



Project no.: **036318**

Project acronym: **OPTIM'OILS**

Project title: Valorisation of healthy lipidic micro-nutrients by optimising food processing of edible oils and fats

Instrument: Specific Targeted Project

Thematic Priority: Food quality and safety

FINAL PUBLISHABLE EXECUTIVE SUMMARY of the OPTIM'OILS Project

Start date of project: 01/09/2006

End date of project : 28/02/2010

Duration: 42 months

Project coordinator name: Anne ROSSIGNOL CASTERA

Project coordinator organisation name: ITERG

Publishable executive summary

Valorisation of healthy lipidic micro-nutrients by optimising food processing of edible oils and fats



www.optimoils.com

OPTIM'OILS CONSORTIUM

OPTIM'OILS was coordinated by the French Institute for Fats and Oils, ITERG (Pessac, France, www.iterg.com). The consortium was composed of 14 partners, including 9 RTD performers, 1 Food Association and 4 industrials.

Institut des Corps Gras	ITERG	France
The Swedish Institute for Food and Technology	SIK	Sweden
Centre de recherche et d'expérimentation sur les Oléagineux	CREOL	France
Asociación de Investigación de la Industria Agroalimentaria	AINIA	Spain
Istituto superiore di Sanità- Section of Food Science, Nutrition and Health	ISS	Italy
Ecole Nationale Supérieure des Industries Agricoles et Alimentaires	ENSIA	France
Instituto de Biología Experimental e Tecnológica	IBET	Portugal
Centre de Recherche en Nutrition Humaine	CRNH	France
Faculté Universitaire des Sciences Agronomiques de Gembloux	FUSAGx	Belgium
UNILEVER	UNILEVER	The Netherlands
LESIEUR	LESIEUR	France
LESIEUR-CRISTAL	LC	Morocco
Ets ABDELMOULA	ABDEL	Tunisia
Association de Coordination Technique pour l'Industrie Agro-alimentaire	ACTIA	France

The project includes 7 WPs, 47 tasks, 443 men-months during 3,5 years and was finished in march 2010. A leaflet and a poster, the main results and the publications are available on the website www.optimoils.com.

OPTIM'OILS OBJECTIVE

The objective of OPTIM'OILS project was to develop new vegetable oils richer in natural micronutrients that have a positive effect on the prevention of the cardiovascular risk: phytosterols, tocopherols, phenols, phospholipids and Co-Enzyme Q10.

The OPTIM'OILS concept is an optimization of the traditional industrial process to get softer technological ways, more respecting the micronutrients' content and the quality and nutritional value of the oil, and being more respectful of the environmental impact.

OPTIM'OILS METHODOLOGY

OPTIM'OILS project adopted a methodological approach coupling analytical, technological, environmental, nutritional and food aspects:

- **Analytical objectives**

OPTIM'OILS aimed to develop or improve and validate analytical methodologies for analysing the 5 micro-nutrients: phospholipids, tocopherols, phenolic compounds, sterols and Co Enzyme Q10, in different products: seeds, crude and refined oils, gums and deodistillates, from 3 oilseeds : soybean, sunflower and rapeseed.

- **Technological & environmental objectives**

OPTIM'OILS aimed to test crushing and soft-refining conditions to can get optimised edible oils with higher levels of micro-nutrients with good sensorial quality and safety. In parallel, the environmental impact of the new optimised process was studied in comparison with the traditional ones. Another explored possibility was an *in-situ* valorization of some by-products naturally rich in micro-nutrients.

- **Nutritional objectives**

By using animal and human nutritional studies, OPTIM'OILS aimed to demonstrate that the micro-nutrients present in natural and synergistic form in edible oils, in nutritional amounts, have a real physiological interest for the prevention of cardiovascular risk and this, in complement of the beneficial role of poly-unsaturated fatty acids omega 3 & omega 6. Measure of bioavailability will be carried out as well as measure of dose-effect on various biomarkers of the cardiovascular risk.

- **Food applications objectives**

OPTIM'OILS proposes a Food Reverse Engineering approach, taking into account the impact of the industrial and culinary uses of healthy optimised oils on their micro-nutrients content. The operations tested were emulsification for sauces, crystallization for margarines, pan and deep frying and oxidation stability during storage.

- **Innovation objectives**

OPTIM'OILS can give process innovation with the proposition of some new processes softer and more respectful of the natural nutrients.

OPTIM'OILS can propose in the European market, new native optimised "healthy oils"; validated on the sensory, quality, storage stability, industrial and culinary processing, as well as for cost and safety, that will bring an added value to the consumer health.

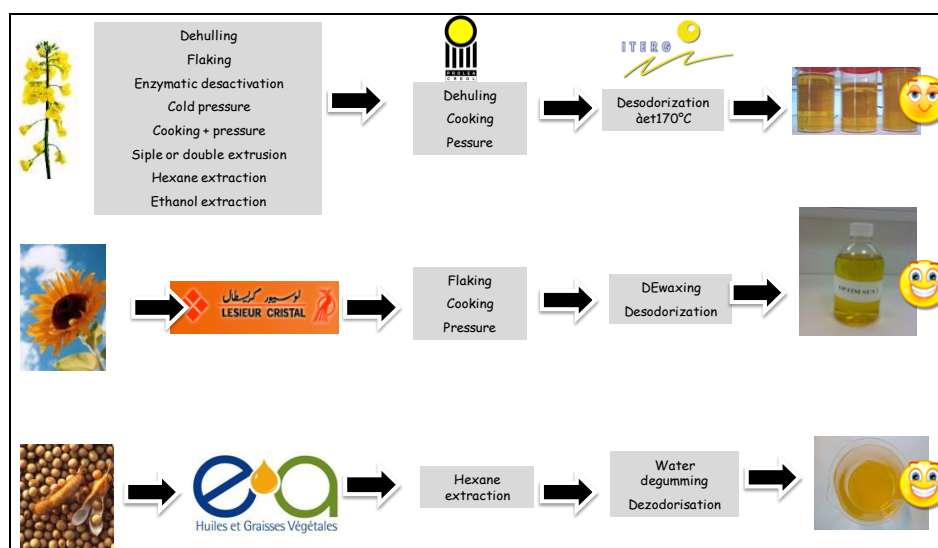


OPTIM'OILS RESULTS

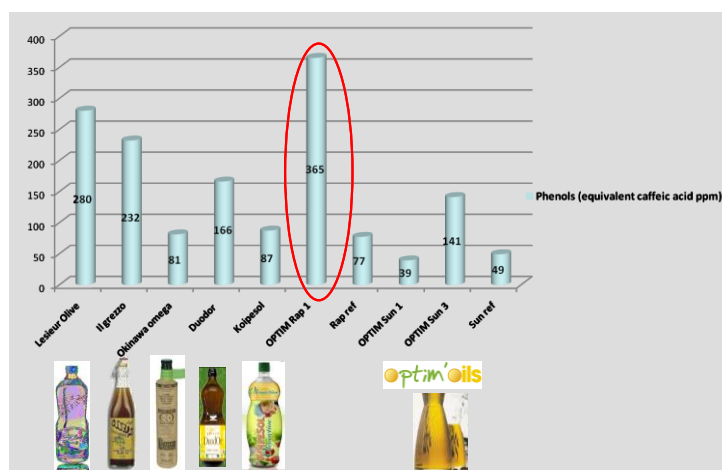
The crushing and refining conditions are optimized for rapeseed, sunflower and soybean oils to get and keep significant higher levels of micronutrients compared with the levels in the classical totally refined oils (+ 20 % to + 100 %).

- for rapeseed oil : the crude rapeseed optim'oil, is obtained by dehulling + cooking + pressure and the final rapeseed optim'oil is just soft deodorized at 170°C.
- for sunflower oil : the process chosen by lesieur cristal is flaking + cooking + pressure and then dewaxing + soft-deodorization to obtain the final optimised sunflower oil.
- for soyabean oil : after classical crushing, ets abdelmoula proposed to keep a water degumming to eliminate the lecithin (mucilage) before a soft deodorization.

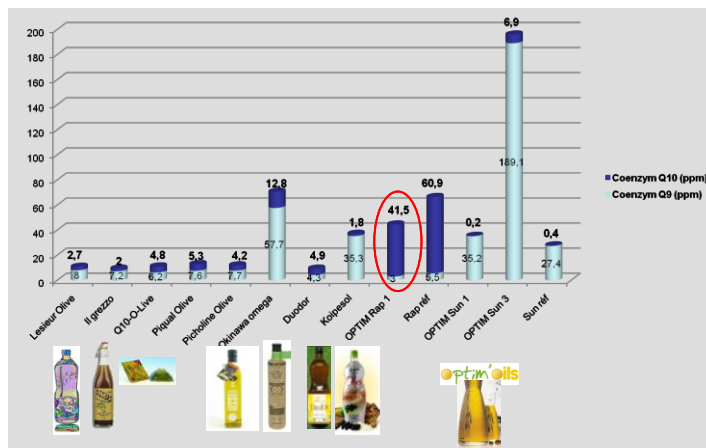
For all the 3 optimised processes, we concluded that some steps of classical crushing and refining can be suppressed; consequently the cost of production is reduced. In parallel, the quantity of by-products and co-products is also reduced. On the other hand, the sensorial quality of the sunflower and soybean optimoils is good for industrials and acceptable for consumers (color, limpidity, odor, taste), but the taste of the rapeseed optim'oil keep strong.



The levels of micronutrients are significantly higher in optim'oids compared with commercial refined oils or even virgin or enriched oils.

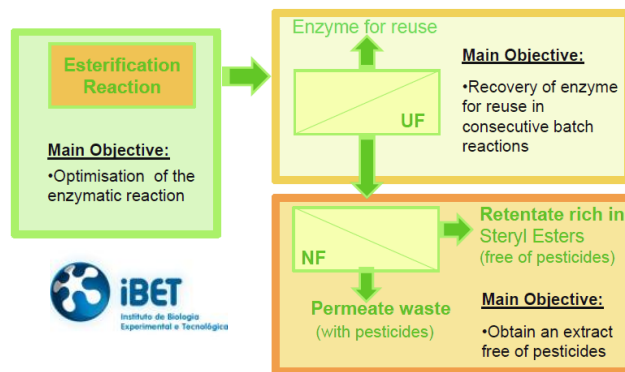


Levels of phenols in different sunflower and rapeseed optim'oids compared with some commercial oils
In red : an rapeseed optim'oil obtained by mechanical crushing



Levels of Co-Enzyme Q9 & Q10 in different sunflower and rapeseed optim'oils compared with some commercial oils
In red : an rapeseed optim'oil obtained by mechanical crushing

The process of the optim'oils is more in respect of environment with a reduction of the by-products generation and of the energy consumption. In parallel, an innovative approach for the valorization of the deodistillate obtained as the unique by-product during the deodorization step, is proposed. It involves an "in-situ" enzymatic esterification of the free sterols with the free fatty acids, coupled with a nano filtration, to obtain a fraction rich in steryl esters (patented process of IBET).



Following a correct selection and storage of the raw material (seeds), the optim'oils are in conformity with the European Regulation and Codex Alimentarius for their quality parameters (colour, acidity, oxidative level) and for the safety specifications. They can be used in different food applications: cooking, pan frying, sauces, margarines...

Lesieur

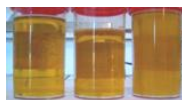
ITERO

ainia
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des sciences agronomiques

Unilever



Some optim'oils...more stable during storage



...more stable during pan frying



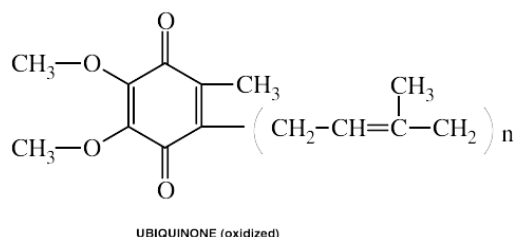
...with effect of phospholipids during emulsification (sauces)



... with effect of phospholipids during crystallization (margarines)

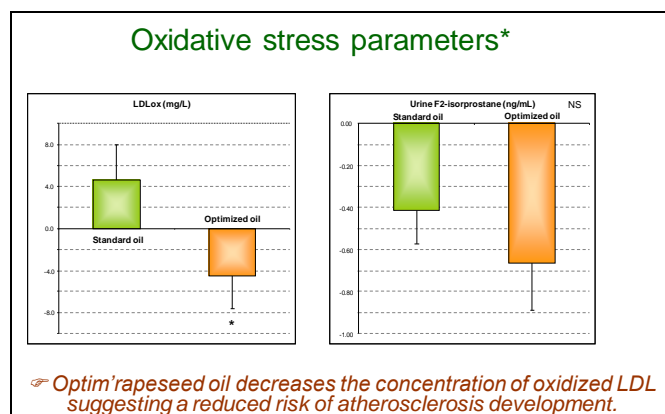
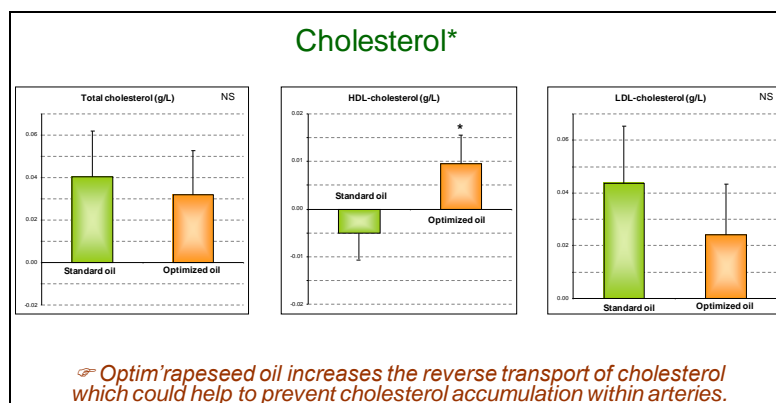
The most innovative oily micronutrients studied in the project are the phenolic compounds and the Co-Enzyme Q10 or ubiquinone.

For the both, a new analytical method is now available for oils, seeds and by-products. The phenolic compounds are good antioxidants in oils, in synergistic action with tocopherols and are able to protect poly-unsaturated fatty acids during storage and culinary applications (sauces, cooking, pan-frying).



A study on animal model has demonstrated a positive effect of different sunflower, soybean and rapeseed optim'oils richer in micronutrients, on different biomarkers of the oxidative stress.

A long term clinical study showed that a rapeseed optim'oil enriched with antioxidants can protect human lipids from peroxidation and therefore seems to reduce the risk of cardiovascular disease.



These first interesting results must be validated in further projects and the future marketing, labelling and regulation status of the optim'oils must be more studied. The optim'oils can be defined as natural and native oils. The price of the optim'oils should be intermediate between the price of virgin oils and the price of refined oils.

