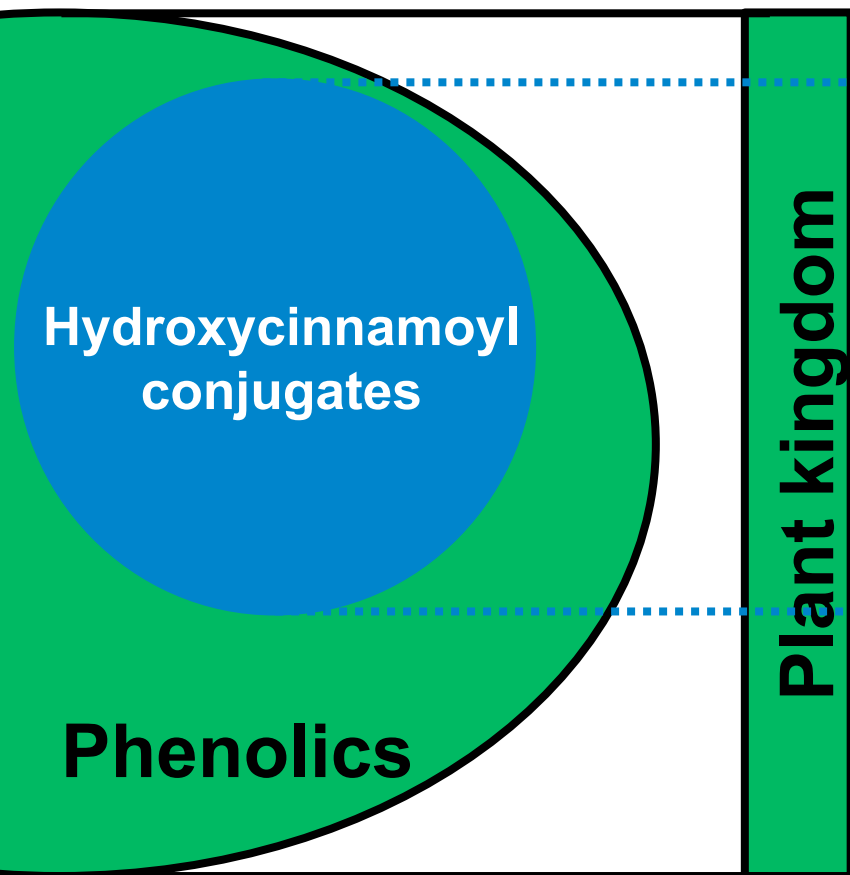


# Screening of phenolic compounds in potato tubers

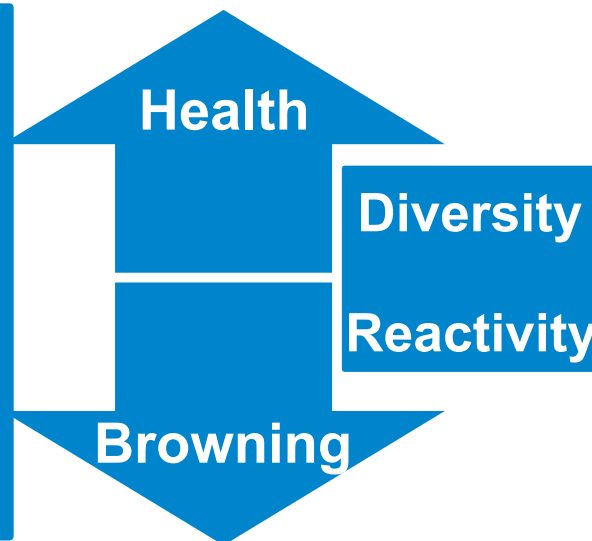
Diversity and reactivity upon processing

Carlos-Eduardo Narváez-Cuenca



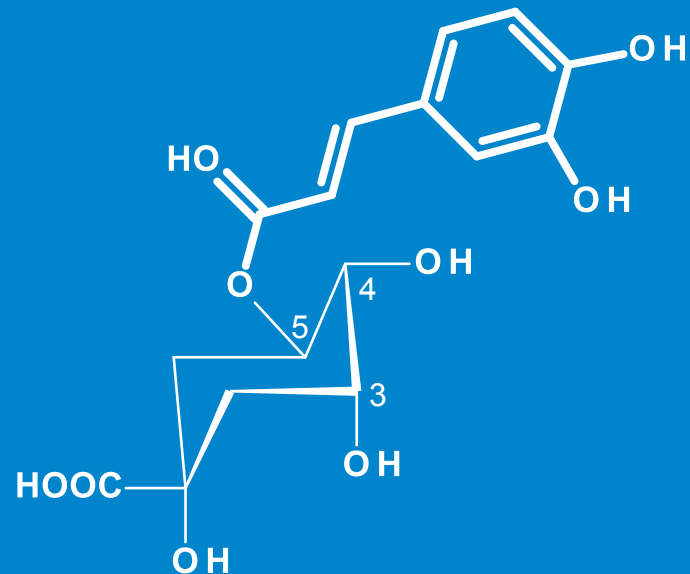


Potato tubers



Hydroxycinnamoyl  
conjugates

Potato tubers



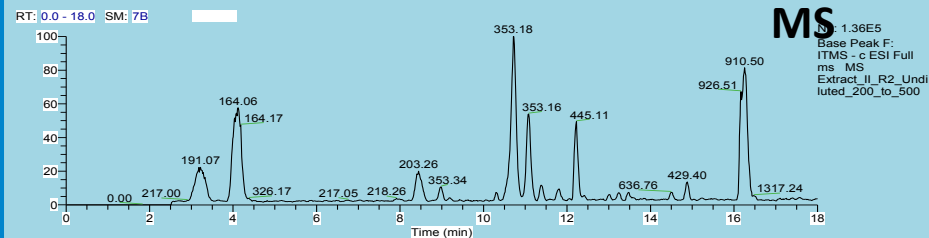
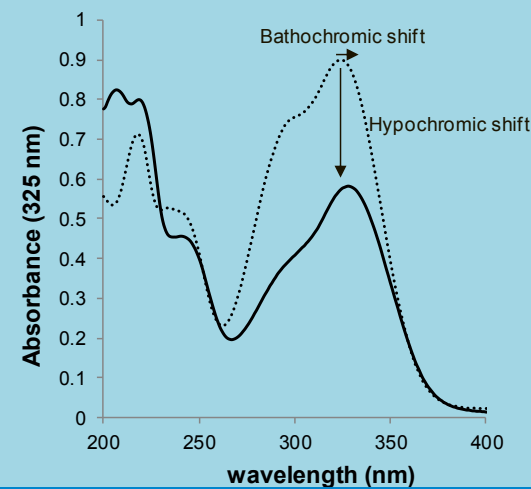
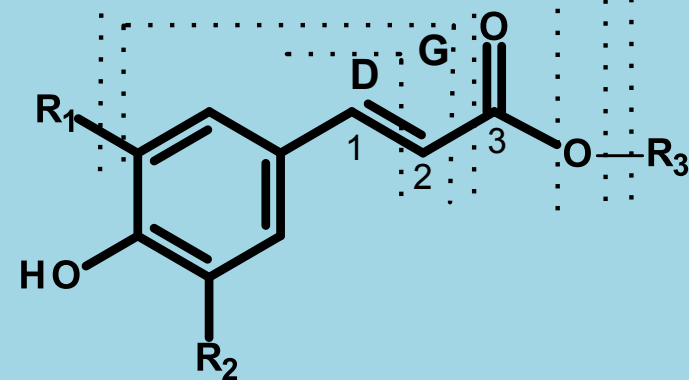
## Chlorogenic acid

### Analytical techniques

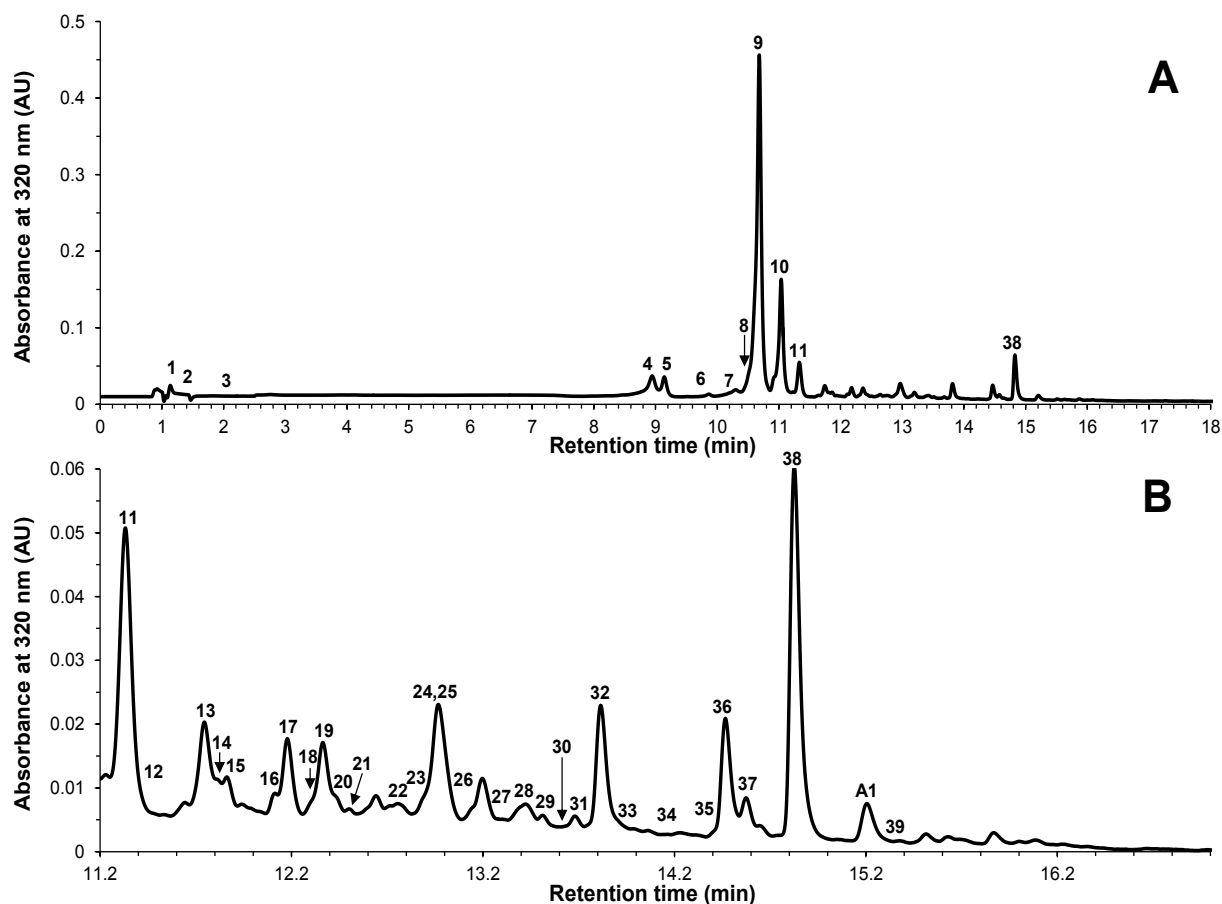
Espectrophotometry- Folin-Ciocalteu  
Gas Chromatography  
Capillary electrophoresis  
HPLC-PDA

**UHPLC-PDA-ESI-MS**

# Hydroxycinnamoyl conjugates

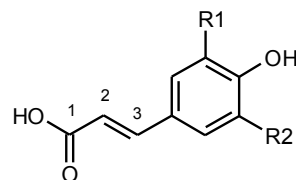


# A large undescribed diversity of phenolic compounds was found



Narváez-Cuenca, C.-E.; Vincken, J.-P.; Gruppen, H. Identification and quantification of (dihydro) hydroxycinnamic acids and their conjugates in potato by UHPLC-DAD-ESI-MS<sup>n</sup>. *Food Chem.* **2012**, *130*, 730-738.

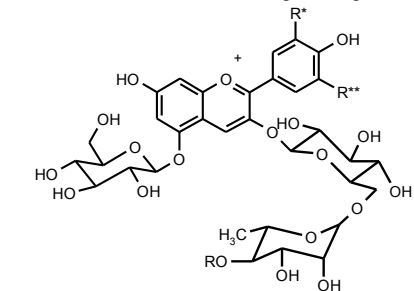
# A large undescribed diversity of phenolic compounds was found



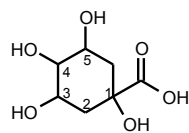
$\Delta^2?$  Substitutions

|                         |     |              |
|-------------------------|-----|--------------|
| <i>p</i> -Coumaric acid | Yes | R1=R2=H      |
| Caffeic acid            | Yes | R1=OH, R2=H  |
| Ferulic acid            | Yes | R1=OMe, R2=H |
| Sinapic acid            | Yes | R1=R2=OMe    |
| Dihydrocaffeic acid     | No  | R1=OH, R2=H  |
| Dihydroferulic acid     | No  | R1=OMe, R2=H |
| Dihydrosinapic acid     | No  | R1=R2=OMe    |

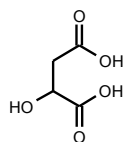
## Hydroxy-compounds (esters)



| Anthocyanin           | R*  | R** | HCA                     |
|-----------------------|-----|-----|-------------------------|
| Del-3-pCou-rut-5-glc  | OH  | OH  | <i>p</i> -Coumaric acid |
| Cyan-3-pCou-rut-5-glc | OH  | H   | <i>p</i> -Coumaric acid |
| Pet-3-pCou-rut-5-glc  | OMe | OH  | <i>p</i> -Coumaric acid |
| Pet-3-F-rut-5-glc     | OMe | OH  | Ferulic acid            |



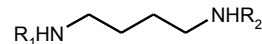
Quinic acid



Malic acid

Hexose

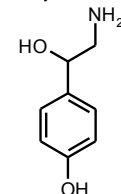
## Amino-compounds (amides)



Putrescine  
Spermidine  
Spermine

Substitutions

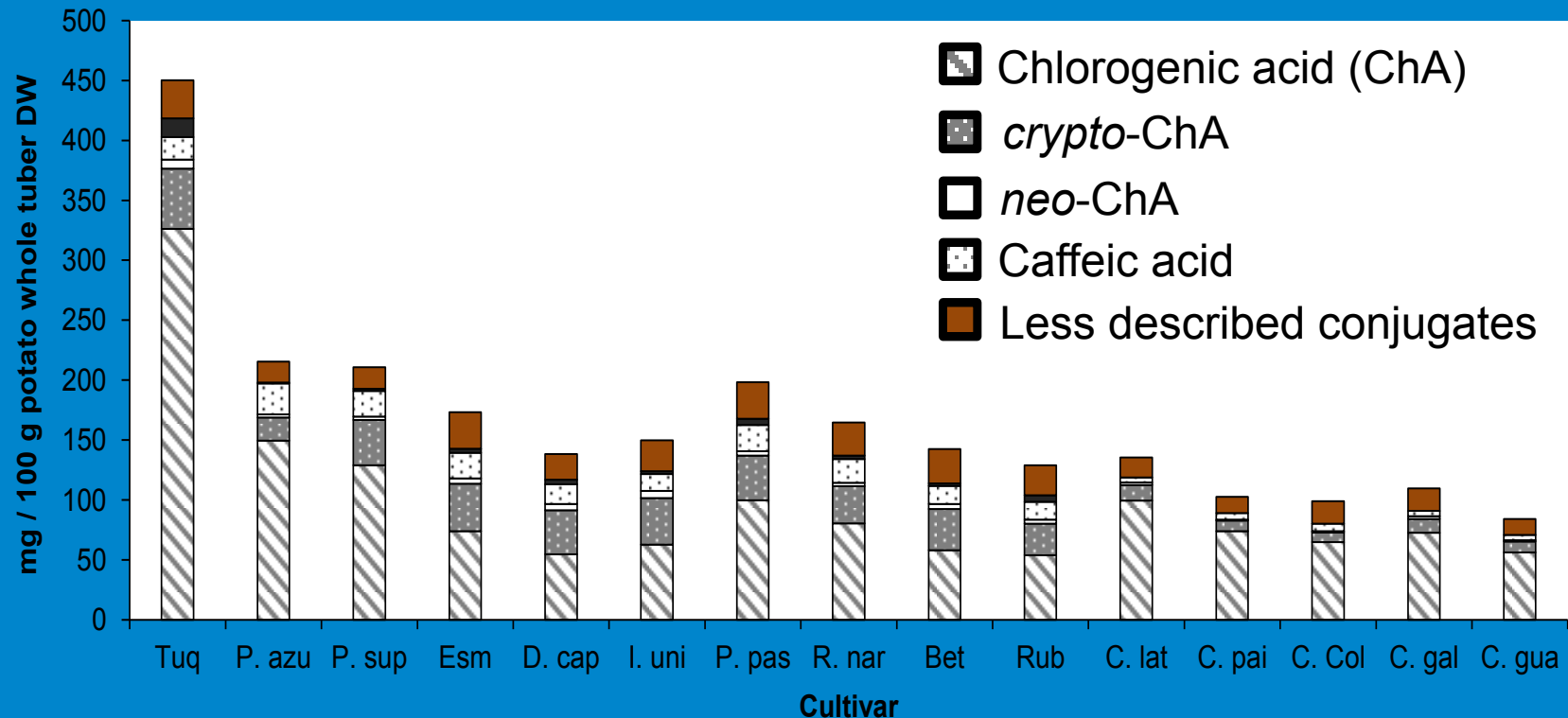
|                                                                                  |
|----------------------------------------------------------------------------------|
| R <sub>1</sub> =R <sub>2</sub> =H                                                |
| R <sub>1</sub> =H, R <sub>2</sub> =C <sub>3</sub> H <sub>6</sub> NH <sub>2</sub> |
| R <sub>1</sub> =R <sub>2</sub> =C <sub>3</sub> H <sub>6</sub> NH <sub>2</sub>    |



Octopamine

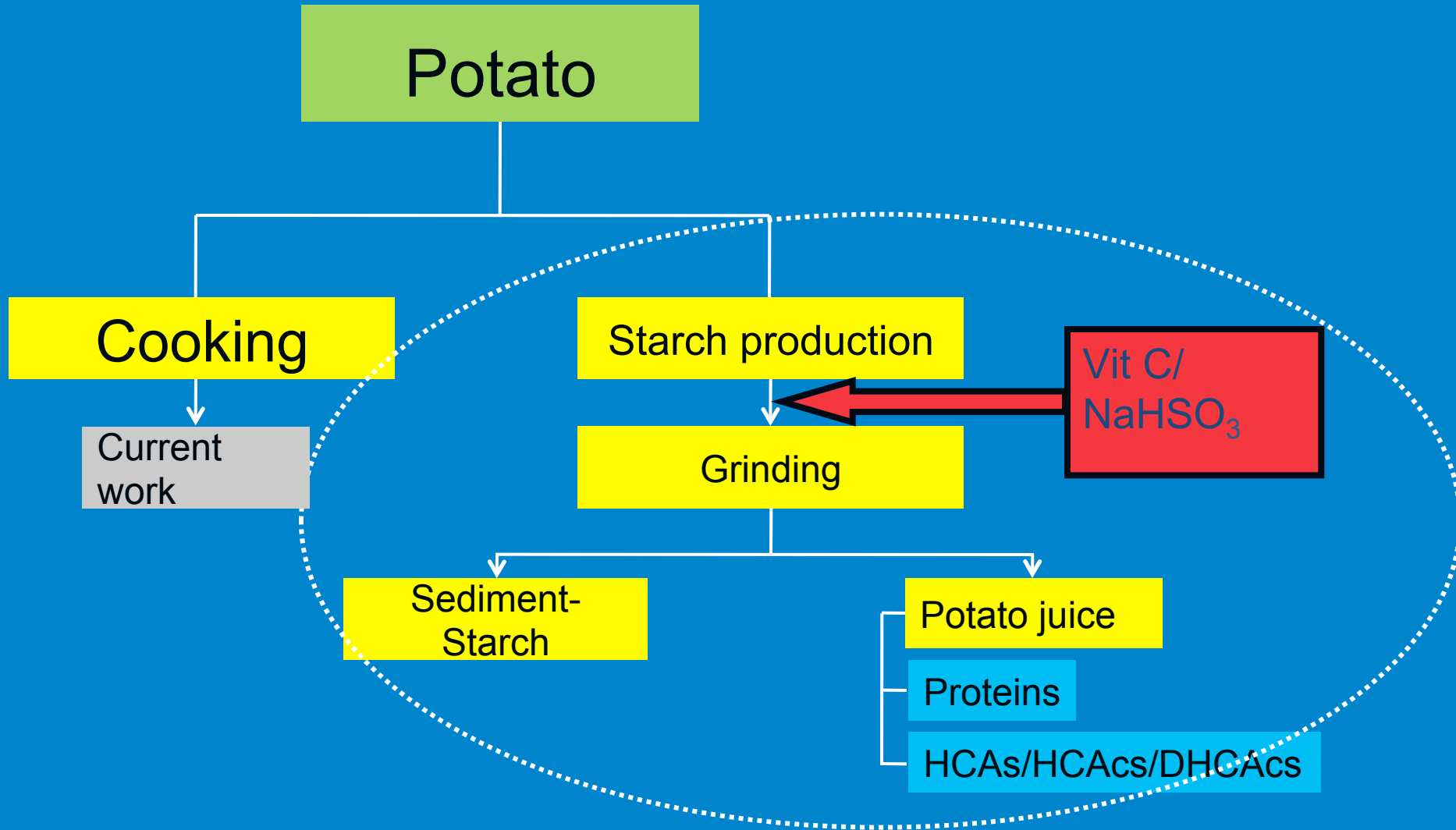
Narváez-Cuenca, C.-E.; Vincken, J.-P.; Gruppen, H. Identification and quantification of (dihydro) hydroxycinnamic acids and their conjugates in potato by UHPLC-DAD-ESI-MS<sup>n</sup>. *Food Chem.* **2012**, *130*, 730-738.

# Important contribution of the less commonly described conjugates to the total amount of phenolics in raw potato (7.1-20.1 % w/w)



Narváez-Cuenca, C.-E.; Vincken, J.-P.; Zheng, C.; Gruppen, H., Diversity of (dihydro) hydroxycinnamic acid conjugates in Colombian potato tubers. *Food Chem.* **2013**, 139, 1087-1097

# Potato and Processing



**Visual browning in potato aqueous extracts is inhibited by using ascorbic acid or  $\text{NaHSO}_3$**



Water



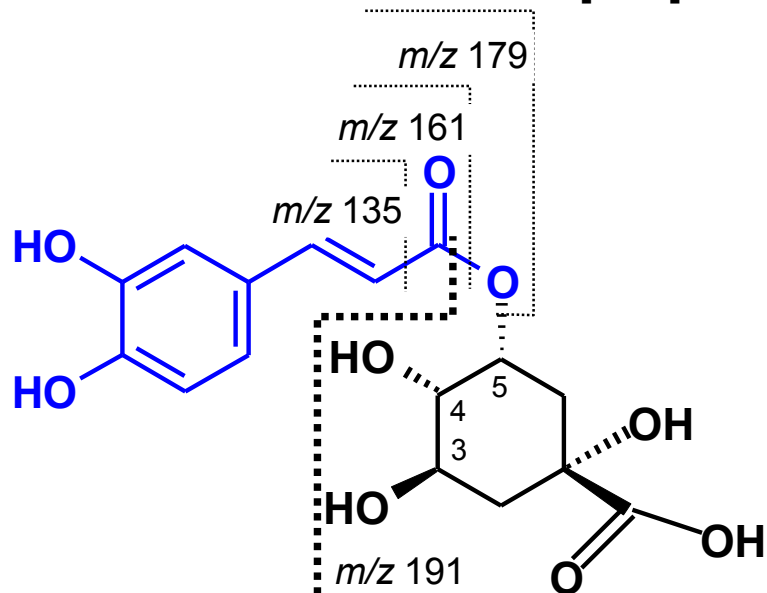
Ascorbic Acid



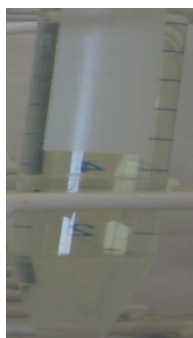
$\text{NaHSO}_3$

# NaHSO<sub>3</sub> modifies molecular identity of phenolic compounds

$$[P-H]^- = 353$$

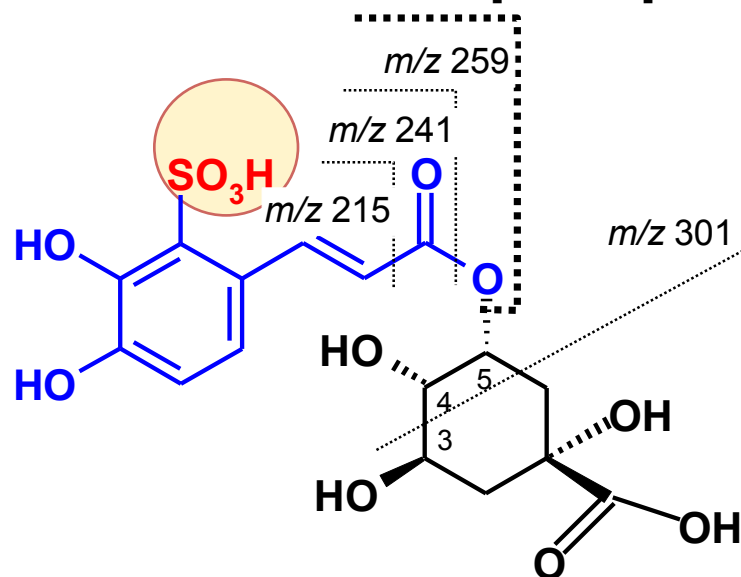


5-*O*-caffeoyl quinic acid

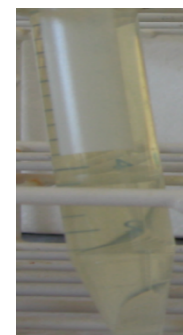


Ascorbic Acid

$$[P+80-H]^- = 433$$



2'-sulfo-5-*O*-caffeoyl quinic acid



NaHSO<sub>3</sub>

Narváez-Cuenca, C.-E.; Kuijpers, T.; Vincken, J.-P.; Gruppen, H. Quantitative fate of chlorogenic acid during enzymatic browning of potato juice. *J. Agric. Food Chem.* **2013**, 61, 1563–1572

# Potato - cultivars and Processing

