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# Impact of mechanical treatment and particle concentration on fruit suspensions stability

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The objective of this work is to confirm the **structural parameters that control the rheological behaviour of plant cells dispersions** related to the texture of the products and to **pave the way for stabilization methods of fruit suspensions limiting the use of additives.**

Two species presenting different cellular structure were studied as examples:

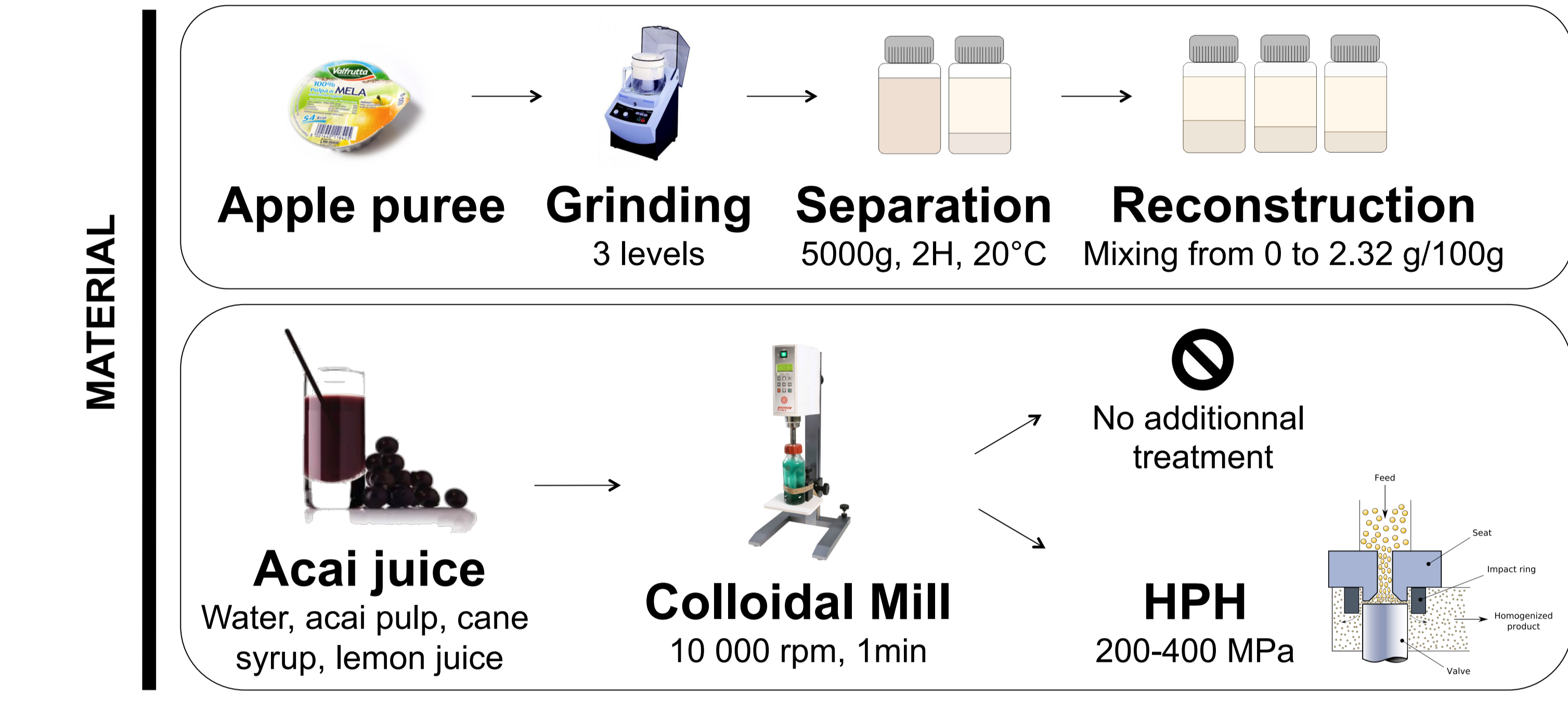
- **apple** (*Malus domestica* Borkh. cv Golden Delicious)
- **acai** (*Euterpe oleracea* Mart.)



## Research question:

**How to stabilize fruit suspensions limiting the use of additives ?**

## Material and Methods



- STRUCTURE**
- Particle size distribution**: Mastersizer 2000, Malvern
  - Settling stability**: Turbiscan™ LAB, Formulation
  - Light microscopy**: Olympus BX51
- BEHAVIOUR**
- Rheology**: MCR 301, Anton Paar, using large gap coaxial cylinders ( $\delta r=5\text{mm}$ )
  - Steady-state measurements**: Flow curve from 10 to 250 s<sup>-1</sup>
  - Oscillatory measurements**: Frequency and strain sweeps

## Results

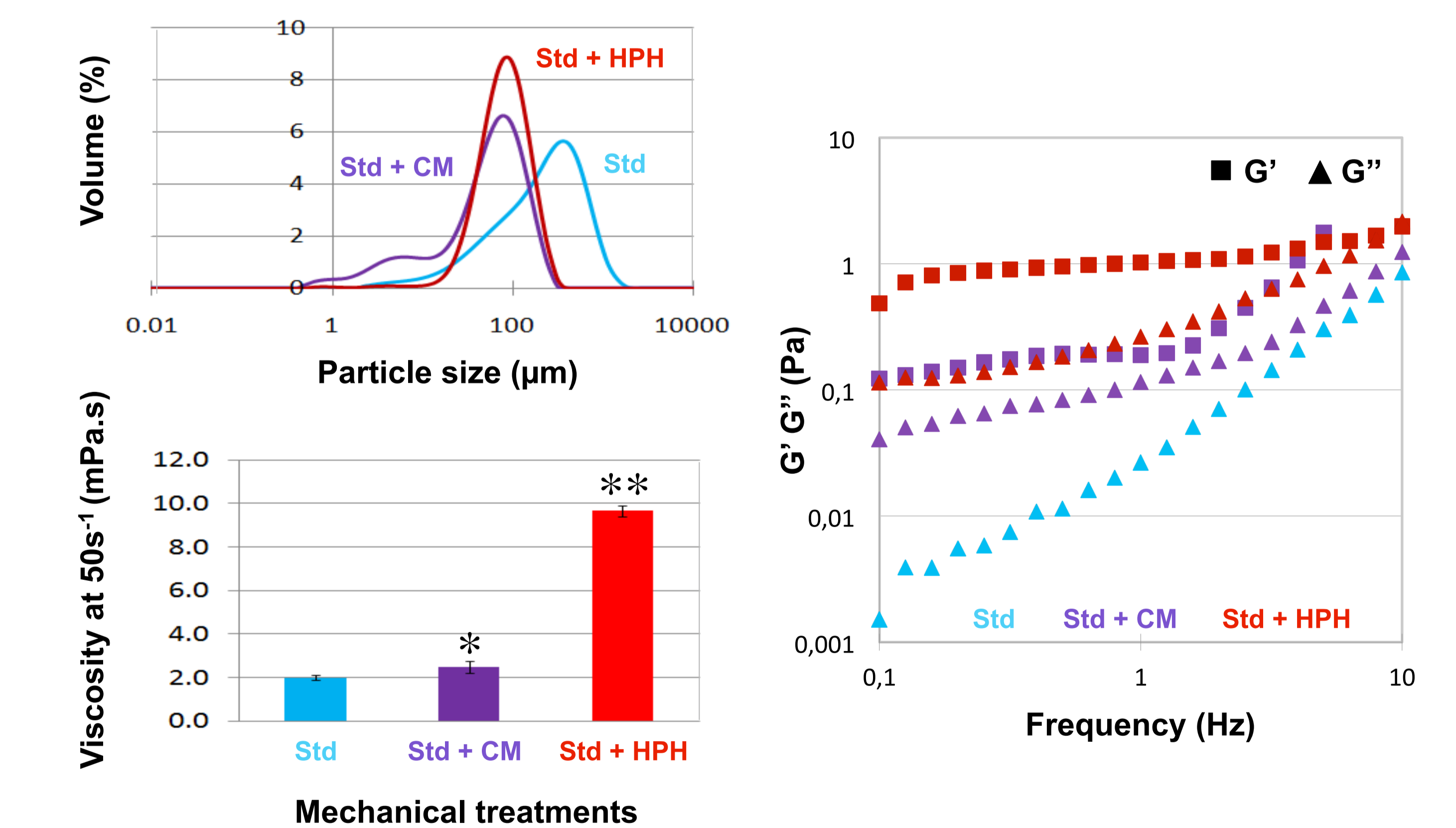
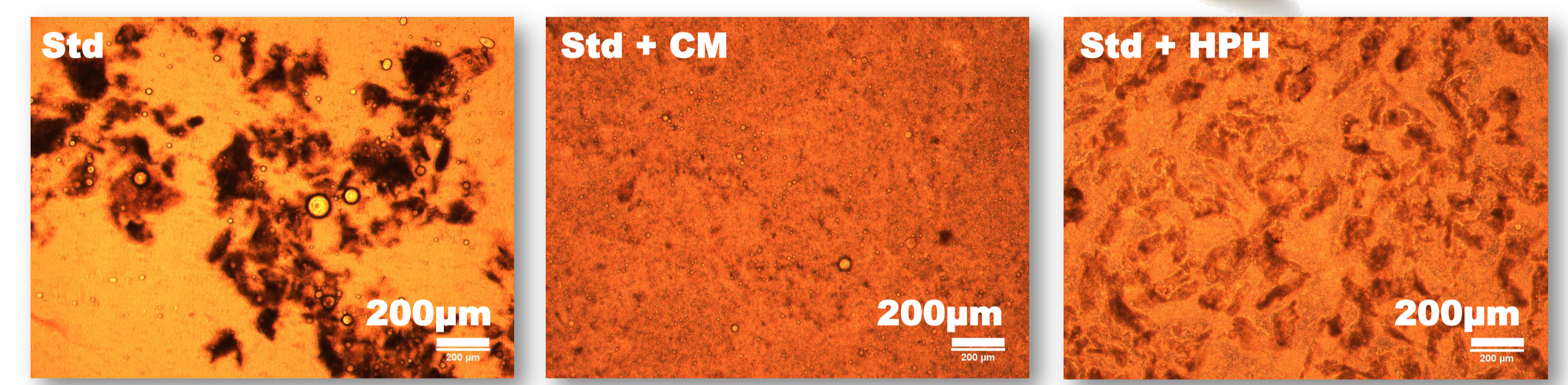
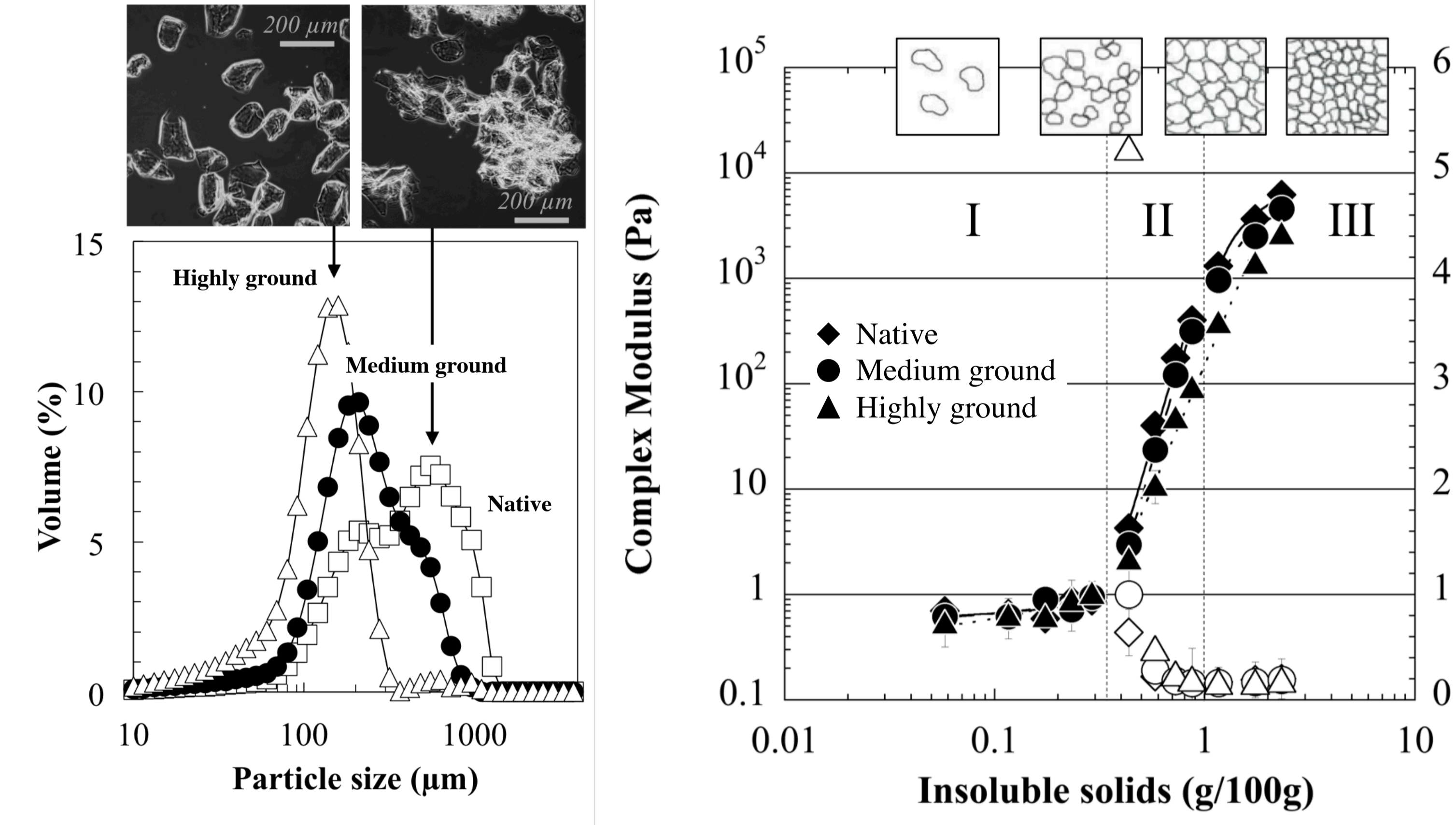
### Apple Suspensions

The insoluble solids content allows to structure to medium. Three concentration domains are highlighted. The appearance of a weak network is observed whatever the particle size distribution.



### Acai Juices

Mechanical treatments allow to functionalize the disperse phase and to create a weak gel, avoiding sedimentation and creaming.



## Conclusions

- For apple, three concentration domains were observed depending on the concentration of insoluble solids
- ✓ **Diluted domain** : Particles size and shape have a little effect on rheology
  - ✓ **Semi-diluted domain** : Building of a weak network between the particles
  - ✓ **Concentrated domain** : Particles begin to pack

These results suggest that a very small amount of particle allows structuring the medium by creating a weak gel, which was confirmed by the results obtained on acai.

**Stabilization of acai juices was successfully achieved using physical treatments**, which decreased the particle size and helped building a connected network. These effects are all positive levers on stabilization, as can be seen after 5 months of storage.

**Particle size and shape have a major impact on rheological behavior and stability of fruit suspensions.**

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