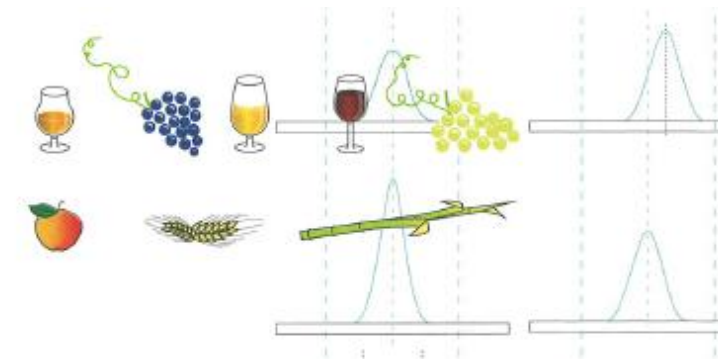


PARTNERSHIP BETWEEN INDUSTRIAL SECTORS: THE EXAMPLE OF « FERMENTED AND DISTILLED PRODUCTS TECHNOLOGICAL NETWORK (RMT- PFD) IN FRANCE

PARTENARIAT ENTRE FILIÈRES : L'EXEMPLE FRANÇAIS DU RÉSEAU MIXTE TECHNOLOGIQUE « PRODUITS FERMENTÉS ET DISTILLÉS » (RMT-PFD)

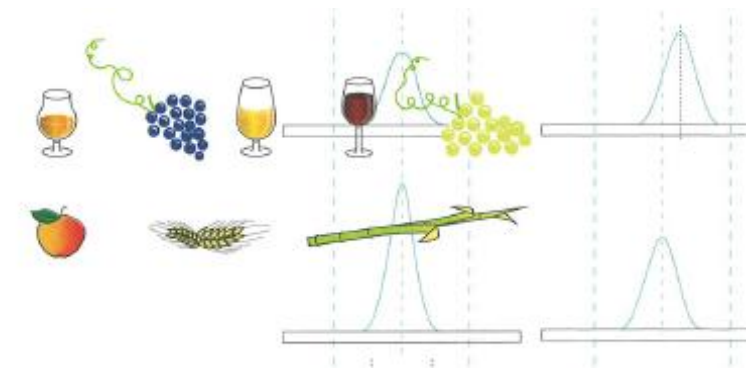
Luc LURTON  
Directeur de la Station Viticole du BNIC

Vendredi 9 mars 2012



## Network stakes and goals

- Established and supported by French Department in charge of food and agriculture ( Food sector => 10 RMT coordinated by ACTIA):
- RMT: Create synergy between industry technical institutes, public research, education and training in agriculture and food sectors
- RMT – PFD: identify and develop synergies between Fermented and Distilled Products sectors: wine, beer, cider, distilled spirits...
- Generate knowledge and create services contributing to sustainable development of economical sectors

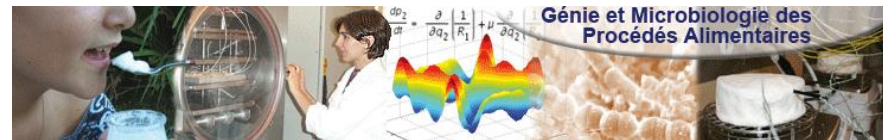


# A wide partnership

- 8 technical institutes representing fermentation / distillation industries



## Education and research institutions

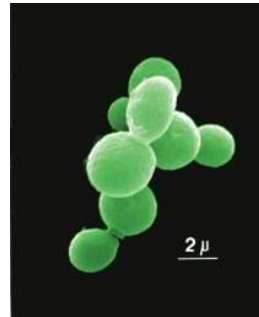




# Four main topics

**Alcoholic  
fermentation**

Coord: IFV



**Energy in  
Distillation**

Coord: BNIC



**Food safety**

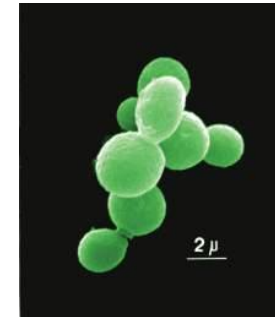
Coord: ADRI Nie



**Process:  
Gushing, O2...**



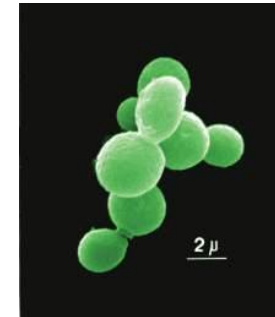
# Alcoholic Fermentation



Objective n°1:

Build a transversal research program on productivity and quality questions

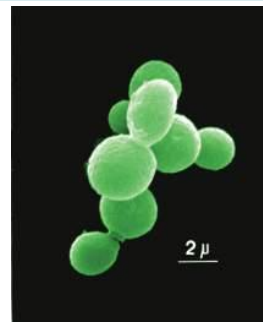
## Find a good topic...



- Shared by all partners but not (too much) competitive
- New
- Innovative
- Subject to developments

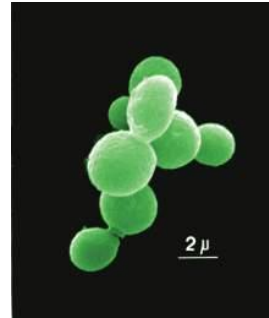
# Yeast – Nitrogen

## Genetic basis of nitrogen use by fermentation yeast



- Shared by all partners but not for the same reasons:
  - Fermentation rate (beer, alcohol...), fermentative safety (wine, cider...), products quality / composition (spirits, beer...)
- New : was not a core topic of any partner
- Innovative:
  - combination of experimental and genetic approaches
  - implementation of different matrices: grape, barley, apple, sugar cane
- Subject to developments
  - production of new tools for the selection and improvement of strains.

# Yeast Nitrogen(YN–RMTPFD) program

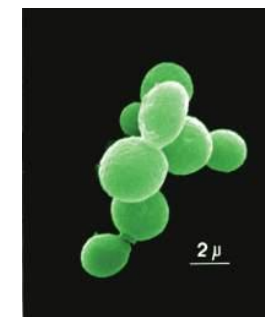


Study on the variety of the response of industrial–fermentation yeasts with regard to nitrogen requirements.

=> Elaboration of new tools for the selection and improvement of yeast strains.



# Yeast Nitrogen Research Program (ANR – ALIA 2009)



<b>Acronyme</b>	<b>YN-RMTPFD</b>		
<b>Titre du projet en français</b>	Etude de la diversité des réponses des levures de fermentation industrielles aux niveaux d'alimentation azotée. Elaboration de nouveaux outils pour la sélection et l'amélioration des souches		
<b>Titre du projet en anglais</b>	Study on the variety of responses of industrial-fermentation yeasts with regard to nitrogen supply. Elaboration of new tools for the selection and improvement of strains		
<b>Axe(s) thématique(s)</b>	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input type="checkbox"/> 3		
<b>Type de recherche</b>	<input checked="" type="checkbox"/> Recherche Fondamentale <input checked="" type="checkbox"/> Recherche Industrielle <input type="checkbox"/> Développement Expérimental		
<b>Coopération internationale (si applicable)</b>	Le projet propose une coopération internationale <input type="checkbox"/> avec un ou des pays spécifiquement mentionnés dans l'appel à projets. <input type="checkbox"/> autres pays.		
<b>Aide totale demandée</b>	414600 €	<b>Durée du projet</b>	36 mois

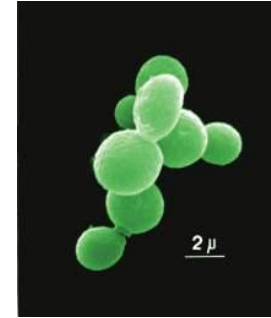
## 7 Technical Institutes

- ADRIA Normandie
- BNIC
- CTCS
- IFBM
- IFPC
- IFV
- UNGDA

## 1 Research team

- UMR 1083 SPO
- INRA -
- Montpellier SUPAGRO
- Université Montpellier

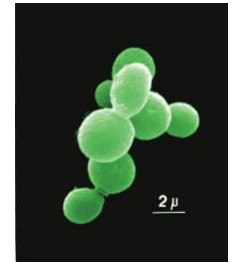
# Evaluation committee opinion



Among positive points underlined by experts in charge of this project:

- Combining experimental and genetic approaches to shorten yeast strain selection processes
- Strong partnership between industrial sectors Technical Institutes

# YN-RMTPFD program



Nitrogen composition of raw materials: essential factor in the qualitative control of alcoholic fermentation, carried out for most fermented beverages by *Saccharomyces cerevisiae*.

However, whatever the product concerned, the composition of the matrices is highly variable and difficult to control for industrial operators.

Raw material variability

- ⇒ Choice of a yeast strain adapted to fermentation medium,
- ⇒ *Saccharomyces cerevisiae* biodiversity, (e.g. for nitrogen requirements)

Understanding of the genetic basis of phenotypic diversity:

- ⇒ ability of strains to use the nitrogen present in the medium to a greater or lesser extent
- ⇒ genetic markers = powerful tools to assist strain selection and improvement.

# First step: strains selection

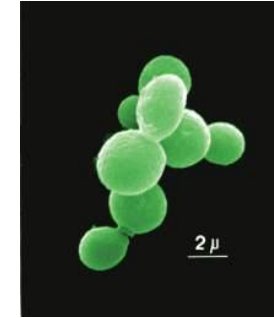
Characterisation of nitrogen requirements of strains originating from different industrial sectors (wine, beer, cider, Calvados, Cognac, rum, and neutral agricultural alcohol).

Evaluation of nitrogen requirements of the strains under fermentation conditions characteristic of different matrices implicated in the project (check generic character of this property and specify limits).

=> selection of two sets of strains with low and high nitrogen requirements, for which the search for genetic markers will be carried out.



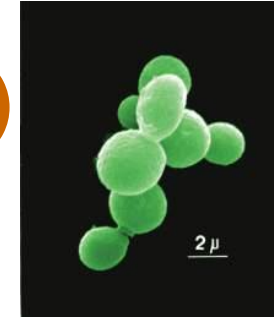
# Genomic approach (INRA)



The data obtained should make it possible to:

- ⇒ Identify alleles linked to nitrogen-requirement characteristics,
- ⇒ Search for these alleles in the natural populations (strains collections from various sectors)
- ⇒ Transfer these alleles to industrial strains by classical genetic approaches.

# Phenotyping ( technical institutes)



- => characterization of low and high nitrogen requirements strains metabolism
- => Studies carried out simultaneously on different matrices
  - => enriching knowledge of the pathways for the use of nitrogen
  - => defining the characteristics for which the yeast-strain effects are distinct and robust.
  - => definition of characteristics for which new research on genetic markers are appropriate.

**Etude de la diversité des besoins en azote**

chez les levures industrielles *Saccharomyces cerevisiae*.

**Elaboration d'outils génétiques pour la sélection et l'amélioration des souches**

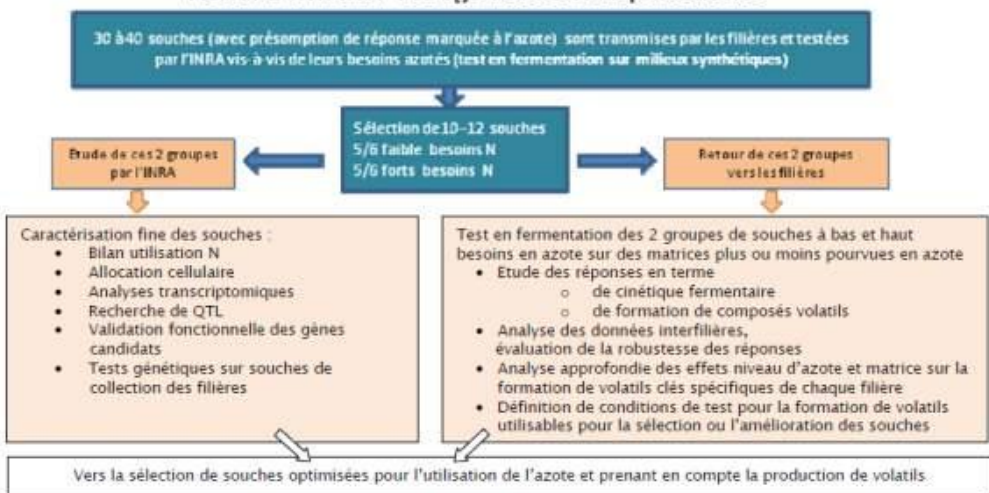
- Ce projet vise à proposer des outils utilisables par les différentes filières de fermentation pour :
- sélectionner plus efficacement les souches de levures vis-à-vis de leurs besoins en azote
  - mieux gérer les opérations fermentaires et les contraintes qualitatives des produits en relation avec la disponibilité en azote des matières premières.

Pour atteindre ces objectifs, le projet s'appuie sur le réseau **RMT « produits fermentés et distillés »** qui rassemble les laboratoires des Instituts Techniques des différentes filières (vins, bières, Calvados, Rhum, Alcool neutre agricole) et un laboratoire académique (INRA).

**Objectifs des partenaires**

- L'INRA identifie les marqueurs génétiques impliqués dans l'expression des besoins en azote
- Les filières caractérisent le métabolisme fermentaire des souches présentant les plus forts et plus faibles besoins en azote sur des matrices de composition très diverse

**Actions à mener et organisation du partenariat**



**Conclusion**

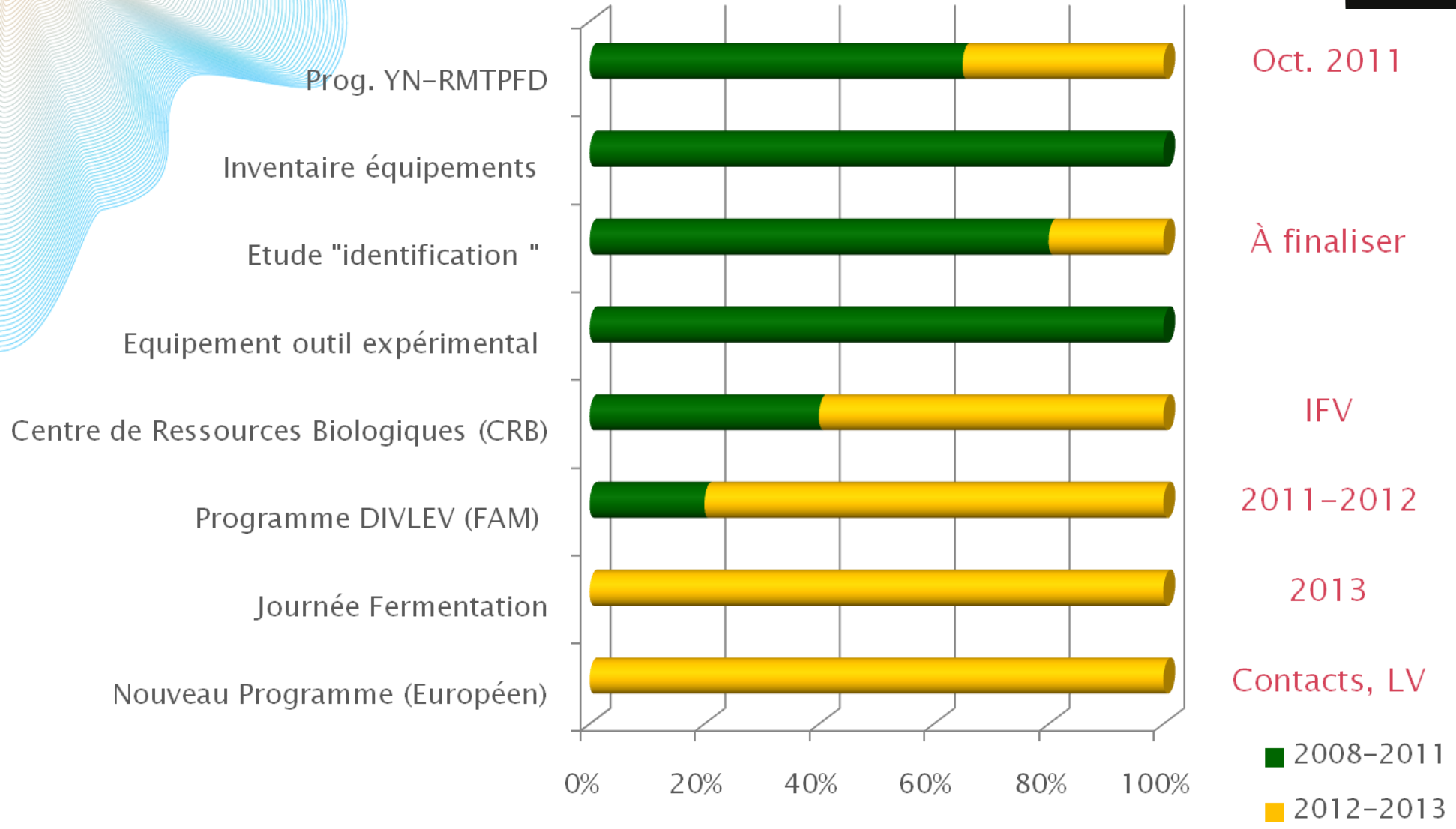
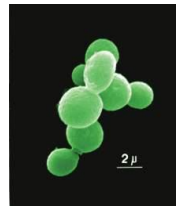
Ce projet doit conduire à la mise au point d'outils génétiques permettant de sélectionner ou améliorer les souches de levures et donc faciliter l'exploitation de la biodiversité naturelle. Ces études menées conjointement sur des matrices très différentes permettront d'enrichir les connaissances sur les voies d'utilisation de l'azote et de définir des caractères pour lesquels les effets souches de levure sont remarquables et robustes. Les données phénotypiques acquises à l'issue de ce travail permettront de définir des caractères d'intérêt technologique pour lesquels de nouvelles recherches de marqueurs génétiques sont opportunes.

**First results published in 2011  
PhD Student: Claire BRICE**

BRICE C, BLONDIN B., 2011. Une approche génétique et génomique des bases moléculaires de la diversité de l'utilisation de l'azote chez les levures *Saccharomyces cerevisiae* industrielles. Poster Journée de l'Ecole Doctorale Sciences des Procédés Sciences des Aliments, Montpellier, 10 Juin 2011.

BRICE C, BLONDIN B. 2011. A genetic approach of the molecular basis of nitrogen in industrial *Saccharomyces cerevisiae* yeasts. 25th International conference on yeast genetics and molecular biology, Olsztyn-Kortowo (Pologne), 11-16 July 2011.

# Other ongoing programs on alcoholic fermentation...

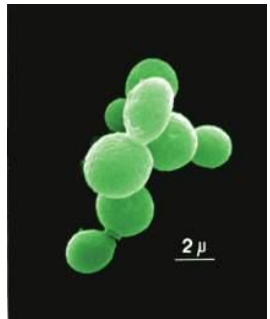


■ 2008-2011  
■ 2012-2013



# And on other transversal topics

**Alcoholic fermentation**  
Coord: IFV




**Energy in Distillation**  
Coord: BNIC



**Food safety**  
Coord: ADRI Nie



**Process: Gushing, O2...**



# Next step 2012 – 2014

Same technical partners but a lot more partnerships:  
–alcoholic fermentation..., energy in distillation, oxygen, mycotoxins, gushing, analysis...



Opening to a new research partner involved in « energy in distillation » programs

Le Laboratoire TREFLE (Transferts, Ecoulements, Fluides, Energétique)  
UMR 8508 from Bordeaux University already associated to different projects on « Distillation and Energy » topics

New coordination for a new step:

from



to

