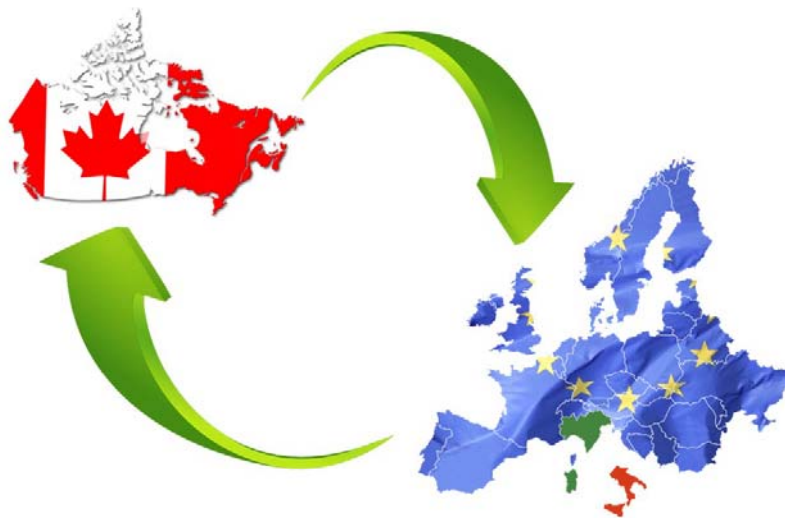


Innovation in food and nutrition: twinning activities in the CANADAIR Project

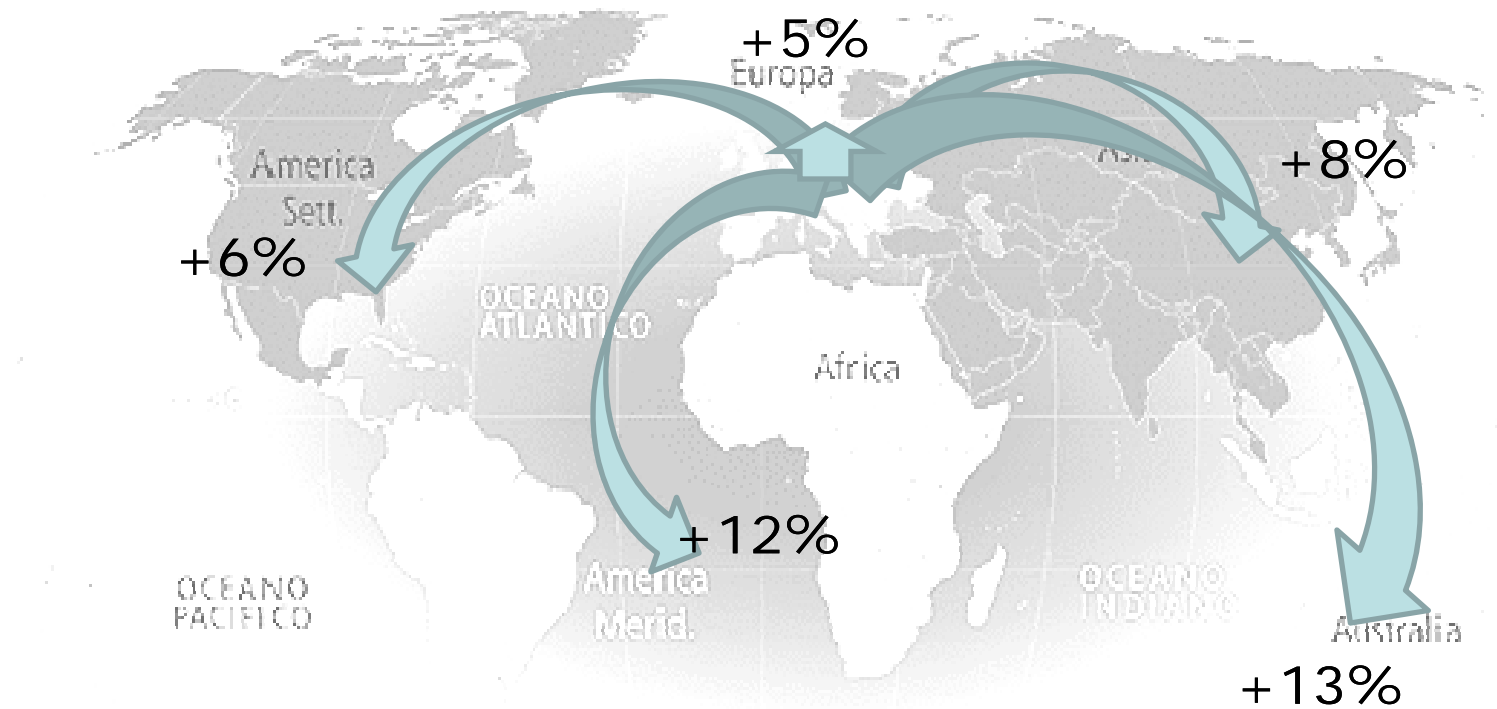
Elisabetta Lupotto

Consiglio per la Ricerca e la sperimentazione in Agricoltura

Roma, Italy



(source: ISTAT)



Value of the Italian agrofood export exceeded 33 MLD Euro in 2013





Olive oil 10%



Wine +8%



Fruits & Vegetables +6%



Pasta +4%

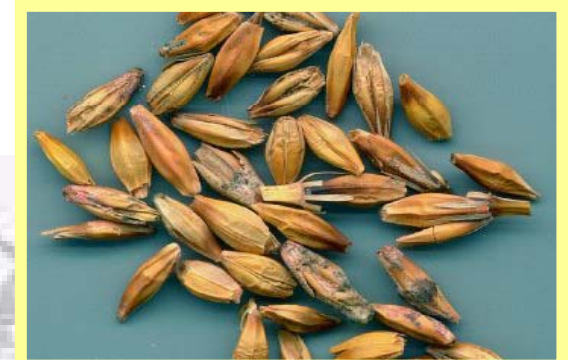
Italian agrofood export increase in 2013

Primary production and food
major concerns:

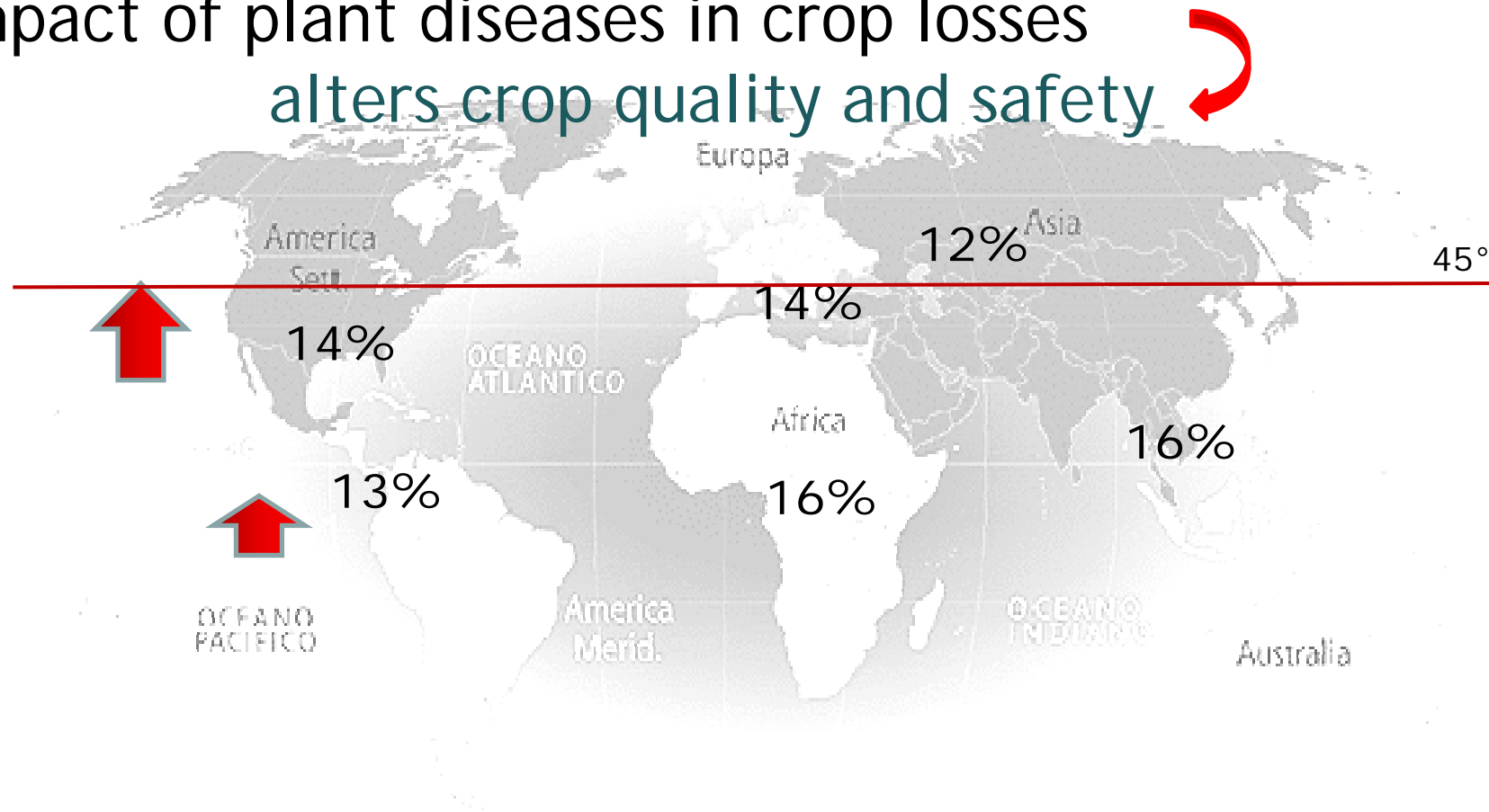
- Safety
- Quality
- Sustainability

Tailoring new varieties...

- Assure absence of biotic and abiotic contaminants
- Take into account the final use and technological value
- Best practices for best yield performance



Impact of plant diseases in crop losses
alters crop quality and safety



Global warming is more relevant
in the northern regions

International cooperation plays a pivotal role in helping the overall community to sustain agricultural production in terms of security, safety and quality

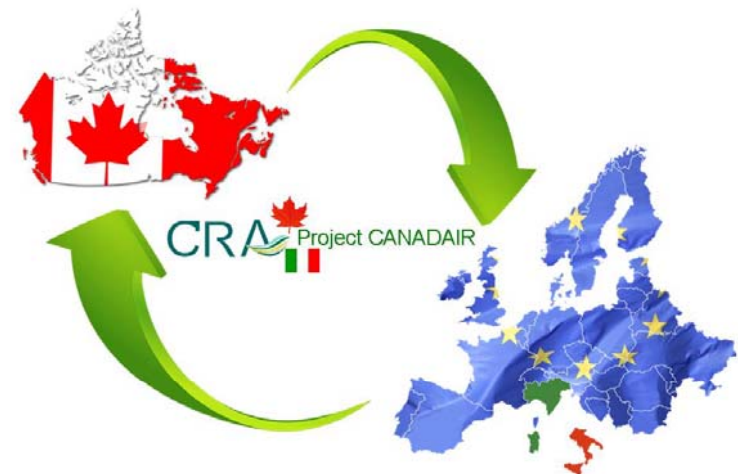
Project CANADAIR Twinning Italy-Canada activities in Research and Innovation in the Agro-Food Area



A project developed by the Italian Agriculture Research Council and Canadian institutions funded by the Italian Ministry of agriculture and forestry policies for the period 2012-2014

CANADAIR areas of research:

- ❖ **Food safety > WP1:** Advanced approaches for resistance improvement to mycotoxigenic fungi in relevant species, diagnosis and infection control
- ❖ **Food quality and human nutrition > WP2:** Implementation of dairy products with added bio-functional value.
- ❖ **Bio-energies > WP3:**
AGro ENERgy plants: *Arundo donax* and *Miscanthus x giganteus*



Cereals

The area of research related to plant and food safety – namely for detection and contrast to mycotoxigenic fungi in cereals maize and wheat by means of genetic and genomic tools represents the core of Worpakage 1



The project twinned research lines between CRA and AAFC in Ottawa and Guelph, and the University of Guelph, Ontario Agricultural College.



Analysis of the maize genetic variability for tolerance to
Fusarium spp. and/or to the mycotoxin accumulation (fumonisin)

Carlotta BALCONI (CRA-MAC, Bergamo)

Collaboration: Linda Harris, Agriculture and Agri-Food Canada,
Eastern Cereal and Oilseed Research Centre (ECORC), Ottawa

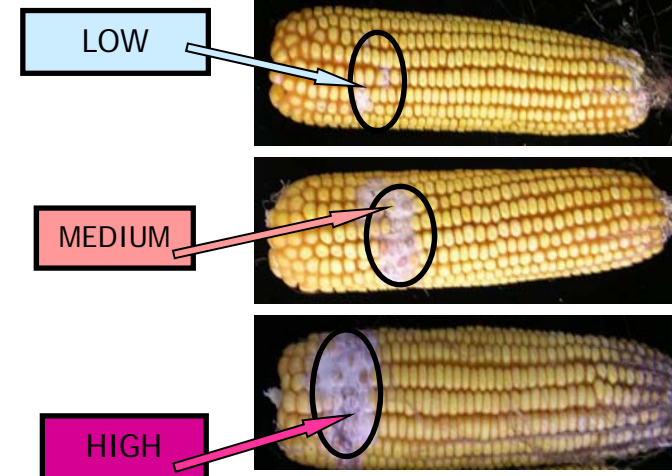


**Screening of MAIZE GERMPLASM through
artificial inoculation of kernels in the field**



(collaboration with Università Cattolica in Piacenza)

**EVALUATIONS: number of kernels with
infection at the inoculation point**



FUMONISIN CONTENT

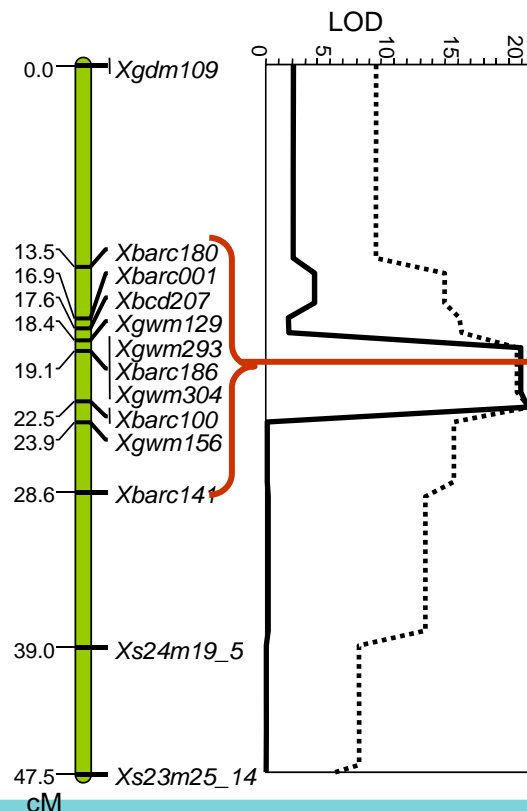
WP1.1 to WP1.9: improvement of resistance to *Fusarium graminearum* infection in wheat

Giampiero Valè (CRA-GPG)

Collaboration: Thérèse Ouellet, Agriculture and Agri-Food Canada, Eastern Cereal and Oilseed Research Centre (ECORC), Ottawa

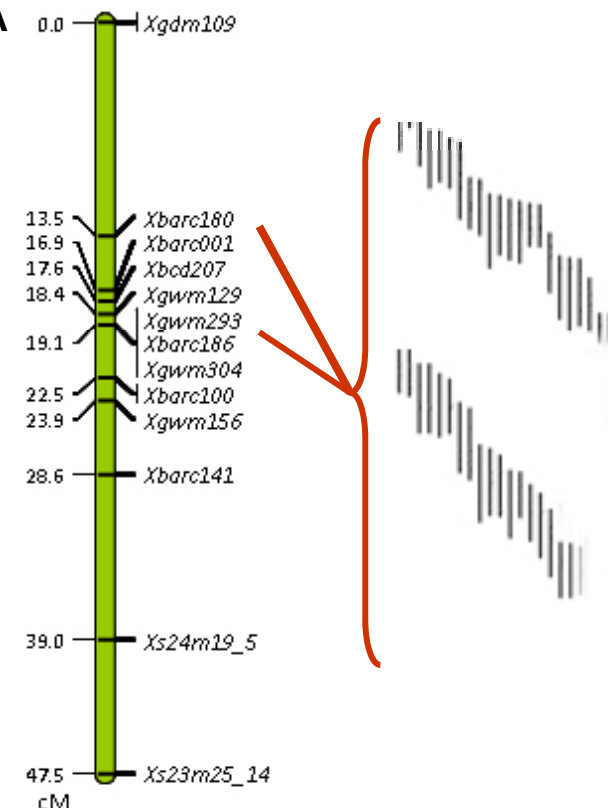


Chromosome 5A



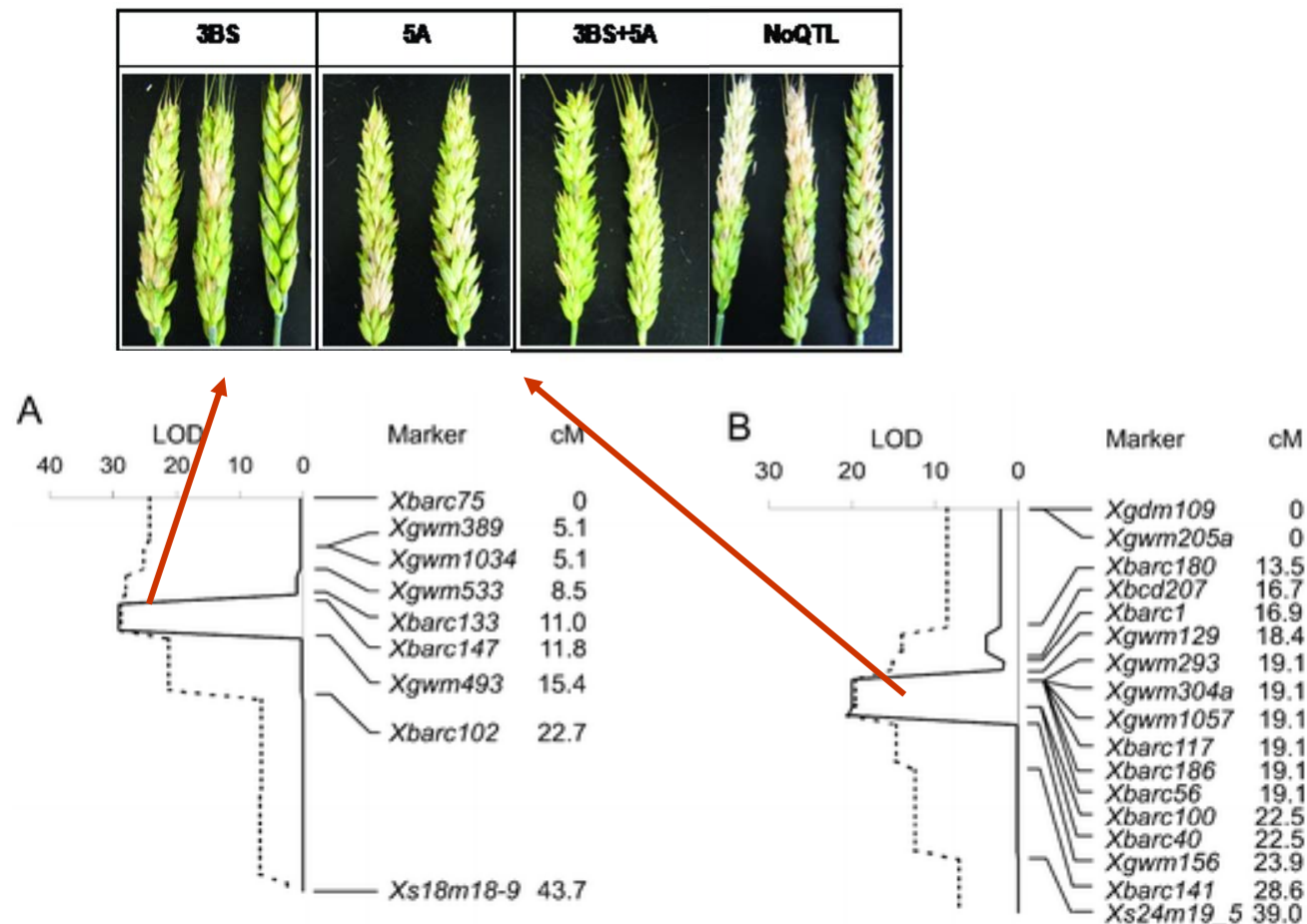
Identification of a DNA physical contig for the resistance gene genomic region

Screening of a 5AS-specific BAC library and identification of a physical contig of DNA sequences for FHB QTL



Introgression of the main QTLs associated with type II resistance on chromosome 3BS and type I resistance on chromosome on bread and durum wheat elite cultivars.

Kang et al., 2010



WP1.15 - Control of mycotoxigenic fungi by using biological antagonists (*Trichoderma* spp.)

Stefania Galletti (CRA-CIN, Bologna)

Collaborations:

Ting Zhou, Guelph Food Research Centre, Guelph,
Allen Xue, Eastern Cereal and Oilseed Research Centre (ECORC),
Agriculture and AgriFood Canada, Ottawa



A large collection of *Trichoderma* spp. is available at CRA-CIN (Bologna) *Trichoderma* spp. is a well known agent for biocontrol of plant pathogens



Mechanisms of control

Direct

Mycoparasitism
Production of
antifungal
metabolites

Indirect

Induction of resistance
Spatial and trophic
competition
Growth promotion

Dairy products: milk, cheese and derived products



- Top contribution to Italian agrofood export
- Value 15 MLD Euro (2013)
- Export increase in 2013 +5,8%

WP 2 Implementation of dairy products with added bio-functional value.

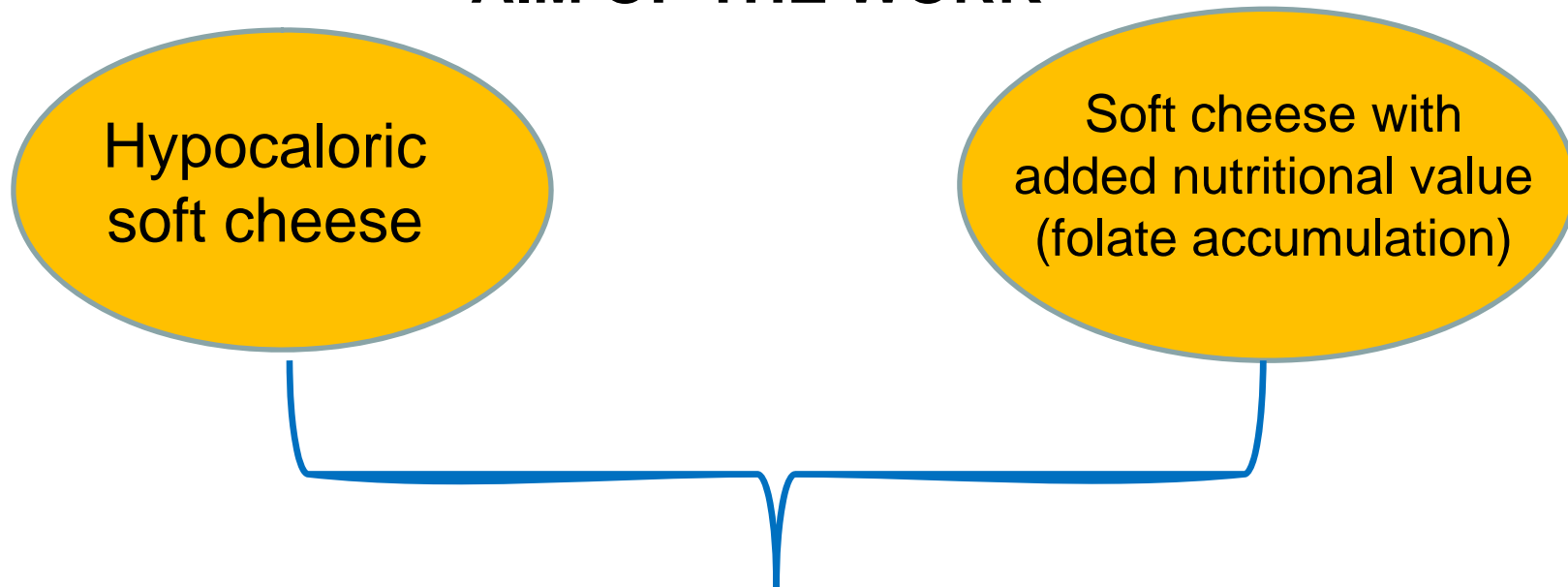
- a) Development of new cheese with enhanced **health-promoting value** (by the addition of bioactive molecules or by *in loco* synthesis by means of selected LAB starter cultures), possibly **dietary (low fat)**, with **pleasant** taste and able to satisfy the consumer expectations;
- b) Study of the microbiological characteristics and chemical composition of **donkey milk**, with particular reference to polyunsaturated fatty acids, protein fractions, and lysozyme content

Giorgio Giraffa, Flavio Tidona, Salvatore Francolino, Francesco Locci, Aurora Meucci, Lucia Monti, Domenico Carminati, Giovanna Contarini, (CRA-FLC, Lodi)

Milena Corredig - Department of Food Science, University of Guelph, Guelph, Canada

Development of innovative cheese

AIM OF THE WORK



Use of previously selected *S. thermophilus* strains

Strain selection – Search for *Streptococcus thermophilus* strains able to produce exopolysaccharides and folate in milk



Exopolysaccharides (EPS) produced in milk by lactic acid bacteria (LAB) have a fundamental role from both a technological and functional standpoint

EPS increase viscosity and stabilize the milk coagulum, thus avoiding whey separation. EPS may also increase taste of low-fat products

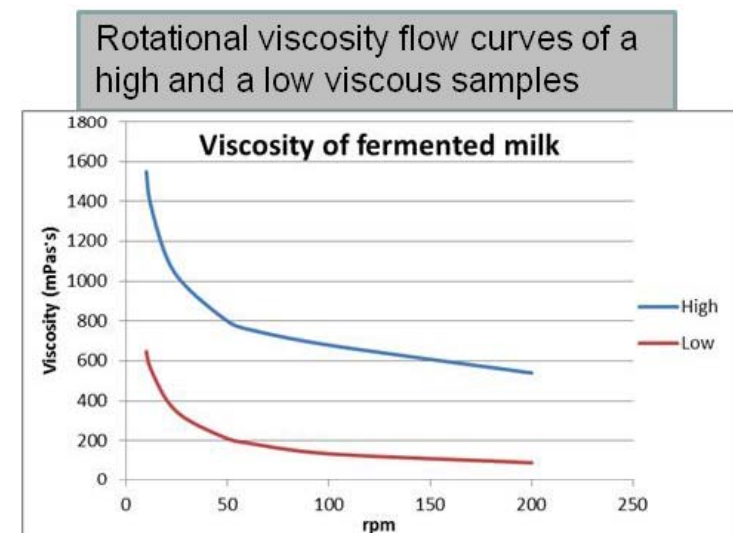


Natural accumulation of vitamins in foods by fermentation is a desired way to improve the nutritional value of products

Vitamin B9 (folate) is an essential component of the human diet; it is not present at high amounts in milk

Search for *Streptococcus thermophilus* strains able to produce exopolysaccharides and folate in milk

Best exopolysaccharides (EPS) producers increased viscosity in milk and accumulated between 84.4 ± 11.5 to 209.2 ± 38.4 mg/L EPS. Analysis of the EPS monomer composition revealed three heteropolysaccharides mainly composed of galactose, glucose and rhamnose at different molar ratios



Phenotypic screening

Best auxotrophic strains for folate produced a maximum amount of 40 µg/l vitamin in milk

Selection of folate-producing St strains by growth assays in a folate-free culture medium :
positive about 50%



Experimental fresh cheeses “crescenza type”

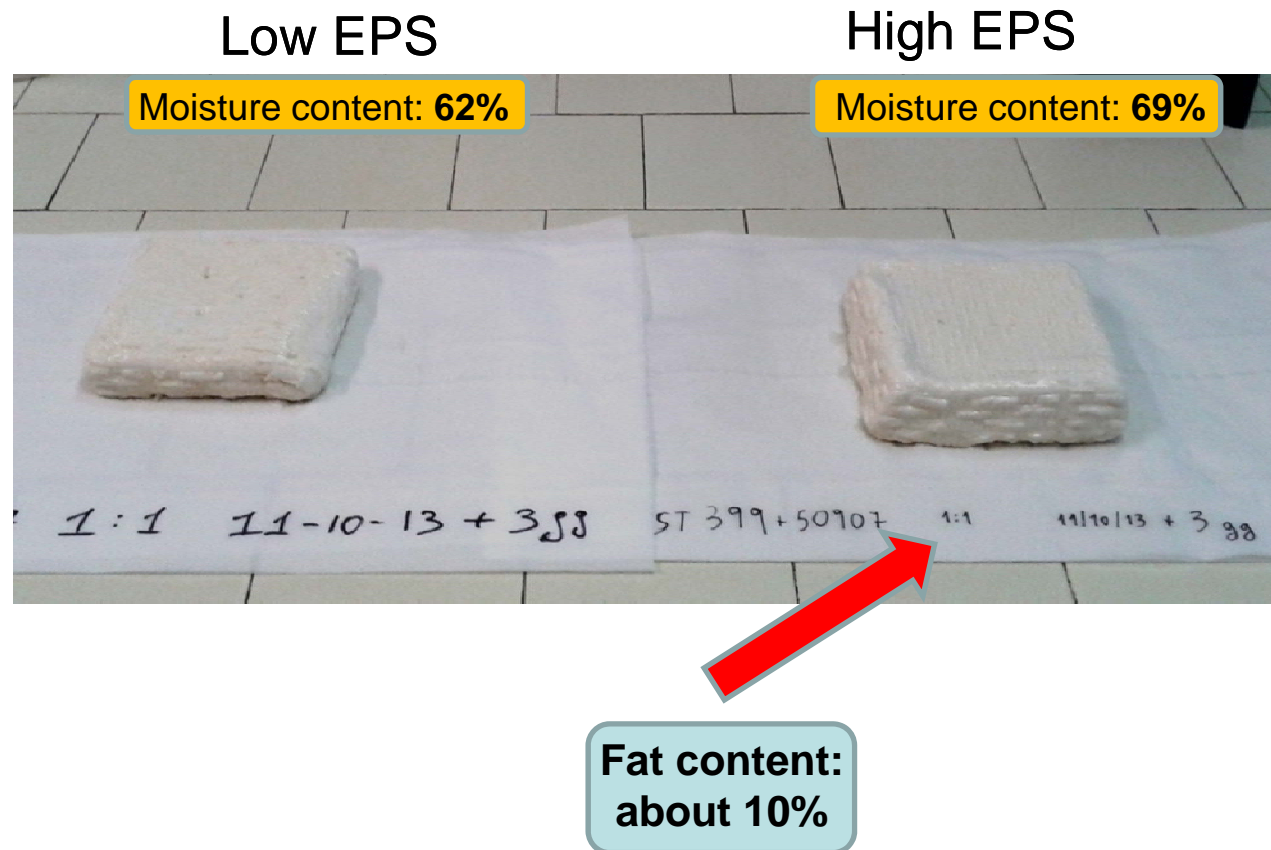
✓ Two series of rindless, crescenza-type, fat-reduced (with half skimmed milk) soft cheese were produced in a pilot cheese plant using as a starter cultures composed of a:

- EPS producer strain used with the aim to improve cheese texture;
- EPS + folate producer strain, with the second aim to bio-enrich cheese with the vitamin



- ❑ The functional product obtained was a low-calorie cheese with about 10% of fat, 17% of proteins and approx 70% of moisture
- ❑ The texture of the cheese was preserved and the low fat content was compensated by the EPS, which exerted a positive effect on mouth feel and cheese yield
- ❑ Pleasant mouth-feel and taste
- ❑ Natural enrichment of folic acid

Development of innovative cheese



Experimental fresh cheeses “crescenza type”

- ✓ This innovative cheese appears slightly creamy with pleasant sensorial characteristics and could meet the growing demands of consumers for healthier and low-fat products



Valorization of donkey milk



WP 2.2 - Activity 1

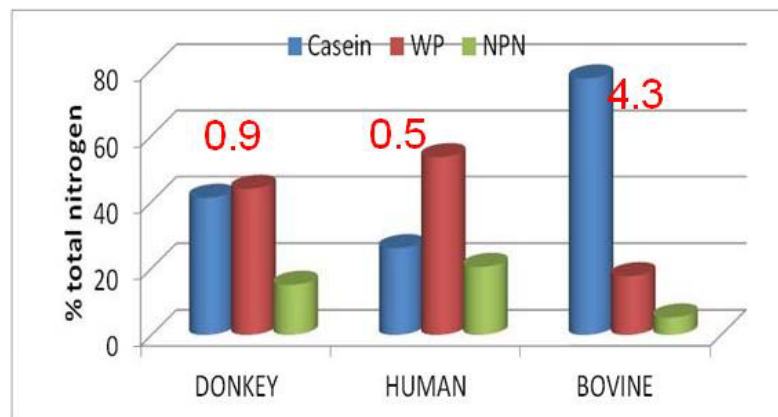
To study the microbiological characteristics and chemical composition of donkey milk, with particular reference to polyunsaturated fatty acids, protein fractions, and lysozyme content

	Samples	Period
Bulk	Bulk milk of different breeds	Febr., March, May, Sept.
R	Bulk milk of Romagnolo breed	Febr., June, Sept.
MF	Bulk milk of Martina Franca breed	Febr., June, Sept.



Valorization of donkey milk

	Bulk		MF		R		HUMAN	BOVINE
(g/100g)	Mean	SD	Mean	SD	Mean	SD	range	range
Protein	1.64	0.08	1.74	0.17	1.79	0.08	0.90-1.70	3.10-3.80
Lactose	6.80	0.17	6.86	0.21	6.81	0.04	6.30-7.00	4.40-4.90
Fat	0.55	0.28	0.52	0.24	0.30	0.09	3.50-4.00	3.50-3.90
Ash	0.35	0.04	0.38	0.04	0.42	0.04	0.20-0.30	0.70-0.80
Citric (mg%)	120.2	18.1	122.8	11.6	150.4	15.7	50.2-87.4	140.1-196-2
Lactic (mg%)	16.9	6.4	10.3	3.3	14.5	8.1	7.0-15.1	110.5-141.3



Gross chemical composition closer to human milk, with a low protein and ash and a high lactose content.

Fat content remarkably low but with a unique composition.

Casein much lower and WP higher than ruminant milk

Hypoallergenicity: low CAS/WP ratio

Potential nutritional significance: NPN higher than ruminant milk



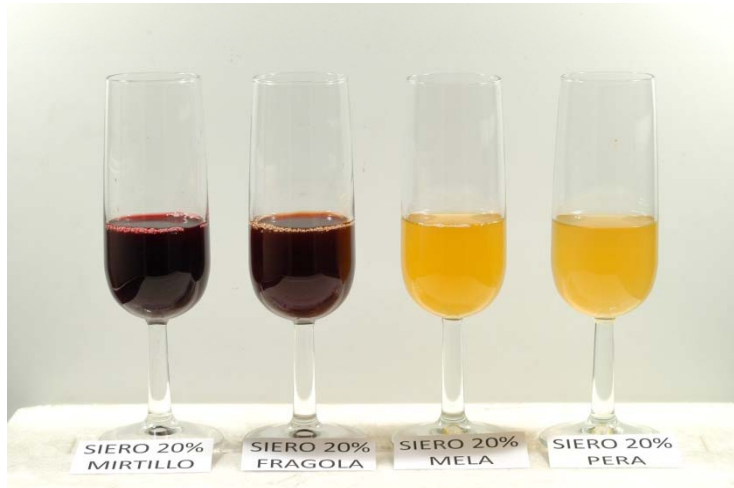
Valorization of donkey milk



WP 2.2 To formulate fermented milks, enriched with biofunctional LAB (or LAB isolated from WP 2.1), to join the useful dietary and nutritional properties of donkey milk to the expected health benefit functions of these microorganisms (*in progress*)

Fruit-based whey-supplemented fresh beverages:

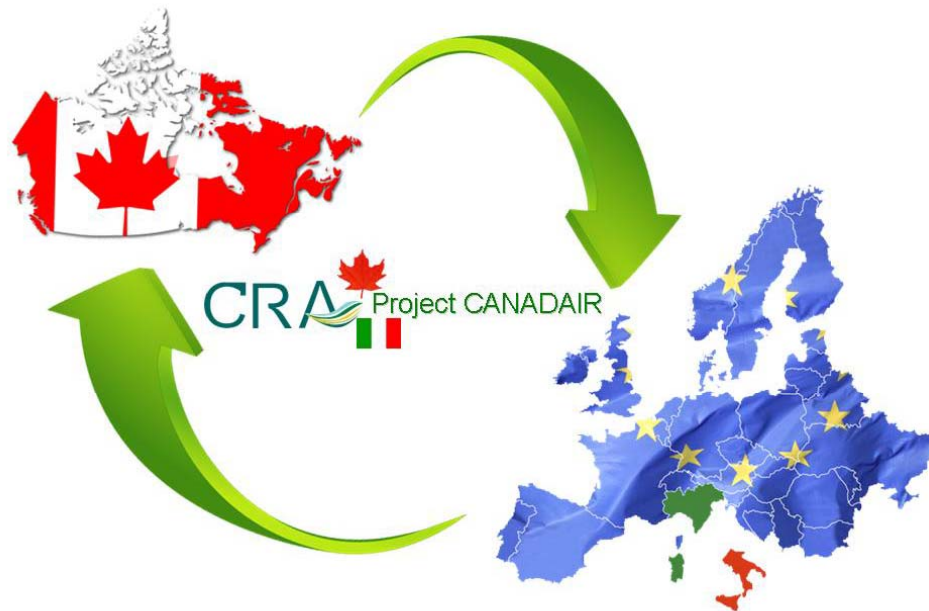
Milk-byproducts valorization and Food innovation



**Mix whey + fruit
extracts: berries,
pear, apple**

Tiziana Cattaneo CRA-IAA, Milano

Project CANADAIR thanks for your attention!



Thanks to CRA colleagues :

Giorgio Giraffa (CRA-FLC)
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Domenico Carminati (CRA-FLC)
Flavio Tidona (CRA-FLC)
Giovanna Contarini (CRA-FLC)
Tiziana Cattaneo (CRA-IAA)
Anna Rizzolo (CRA-IAA)
Carlotta Balconi (CRA-MAC)
Hans Hartings (CRA-MAC)
Rita Redaelli (CRA-MAC)
Sabrina Locatelli (CRA-MAC)
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Anna Mastrangelo (CRA-CER)
Pasquale De Vita (CRA-CER)
Roberto Papa (CRA-CER)
Gianni Tacconi (CRA-GPG)
Paolo Bagnaresi (CRA-GPG)
Primetta Faccioli (CRA-GPG)
Luigi Cattivelli (CRA-GPG)
Giampiero Valè (CRA-GPG)
Alessandro Tondelli (CRA-GPG)
....and others!