





L'accélérateur
d'innovation de la filière
fruits et légumes

New technologies for Fruit and Vegetable Processing

2nd PIC Meeting
5th June 2012



PÔLE EUROPÉEN D'INNOVATION FRUITS ET LÉGUMES

- Processed fruit and vegetable potential
- Sustainability
- Symposium *Fruit and Veg processing* – 2011
- Focus on 3 innovative technologies
- Examples of projects
- Actors and networks

Evolution of F&V consumption: a chance for processed foods !

Food consumption evolution in France

Source : Etude France Agrimer (2011) : « Crise économique et comportement de consommation alimentaire des Français »

	1960	2009
Food expenses	34,6%	19,8%
Fruits	6,5 %	5,7 %
Vegetables	10,6 %	8,7 %

Economic crisis consequences :

- Less eating-out (restaurant), more home cooking
- More seasonable fruits
- Less fresh products, more frozen and canned products (cheaper and practical)

→ **A chance for processed F&Veg !**

Evolution of F&V consumption: a chance for processed foods !

Vegetables purchase= 64 kg / UC / year - 44,5 % processed

*Source : Marie PLESSZ, Séverine
GOJARD,
Inra-SFER-CIRAD, 2010/12/090*

Processed foods were reserved to high income population

Now, a significant change !

« heavy consumers » consume more fresh F&Veg

→ Processed F&Veg became more accessible

2010 : largest gains in sales were recorded for ready-to-eat F&Veg products !

→ **Processed F&V have a great future**

Major tendency : **Sustainable development**

- Economic : Energy saving
- Environment : less water, less energy, less additives
- Social : Answer to consumer expectation (praticity, naturality) and food safety

Support from the French Research Agency (ANR) :
call for proposal « ALID » - *Sustainable food systems*

KBBE 2013 - Area 2.2.5 Environmental impacts and
total food chain



Major research schemes :

- Research in nutritional quality of processed F&V
 - Safety and microbiological quality of processed F&V
 - Consumer expectations
 - Innovative and sustainable processes
- ... all sources of innovation !

- To preserve nutrients: polyphenols, carotenoids, vitamins, glucosinolates
- To valorize antioxidant properties present in processed F&V
- To develop quantitative approaches by modelling and simulations
 - To evaluate losses
 - To improve bioaccessibility of nutrients
 - To evaluate nutrient intake for consumers

Safety and microbiological quality of processed F&V

- Lack of data to compare innovative versus traditional processes
- Development of rapid analytic methods
- Still lot of work to understand neformed components

Consumer expectations

Few projects !

- To understand limits of F&V consumption
- To understand organoleptic quality building

Innovative and sustainable processes (1)

The best known innovative technologies :

- High pressure
- Pulsed electric fields
- Ohmic heating

Now at industrial scale...

...but development of industrial transfer and processes improvement are still needed !

Innovative and sustainable processes (2)

- Development of innovative processes and their integration in the food chain
- Combination of processes : innovative and traditional (PEF + juices extraction)
- Understanding of mechanisms (Impact on texture, on nutritional quality)
- Study limitation and determine best applications of these new processes (ex. fluid / visous products, with or without particules)
- Assesement of nutritional benefices vs microbiological risk compromise

- Comprehension of mechanisms
- Combination of technologies
- Adaptation of technologies for specific applications
- Modelisation of processes
- To select or adapt varieties suitable for processing

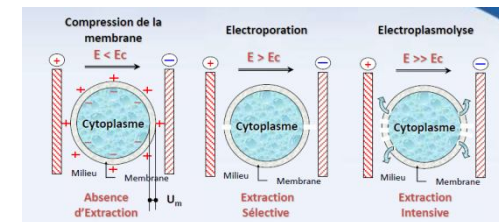
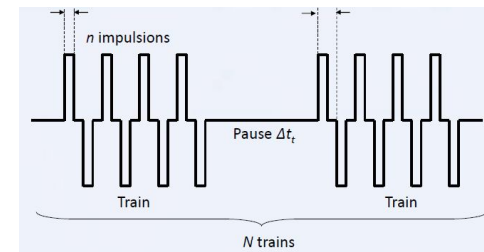
Pulsed electric fields

Principles :

- Application of a non continuous voltage for membranes electroporation

Uses :

- Debacterization
- Pretreatment before other processes :
 - To improve yield of extraction (juices)
 - To reduce treatment time before freezing



Advantages :

- Reduced organoleptic and nutritionnal degradation
- Positive energetic balance

Technological locks :

- To optimize efficiency of electronic components

Principles :

- Application of pressure on products to induce matter state evolution (water-gaz-solid), chemical reactions, molecule links modifications, with a limited temperature elevation.

Uses :

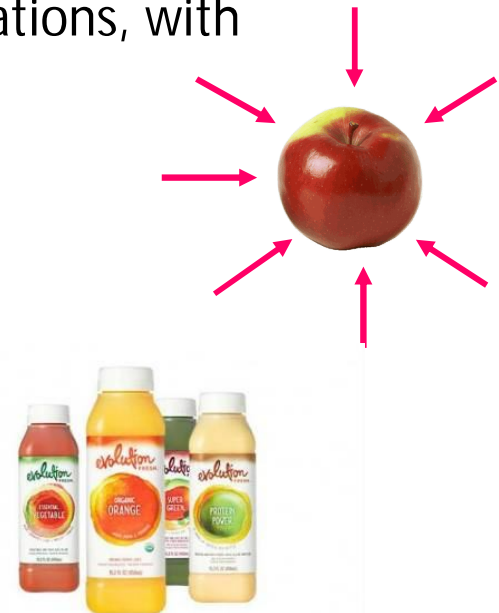
- Pasteurization
- Enzymes inactivation
- Flora degradation
- Texture improvment
- Juices extraction improvment

Advantages :

- Low energy consomption

Technological locks :

- New food development



Ohmic heating

Principles :

- Application of an alternative voltage

Uses :

- Pasteurization
- Enzymes inactivation
- Cooking
- Defreezing

Advantages :

- Flexible, compact and continuous process

Technological locks

- Cooling, work on texture



Pavie peach

ohmic heating
pasteurisation

Examples of projects

- PE3F2
- Tempantiox
- Reactial
- Opti Tom
- Ribenut
- InnoPreF

Low-energy news processes for fruits products preservation



AIMS

To develop a process allowing microbiological stable fruit products with organoleptic and nutritional quality close to fresh fruits

Budget & Funding :

Total budget 3,7M€

FUI, Rhône Alpes Region, Drôme department

Partners : Délifruits – Refresco Group, Hero, Capfruit, CEA

New processes for preservation of fruit-processed products

BUDGET & FUNDING :

1,5 Mios €

ANR (569 K€)

PARTNERS :

Cidrerie Val de Vire

Héro, Reus, **INRA**, CTCPA, ESA Angers,

Université



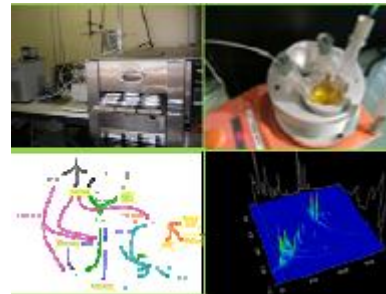
Prediction and control of markers appearance or disappearance during processing or preservation of food products

AIMS

To develop an integrated approach for food production that make it possible to maintain integrity of nutritional compounds, to control the appearance of new compounds, positive (aromas) or negative (negative aromatic notes or potentially toxic compounds)

PARTNERS

Porteur du projet: INRA –SQPOV
Other INRA Labs
CNRS/INP Toulouse
CTCPA
Fromagerie Bell



BUDGETS ET FUNDING

Total budget : 2 250 k€
ANR funding : 475 k€

Industrial application and assessing of a predictiv model for nutritional quality of tomato during processing and storage

PARTNERS :

- CTCPA
- CONSERVES France
- RAYNAL & ROQUELAURE
- LABORATOIRE DE GENIE CHIMIQUE Toulouse
- INRA Avignon - SQPOV

BUDGET & FUNDINGS

Total budget : **216 997€ HT**

National fund (CPER – DGAL)





New approaches for microbial risk – nutritional benefits assessment in the case of heat processed vegetables

AIMS

- To assess the compromise between risk and benefit in the case of heat processed vegetables.
- To preserve nutrients
- To reduce microbiological risk
- To reduce thermic treatments while maintaining food safety



PARTNERS

Project leader : INRA Avignon - SQPOV

UMR Genial, Aérial, CTCPA, ADRIA, Met@risk, Lubem, Créaline, BSA-Bonduelle

BUDGETS ET FUNDINGS

Total Budget : 2 600 k€

ANR fundings : 770 k€

Innovative Processes and Matrix Reactivity: gaining sustainability by a better use of nutritional assets of fruits. (not funded yet)

AIMS

To identify ways to better use the nutritional benefits of fruits when they are processed.
To study processes impacts but also plant matrix behavior.
Focus on 2 matrices: apples and tomatoes - 2 types of treatment: Classic / Innovative

PARTENAIRES

Project leader : INRA SQPOV
INRA other labs
IRSTEA
University of Aix-Marseille
CTCPA
Supagro
UTC Compiègne



BUDGETS and fundings

Total Budget : 4 166 620 k€



Our partners in food processing

- INRA - SQPOV
- ESA
- Polytech
- Montpellier SupAgro
- CIRAD
- University of Avignon
- CTCPA
- Alimentec



- International Academic Network : « Sustainable fruits and vegetable processing for a healthy diet »

Contact : Catherine Renard, INRA Avignon UAPV

→ Symposium Fruit and Veg processing, 2013, Slovenia

- RARETTI = French Network of research for innovative industrial green technologies

Research and transfer of new technologies : PEF,
Micro-waves, Ultra-sound, supercritical fluids,
Instant controlled pressure drop

Our public financial supports



Projet cofinancé par l'Union Européenne.
L'Europe s'engage avec le Fonds européen de développement régional.



Région



Provence-Alpes-Côte d'Azur

RhôneAlpes Région



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avignon**
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