CROP FUNCTIONAL GENOMICS

TRANSLATIONAL RESEARCH PROJECT

- POSITIONAL CLONING

- TILLING

SEX DETERMINATION IN PLANT
Positional cloning project

- Cloning of Genes of Agronomic Importance from Crops
- Set up of Positional cloning platform
  - Marker identification
  - BAC library construction
  - Physical mapping and subcloning
  - Sequencing and annotation of BACS
- Transfer of the tools to INRA partners
Calls for gene of agronomic importance to be cloned

Set up of a positional cloning pipeline:
- HTP marker identification
- HTP genotyping protocol
- Genomic libraries construction

Funding & collaborations
Achievements:

- Positional cloning of the fruit shape, $fs2.2$, in melon (collaboration with M. Pitrat and C. Dogimont)
- Positional cloning of the sex determination loci, $a$ and $g$, in melon (collaboration with M. Pitrat and C. Dogimont)
- Positional cloning of the sex determination locus, $M$, in cucumber (collaboration Rafi Perl-Treves, Israel)
- Positional cloning of the fertility restorer locus, $Rfo$, in radish (collaboration with F. Budar, M. Renard and R. Delourme)
- Positional cloning of the PVY and TEV recessive R gene, $Pvr2$, in pepper (collaboration with C. Caranta and A. Palloix)
- Positional cloning of the MNSV R gene, $nsv$, in melon; ZYMV R gene, $zym$, in watermelon (collaboration with M. Pitrat and C. Dogimont; K. Shu Link, USDA)
- Positional cloning of powdey mildiou R gene, $Pmw$, A. gossypii R gene, $Vat$, in melon (collaboration with M. Pitrat and C. Dogimont)
- Positional cloning of the $Tendril$-less gene, $Tl$, in pea (collaboration with N. Ellis, JIC, UK)
- Positional cloning of 3 genes from A. thaliana required for miRNA pathway function (collaboration with O. Voinnet, CNRS, Strasbourg)
- Positional cloning of the iron uptake gene, $DGL$, in pea; acidity locus, $D$, in peach, P. capsici resistance QTL, $PhyP5$; Embryo transfer cells, $E2748$, Androecy, locus $A$, in cucumber.
TILLING in crop species

*Mutation diagnostic

*Mutant collections

*Integration

*Ambition
TILLING project

Production and management of large collections of chemically mutagenized plants and germplasms

Tools permitting a rapid and systematic identification of mutations in target sequences

Creation of interactive and evolving databases
Achievements

CROPTILLING tool
*Mutation diagnostic
The Endo1 system was set and is currently used by a number of INRA labs and Platforms.
An alternative system is required (The NGS to be tested).

*Mutant collections
Collaborative network to create and manage mutant collections was set.

*Integration
UTILLdb
Calls for genes to till/mutants to phenotypes

*Future development
Saturation mutagenesis: Exploitation of large mutant collections to engineer leader alleles in planta gene engineering
Plant sex determination:
Control of sex types for plant breeding
A model to explain sexual morphs in melon

Carpel

Stamen

CmWIP1 \(\rightarrow\) CmACS-7

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CmWIP1 \(\rightarrow\) CmACS-7\(^{A57V}\)

\(\text{♂}\) Carpel \(\longrightarrow\) Stamen \(\text{♀}\)

\(\text{♀}\) Carpel \(\longrightarrow\) Stamen \(\text{♂}\)

\(\text{♂}\) Carpel \(\longrightarrow\) Stamen \(\text{♀}\)

\(\text{♀}\) Carpel \(\longrightarrow\) Stamen \(\text{♂}\)

CmACS7/CsACS2/CitACS4

Cmacs7/Csacs2/Citacs4

CmWIP1

SAM

Forum Labos IJPB-URGV / March 17th 2011
Conclusions:

- Des plantes cultivées sont utilisées comme plantes modèles
- Plusieurs projets multidisciplinaires

Points à améliorer

- Les modules de signalisation entre espèces: identification et transposabilité
- L’introgression de caractères d’intérêt agronomique à partir des espèces apparentées et nettoyage des génomes: NGS dans tout cela
TRANSLATIONAL RESEARCH in the CFG group
Les modules de signalisation entre espèces

Comment tester efficacement ces modules de signalisation dans un contexte génétique donné?
Points à discuter

L’introgression de caractères d’intérêt agronomique à partir des espèces apparentées et nettoyage des génomes: NGS dans tout cela
Points à discuter

- La validation des données: (par TILLING/OGM, par dissection génétique....etc.)
- « Recherche translationnelle»: applications aux plantes d’intérêts
X \rightarrow y 
\textit{CmWIP1}

\textit{Carpel}

z 
\textit{CmACS-7}

\textit{Stamens}

s \leftarrow t