OMICS Group
Accelerating Scientific Discovery

4th International Conference and Exhibition on
Food Processing & Technology
August 10-12, 2015 London, UK

Introduction to Innovative Food Technologies for Quality Improvement and Shelf Life of Foods

CELAL BAYAR ÜNİVERSİTESİ

KEYNOT FORUM

Associate Professor Dr. Özlem Tokuşoğlu

CONGRESS CHAIR

August 10, 09:05 - 9:30,

Crowne Plaza London, UK



The describing and explaining of innovative technologies impact on

- **Food production and processing**
- **Nutritional value and foods and drinks**
- **Food safety and preservation**
- **New foods**
- **Fortificated foods and drinks**
- **Nutraceutical foods and drinks**
- **Nanotechnological foods**
- **Edible anticancer foods**

New technologies in food production and processing are driven by:

- **knowledge and new techniques gained from research investigations;**
- **attempts to increase efficiency, reduce environmental effect of production;**
- **competition between food companies;**
- **consumer demand.**



Innovation in food production, processing and new product development can offer benefits for consumers and the environment.

1.Environmental Sustainability

2. Dietary and Health Needs and Consumer Demand

3. Farming and Agriculture Capacity forBiotechnical Considerations, New Crops and Nanotechnological Products

4. The Usability of New Technigues and Technologies for Food Improving and Deveoloping, for Food Safety, and for Nutraceutical Foods and Edible Anticancer Agents





1

Environmental Sustainability

Challenges include:

- sustainable, affordable food supply and demand;
- stability in food supplies;
- achieving global access to food and ending hunger;
- reducing the impact of food production on the world's environmental systems.

✓ ✓

Controlled Innovative Technologies are Necessary



2

Dietary Needs and Consumer Demands

Through medical and nutritional research there is more knowledge available on nutrition and dietary needs. This includes information about preventative nutrition and nutrition through life. This creates a demand for new products in the marketplace.

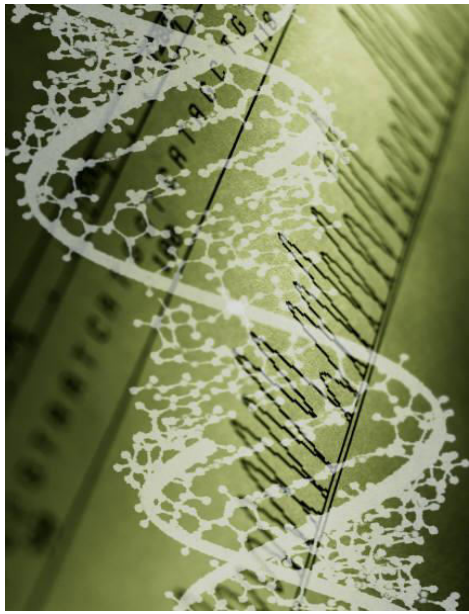
Controlled Innovative Technologies are Necessary

3

Farming and Agricultural Capacity

The availability of new techniques from biotechnology and genetic research provides opportunity to control cell metabolism and breeding.

This makes it possible for developers to meet more specific requirements e.g. to increase a specific nutrient in a food.



Innovative Technologies are Necessary

Consumer Demands

- **With less additives**
- **With high nutritional value**
- **High quality**
- **Less thermal damage**
- **Good sensory properties**
- **Safe products**



Thereby, food manufacturing designed for better food safety and quality.

Strategies for Food Processors



- **Premium food products**
- **Long lasting Foods**
- **Convenience foods**
- **Minimally processed foods**
- **Ready-to-cook meals**
- **Ready-to-eat foods**
- **Low-fat foods**
- **Low-carbohydrate foods**
- **Specialities in foods**

(For Health Treatments-
For Anticancer Support
For Kids
For Military
For Pregnants
For Sportmans)



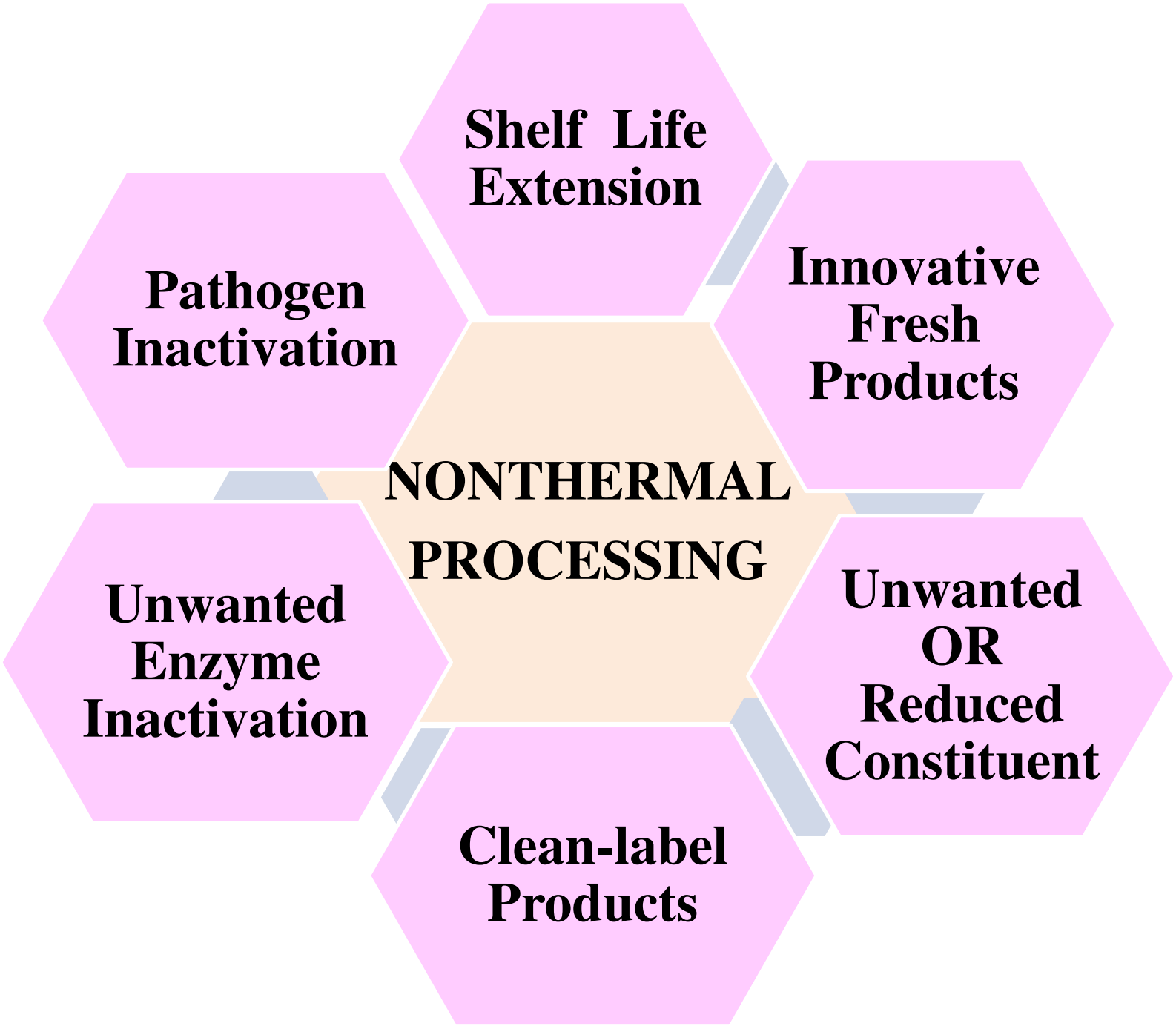
NONTHERMAL

- High Hydrostatic Pressure
- Pulsed electric fields
- Ultrasound
- Ultraviolet
- Irradiation
- Cold Plasma
- DensePhase CarbonDioxide
- Ozone
- Chemicals

THERMAL

- Microwave
- Radiofrequency
- Ohmic Heating
- Induction Heating

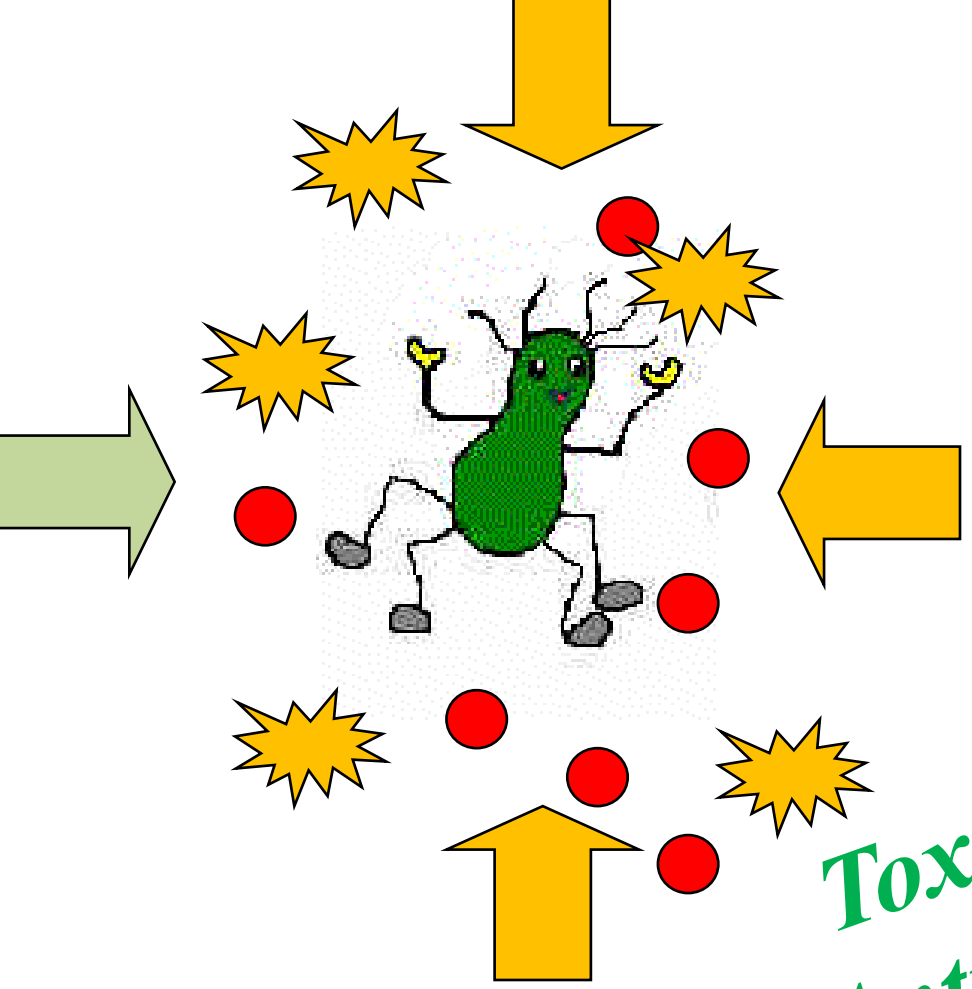
Template graphic elements and format © 2013, Institute of Food Technologists.
All rights reserved. Slide content © 2013, by the presenter. All rights reserved.


Shelf Life Extension
Innovative Fresh Products
Unwanted OR Reduced Constituent
Clean-label Products
Unwanted Enzyme Inactivation
Pathogen Inactivation
NONTHERMAL PROCESSING

✓ *High Pressure Processing (HPP)*

HPP carried out around room temperature, is one of the non-thermal processes,

- **that inactivates bacterial cells, yeasts and molds and unwanted enzymes without the use of heat,**
- **having a minimal effect on the sensory qualities associated with 'fresh-like' attributes such as texture, color and flavor…**
- **uses water as a medium to transmit pressures from 300 to 700**
- **useful in retaining the nutritional quality of foods after processing**



With HHP; Toxigenic compounds Antioxidant activity and phenols has not been extensively studied in more complicated food matrices.

Utilizing of HPP in Food Science &Technology

Inactivation of Microorganisms and Enzymes

Enhancing the Efficiency of Unit Operations

- Extraction Enhancing
- Emulsification in Lipid Containing Foods
- Hommogenization in Lipid Containing Foods

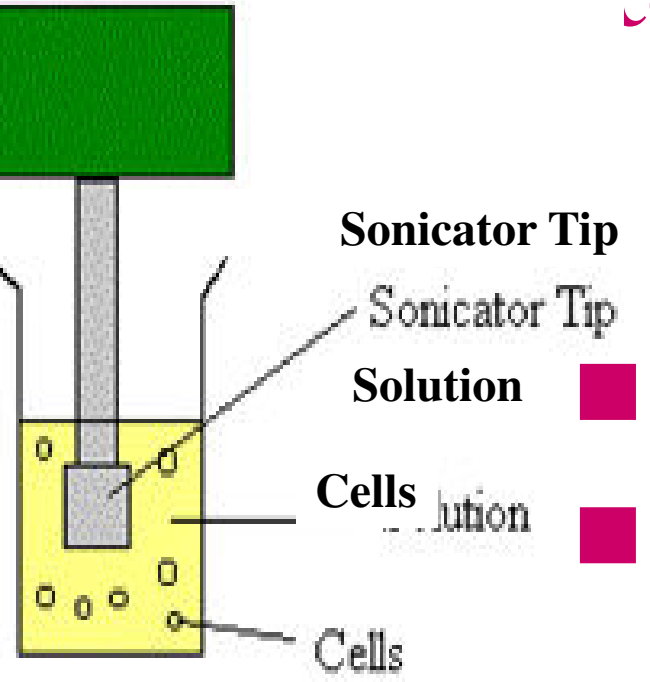
Modifications

- Color Modifi.
- Antioxidant Modifi.
- Bioactive Modifi.
- Polysacharide Modifi.

Ultrasound (US)

- **US is also emerging technology applied to impart positive effects in food processing such as improvement in mass transfer, food preservation, and manipulation of texture and food analysis**
- ***It travels through a medium like any sound wave, resulting in a series of compression and rarefaction.***
- **the attractive forces between molecules in a liquid phase, which subsequently leads to the formation of cavitation bubbles.**
- **The collapse of each cavitation bubble acts as a hotspot,which generates energy to increase the temperature and pressure up to 4000 K and 1000 atm, respectively.**

- **Energy generated from waves of 20,000 or more vibrations per second**
  - *high frequency or diagnostic (2-10 MHz)*
  - *low frequency or power (20-100 kHz)*
- **Lyses and inactivates cells**
  Intracelullar cavitation
- **Variables to control:**
  Temperature
  Amplitude of the ultrasonic wave
  Time of treatment
  Cycles



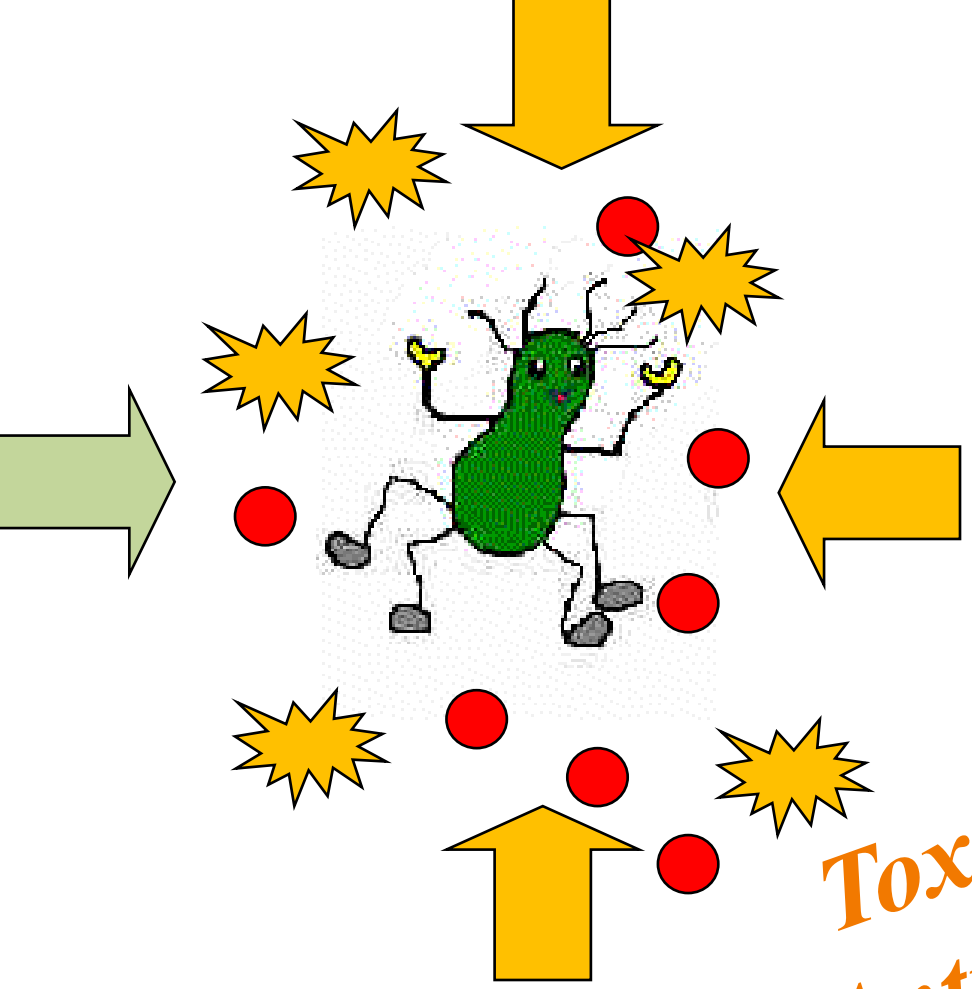
Sonication (US) **Ultrasound**

Thermo-sonication (TS) **US plus heat**

Mano-thermo-sonication (MTS) **US plus heat and pressure**

Most Frequently Utilizing of Ultrasound ;

- **Ultrasonic extraction of phenolic compounds and phenolic pigments (Anthocy., Betacyanin, Betaxanthin) from plant tissues**
- **Ultrasonic extraction of lipids and proteins from plant seeds, such as soybean**
- **Cell membrane permeabilization of fruits**
- **Ultrasonic processing of fruit juices, purees, sauces, dairy**
- **Ultrasonic processing for improving stability of dispersions**
- **Microbial and enzyme inactivation (preservation) is another application of ultrasound in the food processing**



With US;
Toxigenic compounds
Antioxidant activity and
phenols has not been
extensively studied in
more complicated food
matrices.

Utilizing of Ultrasound in Food Science &Technology

Inactivation of Microorganisms and Enzymes

Enhancing the Efficiency of Unit Operations

- Ultrasound-Assisted Extraction
- Ultrasound Assisted Drying
- Ultrasound Assisted Osmotic Dehydration
- Ultrasound Assisted Filtration
- Ultrasound Assisted Freezing
- Emulsification in Lipid Containing Foods
- Hommogenization in Lipid Containing Foods
- Cutting in Lipid Containing Foods

Modifications

- Color Modifi.
- Antioxidant Modifi.
- Bioactive Modifi.
- Polysacharide Modifi

Case Studies on HPP

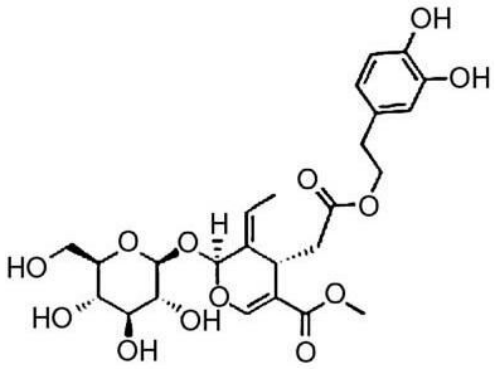
Case 1 Black & Green Table Olive & HPP Studies

HHP Effects on total phenolics, major polyphenols (hydroxytyrosol, oleuropein), antioxidant activity, microbial quality and mycotoxin citrinin and OTA content in black and green table olive fruits

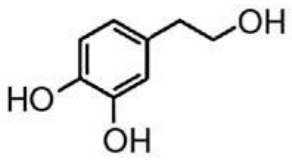
- ✓ **The total phenolics of table olives increased (2.1–2.5)-fold after HPP (as mg gallic acid equivalent/100 g).**
- ✓ **Phenolic hydroxytyrosol in olives increased on average (0.8 – 2.0)-fold, whereas oleuropein decreased on average (1 – 1.2)-fold after HPP (as mg/kg dwt).**
- ✓ **Antioxidant activity values varied from 17.238 – 29.344 mmol Fe^{2+}/100 g for control samples, and 18.579 – 32.998 mmol Fe^{2+}/100 g for HPP-treated samples.**







Oleuropein (OLE)



Hydroxytyrosol (HYD)

Major olive fruit phenolics

Tokuşoğlu, Alpas & Bozoğlu, 2010 (Innovative Food Sci and Emerging Technologies)

Table 6. Major phenolics hydroxytyrosol (HYD), oleuropein (OLE), and total phenolic profiles of control and HHP-treated black table olives

Olive sample	Major phenolics (as mg/kg dwt)				Total phenolics (as mg GA/100 g dwt)	
	Hydroxytyrosol (HYD) control	Hydroxytyrosol HYD HHP-treated	Oleuropein (OLE) control	Oleuropein (OLE) HHP-treated	TP control	TP HHP-treated
Vakum F-XL	8200.6 ± 2.93	11386.9 ± 1.87	1036.64 ± 0.56	750.98 ± 1.05	1788.2 ± 6.07	4073.2 ± 1.00
Vakum F-L	9486.1 ± 2.03	12772.9 ± 0.17	1272.1 ± 0.09	914.0 ± 0.00	1853.7 ± 3.56	4895.1 ± 3.33
F-Tin	5420.6 ± 0.78	6201.1 ± 7.05	2441.2 ± 1.90	1148.8 ± 1.76	1455.2 ± 2.55	3117.7 ± 0.97
Dock out-F	6662.4 ± 0.50	7002.7 ± 3.37	1758.0 ± 0.88	1084.8 ± 2.33	1677.1 ± 0.99	3551.0 ± 1.54
Washed/selected-F	6820.2 ± 1.23	8015.9 ± 0.05	1802.3 ± 0.44	1021.2 ± 0.56	1694.6 ± 1.58	3846.2 ± 1.90
Pastör.out-F	5498.0 ± 1.07	7291.7 ± 1.74	1739.2 ± 2.11	1000.1 ± 0.06	1416.5 ± 3.00	3677.5 ± 0.11
Vakum U.Özel	7101.6 ± 0.73	8005.4 ± 1.06	1355.6 ± 1.08	957.0 ± 0.18	1711.7 ± 2.82	3267.6 ± 2.72
Light U.Gemlik.Type	3937.3 ± 1.37	4660.1 ± 5.08	778.6 ± 0.06	518.5 ± 0.95	1292.2 ± 0.71	2669.9 ± 1.13
Light U.Aegean.Type	4522.5 ± 3.86	5240.6 ± 1.77	794.3 ± 0.19	547.2 ± 2.12	1570.8 ± 4.11	3141.5 ± 4.72
Vakum U.Jumbo	7708.3 ± 4.06	8115.0 ± 0.09	2121.6 ± 0.75	1910.1 ± 1.05	1792.6 ± 1.74	3518.1 ± 0.85
U-Sele	7277.5 ± 3.15	7965.3 ± 0.17	1962.5 ± 1.23	1623.3 ± 0.79	1432.5 ± 0.97	2542.3 ± 1.07
U-Tin	5007.2 ± 0.99	6487.5 ± 1.43	2155.5 ± 3.00	1362.6 ± 3.02	1380.8 ± 5.04	2852.5 ± 2.08

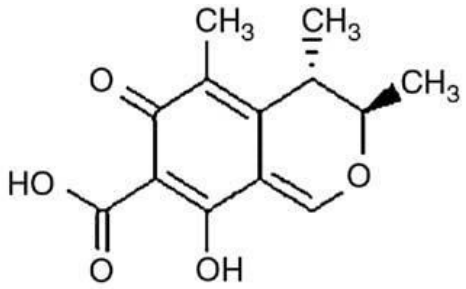
Data are expressed as an average of two determinations corresponding to the duplicate extraction of each injected duplicate. Mean concentrations with ± standard deviations ($n=2$).

Tokuşoğlu, Alpas & Bozoğlu, 2010 (Innovative Food Sci and Emerging Technologies)

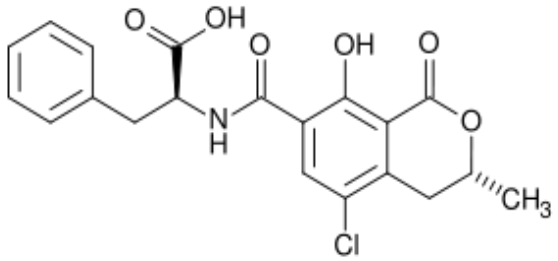
Table 7. The antioxidant activity (as FRAP values mmol Fe^{II}/100g) values in selected table olives

Olive sample	Antioxidant activity (FRAP values mmol Fe^{2+}/100 g)	
	Control	HHP
Vakum F-XL	25.320 ± 1.21	27.320 ± 0.72
Vakum F-L	29.344 ± 0.96	32.998 ± 1.03
F-Tin	20.215 ± 2.05	22.215 ± 0.11
Dock out-F	21.013 ± 0.15	22.532 ± 0.42
Washed/selected-F	22.505 ± 1.45	23.237 ± 0.85
Pastör.out-F	20.233 ± 0.50	21.965 ± 0.15
Vakum U.Özel	23.262 ± 1.78	25.488 ± 0.66
Light U.Gemlik.Type	17.238 ± 0.47	18.579 ± 0.53
Light U.Aegean.Type	19.056 ± 0.55	21.290 ± 0.5
Vakum U.Jumbo	24.289 ± 0.30	25.210 ± 0.58
U-Sele	20.402 ± 0.52	20.996 ± 0.07
U-Tin	19.533 ± 0.25	22.285 ± 0.10

Data are expressed as an average of two determinations corresponding to the duplicate reading. Mean concentrations with ± standard deviations ($n = 2$).



Mycotoxin Citrinin (CIT)



Mycotoxin Ochratoxin A (OTA)

Olive Fruit Mycotoxins

✓ **In the HPP applicated olives, total mold was reduced 90% at 25 °C, and it was reduced 100% at 4 °C . Total Aerobic-Mesofilic Bacteria load was reduced 35 – 76% at 35 ± 2 °C.**

✓ **Citrinin load was reduced 64 – 100% at 35 ± 2 °C. Especially, 1 ppb and less CIT contamination in table olives degraded as 100%.**

Table 8. CIT levels in control and HHP-treated olives

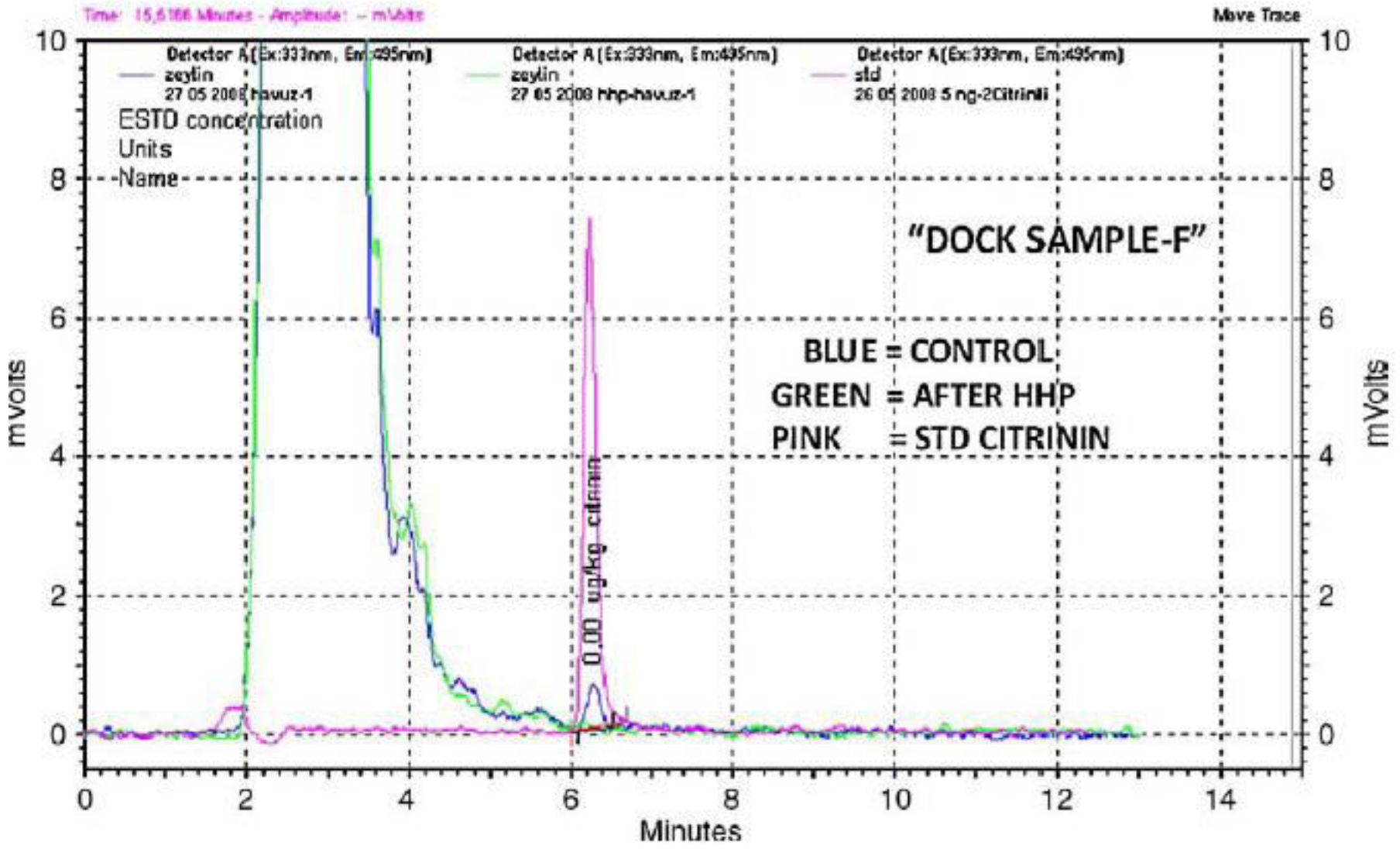
Citrinin data (as µg/kg dwt)

	Vakum F-XL	Vakum F-L	F-Tin	Light U.Gemlik. Type	Light U.Aegean. Type	Vakum U.Jumbo	Vakum U.Özel	U-Tin	U-Sele	Dock out-F	Pastör. out-F	Washed/ selected-F	Dock out-F/ liquid	Pastör.out-F/ liquid
Control	0.11±0.01	ND	<0.10±0.01	ND	ND	0.14±0.01	ND	<0.10±0.01	0.12±0.02	0.53±0.05	ND	<0.10±0.01	2.26±0.11	1.71±0.02
HHP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.19±0.05	0.58±0.02

Data are expressed as an average of two determinations corresponding to the duplicate extraction of each injected duplicate. Mean concentrations with±standard deviations ($n=2$). Not detected = ND.

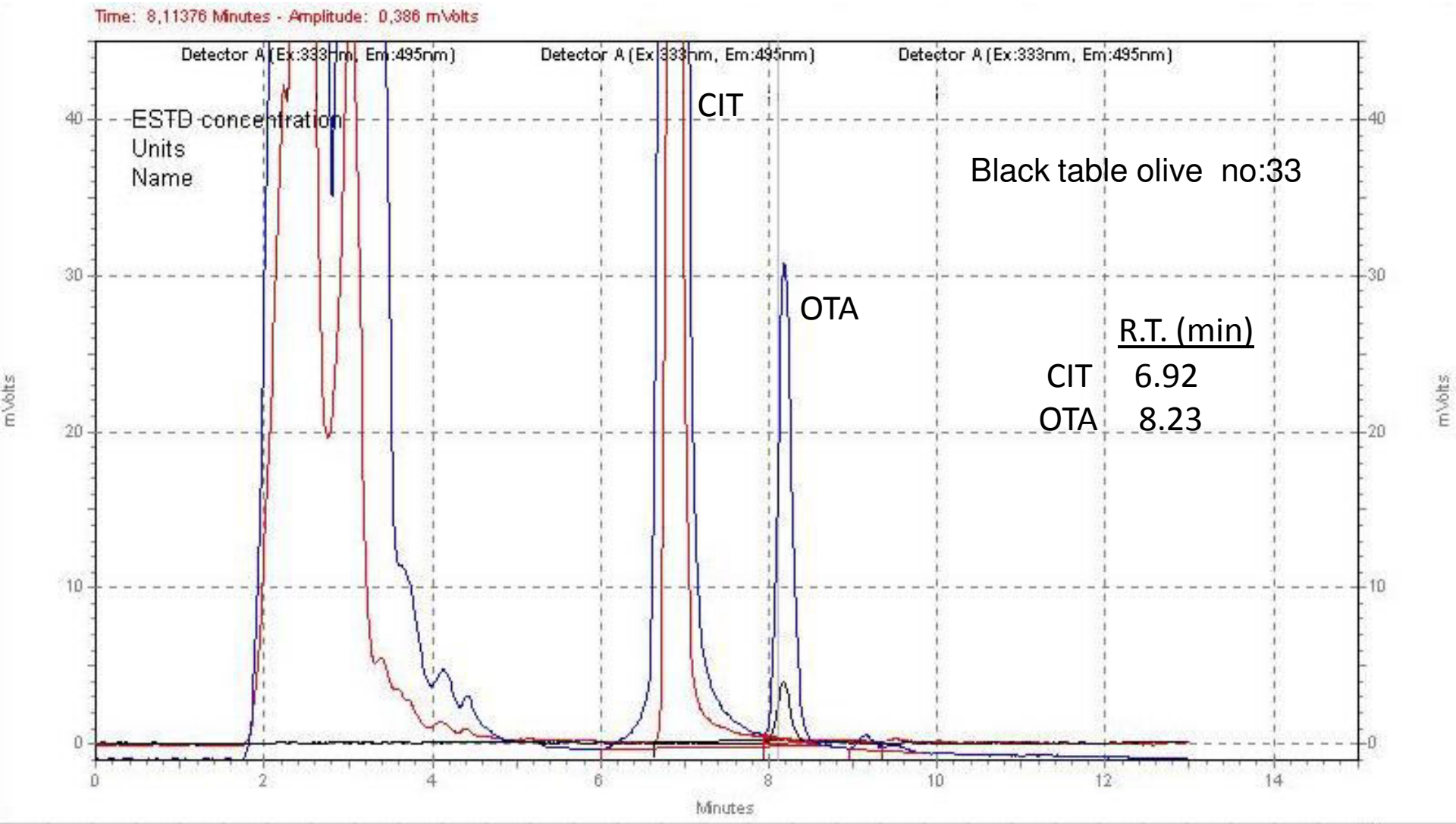
Tokuşoğlu, Alpas & Bozoğlu, 2010 (Innovative Food Sci and Emerging Technologies); Tokuşoğlu & Bozoğlu,2010 (Italian Journal of Food Sci)

HPLC Chromatogram of CIT occurrence in control and HHP-treated olive sample



HPLC chromatogram of citrinin occurrence in control "dock-F" and HHP-treated "dock-F" olives and standard citrinin.

HPLC Chromatogram of CIT & OTA in control and HHP-treated olive sample

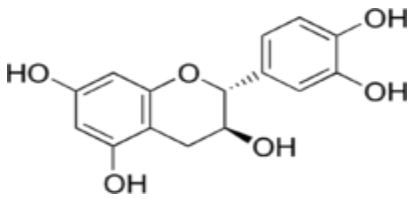


Case 2 Grape & Berry & HPP Studies

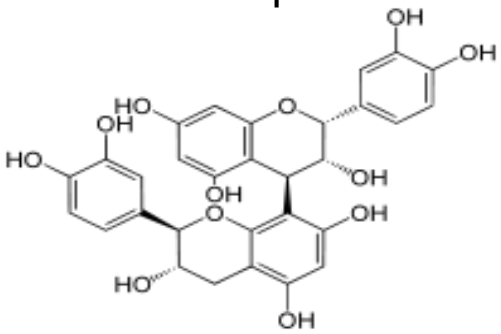
HHP Effects on total phenolics, major polyphenols (Procyanidin B_1), catechin), antioxidant activity, microbial quality in grape pomaces

✓ High Pressure (500 MPa, 30 min) and also ultrasound effects on procyanidin B_1 -catechin alteration and microbiological quality detection of 10 varieties of grape pomaces (*Alicanthe Buche,Merlot, Öküzgözü, Kalecik Karası, Boğazkere, Ugniblanc, Cabernet Savignon, Emir, Syrah, Narince*) were carried out.

✓ In HHP treated pomace samples, antioxidant activity, total phenolic levels increased (due to extraction capability rised). Catechin concentration increased in HHP treated and ultrasound treated samples. Microbial stability was highly preserved in HHP treated samples



Catechin



Procyanidin B_1

WASHINGTON STATE UNIVERSITY

Tokuşoğlu Ö., Swanson B.G., *Powers* Joseph R.,Younce F. 2010,2011.

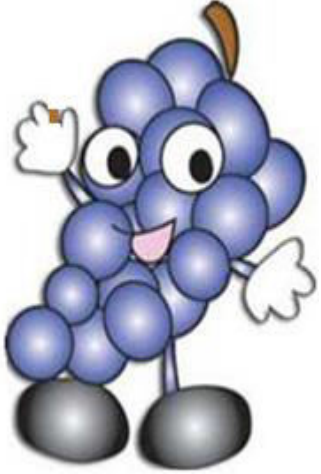






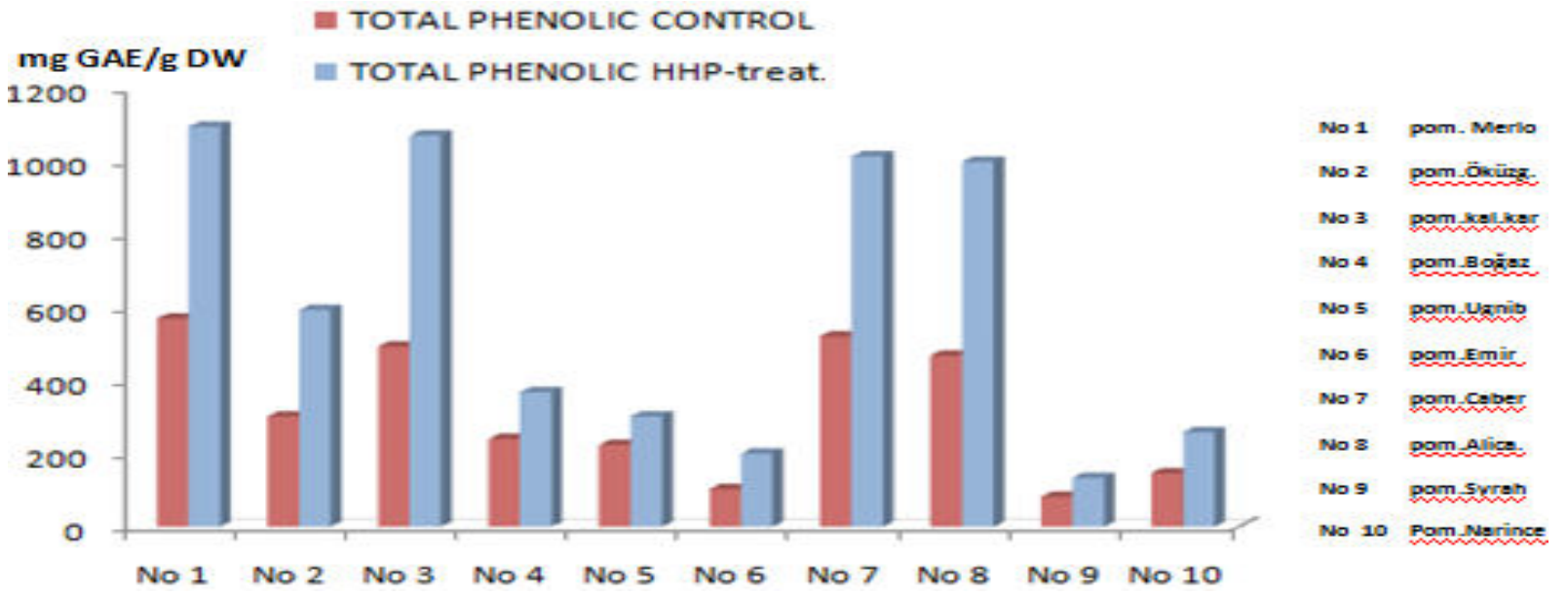
It is stated that (+)-catechin (Cat), epicatechin (Epicat), procyanidin dimmers (B_1-B_4) and trimers in grape skin and seed.

SKIN: It had been determined that B_1 dimer is dominant (64%) in grape skin. Besides, it was detected that (+)-catechin (Cat) level was 4 fold more than epicatechin (Epicat) amount in grape skin

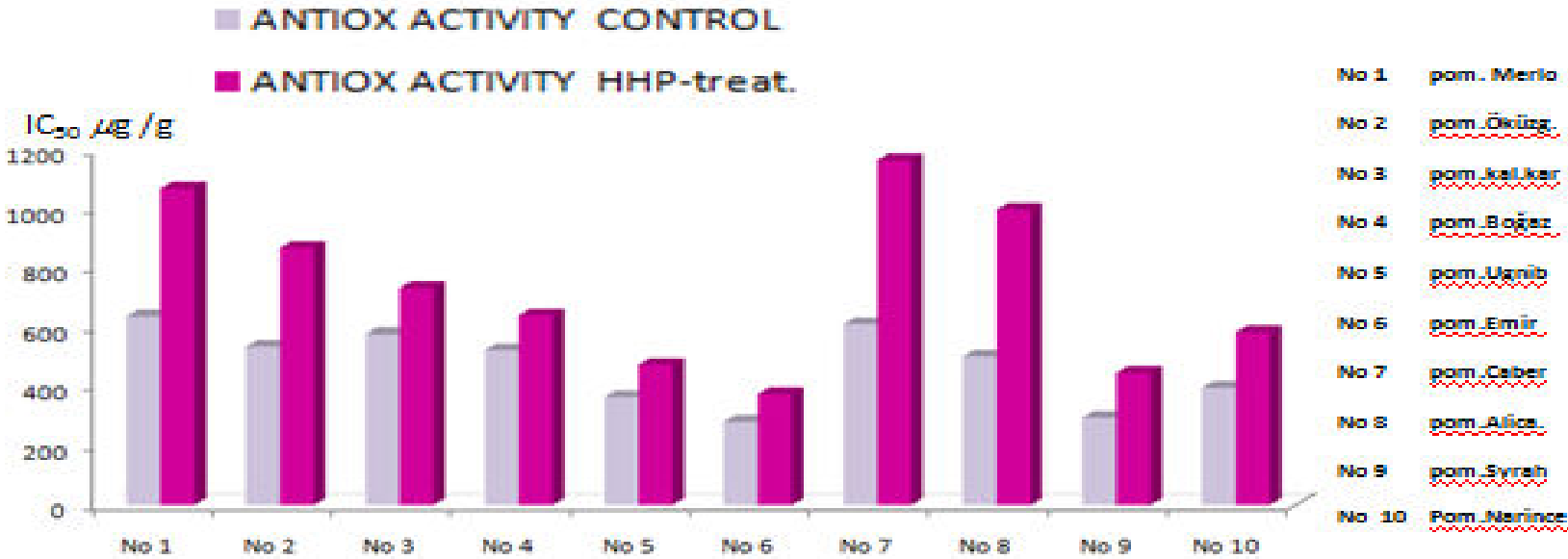




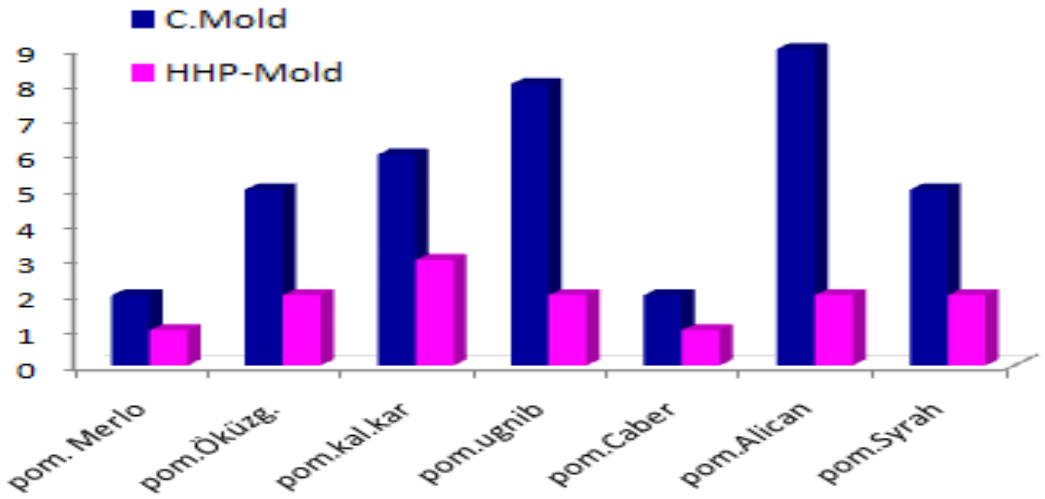
TOTAL PHENOLIC

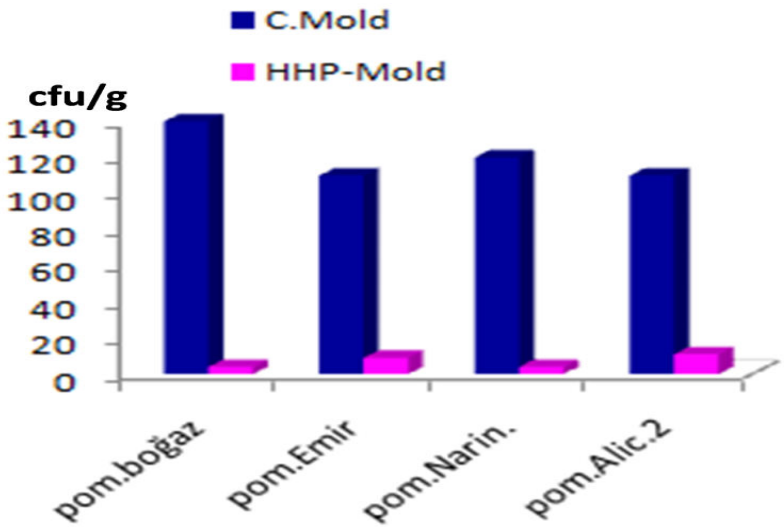


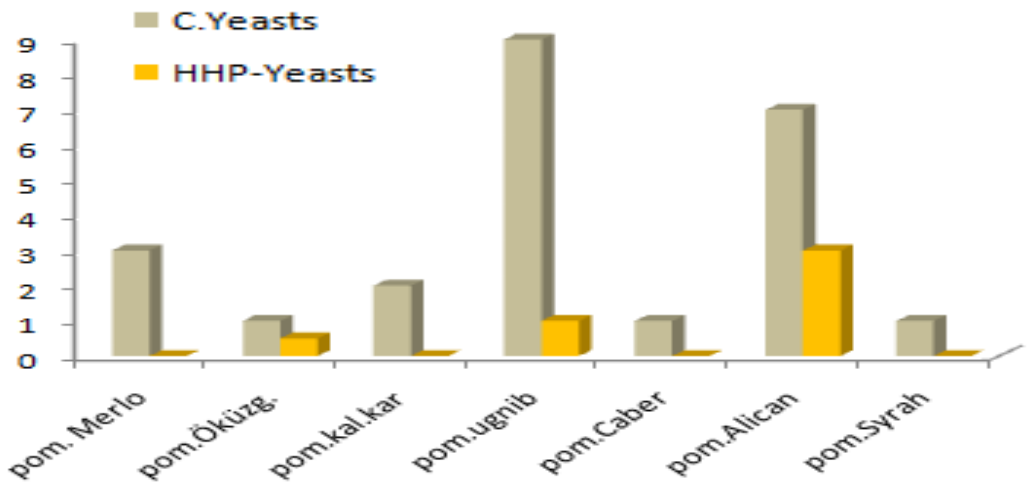
ANTIOXIDANT ACTIVITY

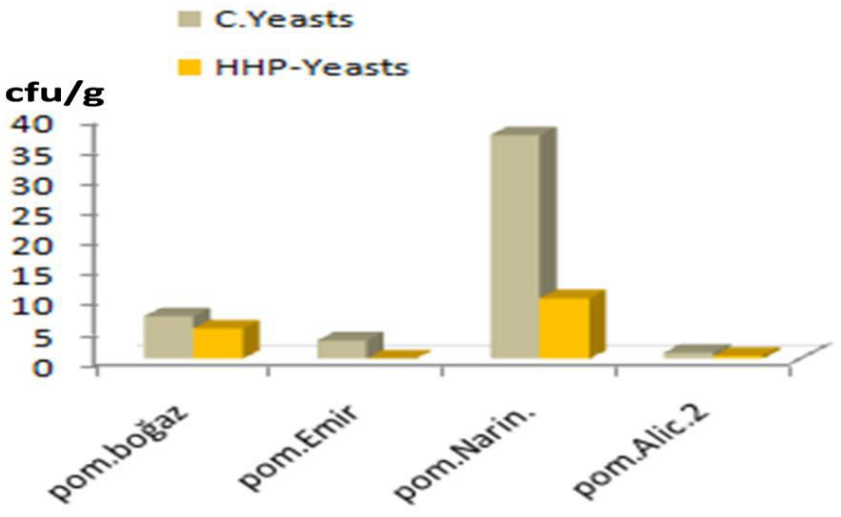


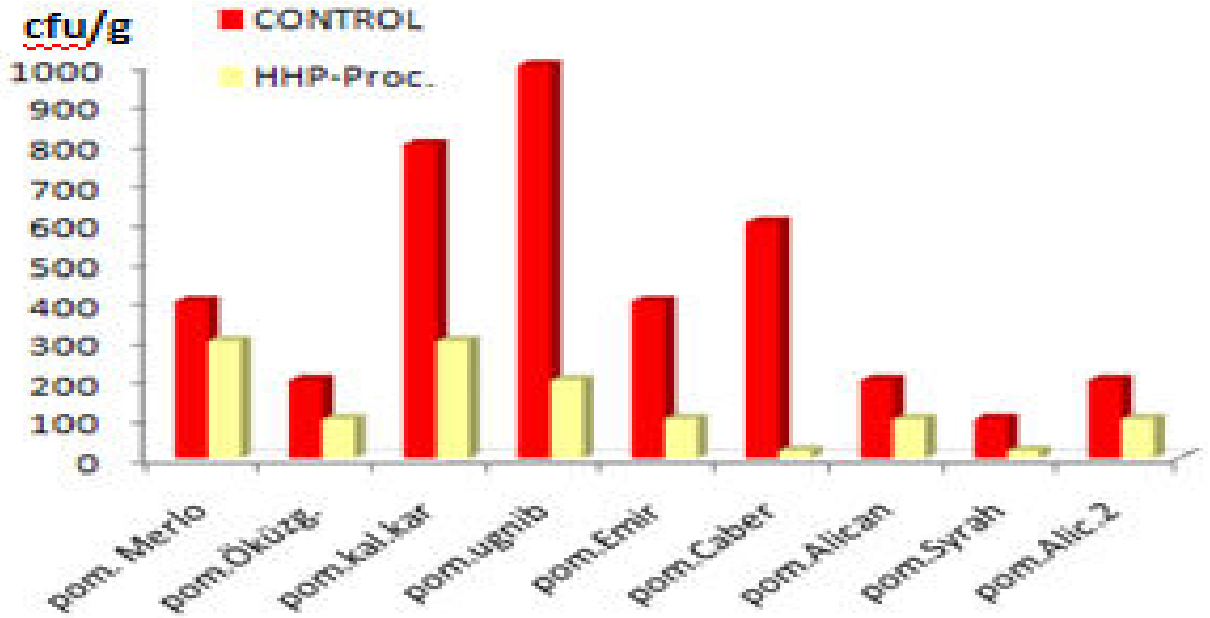
MICROBIAL QUALITY FOR HHP PROCESSED GRAPE POMACES

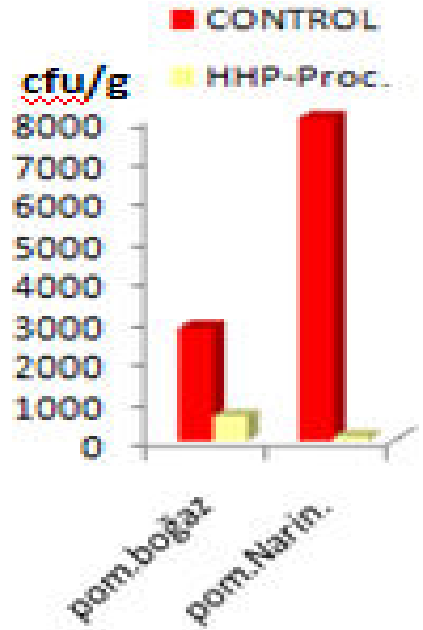




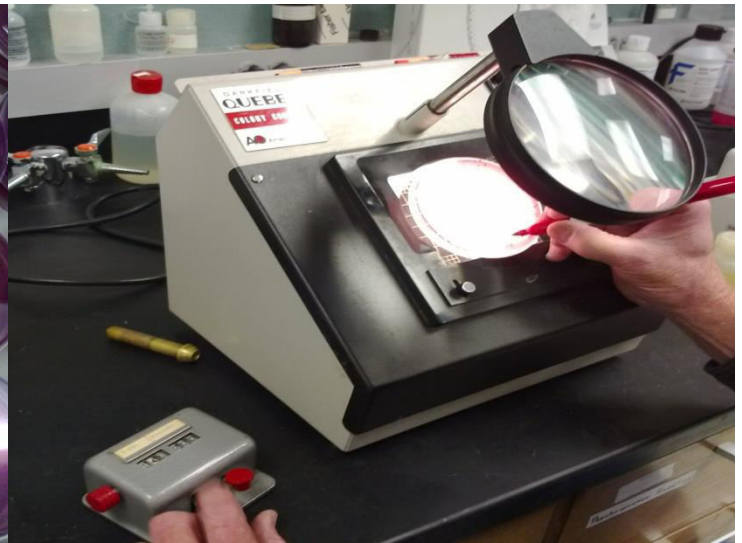


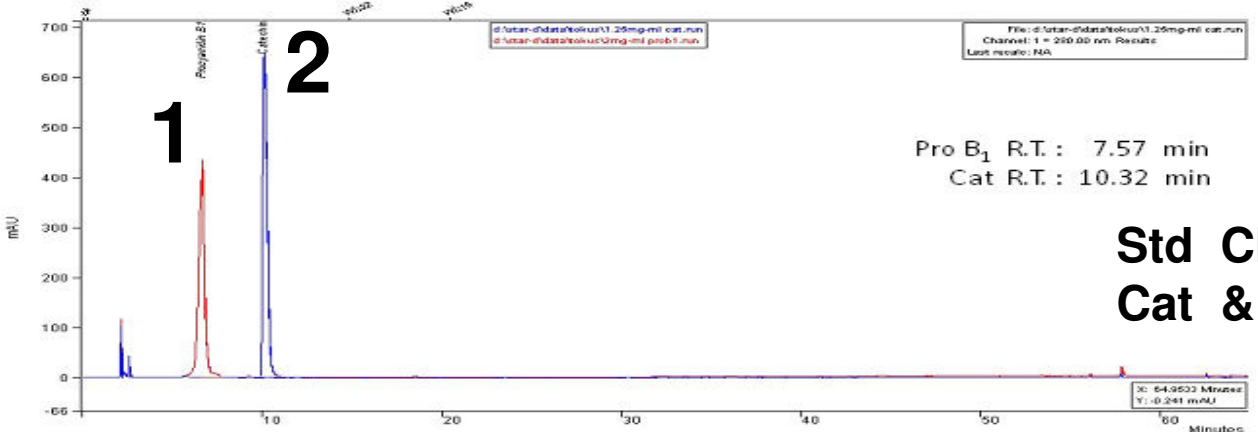



cfu/g
CONTROL
HHP-Proc.
1000
900
800
700
600
500
400
300
200
100
0
pom. Merlo
pom.Ökuzg.
pom.kal.kar
pom.ugnib
pom.Emir
pom.Caber
pom.Alican
pom.Syrah
pom.Alic.2

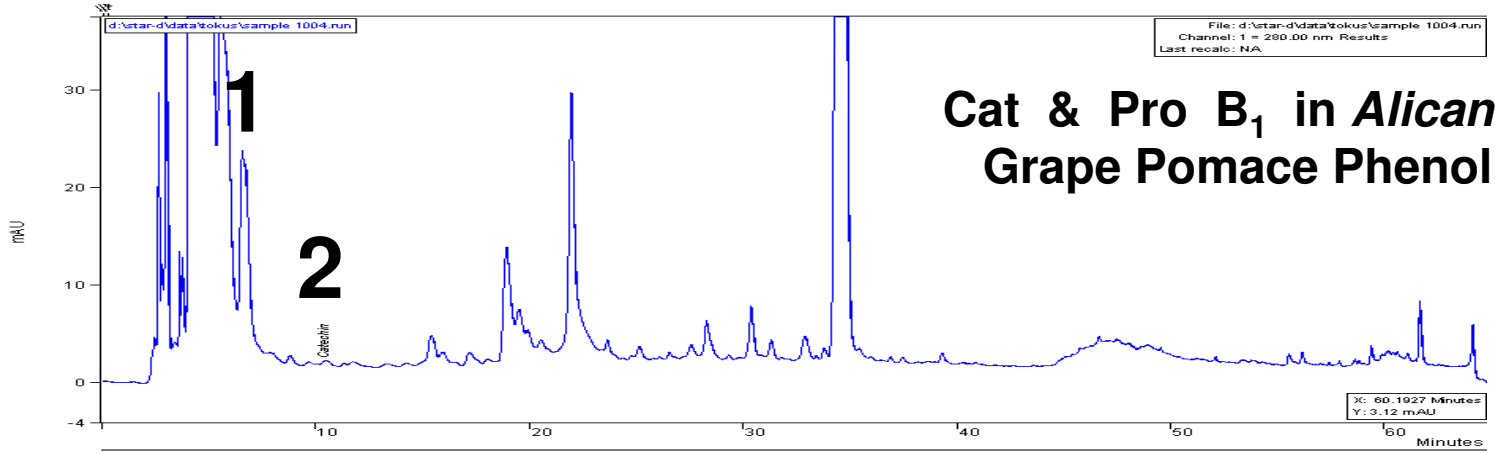

CONTROL
cfu/g
HHP-Proc.
8000
7000
6000
5000
4000
3000
2000
1000
0
pom.boğaz
pom.Narin.



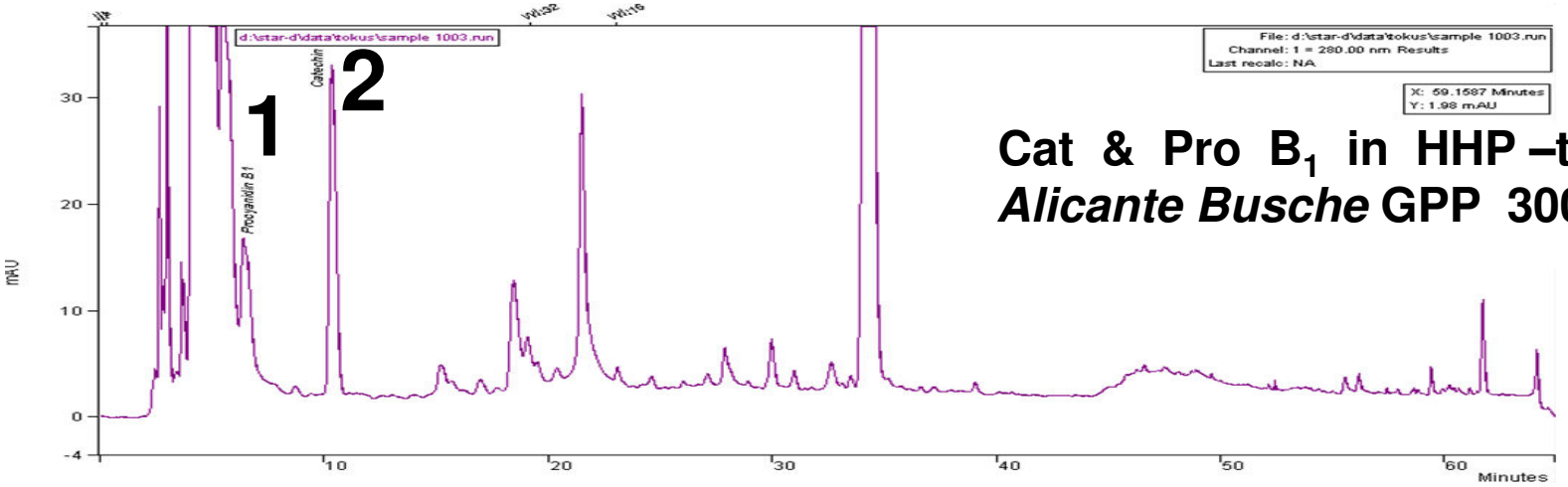




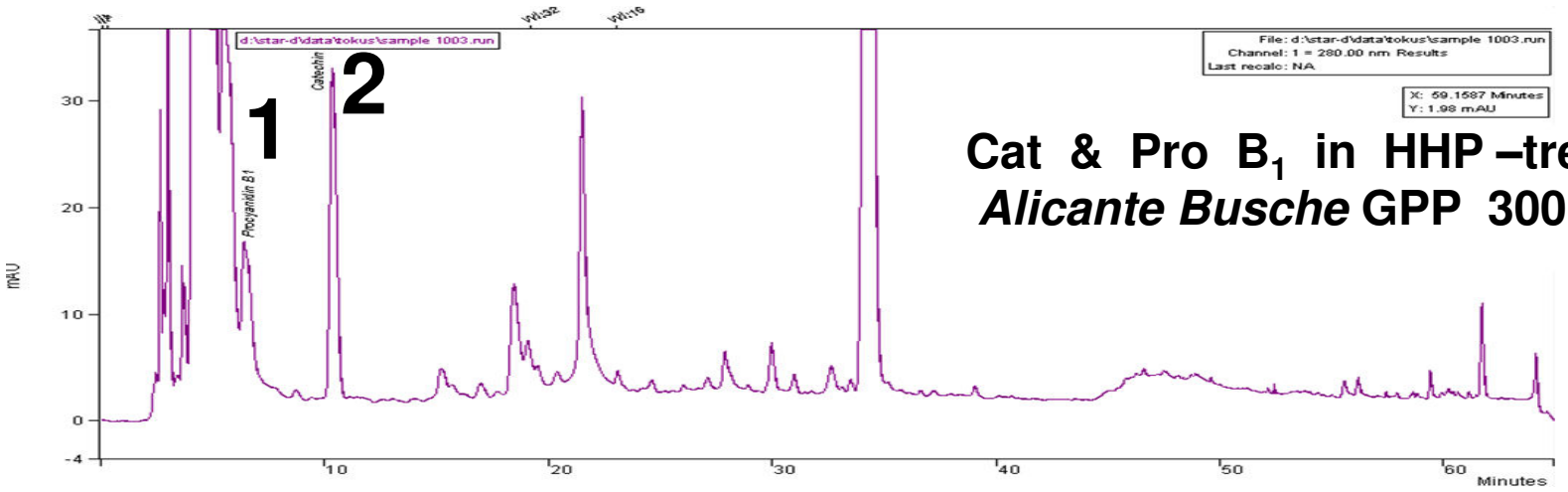
Std Chrpmatogram Cat & Pro B_1



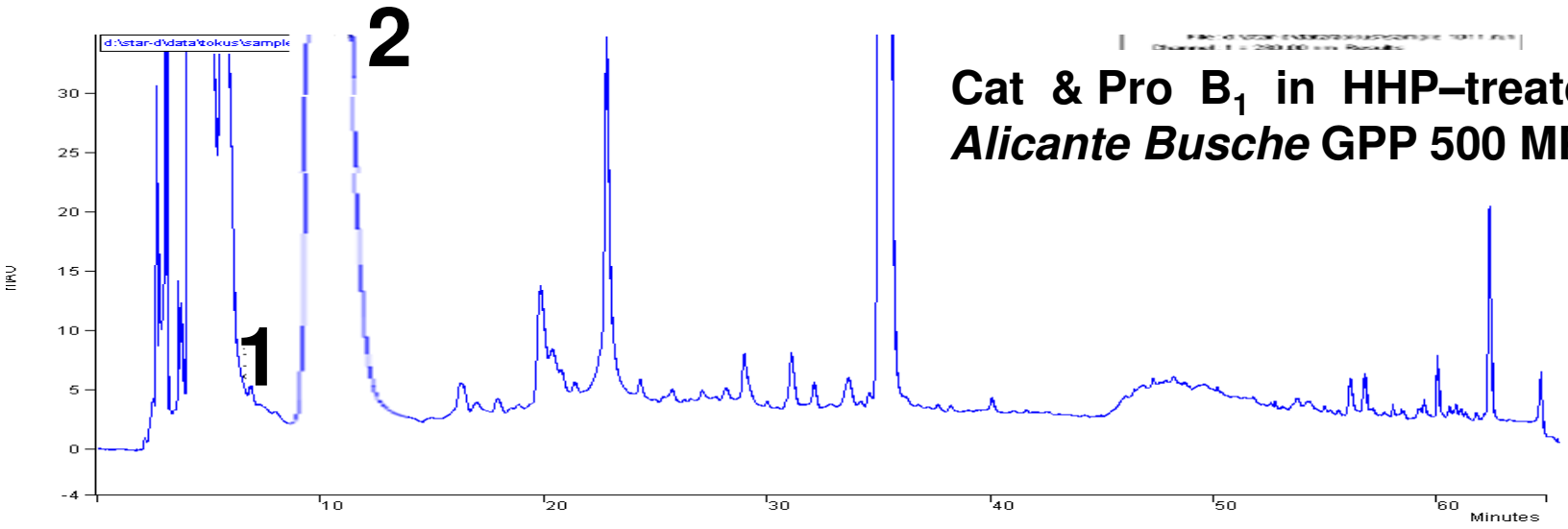
Cat & Pro B_1 in *Alicante Busche* Grape Pomace Phenolics (GPP)



Cat & Pro B_1 in HHP –treated *Alicante Busche* GPP 300 MPa

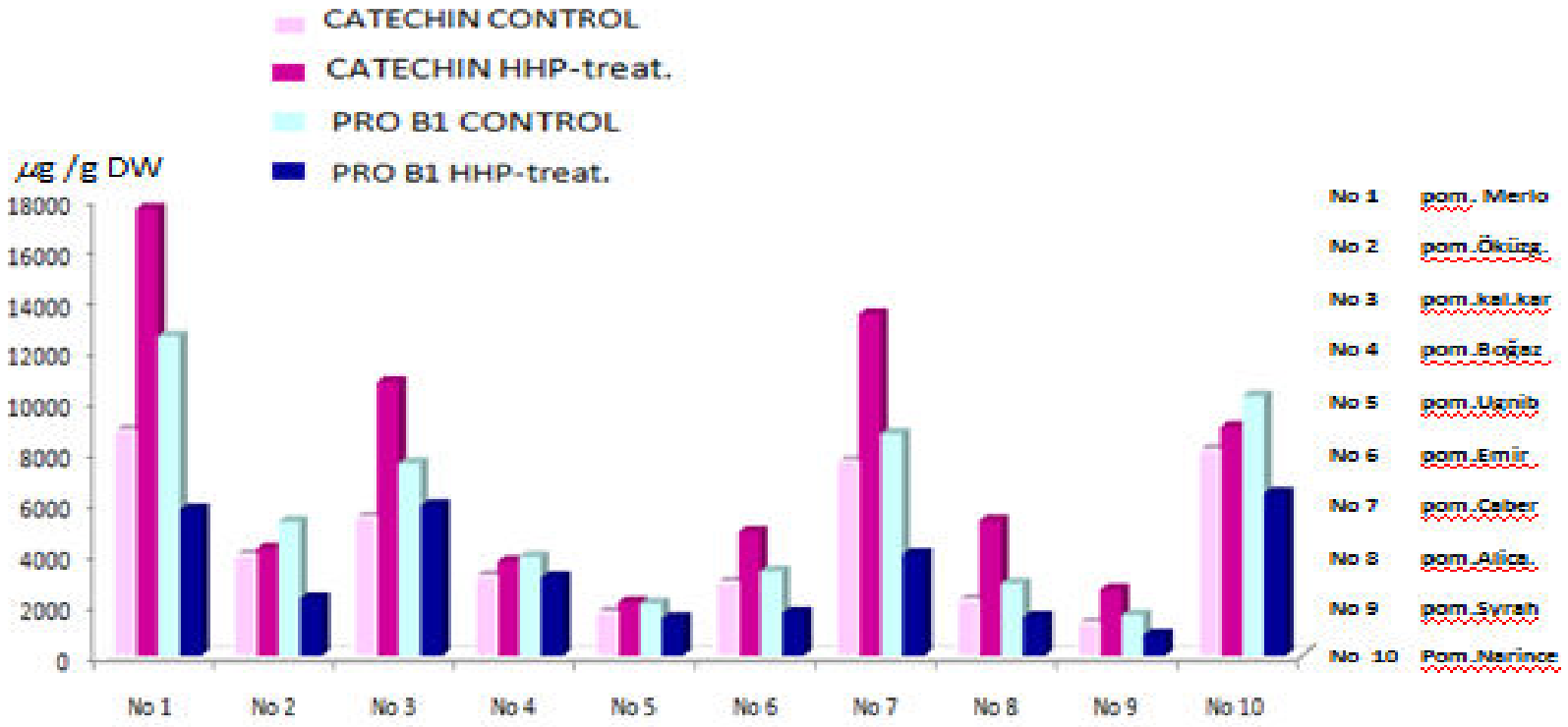


Cat & Pro B_1 in HHP –treated *Alicante Busche* GPP 300 MPa



Cat & Pro B_1 in HHP–treated *Alicante Busche* GPP 500 MPa

CATECHIN / PROCYANIDIN B_1







With HHP application of pomaces, total mold and yeast load was reduced more than 95% at 25 ° and total plate count (TPC) was reduced more than 95%.

Antioxidant activity (AA) increased 1.22-1.98 fold after HHP processing.

Total Phenolics (TPs) increased 1.35-2.16 fold after HHP processing. The correlation between the TP control and TP-HHP processed was found very high for all samples (R^2=0.9635) (y= 2.1386x - 78.103)

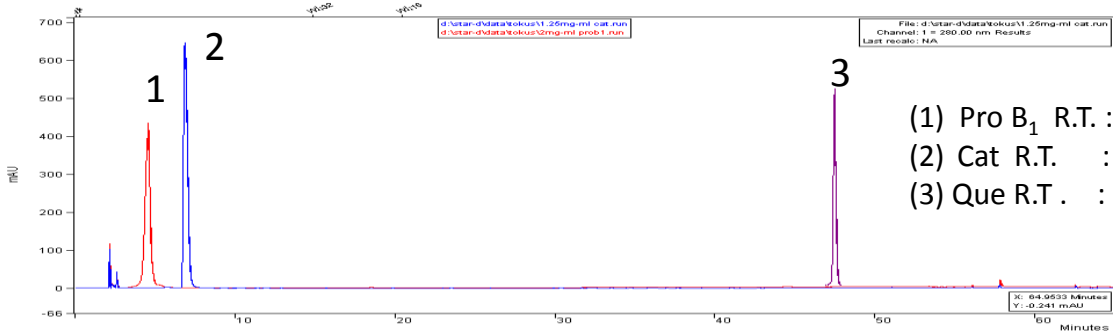
(+)-Catechin (CAT) phenolic increased 1.11 - 2.42 fold after HHP processing.

Procyanidin B_1 (Pro B_1) phenolic decreased 1.27-2.34 fold after HHP processing

HHP Effects on total phenolics, major polyphenols (Procyanidin B_1 , catechin, quercetin), antioxidant activity, microbial quality in huckleberry ice-cream

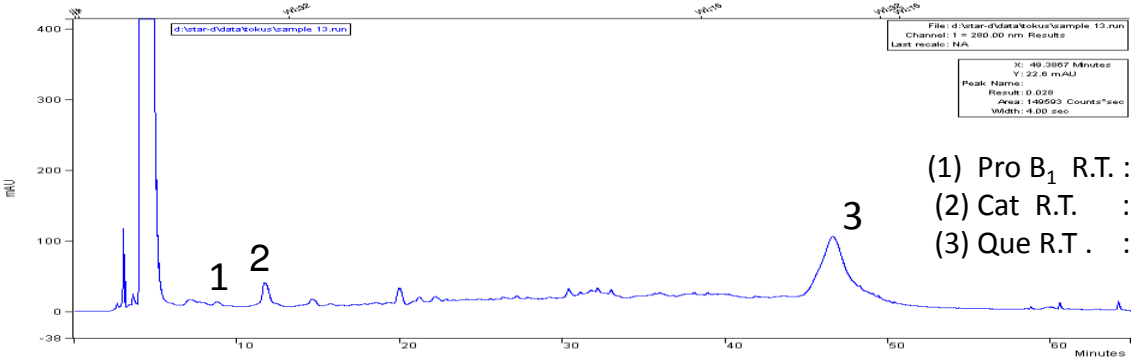
✓In HHP treated huckleberry ice-creams, antioxidant activity, total phenolic levels increased (due to extraction capability rised). Especially, quercetin levels highly increased and microbial stability was highly preserved in HHP treated samples

Std. Chromatogram



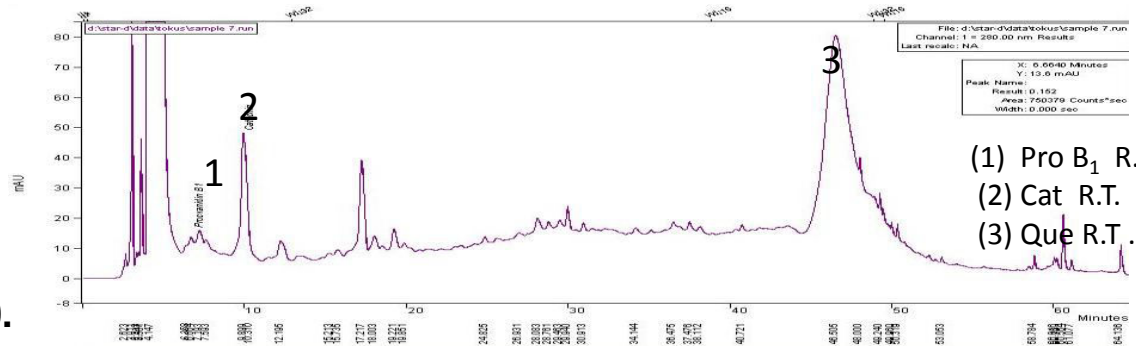
(1) Pro B_1 R.T. : 7.57 min
(2) Cat R.T. : 10.32 min
(3) Que R.T . : 47.34 min

with Huckleberry ingredient control



(1) Pro B_1 R.T. : 7.63 min
(2) Cat R.T. : 10.38 min
(3) Que R.T . : 47.34 min

withHuckleberry ingredient HHP-treated



(1) Pro B_1 R.T. : 7.58 min
(2) Cat R.T. : 10.32 min
(3) Que R.T . : 47.33 min

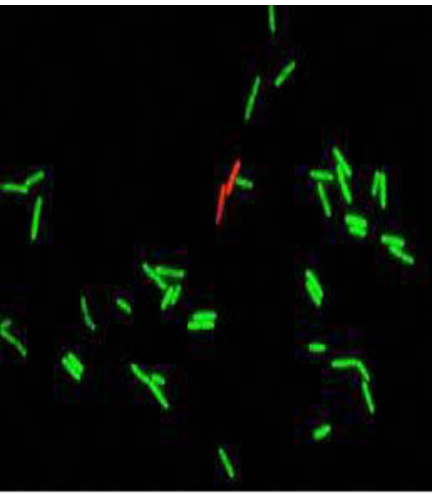
Tokuşoğlu Ö., Swanson B.G., *Powers* Joseph R.,Younce F. **2010.**

Case Studies on US

Case 1 *Alicyclobacillus acidoterrestris* and Ultrasound

Alicyclobacillus acidoterrestris is a spore-forming, rod-shaped organism with **a central, subterminal, or terminal oval spore and grows at pH values ranging from 2.5 to 6.0 at temp. of 25–60 °C.**

- ✓**Acidophilic m.o.**
- ✓**Thermophilic m.o.**



Alicyclo. acido.1



Alicyclo. acido.2



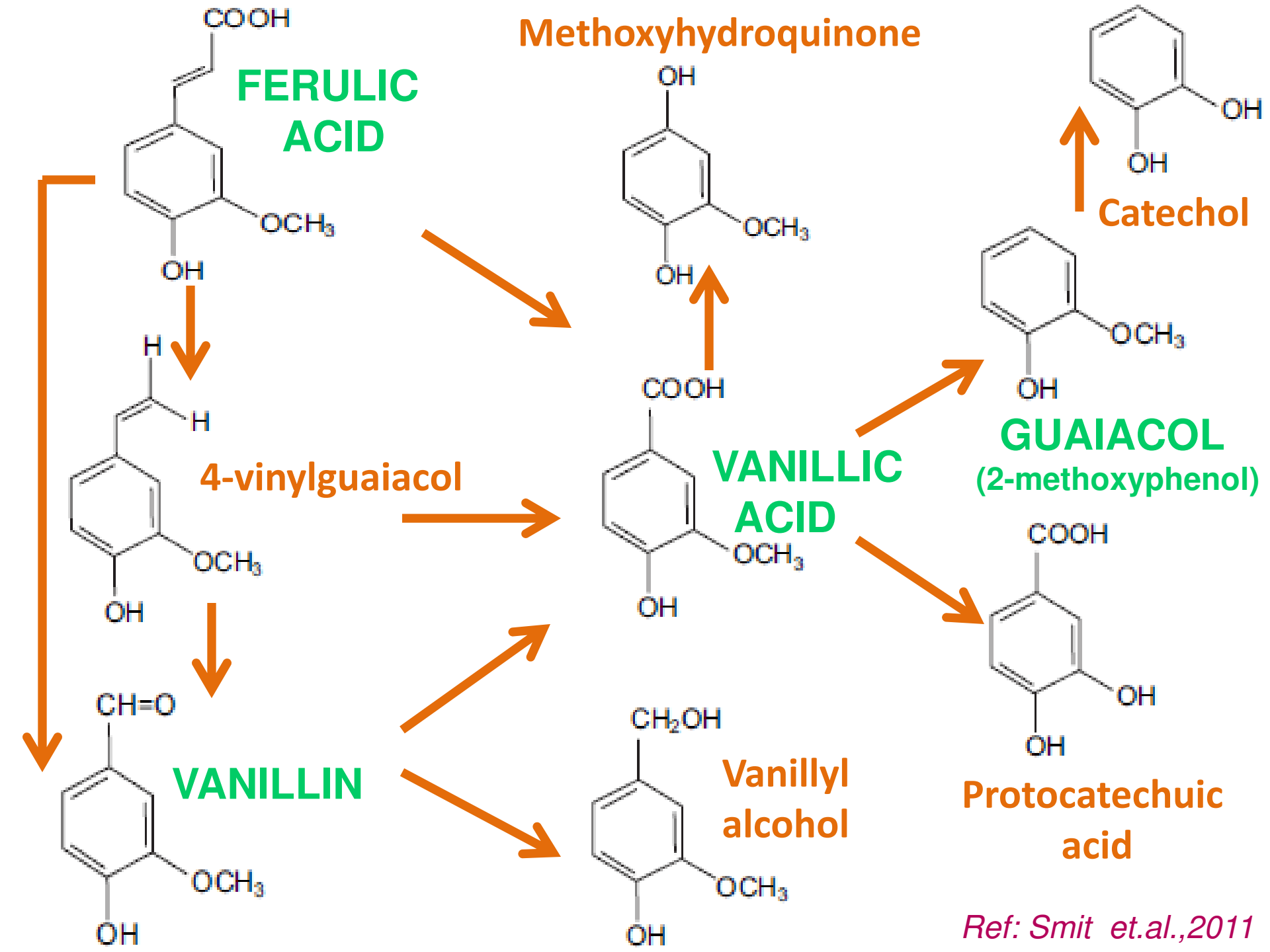
Murakami et.al.,1998

A. acidoterrestris is an important spoilage organism of acidic foods because its spores are able to germinate and grow in highly acidic environments and produce guaiacol which causes ‘medicinal’ or ‘antiseptic’ off-flavors





(Yamazaki et al., 1997).


FERULIC ACID
Methoxyhydroquinone
Catechol
GUAIACOL
(2-methoxyphenol)
4-vinylguaiacol
VANILLIC ACID
VANILLIN
Vanillyl alcohol
Protocatechuic acid
Ref: Smit et.al.,2011

The emergence of juice-associated outbreaks

According to the juice hazards analysis and critical control point (HACCP) regulation-2001 by US Food and Drug Administration (FDA);

* ***juice processors include in their HACCP plan measures to provide at least a 5-log reduction in the pertinent pathogens most likely to occur*** *(FDA, 2001).*

* * * **The juice HACCP regulation only applies to pathogens, and there is no regulation for controlling juice spoilage. It is necessary for the juice and beverage industries to take measures to ensure the quality of their products.**

With US

Apple Juices



20 kHz, ultrasound amplitude 0.4 to 37.5 μm

Ultrasound Processing Effects

With ultrasonic treatments, about 60% and 90% of the *Alicyclobacillus acidoterrestris* cells were inactivated after treating the apple juice with 300-W ultrasound for 30 min/ The lowest D value at 36.18 min was found when using 600-W. The alterations of sugar level, acidity, haze and juice browning were not affected the juice quality.

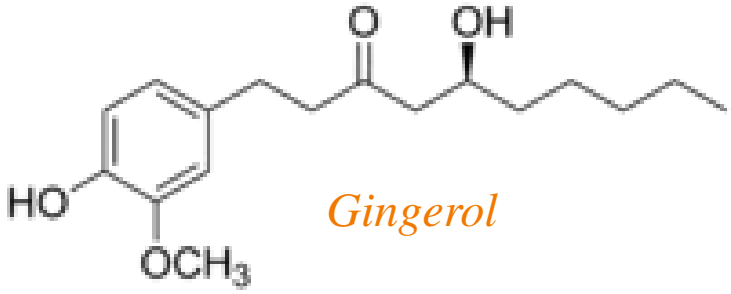


Tokuşoğlu et.al.,2014

Case 2 Alicyclobacillus acidoterrestris and Ultrasound

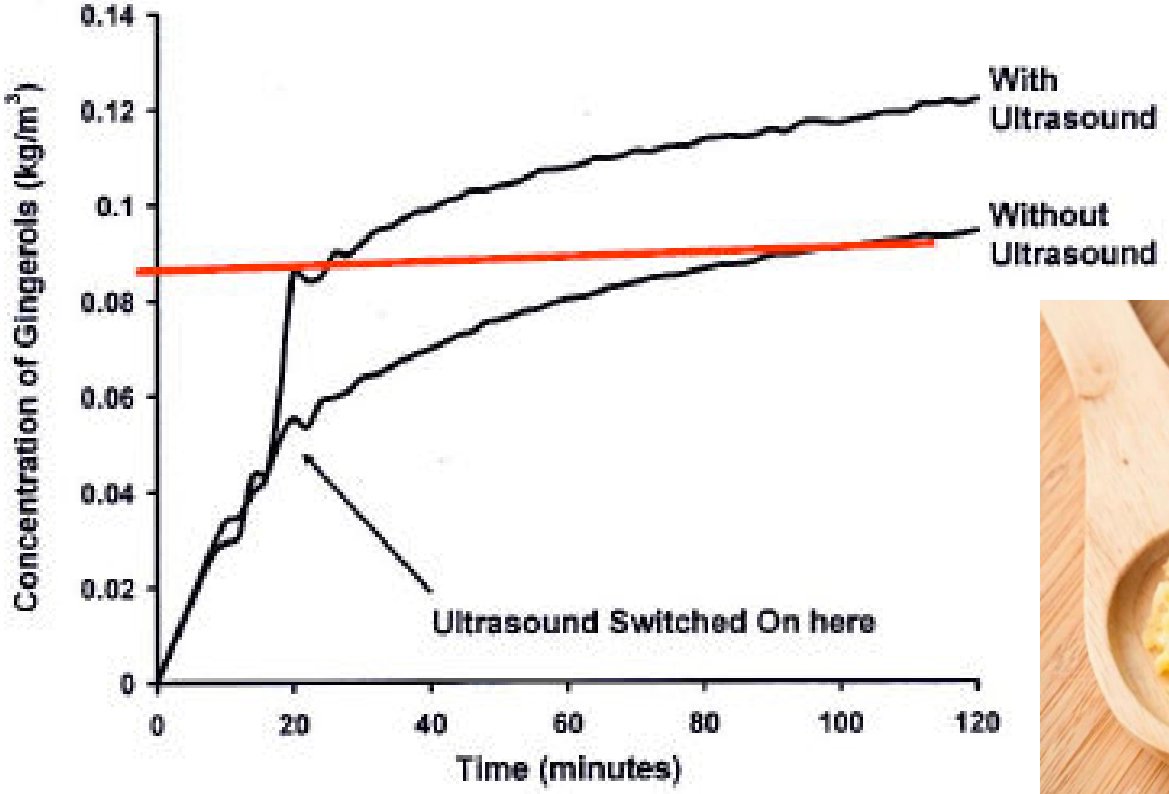
Extraction Yield Improvements By Ultrasound

Gingerol is the active constituent of fresh ginger….



Gingerol

Supercritical extraction (SCF-CO_2)





Extraction Yield Improvements By Ultrasound

β-Carotene Polyphenols and Gingerol Study in Different Solvents

Product	Extract	Solvent	Yield increase (%)
β - carotene	Carrot	Aqueous	8-25
	Carrot	Ethyl-acetate	20-25
Polyphenols	Grape must	Aqueous	16-18
	Grape marc	Aqueous	11-35
	Black tea	Aqueous	6-18
	Apple	Aqueous	6
Gingerol	Ginger	SCF - CO_2	30

*CFNS data

Tokuşoğlu et.al.,2015

Case 3 Oily Nuts and Ultrasound Study

Target extract : Phenolics of nuts and pastes
Solvent: ethanol-distilled water (30/70, v/v)
Process: Laboratory 24 kHz, 20-75 W s ml^{-1}
Processing conditions: Ambient
Exposing duration: 10 min

Target extract : Lipids of nuts and pastes
Solvent: chlorophorm /methanol (2/1, v/v)
Process: Laboratory 24 kHz, 20-75 W s ml^{-1}
Processing conditions: Ambient
Exposing duration: 10 min

Target: Microbiological quality of nuts & pastes
Solvent: Pepton water (0.1%)
Process: Laboratory 24 kHz, 20-75 W s ml^{-1}
Processing conditions: Ambient
Exposing duration: 10 min






Almond
Pistachio
Peanut
Hazelnut

Tokuşoğlu et.al.,2011

The Alterations of Total Lipid Value After Processing

NUTS Total Lipid g/100 g	KONTROL	Ultrasound Treated
Almond	42.3 ± 1.9	38.63 ± 2.1
Pistachio	54.3 ± 0.8	46.12 ± 1.8
Peanut	48.9 ± 1.2	43.66 ± 1.3
Hazelnut	62.6± 2.03	57.25± 2.83

Tokuşoğlu et.al.,2011

Total lipid content decreased after ultrasound treatment ($p<0.05$)

With ultrasound, the destruction of the cell walls facilitates the pressing and thereby reduces the residual oil or fat in the pressing cake.



Total Phenolics of Studied Nuts

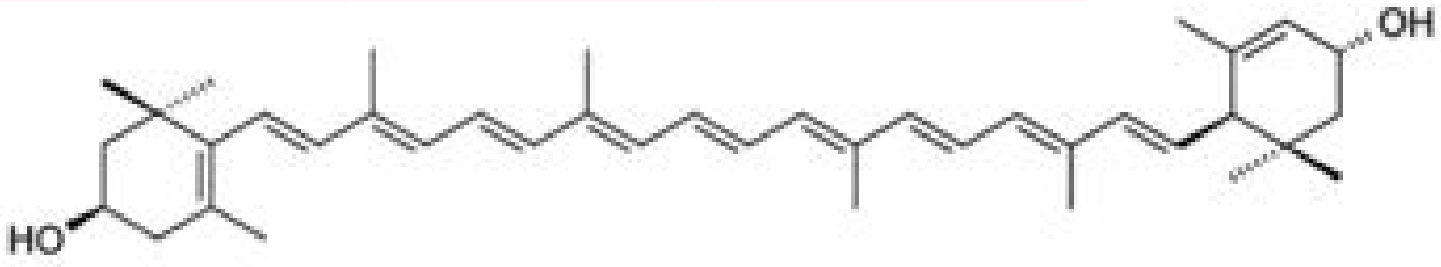
NUTS	CONT . Total Phenolics g/100g D.W	UP Effect g/100g D.W
Almond	176.58 ± 13.83	192.43 ± 6.75
Pistachio	378.72 ± 9.77	397.23 ± 11.04
Peanut	334.51 ± 6.06	361.30 ± 5.46
Hazelnut	278.43 ± 10.1	298.55 ± 7.22

After Ultrasound Processing
(Avg. 12% increasing in total phenolics)

The use of Ultrasound Ass.extraction enhanced mass transfer rates, increases cell permeability, and increased the extraction capacity of phenolic constituents, and higher levels of bioactive compounds are preserved with ultrasound assisted extraction.

Minor Bioactive (Lutein Xanthophylls) of Studied Nuts

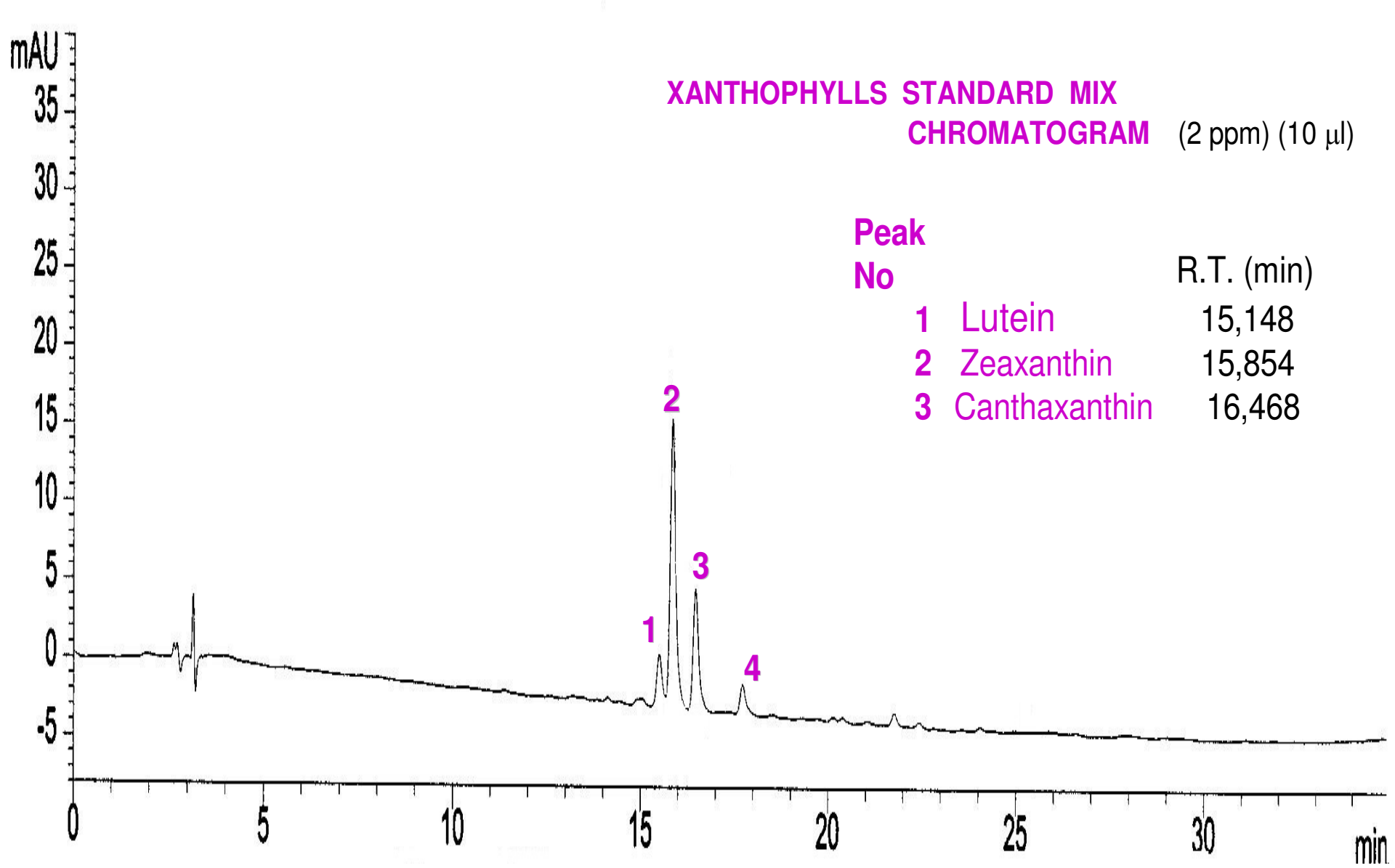
NUTS	Lutein Xanthopyyllsg /100g D.W	UP Effect
Almond	ND	ND
Pistachio	4.12 ± 0.48	7.3 ± 2.02
Peanut	ND	ND
Hazelnut	ND	ND



Lutein Xanthophyll

PISTACHIO LUTEIN

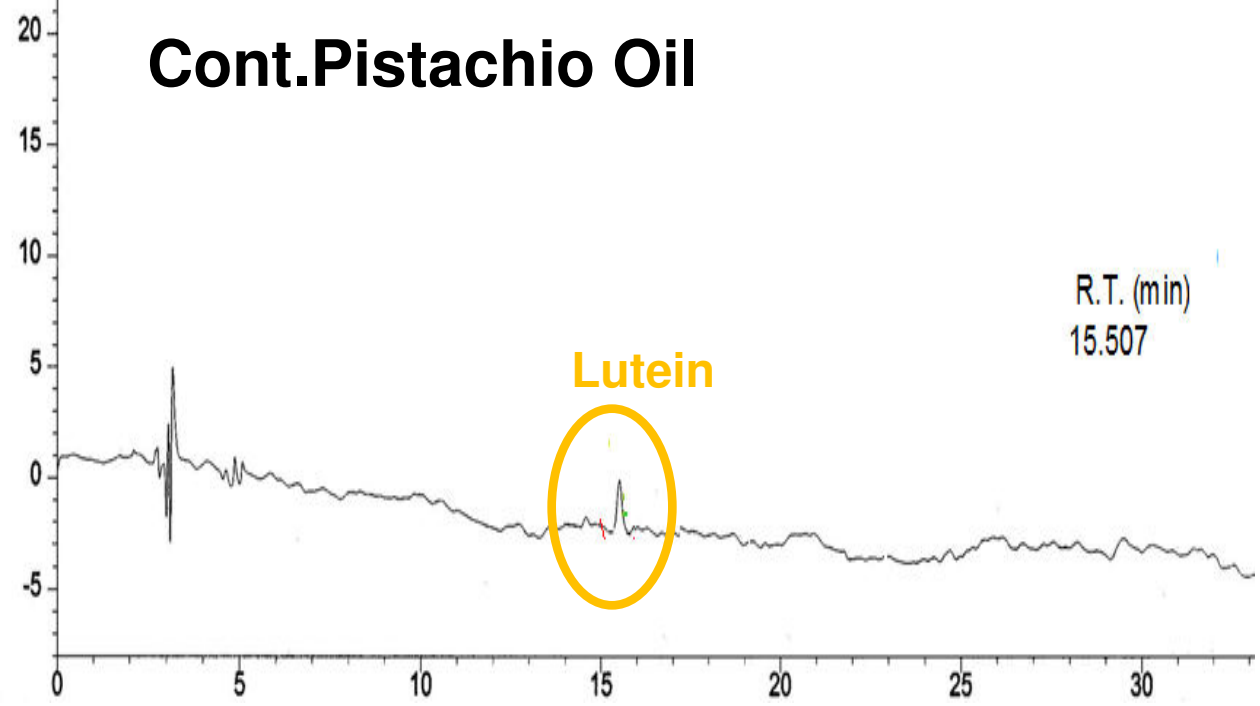
73% Increasing



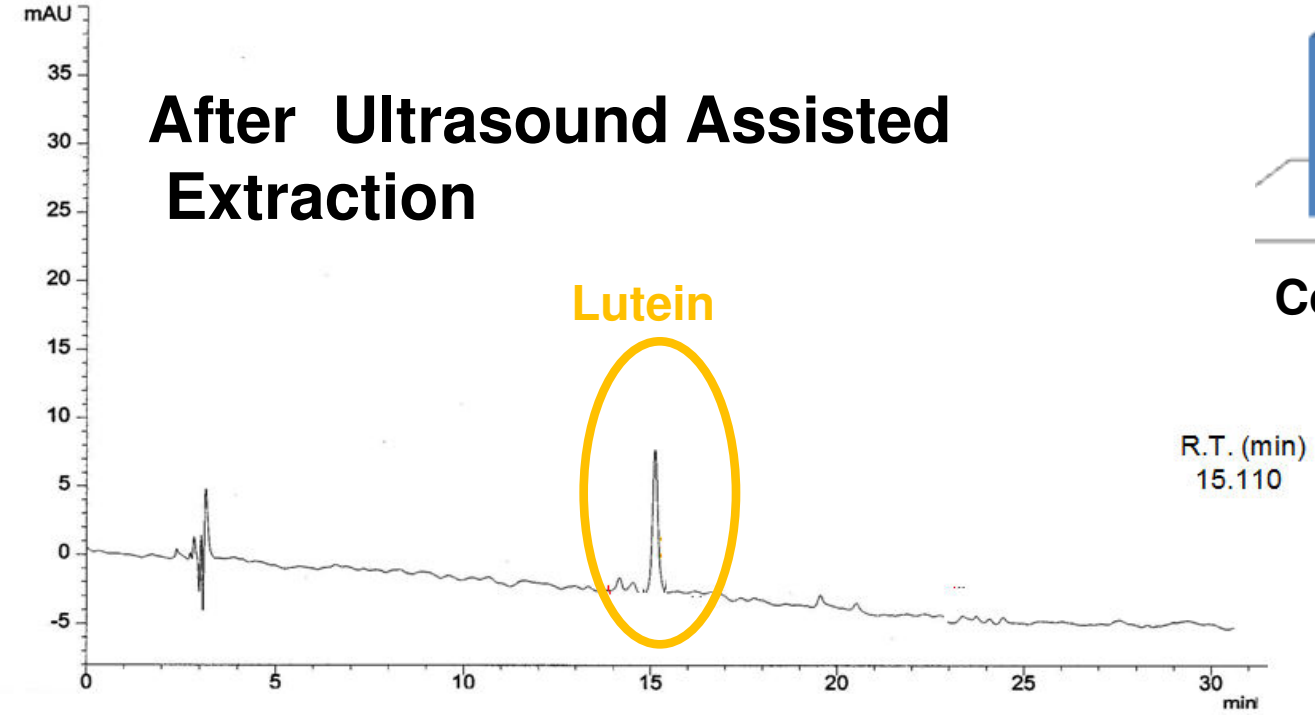
XANTHOPHYLLS STANDARD MIX
CHROMATOGRAM (2 ppm) (10 μl)

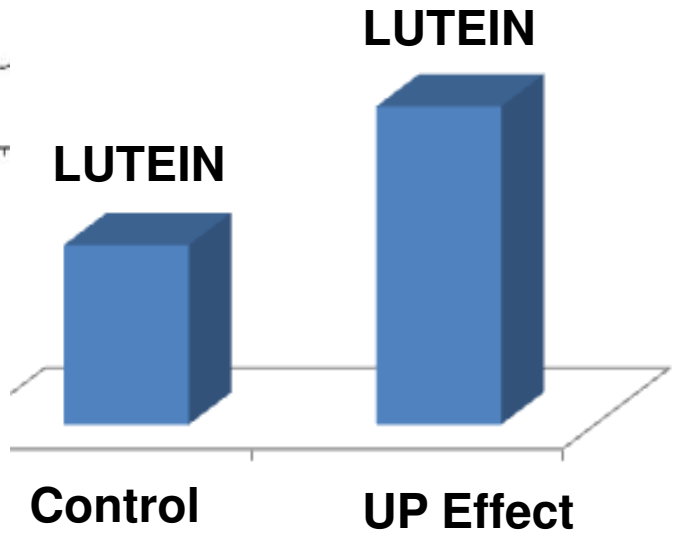
Peak No		R.T. (min)
1	Lutein	15,148
2	Zeaxanthin	15,854
3	Canthaxanthin	16,468

Cont.Pistachio Oil



After Ultrasound Assisted Extraction





Case 4 Cyclopiazonic Acid Mycotoxin and Cheese

CPA is a mycotoxin that occur in homogenized and fermented foods, in dairy foods and in nuts.

Sample	Bileşim	Retention Time (min)	Conc. ng/ml
Cottage cheese	*Cyclopiazonic Acid*	7.888	5.2246
Whie cheese	*Cyclopiazonic Acid*	7.523	0.9315

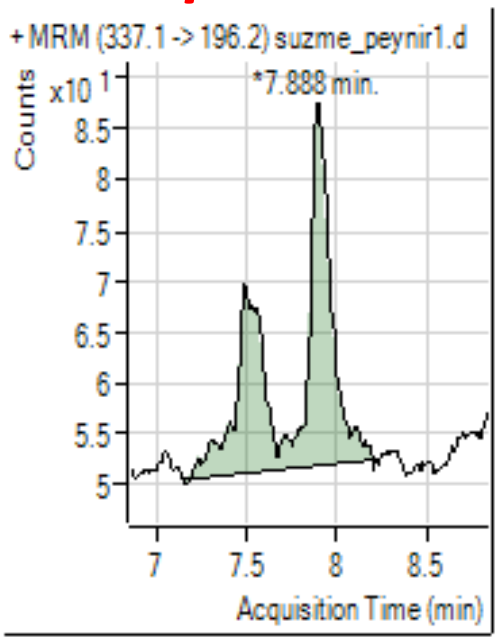
HPLC	:	Agilent 1260
Kolon	:	Agilent Poroshell 120 EC-C18 3.0 x 150 mm x 2.7 micron
Mobil Faz	:	Elüent A : Su 5 mM amonyum format, Elüent B : Methanol
Akış	:	0.5 mL/dak
Kolon Sıcaklığı	:	40 °C
Enjeksiyon Hacmi	:	5 µL
Analiz Süresi	:	15 dk
Dedektör	:	Agilent 6460 LC-MS/MS Triple Quadrupole
İyonizasyon Modu	:	ESI
Polarite	:	Pozitif
Kurutma Sıcaklığı	:	325 °C
Collison Gas	:	11 L/dak.
Ion Spray Voltage	:	4000 V

(Tokusoglu & Boluk,2015)

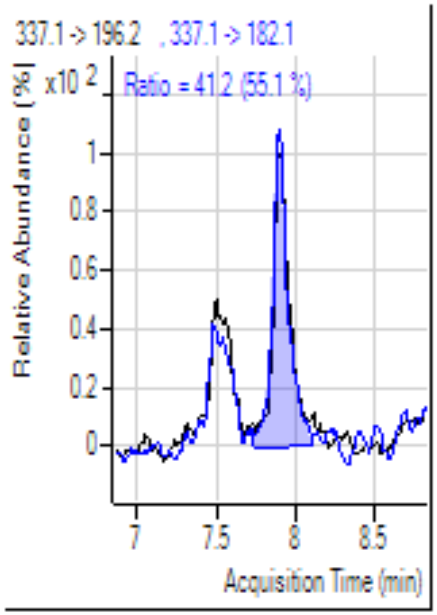
Cottage Cheese Study & US

Suzme Peynir

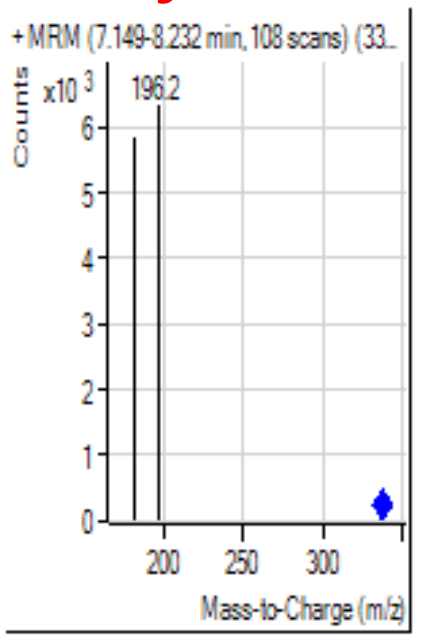
Sample with CP



After US

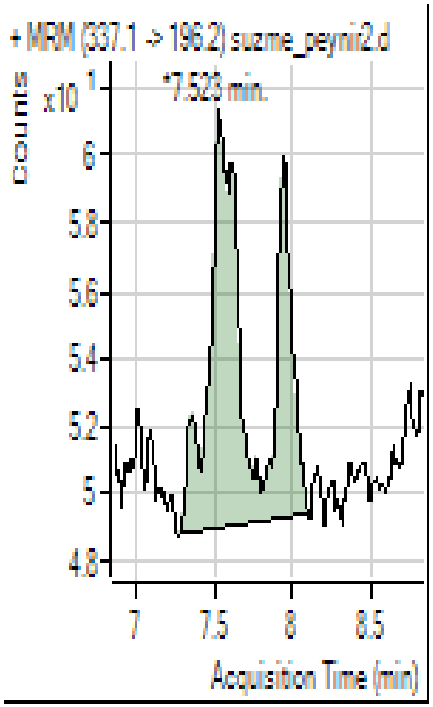


After US

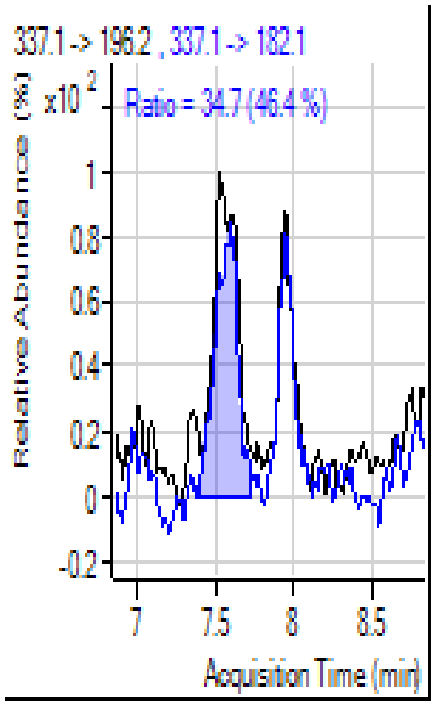


White Cheese Study & US Beyaz Peynir

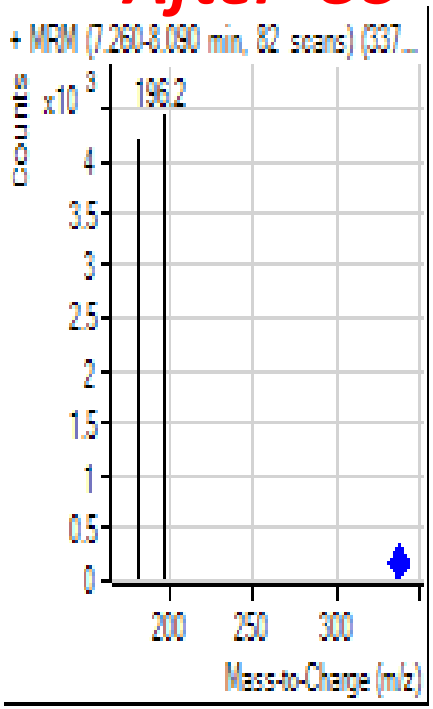
Sample with CP



After US



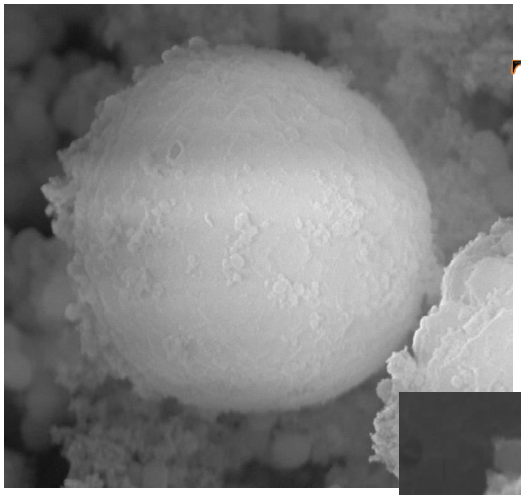
After US



Case 5 Coconut Oil Fatty Acid Profile & Ultrasound

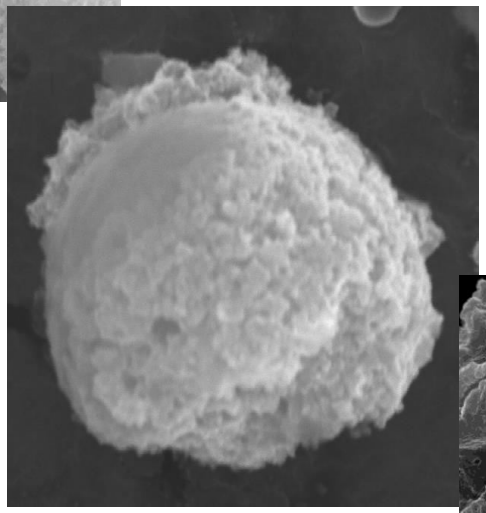
Fatty Acid	Control	After US
Caproic Acid	0.94	0.73
Caprilic Acid	11.72	10.47
Capric Acid	7.83	7.77
Lauric Acid	50.69	52.35
Miristic Acid	16.61	16.84
Palmitoleic Acid	5.93	5.79
Stearic Acid	1.77	1.68
Oleic Acid	3.80	3.66

Disruption of fat globules of coconut

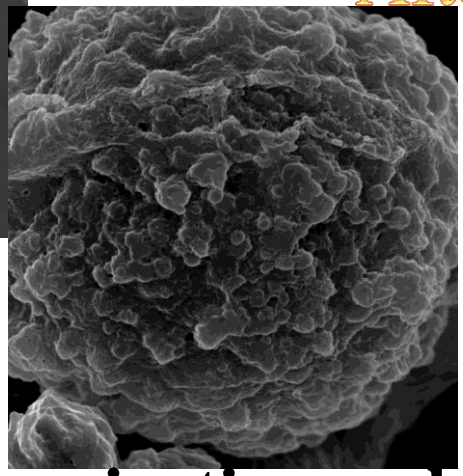


Thermal treatment

Ultrasound
After 10 min



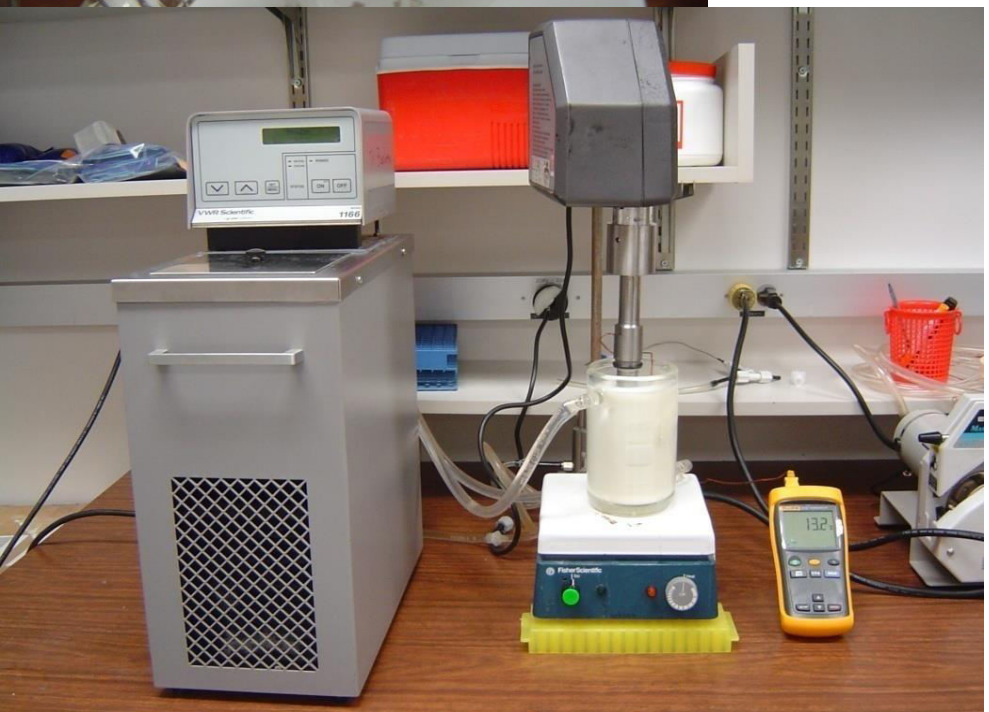
Ultrasound
After 30 min



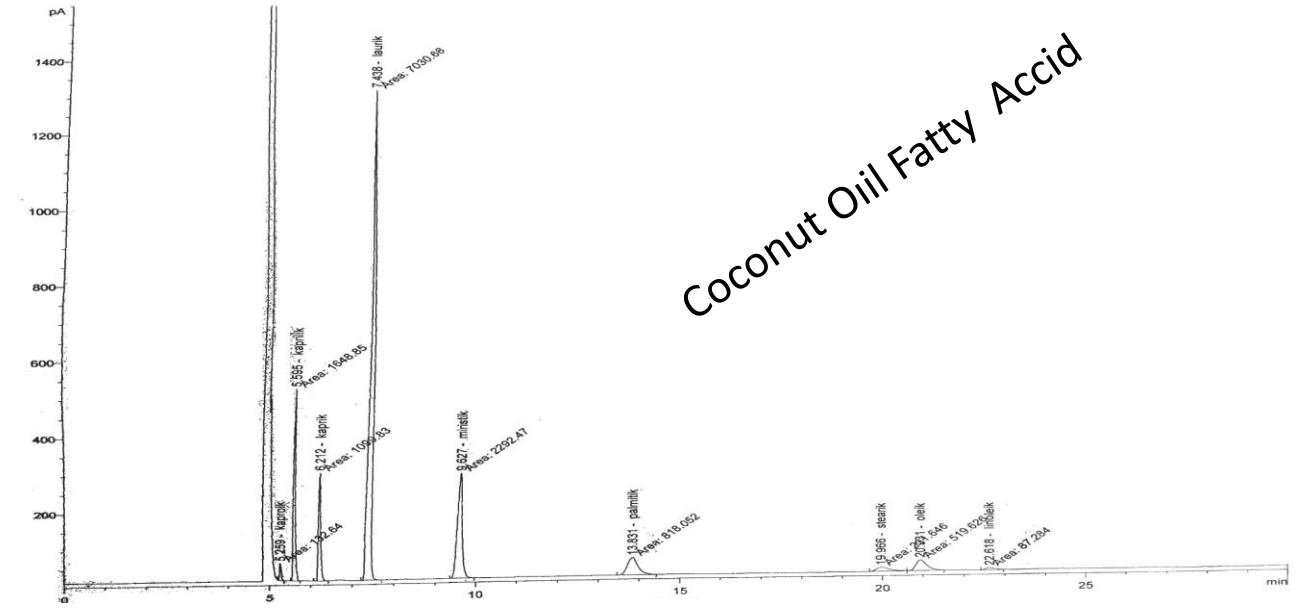
By US, better homogenization, color, appearance and consistency



Ultrasonic processor Hielscher® UP400S (400 W, 24 kHz) with a 22 mm probe

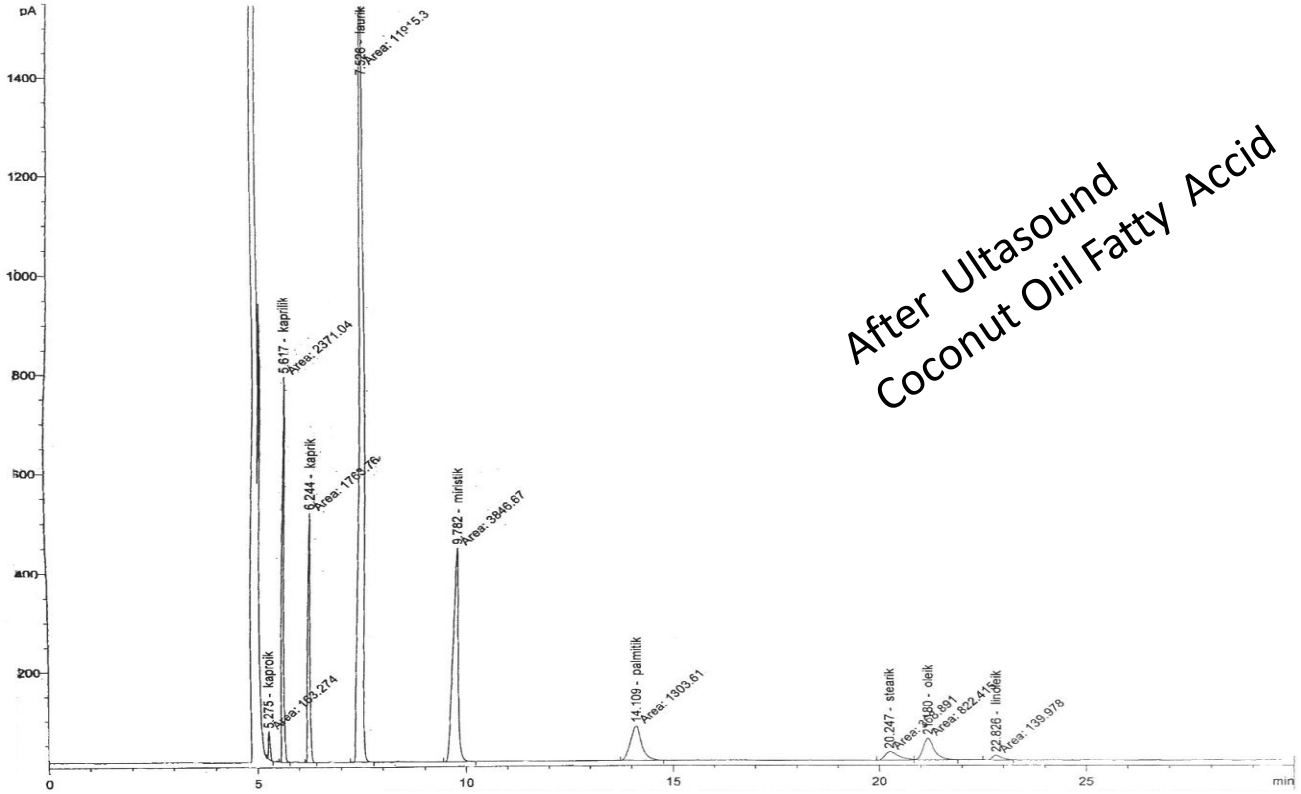


Lauric acid have been blocked the colon cancer cell s (Caco-2) and preserved the oxidative stress of the cell.



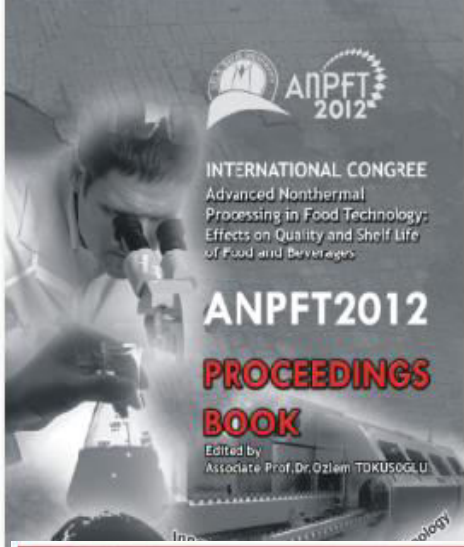
Coconut Oiil Fatty Accid

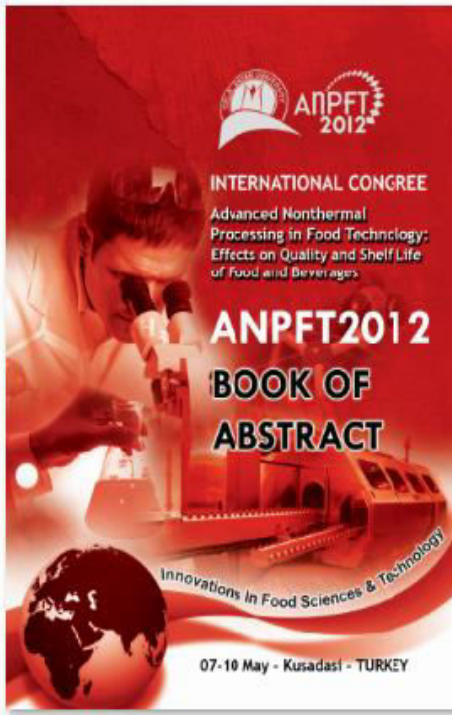
50 s US application

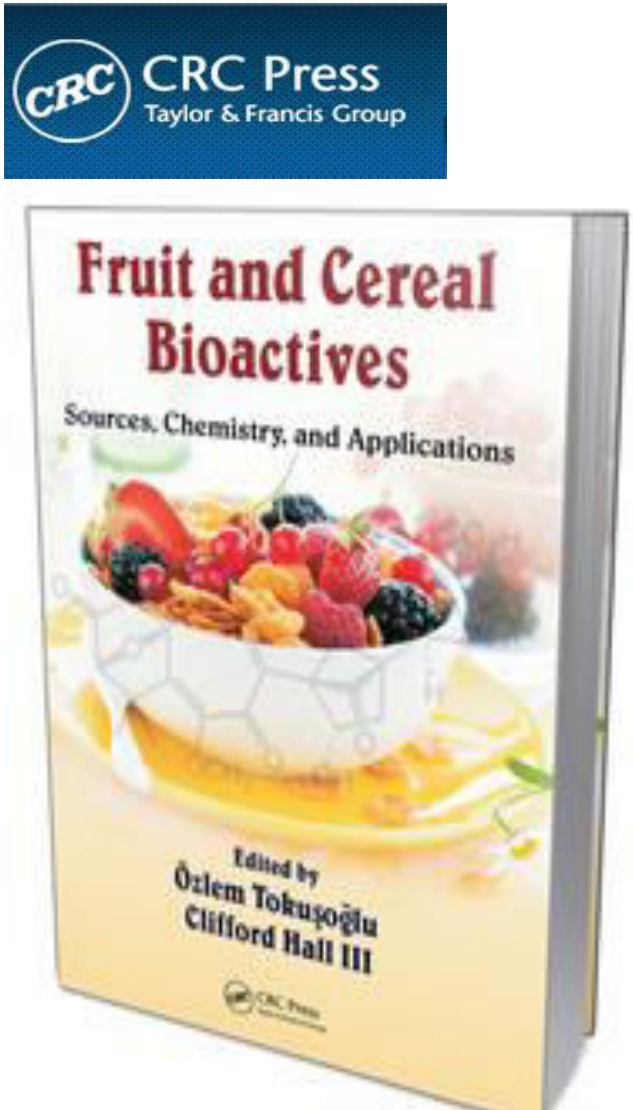


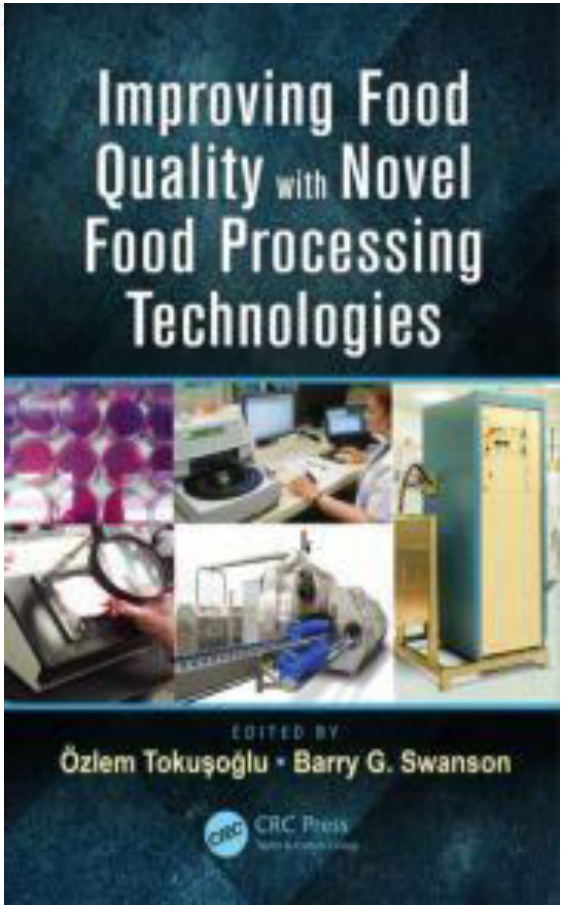
After Ultasound
Coconut Oiil Fatty Accid

Tokuşoğlu International Books



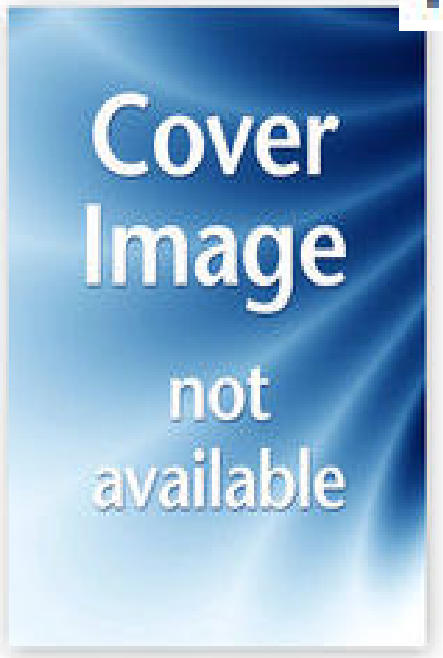






CRC Press
Taylor & Francis Group

Food By-Product Based Functional Food Powders



Series: Nutraceuticals
Published: March 15, 2015 by CRC Press
Content: 336 Pages | 80 Illustrations
Editor(s): Özlem Tokuşoğlu

Share
Beğen 0

» Recommend to Librarian

In Fortcoming

See You Next Conference in Istanbul

It will be announced soon….

12th International Conference and Exhibition on

Food Processing & Technology

Oct 24-26, 2016 Istanbul, Turkey



Ozlem Tokusoglu

Conference Chair

Department of Food Engineering

Celal Bayar University

Turkey