



**EL PARTNER  
TECNOLÓGICO**

**LEITAT** | **Technological  
Center**  
managing your technologies member of **TECNIO**  
Be tech. Be competitive

## **Horizonte PYME LIGHTCLEAN**

**Results**

**April 2016**



## TEST A: Radiation + Chemical analysis

### Experimental conditions

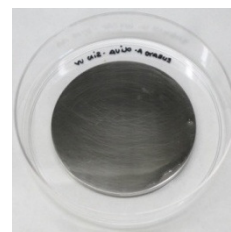
Sample	UV exposure time (h)
Disk 1	Without exposure
Disk 2	6
Disk 3	24
Disk 4	48
Disk 5	72

**Wavelength:** 360-370 nm

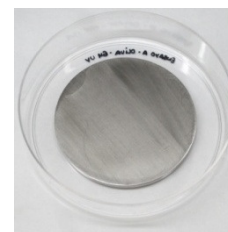
**Radiation:** 5-10 mW/cm<sup>2</sup>

**Stainless steel AISI304**

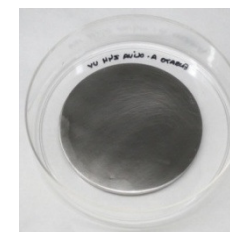
**Amount:** 500 mg of fried fat



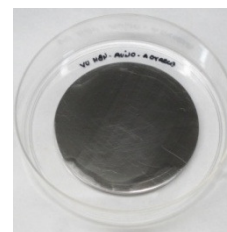
Disk 1



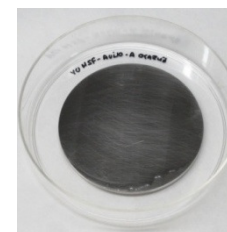
Disk 2



Disk 3



Disk 4



Disk 5



- IR
- GPC
- GC-MS



## TEST B: Radiation + Weight control (Gravimetric)

### Experimental conditions

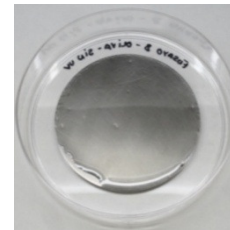
**UV exposure time:** 96 hours

**Wavelength:** 360-370 nm

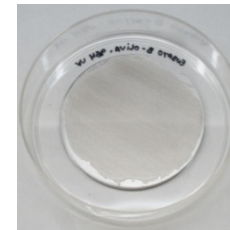
**Radiation:** 5-10 mW/cm<sup>2</sup>

**Stainless steel AISI304**

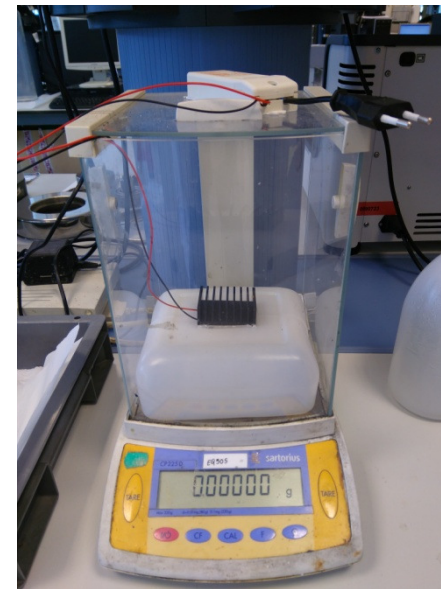
**Amount:** 500 mg of fried fat

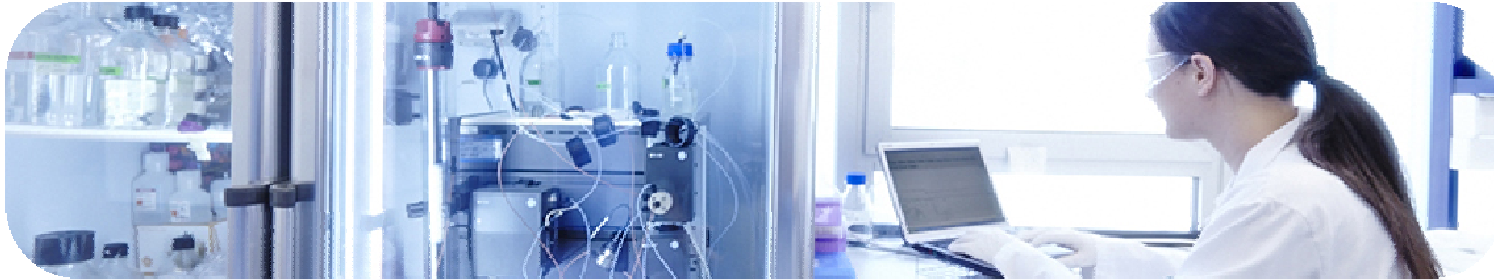


0 hours



96 hours





### TEST C: Range hood + Weight control (Gravimetric)

#### Experimental conditions

**Frying time:** 1 hour every day, over 4 days

**UV exposure time:** 23 h a day, over 4 days

**Wavelength:** 360-370 nm

**Radiation:** 0,9 - 1,0 mW/cm<sup>2</sup>

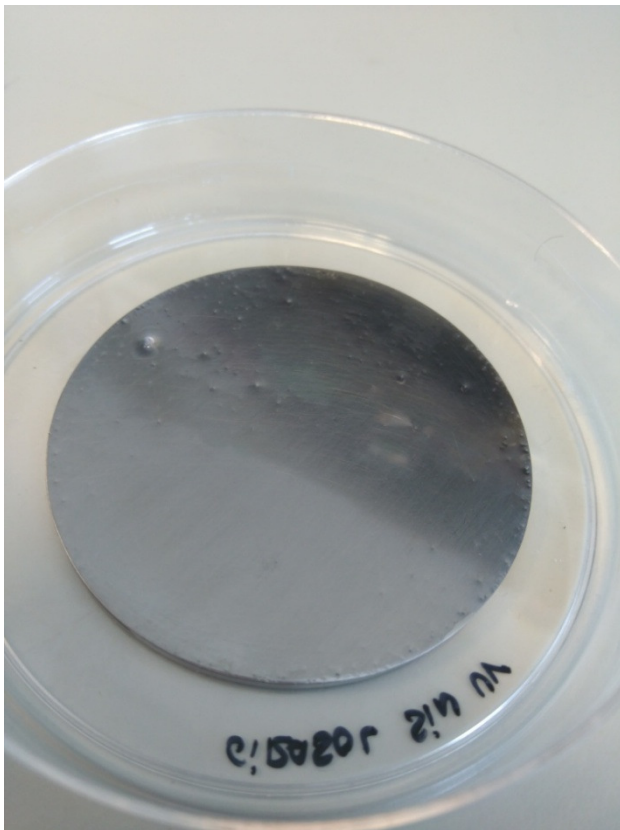
**Stainless steel AISI304**



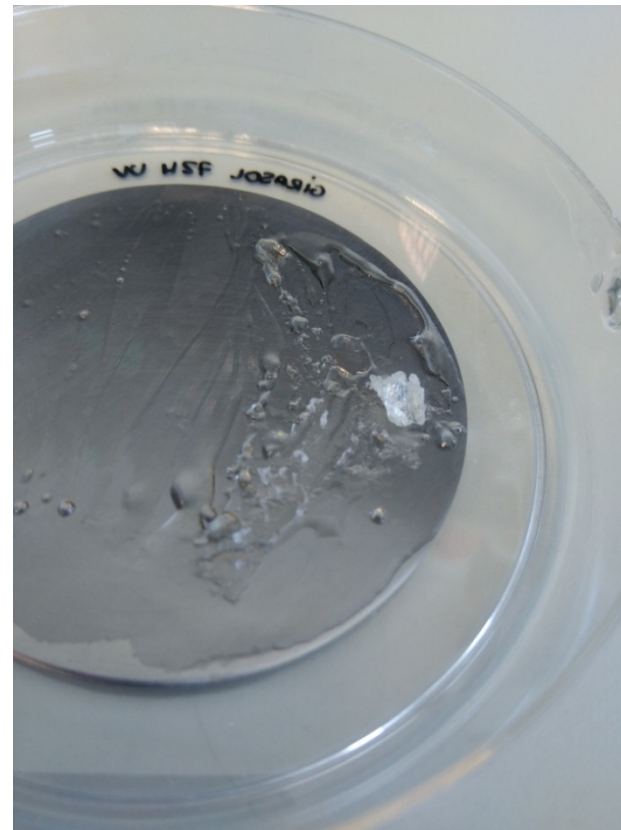


### TEST A (Radiation + Analysis): Results

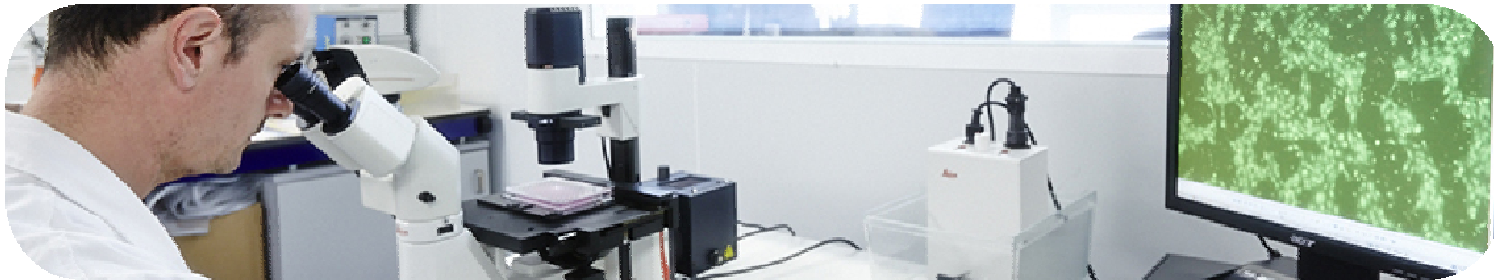
**Appearance:** A gelatinous film is formed



Sunflower oil (without radiation)

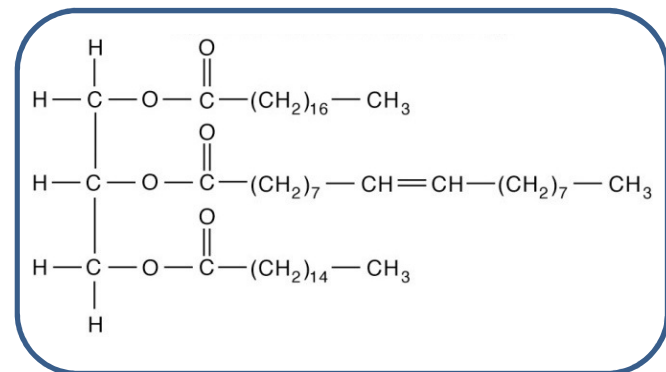
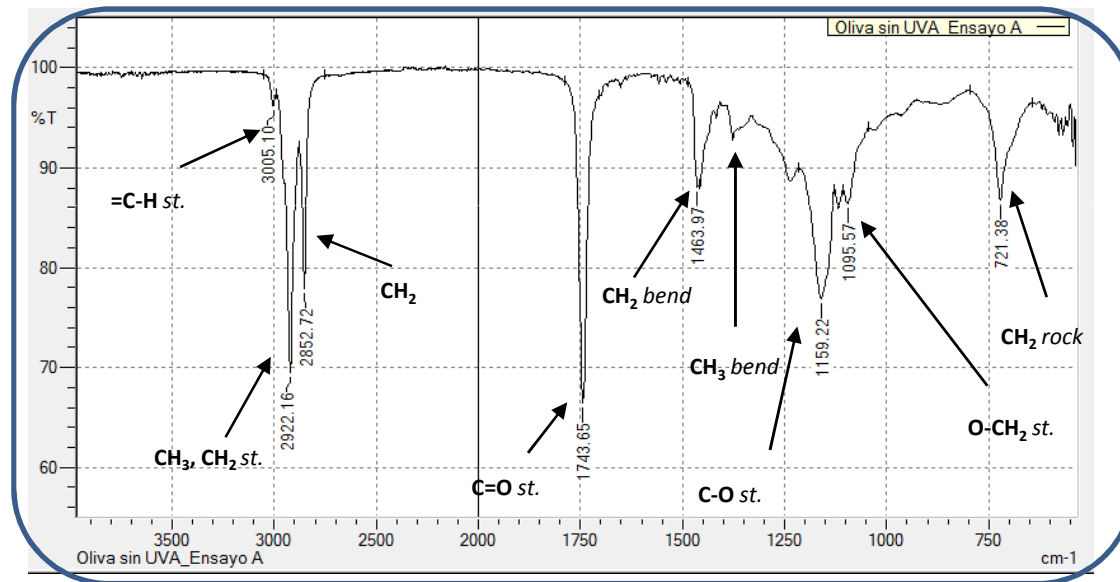


Sunflower oil (72 h radiation)

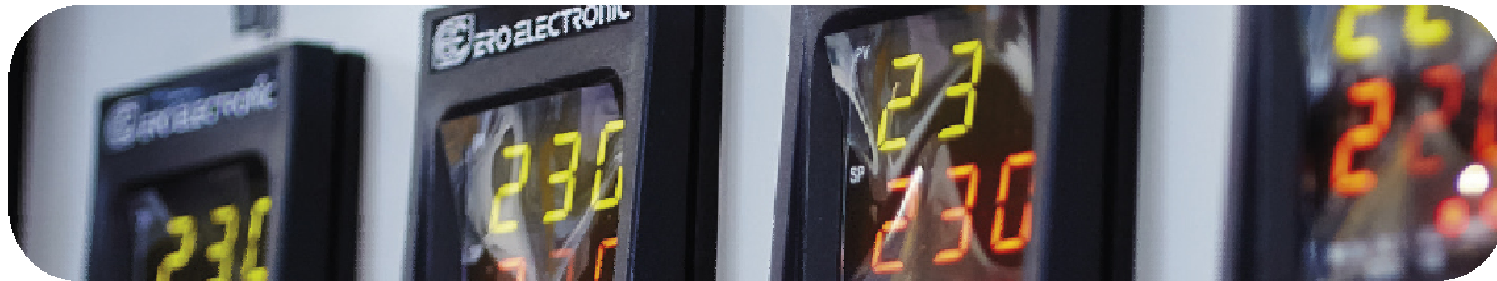


## TEST A (Radiation + Analysis): Results

### IR: Triglycerides identification bands



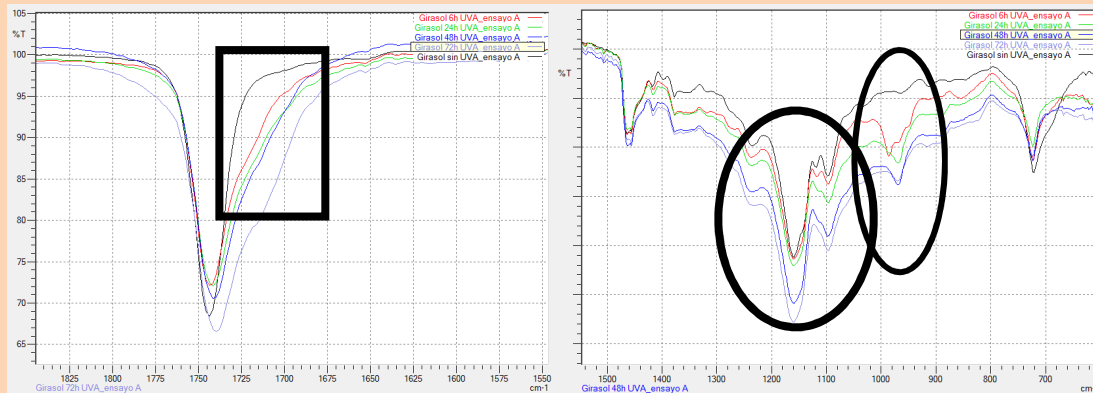
Triglycerides



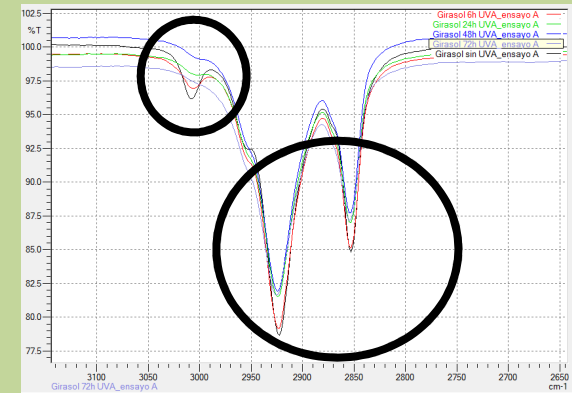
## TEST A: Results

### IR: Evolution of triglycerides IR bands during radiation

- Split of carbonyl band ( $C=O$ )
- New bands of  $O-O$  bonds
- Increase of  $C-O$  and  $O-CH_2$  bands



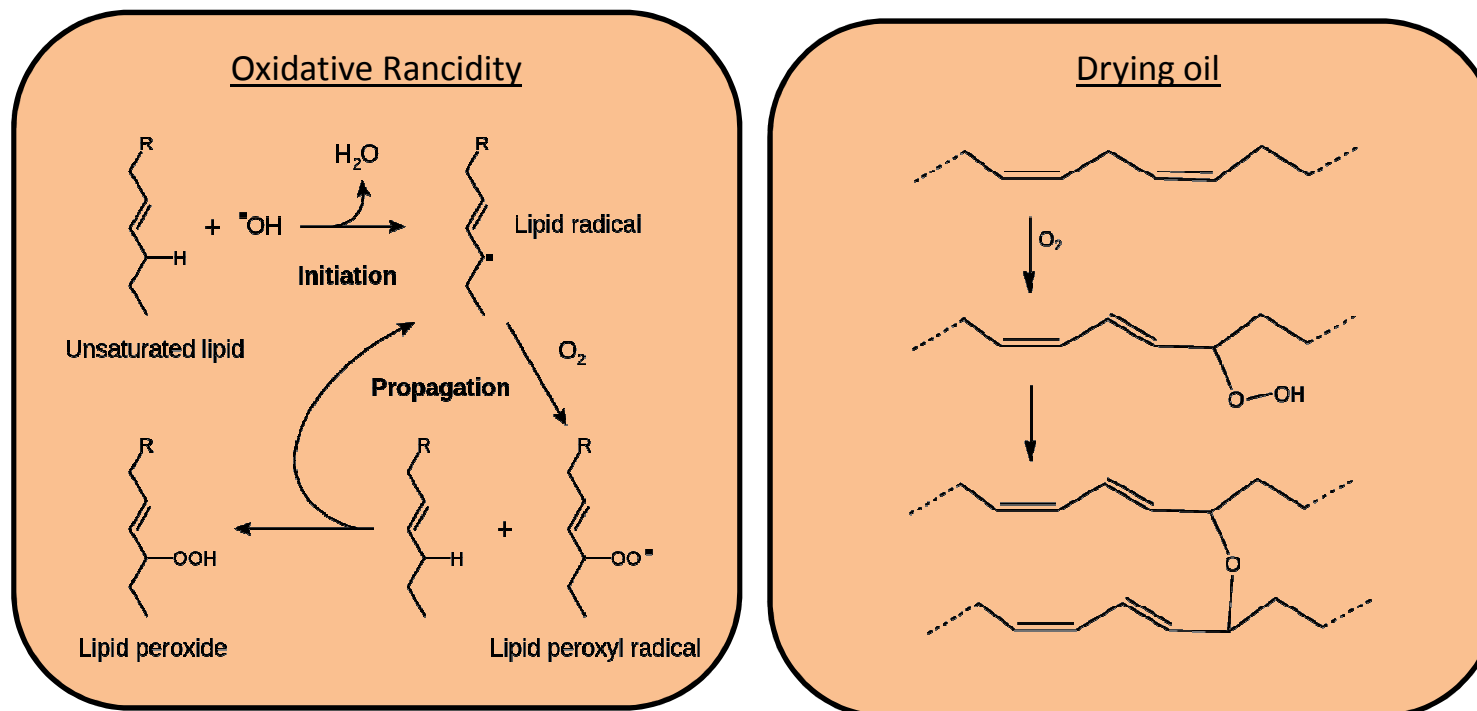
- Decrease of  $C=C$  bands
- Decrease of  $CH_3$  and  $CH_2$  bands

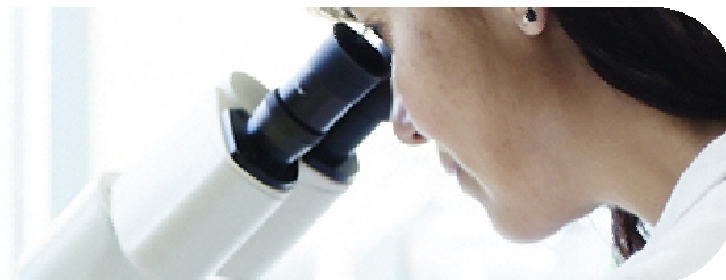
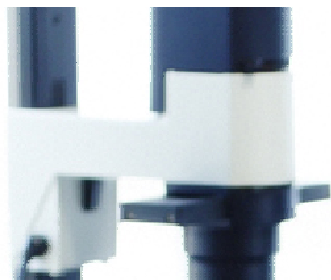




## TEST A (Radiation + Analysis): Results

**IR summary:** A possible reaction between oxygen and triglycerides (oxidative rancidity or drying oil)

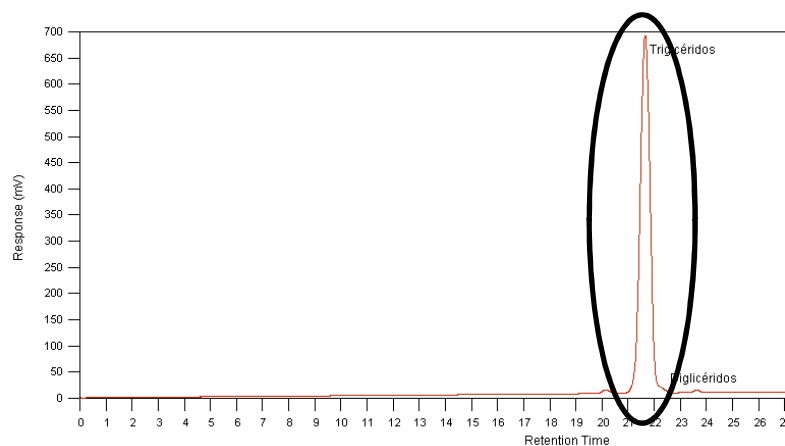




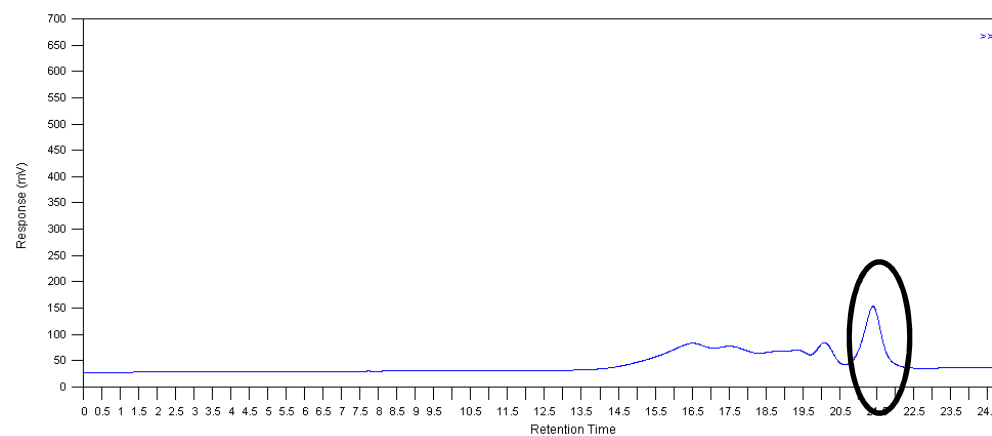
## TEST A (Radiation + Analysis): Results

GPC: Decreased triglycerides

Sample	Molecular Weight	% Triglycerides				
		Initial time	6h of UV	24 h of UV	48h of UV	72 h of UV
Sunflower oil	1268	98,79	53,56	33,43	15,35	25,85
Olive oil	1111	98,47	88,49	69,17	63,26	62,80
Corn oil	1148	99,56	89,66	28,87	22,60	23,50
Lard	1372	99,53	90,79	71,71	67,17	60,53



Sunflower oil (without radiation)



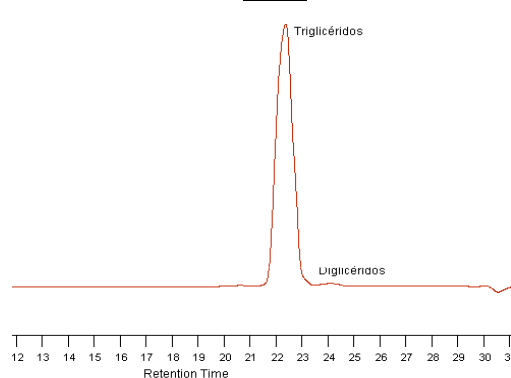
Sunflower oil (72 h radiation)

LEITAT

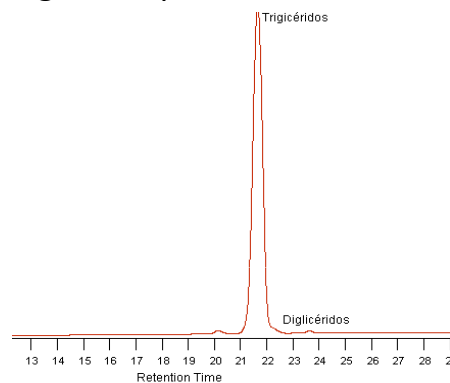


## TEST A (Radiation + analysis): Results

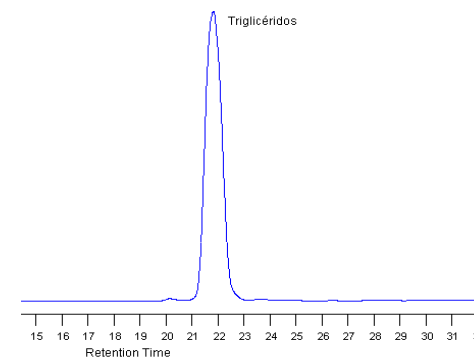
### GPC: Formation of new larger compounds



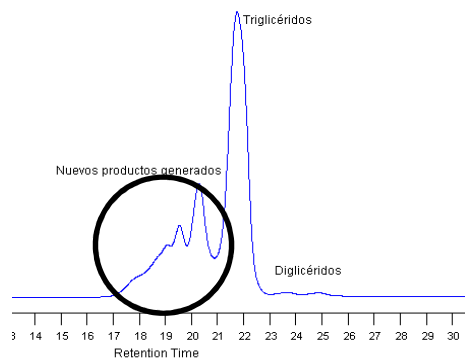
**Olive Oil  
(without radiation)**



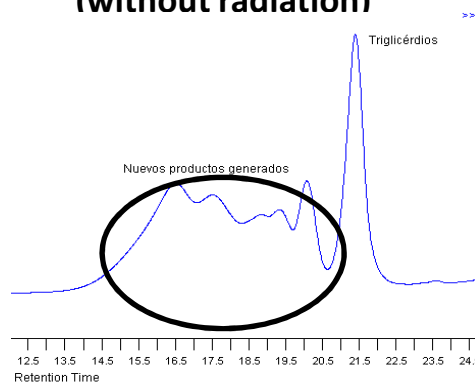
**Sunflower Oil  
(without radiation)**



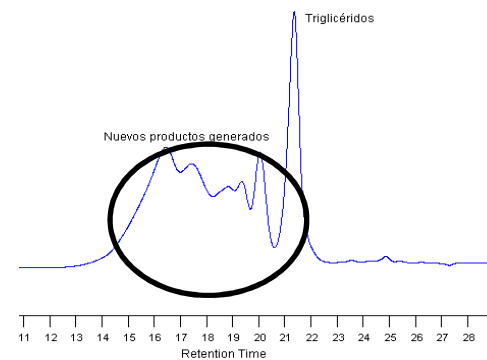
**Lard  
(without radiation)**



**Olive Oil  
(72 h radiation)**



**Sunflower Oil  
(72 h radiation)**

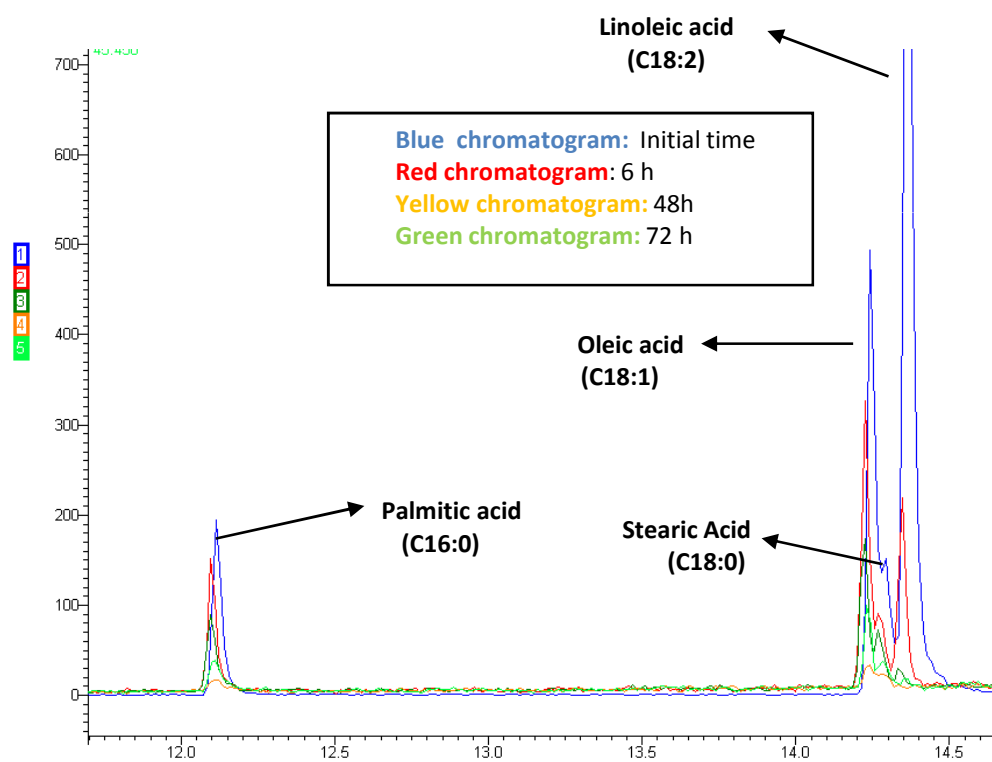


**Lard  
(72 h radiation)**



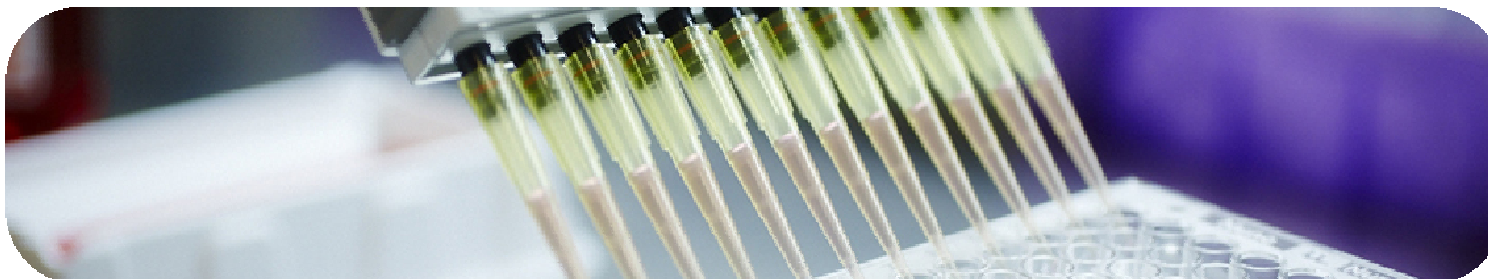
## TEST A (Radiation + Analysis): Results

### GC-MS: Decrease of fatty acids



Sunflower oil	Decrease of fatty acids %			
Time of radiation (h)	C16:0	C18:1	C18:0	C18:2
Without radiation	10	21	6	62
6 h	10	19	6	14
24 h	4	7	3	1
48 h	1	2	1	1
72 h	3	4	2	1

Olive oil	Decrease of fatty acids %			
Time of radiation (h)	C16:0	C18:1	C18:0	C18:2
Without radiation	19	51	9	21
6 h	25	54	13	22
24 h	28	55	13	3
48 h	21	34	10	0
72 h	26	38	14	0

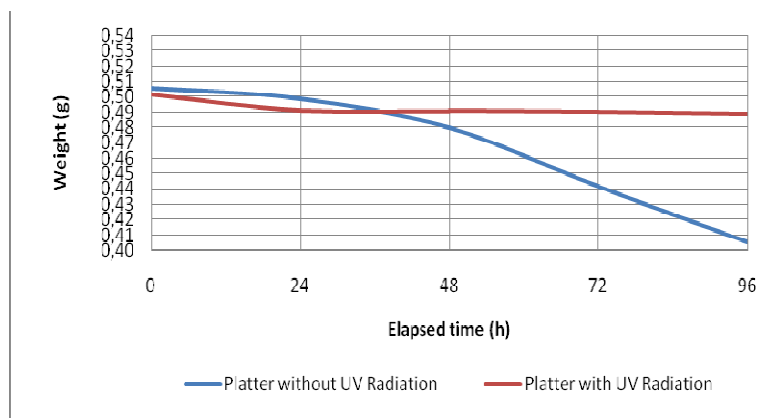


## TEST B (Radiation + Weight control): Results

### Weight control

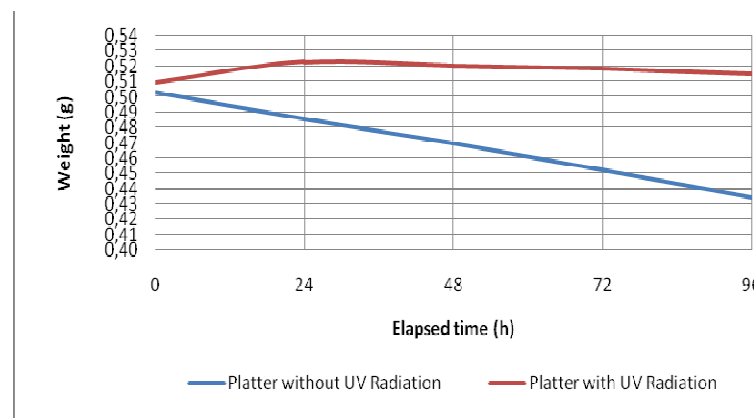
#### Olive Oil

Elapsed time (h)	Weight (g)	
	Platter without UV Radiation	Platter with UV Radiation
0	0,5054	0,5017
24	0,4990	0,4913
48	0,4799	0,4909
72	0,4413	0,4901
96	0,4056	0,4889
% Weight after 96h	80,25%	97,45%
TARA	54,5563	54,5775



#### Corn oil

Elapsed time (h)	Weight (g)	
	Platter without UV Radiation	Platter with UV Radiation
0	0,5030	0,5090
24	0,4854	0,5230
48	0,4693	0,5207
72	0,4522	0,5181
96	0,4340	0,5152
% Weight after 96h	86,28%	101,22%
TARA	54,7965	54,6066

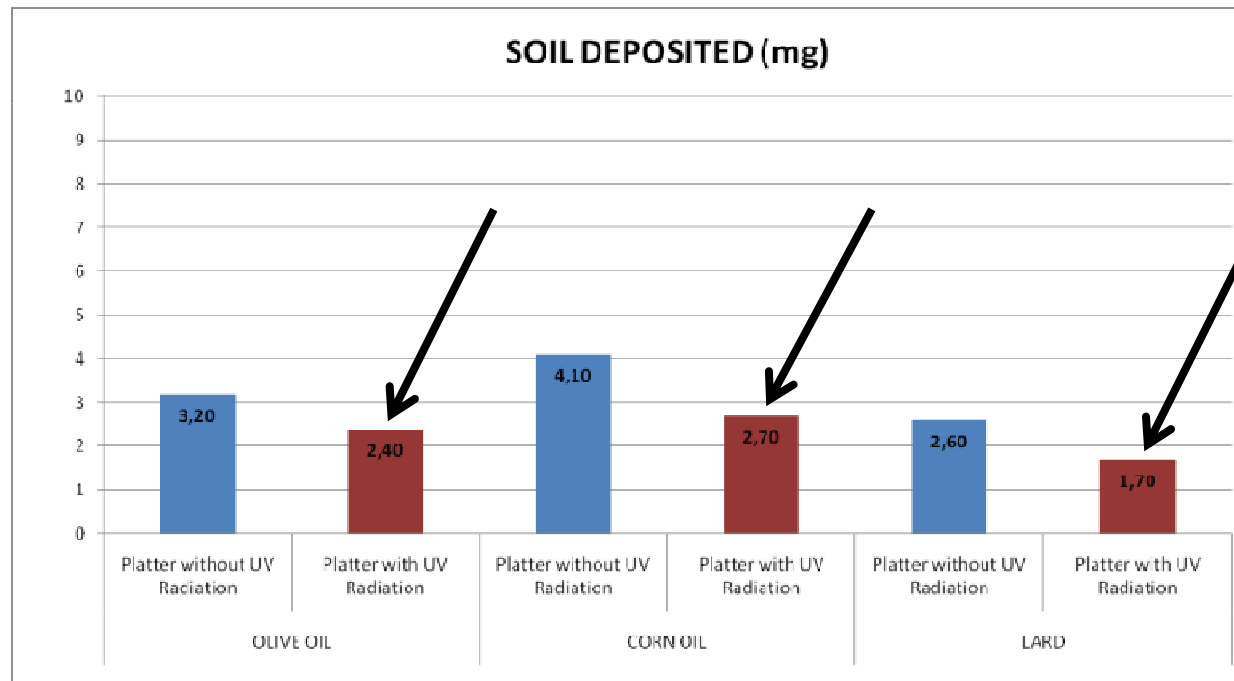




### TEST C (Range hood + Weight control): Results

#### Weight control

In the irradiated area, less amount of material is deposited





## SUMMARY

### **“Unfavorable” evidences**

- Jelly formation during radiation
- Formation of dimers, trimers and others
- The weight of oil does not decrease during radiation

### **“Favorable” evidences**

- “Decrease” of triglycerides
- “Decrease” of fatty acids
- Less amount of material is deposited in the rage hood during radiation

## LEITAT

Acondicionamiento Tarrasense

Tel. (+34) 93 788 23 00

Fax (+34) 93 789 19 06

[www.leitat.org](http://www.leitat.org)

[info@leitat.org](mailto:info@leitat.org)

### Terrassa

C. de la Innovació, 2

08225 Terrassa (Barcelona)

### Barcelona

Parc Científic de Barcelona

C. Baldri Reixach, 15-21

08028 Barcelona

### Vilanova del Camí

Centre d'Innovació Anoia

Carrer dels Impressors, 12

08788 Vilanova del Camí

Terrassa



Innpulso

Ciudad de la Ciencia  
y la Innovación

Ministerio de Ciencia e Innovación



SOCIAL NET:



# THANK YOU FOR YOUR ATTENTION

**LEITAT** | **Technological Center**  
managing your technologies | member of **TECNIO**  
Barcelona Research Park