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Impact of mechanical treatment and particle concentration on fruit suspensions stability

Cassandre Leverrier, Delphine Huc-Mathis, Giana Almeida, Véronique Bosc, Damien Binois, Gérard Cuvelier

UMR Ingénierie Procédés Aliments (JRU Food & Process Engineering)

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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 ?

Settling stability

Turbiscan[™] LAB, Formulaction

Material and Methods



Particle size distribution Mastersizer 2000, Malvern

Light microscopy Olympus BX51

Rheology

MCR 301, Anton Paar, using large gap coaxial cylinders (δr=5mm)

Steady-state measurements Flow curve from 10 to 250 s-1 **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

tan∂

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

Mechanical treatments

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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