

Healthier Frying Oils – Current and Future Trends

BY

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Important Characteristics of Industrial Frying Oils

- **High oxidative stability**
- **High smoke point**
- **Low melting point**
- **Low foaming**
- **Bland flavour**
- **Nutritionally valuable**
- **Cost & Availability**

NEW
DEVELOPMENTS
IN
INDUSTRIAL
FRYING



30 April 1997
15 Belgrave Square
London, SW1

Organised by the SCI Oils and Fats Group

SCI

Criteria of Healthy Frying Oil

- Rich in MUFAs (C18:1) i.e. (ω -9)
- Low in SFAs & PUFAs (C18:2)
- Very low in C18:3
- Zero in **Trans Fatty Acids (TFAs)**
- Appelqvist, 1997

Trans Fatty Acids (TFAs) Issue

Harmful health effects

- **The FDA Regulation:** Declaration of TFAs in nutrition label of foods – effective 1 January 2006
- **Danish legislation:** Restricts TFAs max 2% in processed foods - effective from 31 December 2003
- **WHO/FAO:** Internal report on global food standards, strategy on 'Diet, physical activity and health', limits on amounts of saturated and TFAs in processed foods

Criteria of Stable & Healthful Frying Oil

	Kochhar (2000)	Warner (2005)*
TSAAs	< 15%	low < 7%
MUFAs (ω -9)	> 75%	50 - 65%
C18:2	< 15%	25 - 35%
C18:3	< 1.5%	< 3%
TFAAs	practically zero	not mentioned
Total Polar Compounds	not mentioned	10-15%

* For stored fried foods

Rapid / Quick Tests for Monitoring Frying Oil Quality

- ❖ **Fritest** - alkali colour number
- ❖ **ACM/PCM** Mir Oil Opti-Fry
- ❖ **Food Oil Sensor** - dielectric constant
- ❖ **Fri-Check** - viscosity, surface tension
- ❖ **PCT 120 (3M)** - % polar material
- ❖ **Oxifrit** - oxidation products

Ebro Food Oil Monitor 200



Typical Frying Oils and Fats

Oil	Iodine Value	% Fatty acids		
		Sat	Mono	Poly
GNO	85-100	15-20	37-65	25-50
Tallow	45-55	54	42	4
Palm oil	50-55	49	41	10
Palm olein	56-63	44	44	12
RSO	116-119	7	62	31
PHRSO*	88-96	12	71	17
PHBO*	75-78	19	70	11
PHSFO*	95-105	20	42	38

* contains considerable amount of **trans fatty acids, 20 - 46%**

Typical fatty acid composition of new frying oils and of normal sunflower oil and Good-Fry Oil

Fatty acid	Sunflower seed oils			Good-Fry Oil
	Norm	Nu-Sun	HOSO	
C16:0	7.0	8.8	4.3	4.5
C18:0	4.5	2.3	4.2	3.7
C18:1 (ω-9)	18.7	64.5	81.5	78.6
C18:2	67.0	22.1	8.2	10.7
C18:3	0.8	0.4	< 0.1	0.1
Others	2.0	1.9	2.0	2.4
Iodine value	134	95	83	86
IP at 110° C	4.5 h	12 h	18 h	19 h

Stability of various oils by actual frying of French fries

Oil type	Endpoint (hours)	Criteria
Groundnut Oil	20	greasy fries
HOSO	30-35	dark/greasy
Long-Life*	40	greasy fries
Palm Olein	40	greasy fries
Good - Fry Oil	65	foaming, fries still OK

TPM = 21.1 – 23.4%

* partly hydrogenated rapeseed oil

Results of 14 days of frying French fries in a fast food sector

**Good-Fry Oil Oil blend*
+ 3.5% GFC**

Batch size (g)	625	625
Frying temp °C	168	168
Quantity fried (kg)	1,200	1,200
Frying time (h)	140	140
TPM (%)	8	8
Polymers (%)	2.5	2.7
FFAs (as % oleic)	0.3	0.3
Trans fatty acids (%)	0.5	1.0

*** Vegetable oils : Sat: Mono: Poly 1:1:1 + Good Fry Constituents**

Other Emerging Healthful Frying Oils

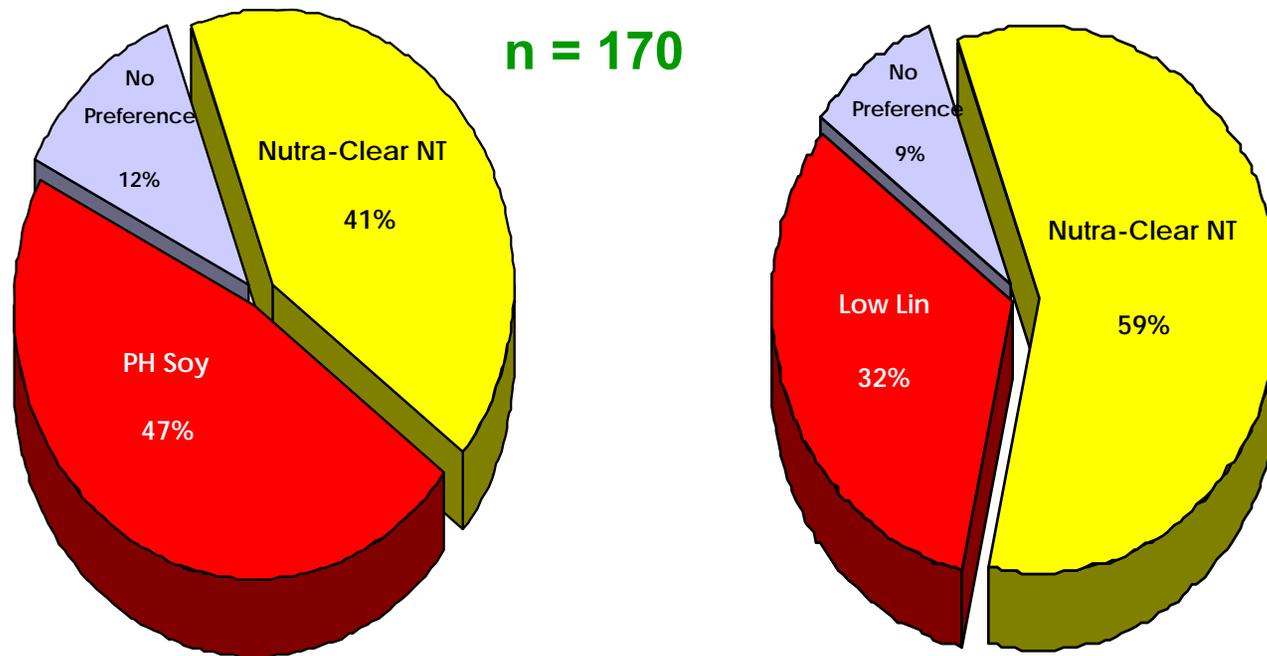
- High Oleic Low Linolenic Canola Oil
- High Oleic Soybean Oil
- High Oleic Safflower oil
- High Oleic Corn Oil
- High Oleic Groundnut Oil
- Rice Bran Oil
- Sesame Oil
- DAG Oil, Low-calorie

Fatty Acid Profiles of Commercially Available High-Oleic ω -9 Vegetable Oils

	Total Sats	C18:1 (ω -9)	C18:2	C18:3	TFAs
Canola / Rapeseed					
HOLL Natreon™	7	75	14	3	<1
Commodity	7	60	20	10	<1
High-Oleic					
Soybean	12	83	2	3	<1
Safflower	10	75	14	<1	<1
Olive	14	75	8	<1	<1

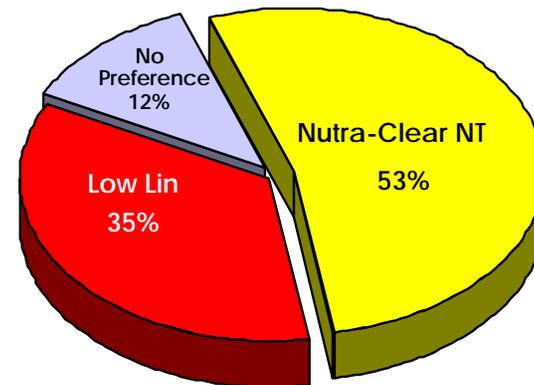
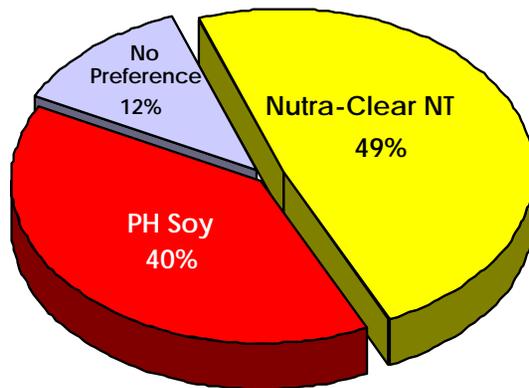
Results of the Consumer Tasting of French Fries (Adults)

High-oleic Canola vs. PHSBO High-oleic Canola vs. Low Lin SBO



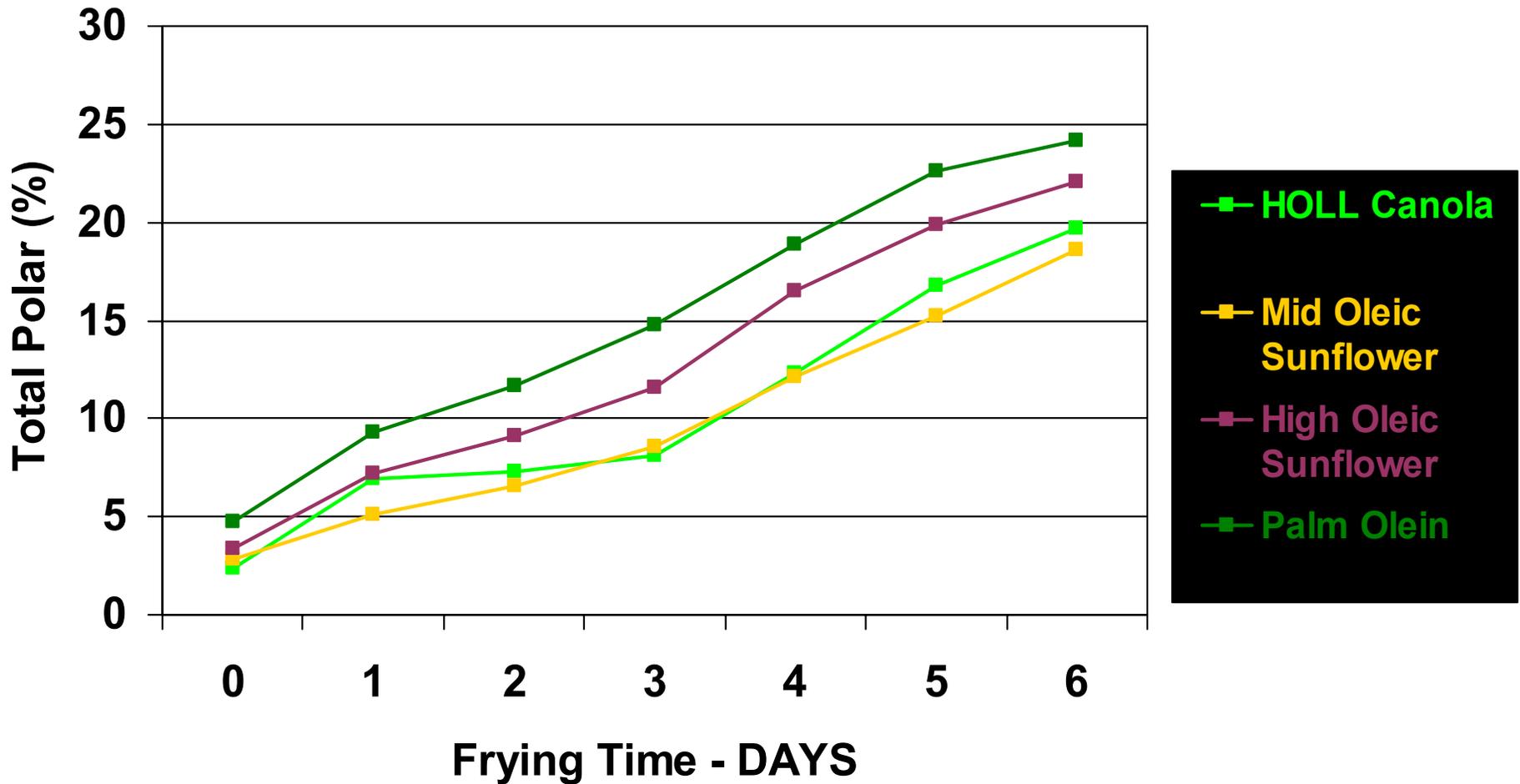
Results of the Consumer Tasting of French Fries (Teenagers)

High-oleic Canola vs. PHSBO High-oleic Canola vs. Low Lin SBO

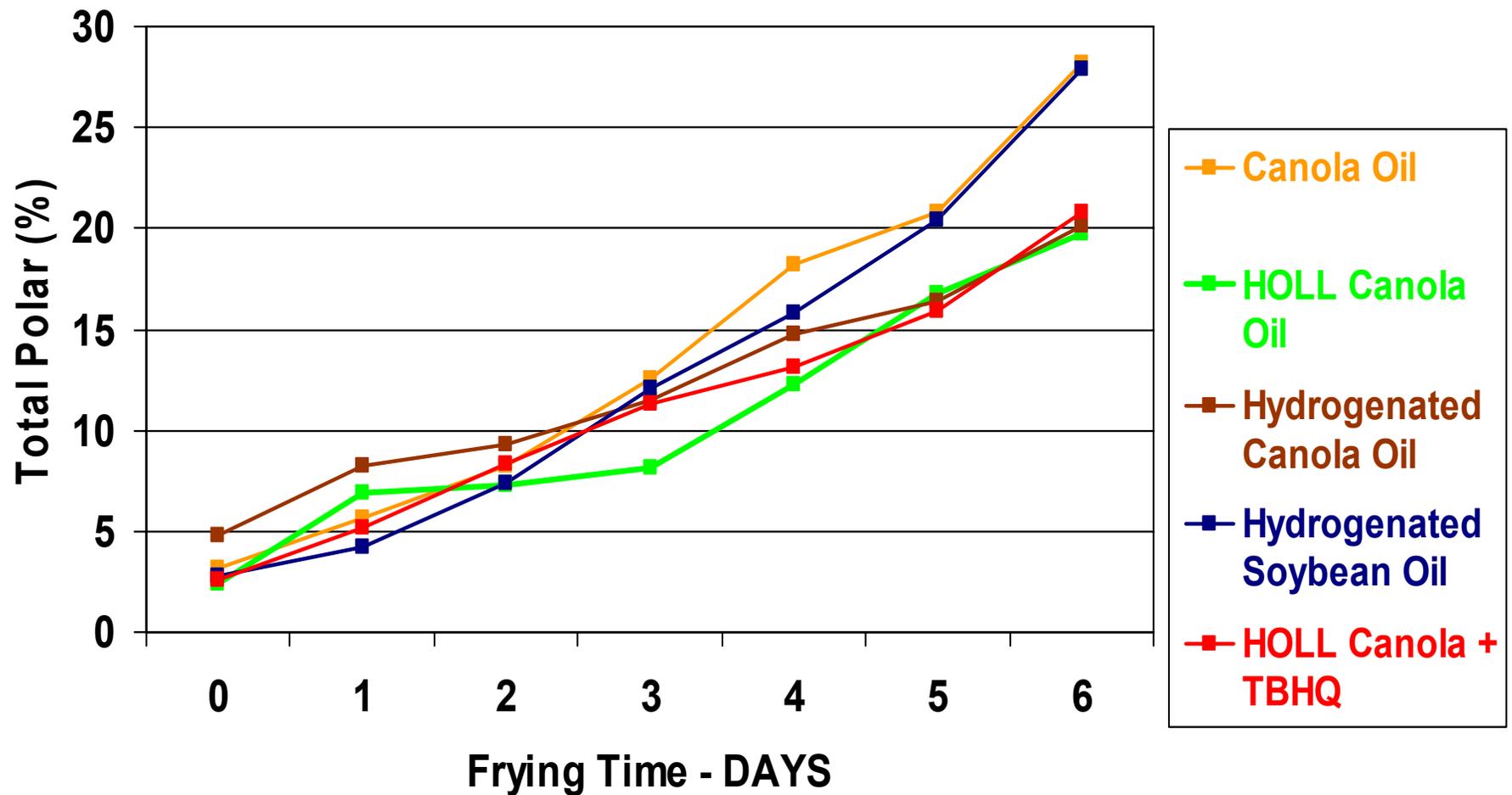


(N = 179)

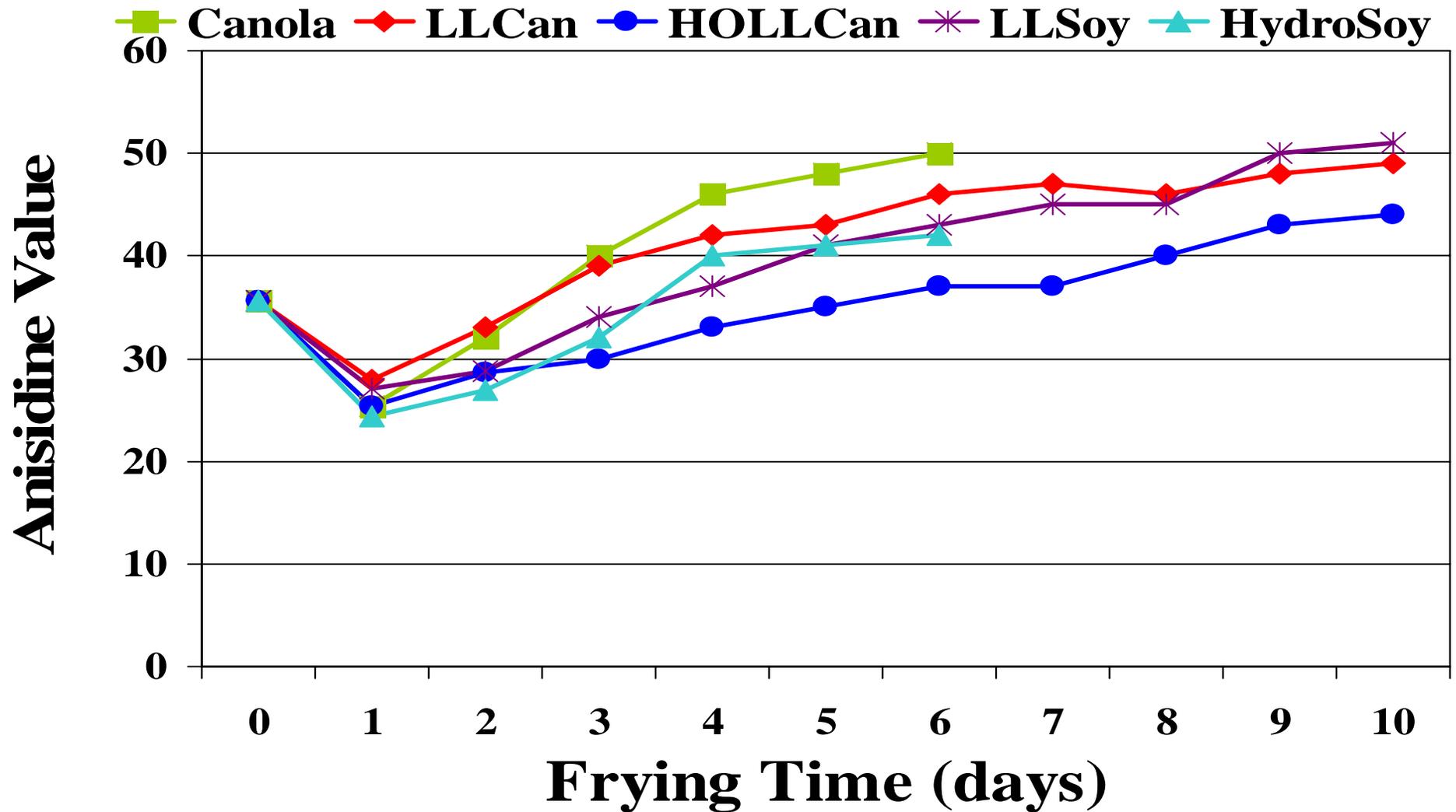
Formation of Total Polar Materials in Rotation Fry Study I (Przybyski, 2006)



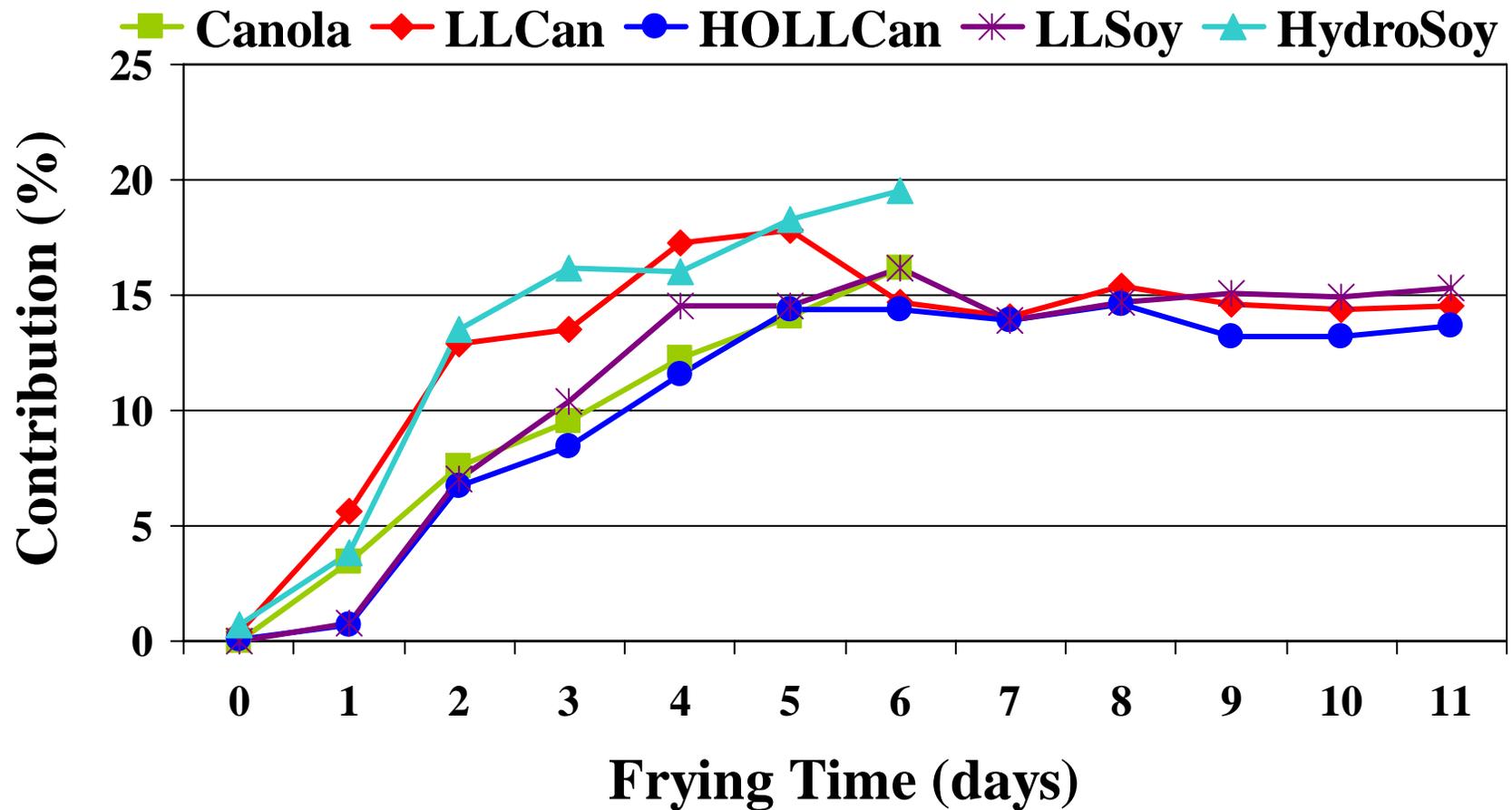
Formation of Total Polar Materials in Rotation Fry Study II



Formation of p-Anisidine Reacting Compounds



Formation of Polymers Components in Frying Oils



NOW 55% LESS Saturated Fat*
✓ SAME GREAT TASTE

**HULA
HOOPS®**

MADE WITH
100%
SUNFLOWER OIL

**SALT &
VINEGAR**
FLAVOUR POTATO RINGS



WALKERS

**READY
SALTED**

CRISPS



SUNSEED

ONE OF THE HEALTHIEST
OILS THERE IS

70% LESS SATURATED FAT¹



Formation of Nutritionally Undesirable Components during Deep Frying

- **Acrylamide**
- **Cyclic monomer fatty acids**
- **Trans fatty acids**
- **Secondary oxidation products e.g. alpha-, beta-unsaturated aldehyde, 4-hydroxy-2-trans-nonenal (HNE) from highly unsaturated oils**

Future Trends in Healthier Frying Oils

Trans-Free
Low in
Saturates & PUFAS
and
High in MONO (ω -9)

Functional fried foods ? – Vacuum frying
Rich in natural antioxidants + Health
beneficial components, & possibly labelling
and

Practically free from undesirable components
e.g. **acrylamide, CFAs, HNE, etc.**

Thank You

For Your

Kind Attention