



# Impact of processing conditions on apple ➤ puree qualities

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# ProOrg : SQPOV's involvement in WP3

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**SQPOV : Understand how F&V, with their variability and heterogeneity, interact with unit operations to build the quality of processed F&V products**

-How tissue destructuration, notably during heat process, impacts quality linked to: cell wall (cellulose, hemicelluloses, pectins) and enzymes (PG, PME, PPO, LOX) microconstituents (polyphenols, carotenoides, vitamins), polyphenol/cell wall interactions liberation of volatile compounds during the first steps of processing

-Analytical developments to characterize F&V and their variability/heterogeneity development of fast analytical methods (NIR and MIR) analyzing tissue structure at different scales (cm- ~ 10  $\mu$ m) and texture using our analytical expertise for raw & processed F&V (sugars, organic acids)

# ProOrg : SQPOV's involvement in WP3

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**Evaluate the code of use on real products (purées) in order to maintain the nutritional qualities of the organic products by soft methods limiting the additives**

-Fruits (apple-2019-2020-2021)

-Necessary to know the different food processing characteristics of the selected products and the differences **obtained between organic and conventional products** and the difficulties encountered when using organic products (avoid browning without any additives ..)

-At the Lab :

compare classical food chain with a **gentle organic food processing chain** at a lab scale to maintain a high food quality

adapt processing conditions to avoid additives like Vitamin C

# ProOrg : Year 2019

3 Apple cultivars from SUDEXPE orchards  
Organic: Dalinette and Goldrush  
Conventional: Golden delicious



- Conventional processing:  
(RoboQbo)

- Under vacuum
- With oxygen without additive,
- With oxygen with additive.

- Innovative processing:  
(Microwaves + vapour)

- Without grinding
- Temperature between 90 and 95 °C , 6 min.



*In collaboration with Sairem*

Characterization

-NIR and MIR

-texture (fruit) and rheology (purees), colour

-sugars, organic acids, polyphenols (natives and oxidized), volatile compounds, vitamin C (native and degradation products)

# ProOrg : Year 2019, results

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-ATR-FTIR spectra performed on homogenized fruit purees allowed to discriminate samples according to variety, break process (HB/CB) and the oxygen conditions.

-The color was not modified by the process (HB/CB and conventional/innovative) nor the refining. However,  $L^*$  and  $a^*$  CIE  $L^*a^*b^*$  coordinates were significantly different according to variety, oxygen (+/-) and vitamin C (+/-).

-Viscosity of the products was not modified by oxygen (+/-) and break (CB/HB) but it was significantly different according to variety, process (conventional vs innovative) and refining (+/-).

-Polyphenol content varied according to variety. The effects of break (HB/CB), oxygen (+/-), vitamin C (+/-) were significant on polyphenol which are direct or indirect substrates of PPO. Contrary to literature data, refining had no effect on polyphenol contents.

-Cooking under vacuum allowed obtaining the same polyphenol content and the same color than cooking with vitamin C (ascorbic acid), but requiring any additive.

Fast innovative microwave process allowed producing purees with the similar polyphenol contents but with a higher viscosity than the conventional process.

# ProOrg : Years 2020 and 2021

2 Apple cultivars from the Polish experimental orchards  
Pinova and Champion  
conventional and organic



- Conventional processing:  
(RoboQbo)

- Under vacuum
- With oxygen without additive,

- Innovative processing:  
(Microwaves + vapour)

- Without grinding
- Temperature between 90 and 95 °C , 6 min.



*SQPOV now equipped with microwave oven*

Characterization

-NIR and MIR

-texture (fruit) and rheology (purees), colour

-sugars, organic acids, polyphenols (natives and oxidized), volatile compounds, vitamines C (native and degradation products)

Juice production to compare process : collaboration with Warsaw University of Life Sciences – WULS (PL)

# ProOrg : in collaboration with ITAB (2020-2021 ?)

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## Nutritional characterization of « real products »

- Apple processing with lycée du Valentin
- Sugar beet with le Gabnor
  
- before and after processing
  
- Apple : polyphenols, ascorbic acid
- Sugar beet : Betalains in 2 forms Betacyanin and Betaxanthin