

Developments in International Standards & Methods

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Australian Oils Research



Australian Olive Association
Hobart, Tasmania | 2013
October 7 - 8



Standards

Methods

- **AOCS** - American Oil Chemists' Society
- **IOC** - International Olive Council
- **ISO** - International Standards Organisation
- **AOAC** - Association of Official Agricultural Chemists
- **CEN** - Comité Européen de Normalisation

Limits

- **Codex** - Codex Alimentarius
- **IOC** - International Olive Council
- **EU** - European Union
- **SA** - Standards Australia

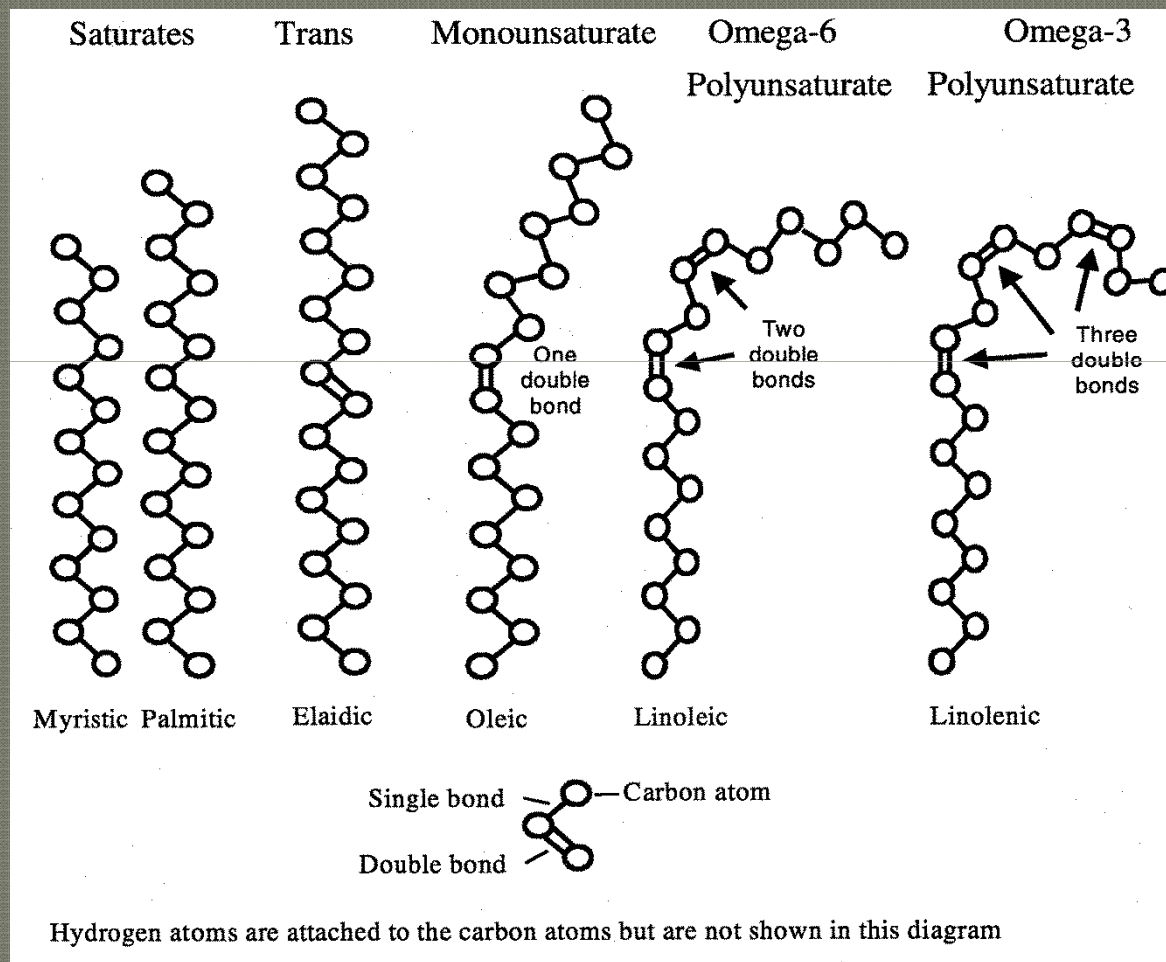


Chemical testing laboratories recognized by IOC

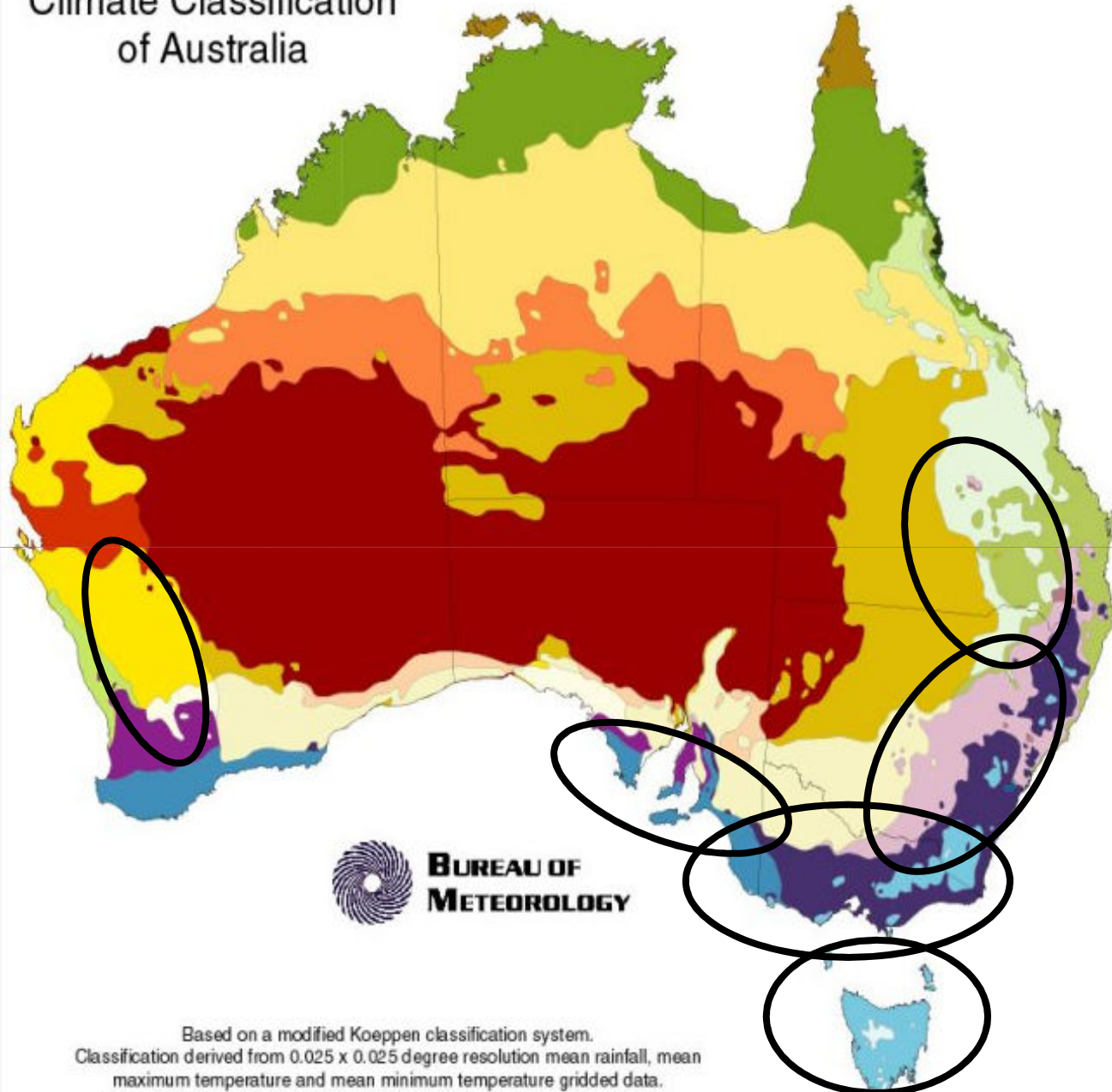
Sensory laboratories recognized by IOC

Argentina	Argentina
Australia	Australia
Canada	Cyprus
France	Czech Republic
Greece	France
Italy	Germany
Morocco	Greece
Portugal	Israel
Slovenia	Italy
Spain	Jordan
Syria	Morocco
Tunisia	New Zealand
Turkey	Portugal
USA	Slovenia
	Spain
	Syria
	Tunisia

Olive Oil Fatty Acids



Climate Classification of Australia



Climate Classes

- Equatorial**
 - rainforest (monsoonal)
 - savanna
- Tropical**
 - rainforest (persistently wet)
 - rainforest (monsoonal)
 - savanna
- Subtropical**
 - no dry season
 - distinctly dry summer
 - distinctly dry winter
 - moderately dry winter
- Desert**
 - hot (persistently dry)
 - hot (summer drought)
 - hot (winter drought)
 - warm (persistently dry)
- Grassland**
 - hot (persistently dry)
 - hot (summer drought)
 - hot (winter drought)
 - warm (persistently dry)
 - warm (summer drought)
- Temperate**
 - no dry season (hot summer)
 - moderately dry winter (hot summer)
 - distinctly dry (and hot) summer
 - no dry season (warm summer)
 - moderately dry winter (warm summer)
 - distinctly dry (and warm) summer
 - no dry season (mild summer)
 - distinctly dry (and mild) summer
 - no dry season (cool summer)



Based on a modified Koeppen classification system.
 Classification derived from 0.025 x 0.025 degree resolution mean rainfall, mean maximum temperature and mean minimum temperature gridded data.
 All means are based on a standard 30-year climatology (1961 to 1990).

World Map

The Nations of the World



Fatty Acid Profile

Fatty Acid	IOC	Australia
Myristic	≤ 0.05	*
Palmitic	7.5 - 20.0	7.0-20.0
Palmitoleic	0.3 - 3.5	*
Heptadecanoic	≤ 0.3	*
Heptadecenoic	≤ 0.3	< 0.4
Stearic	0.5-5.0	*
Oleic	55.0-83.0	53.0-85.0
Linoleic	3.5 - 21.0	2.5-22.0
Linolenic	≤ 1.0	< 1.5
Arachidic	≤ 0.6	*
Gadoleic	≤ 0.4	≤ 0.5
Behenic	$\leq 0.2^*$	*
Lignoceric	≤ 0.2	*

Sterol composition (% total sterols)

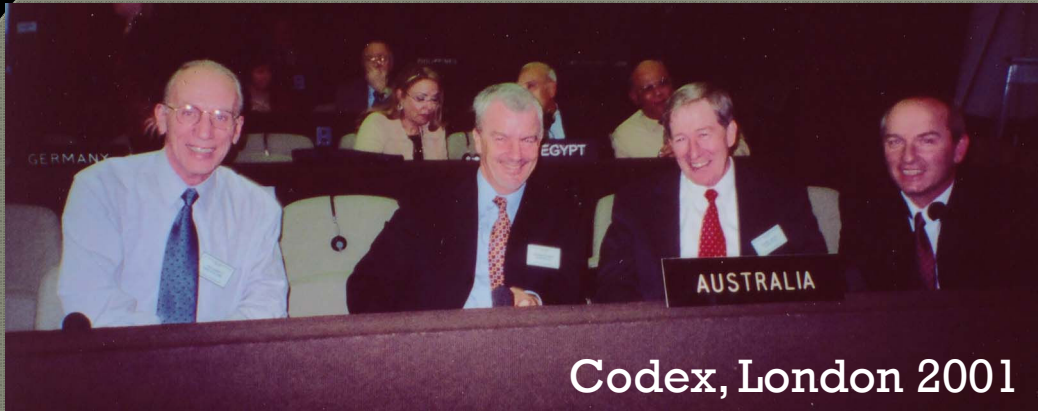
	IOC	Australia
Cholesterol	≤ 0.5	*
Brassicasterol	≤ 0.1 *	*
Campesterol	≤ 4.0	≤ 4.8
Stigmasterol	< campesterol	≤ 1.9
Delta-7-stigmastenol	≤ 0.5	*
Apparent beta-sitosterol:	≥ 93.0	≥ 92.5
<u>Total sterol (mg/kg)</u>	≥ 1000	*
<u>Erythrodiol and uvaol</u>	≤ 4.5	*

Grades of Olive Oil

	IOC	Codex	EC	Australia	USA	China
1	Extra virgin	*	*	*	U.S. *	*
2	Virgin	*	*	*	U.S. *	Medium grade virgin
3	Ordinary virgin	*	NO	NO	NO	NO
4	Lampante virgin	NO	*	*	U.S. *	*
5	Refined	*	*	*	U.S. *	*
6	Olive oil (blend of refined olive oil and virgin olive oils)	*	Olive oil composed of refined and virgin olive oil	Olive oil composed of refined and virgin olive oil	U.S. *	Blended olive oil
7	Crude olive-pomace oil	NO	Crude olive-residue oil	*	U.S. *	*
8	Refined olive-pomace oil	*	Refined olive-residue oil	*	U.S. *	*
9	Olive-pomace oil (blend of refined olive-pomace oil and virgin olive oils)	*	Olive-residue oil	Olive-pomace oil-composed of refined olive-pomace oil and virgin olive oils	U.S. *	Blended olive-pomace oil

International Olive Council Madrid 2001-12





Codex, London 2001

CODEX ALIMENTARIUS



Codex, London, 2005



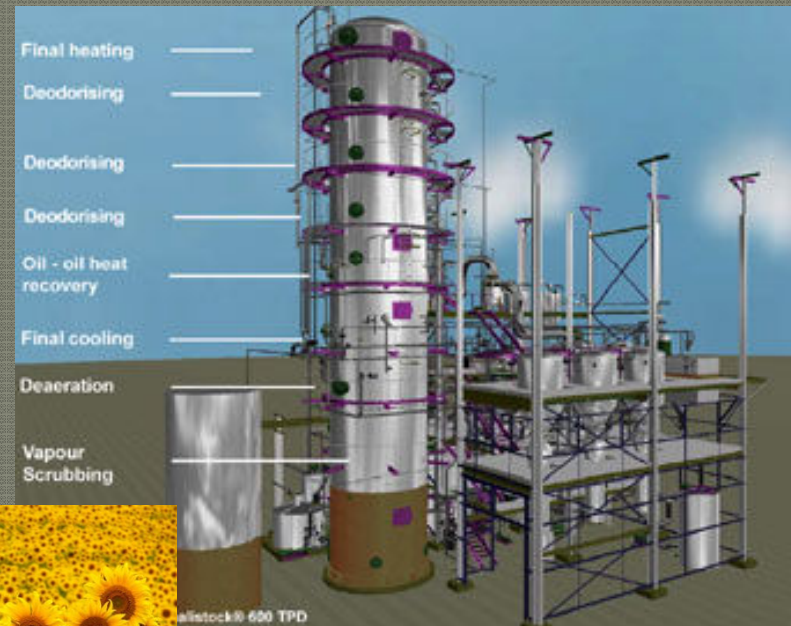
Codex, Langkawi, 2013

outcomes of the Codex Alimentarius
meeting on Fats and oils in Malaysia

Authenticity & Adulteration

1. Refined oil

2. Seed oil



Example Supermarket Sample

Fatty Acids	C16:0	C17:1	C18:0	C18:1	C18:2	C18:3	C20:0	C20:1
Sample	6.8	0.1	2.2	68.2	15.5	5.0	0.5	0.8
IOC	7.5 - 20.0	≤ 0.3	0.5-5.0	55.0-83.0	3.5 - 21.0	≤ 1.0	≤ 0.6	≤ 0.4

No oil sample has ever been rejected in Australia based on fatty acids alone!

Sterols	Cholesterol	Brassicasterol	Campesterol	Apparent β sitosterol	Diols
Sample	0.24	6.29	23.23	68.30	6.48
IOC	≤ 0.5	≤ 0.1 *	≤ 4.0	≥ 93.0	≤ 4.5

IOC Methods for Adulteration

Seed oil

Phytosterols
ECN42
Fatty acids

Refined oil

UV absorption
Trans fatty acids
Stigmastadienes



Pomace oil

Wax

Supermarket Surveys



IOC Tests	Results	IOC # limits
Free Fatty Acids	0.27	≤ 0.8
Peroxide Value	17	≤ 20
UV Absorbance		
ΔK	<u>0.070</u>	≤ 0.01
K_{232nm}	<u>3.188</u>	≤ 2.50
K_{270nm}	<u>0.892</u>	≤ 0.22
Stigmastadiene Content	<u>6.160</u>	≤ 0.10
Unsaponifiable matter	<u>15.4</u>	≤ 15
Wax Content	<u>2002</u>	≤ 250
Trans Fatty Acids		
C18:1T	<u>0.071</u>	≤ 0.05
C18:2T and C18:3T	<u>0.099</u>	≤ 0.05



Despite methodologies:

UC Davis Study

73% Top Selling Imported EVOO Failed Sensory Test



Storage

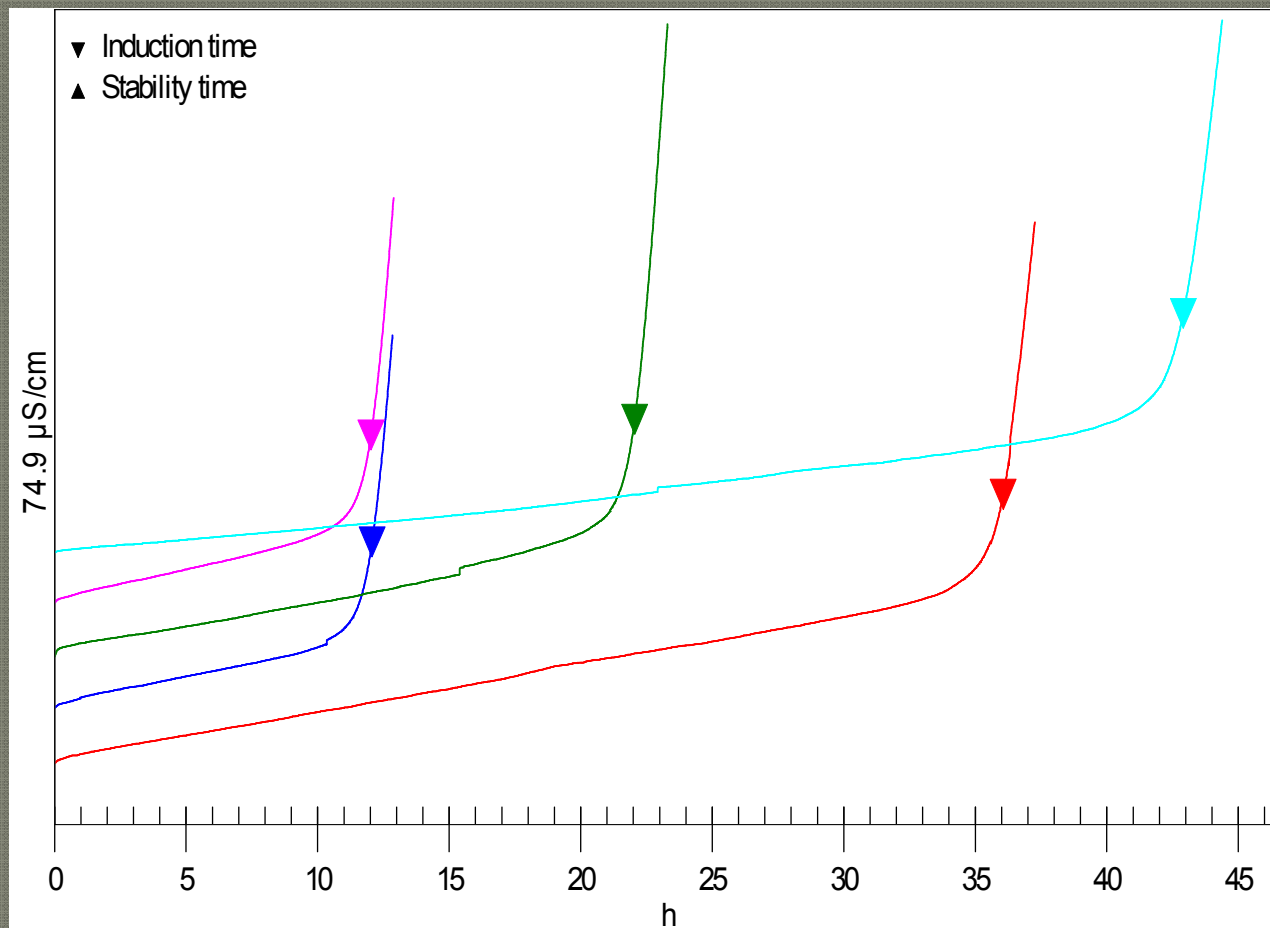


Storage & Handling

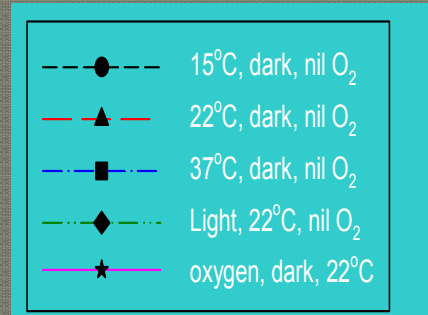
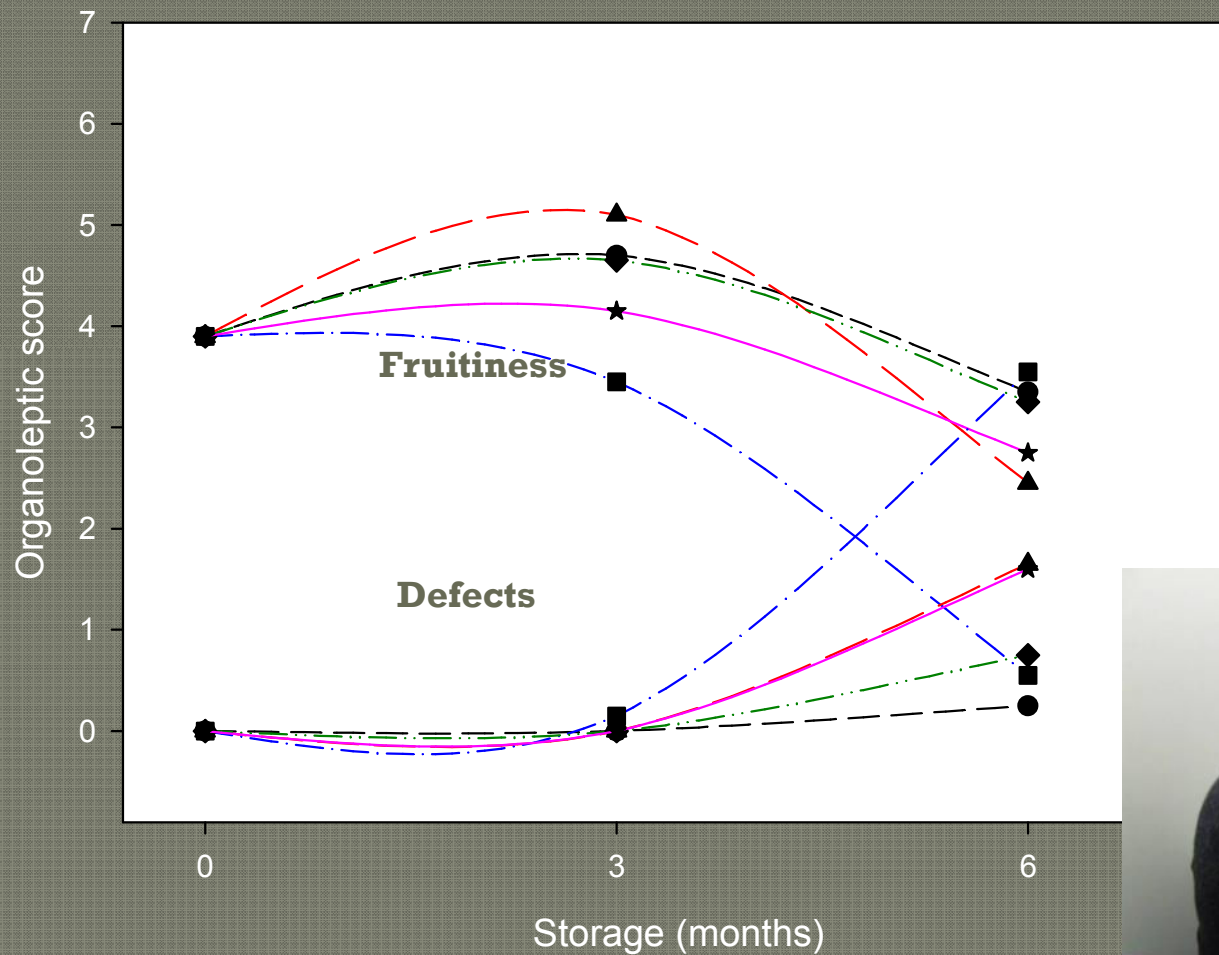
- The biggest concern for EVOO
- Storage – excessive times
- Transport
- Oxygen – plastic containers
- Temperature
- Light – clear glass

Rancimat - induction time

Predicting shelf life



Sensory Analysis

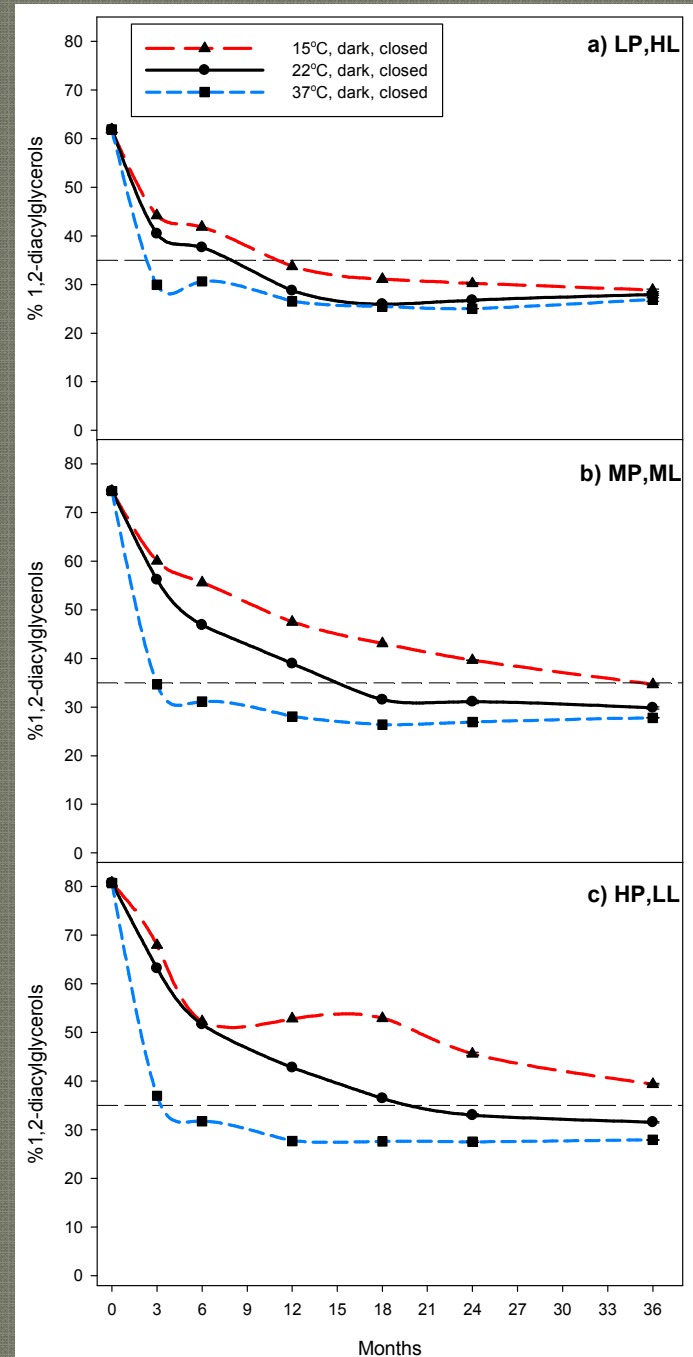


Effect of temperature on 1,2-diacylglycerol (DAG)

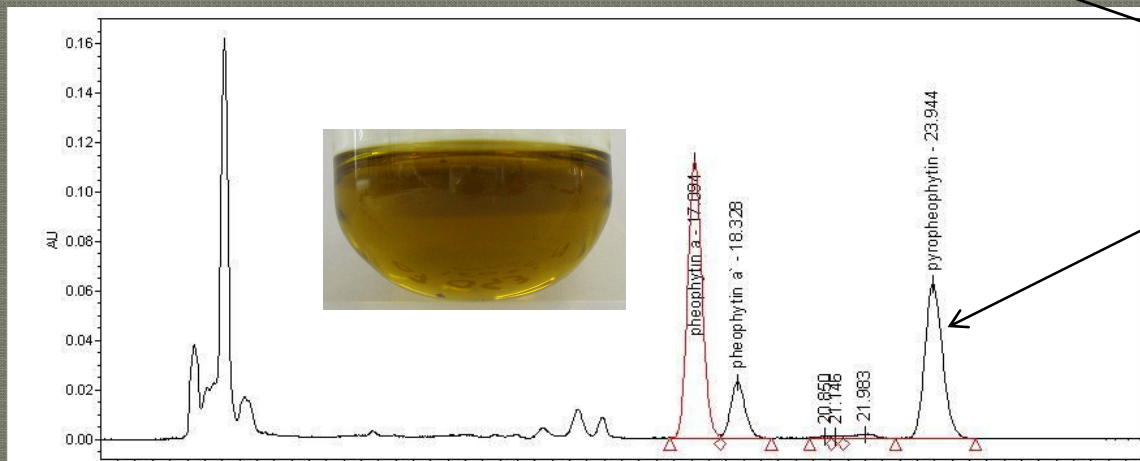
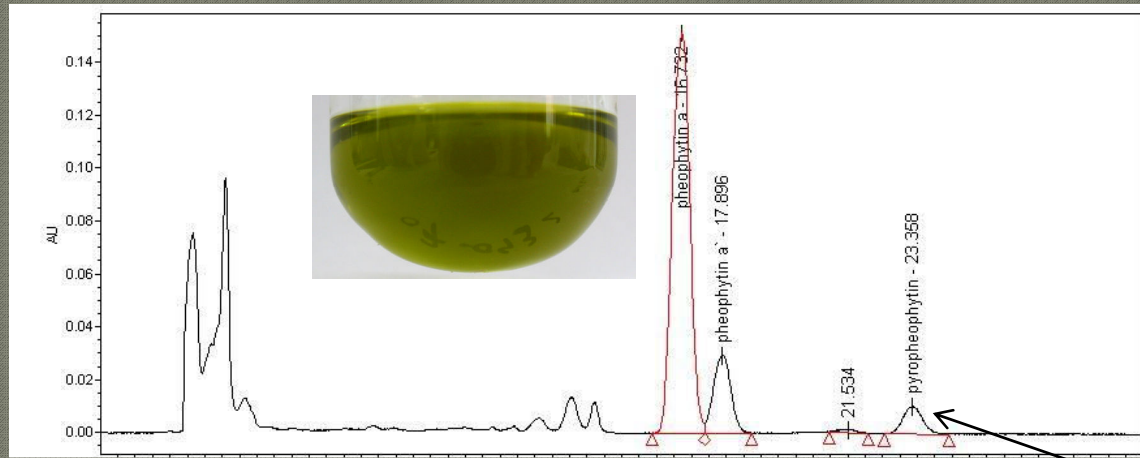
Low polyphenols, High linoleic acid

Mid polyphenols, Mid linoleic acid

High polyphenols, Low linoleic acid.

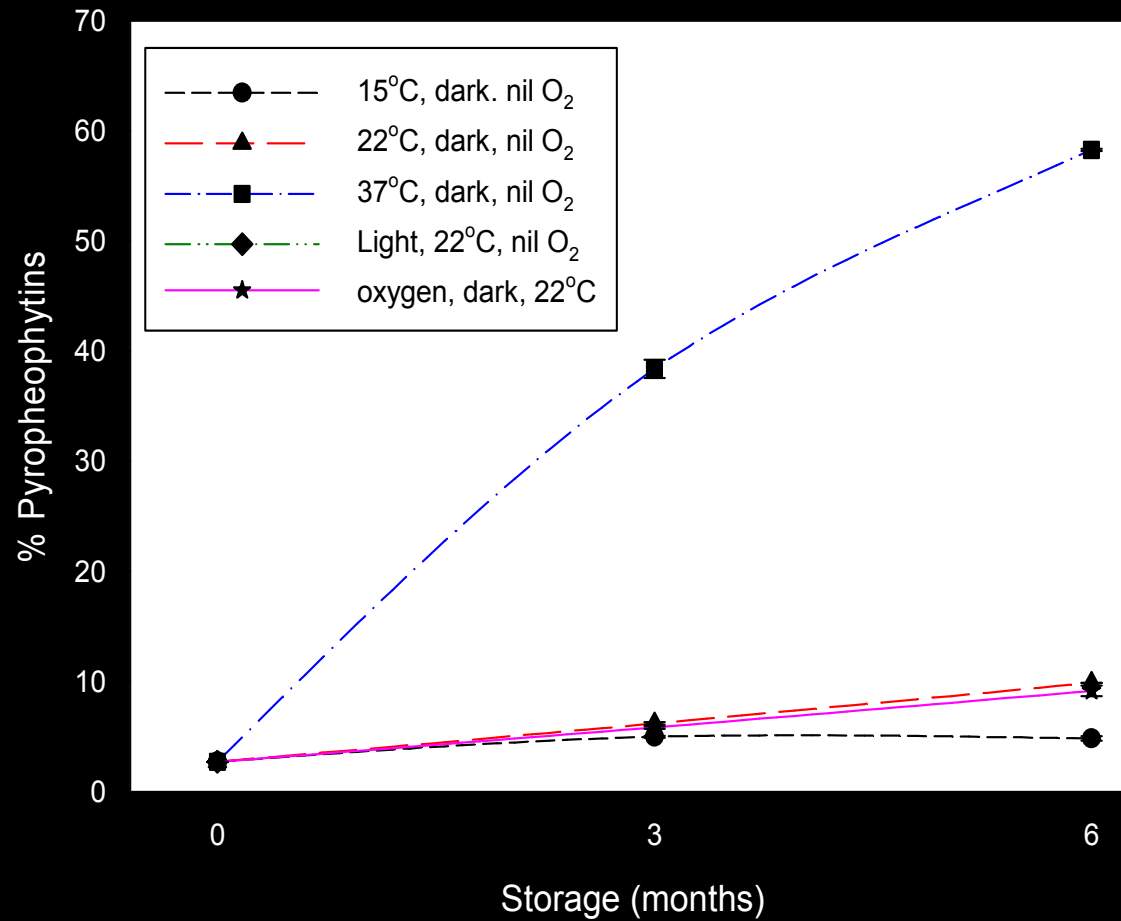


Pyropheophytin a (PPP)



Pyropheophytin a

Pyropheophytin



- Main heat affect
- Disappeared in light

Relationship - Sensory and Chemical

% SAMPLES FAILING BOTH SENSORY AND CHEMICAL ANALYSIS							
	Sensory	IOC CHEMICAL TEST				DGF / Aust Tests	
BRAND	FAILED SENSORY	FFA	FAP	PV	UV	DAGs	PPP
California Olive Ranch	0	0	0	0	0	0	0
Cobram Estate	0	0	0	0	0	0	0
Lucini	11	0	0	0	100	0	0
Filippo Berio	83	0	0	0	33	33	20
Star	61	0	0	0	0	64	27
Bertolli	72	0	0	0	8	62	46
Colavita	56	0	0	0	50	70	50
Pompeian	94	0	0	0	65	100	94
Failed (%)	51%	0	0	0	34	65	49

International Standards Organisation



ISO at ISF meeting, Sydney, 2009



ISO meeting, Montreal 2012



ISO, Madrid 2011

United States International Trade Commission

**Olive Oil: Conditions
of Competition
between U.S. and
Major Foreign
Supplier Industries**

5th Dec 2012

Investigation No. 332-537

USITC Publication 4419

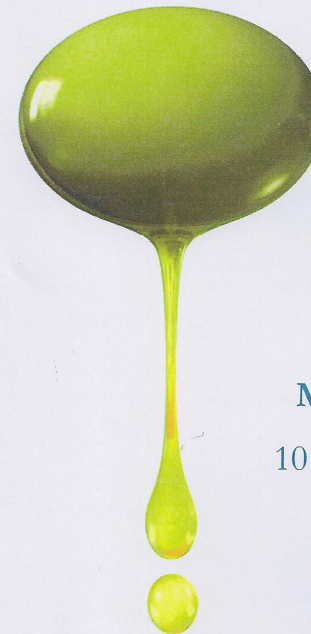
August 2013



EU Meeting on Adulteration



Workshop on olive oil authentication



Madrid, Spain
10 & 11 June 2013

Organised by
European Commission
Directorate General
Agriculture and Rural Development
and the
European Commission
Joint Research Centre
Institute for Reference Materials and Measurements

With the participation of the
International Olive Council



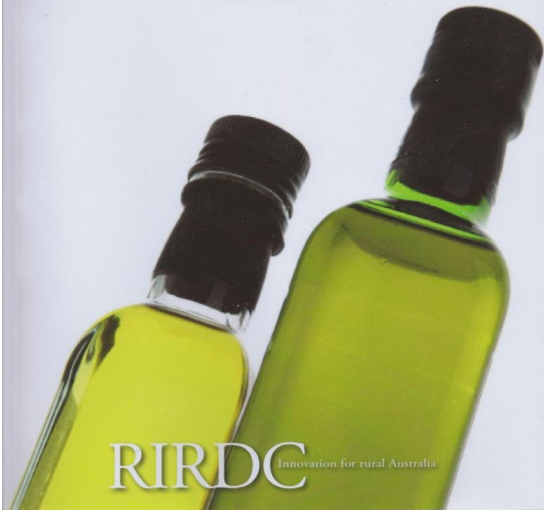
EU Workshop 2013

- Too many tests
- Need to consider natural variation
- Need to detect fraud



The Effect of Storage Conditions on Extra Virgin Olive Oil Quality

RIRDC Publication No. 12/024



Summary

- Need for an international standard
- IOC have resisted change
- IOC & EU have prevented change at Codex
- EU investigation may be the answer
- Codex needs to set international standards
- **Legal actions by consumers against corrupt sale of adulterated olive oil.**

