7th Palm Oil Seminar Series
Commercial • Technical • Sustainability

Tuesday, September 22nd
8:00 am to 12:30 pm
Hilton Garden Inn Montreal Centre-Ville
380 Sherbrooke St. West, Montreal, Quebec
PALM OIL: PRODUCTION, PROCESSING, PRODUCTS AND PROPERTIES
CONTENTS

- About MPOB
- Palm Oil 101
  - Production
  - Processing
    - Milling
    - Refining
    - Fractionation
    - Blending
  - Products
  - Properties
  - Nutritional Properties
- Facts about Palm Oil
Ministry of Plantation Industries and Commodities - Structure

MINISTER

Deputy Minister I

Secretariat General

Deputy Minister II

Deputy Sec. General Plantation & Commodities

Deputy Sec. General Strategic Planning & Mgt.

Malaysian Palm Oil Board - MPOB

Malaysia Rubber Board - MRB

Malaysian Timber Industry Board

Malaysian Cocoa Board

Malaysian Pepper Board

Malaysian Kenaf & Tobacco Board

Malaysian Palm Oil Council - MPOC

MREPC

MTC

MTCC

MFPC
MPOB MAIN FUNCTIONS

- Implement Policies and Development Programmes for Viability of Oil Palm Industry
- Conduct and Promote Research and Development (R&D)
- Regulate, Register and Promotes All Activities related to Oil Palm Industry
- Provide Consultancy and Advisory Services
- Commercialization of Research Findings
- Develop Training Programme
- Resource and Information Centre
ADVISORY SERVICES OFFICES

- Technical Support
- General Advisory Services
- Product Technology Transfer
- Training – POFP, Seminars, Etc
- Consultancy
- Trouble Shooting
ORIGIN OF OIL PALM

Rainfall: 1500-2000 mm/year, evenly distributed
Temperature: min 22-24°C max 29-33°C
Sunshine: continuous 5 hours/day
Soil: loose-textured, no hard layer

Elaeis oleifera
Elaeis guineensis
ELAEIS GUINEENSIS

DURA

X

PISIFERA

TENERA
Species: *Elaeis guineensis*
Type: Tenera (DXP)
Planting density: 148 palm/ha
Nursery period: 24 months
Economic Life: 25 years
Palm Height: 2.3 meters
Harvesting interval: 15 days
No. of bunches/yr: 19
ELAEIS GUINEENSIS

- Bunch weight: 10-15 kg
- Fruitlets/bunch: 1000-3000
- Oil/bunch: 22-25%
- Kernel/bunch: 4%
- Kernel production/year: 8kg
- Oil production/year: 42.5 kg
ELAEIS GUINEENSIS

- Fruit shape: Oval
- Fruit size: 5 cm
- Fruit weight: 10 g
- Mesocarp/fruit: 83%
- Oil/dry mesocarp: 75%
- Kernel/fruit: 7%
OIL PALM MILL
OIL EXTRACTION AT THE MILL

FFBs enter the mill for processing

Sterilization in large Pressure vessel/cages

Extraction in a Homogeneous oil mesh

Stripping in Rotating drum stripper

CRUDE PALM OIL

Purification in a continuous clarification tank

PALM KERNEL
OIL PALM FRUIT

Shell

Kernel: Palm Kernel
REFINING OF PALM OIL
FRACTIONATION OF PALM OIL
FRACTIONATED PALM & PALM KERNEL OIL PRODUCTS
### FATTY ACID COMPOSITION OF PALM OIL AND FRACTIONS

<table>
<thead>
<tr>
<th>Fatty Acid</th>
<th>Palm Oil</th>
<th>Std. Palm Olein</th>
<th>Special Palm Olein</th>
<th>Palm Stearin</th>
</tr>
</thead>
<tbody>
<tr>
<td>C14:0</td>
<td>1.1</td>
<td>1.0</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>C16:0</td>
<td>44.4</td>
<td>39.8</td>
<td>31.5</td>
<td>54.0</td>
</tr>
<tr>
<td>C18:0</td>
<td>4.5</td>
<td>4.4</td>
<td>3.2</td>
<td>4.7</td>
</tr>
<tr>
<td>C18:1</td>
<td>39.2</td>
<td>42.5</td>
<td>49.2</td>
<td>32.3</td>
</tr>
<tr>
<td>C18:2</td>
<td>10.1</td>
<td>11.2</td>
<td>13.7</td>
<td>7.0</td>
</tr>
<tr>
<td>C18:3</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Iodine Value</td>
<td>53</td>
<td>58</td>
<td>66.4</td>
<td>39.9</td>
</tr>
<tr>
<td>Melting Pt. (°C)</td>
<td>36</td>
<td>21.6</td>
<td>12.0</td>
<td>51.3</td>
</tr>
<tr>
<td>Cloud Point (°C)</td>
<td>-</td>
<td>8.8</td>
<td>2.2</td>
<td>-</td>
</tr>
</tbody>
</table>
MULTIPLE FRACTIONATION OF PALM OIL
## PALM PROCESSING STEPS AND THEIR PRODUCTS

<table>
<thead>
<tr>
<th>Processing</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milling</td>
<td>Crude fruit palm oil, palm kernel</td>
</tr>
<tr>
<td>Crushing</td>
<td>Crude palm kernel oil</td>
</tr>
<tr>
<td>Refining</td>
<td>RBDPO, PFAD, PAO, (RBDPKO, PKFAD, PKAO)</td>
</tr>
<tr>
<td>Fractionation</td>
<td>Palm oil, Palm olein, Palm stearin, Superolein, hard stearin (Palm oil products)</td>
</tr>
<tr>
<td>Double Fractionation</td>
<td>Df Olein, PMF, super stearin (very hard stearin), Soft PMF</td>
</tr>
<tr>
<td>Triple Fractionation</td>
<td>Top olein, Mid Olein, Hard PMF</td>
</tr>
<tr>
<td>Blending</td>
<td>Various products</td>
</tr>
</tbody>
</table>
MULTIPLE FRACTIONATIONS

Images of various palm products, including RBD Palm Oil, RBD Palm Stearin, and Hanady frying oil.
SFC OF PALM PRODUCTS

Diagram showing the distribution of hard stearin, Hpo(43), stearin, palm oil, olein, and shortening on a graph with axes T/C and percentage values.
SFC OF PALM PRODUCTS
CLOUD POINT VERSUS IODINE VALUE

Super olein
SFC VERSUS IODINE VALUE
MALAYSIA: RANGE OF PALM OIL PRODUCTS EXPORTED

<table>
<thead>
<tr>
<th>Palm Oil Products</th>
<th>Palm Kernel Oil Products</th>
<th>Oleochemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Palm Oil</td>
<td>Crude Palm Kernel Oil</td>
<td>Oleic Acid</td>
</tr>
<tr>
<td>Crude Palm Olein</td>
<td>Crude Palm Kernel Stearin</td>
<td>Palmitic Acids</td>
</tr>
<tr>
<td>Crude Palm Stearin</td>
<td>RBD Palm Kernel Oil</td>
<td>Glycerine</td>
</tr>
<tr>
<td>Neutralised Palm Oil</td>
<td>RBD Palm Kernel Olein</td>
<td>Stearic Acid</td>
</tr>
<tr>
<td>Neutralised Palm Olein</td>
<td>RBDH Palm Kernel Olein</td>
<td>Lauric Acid</td>
</tr>
<tr>
<td>Bleached Palm Oil</td>
<td>RBDH Palm Kernel Stearin</td>
<td>Palm Kernel Methylester</td>
</tr>
<tr>
<td>NB Palm Oil</td>
<td>NBPDH Palm Kernel Stearin</td>
<td>Caprylic-Capric Acid</td>
</tr>
<tr>
<td>NB Palm Oil</td>
<td>NBPDH Palm Kernel Olein</td>
<td>Split Palm Stearin Fatty Acid</td>
</tr>
<tr>
<td>NBD Palm Oil</td>
<td>NBPDH Palm Kernel Olein</td>
<td>Methylester</td>
</tr>
<tr>
<td>RBD Palm Oil</td>
<td>NBPDH Palm Kernel Stearin</td>
<td>Methylester Residue</td>
</tr>
<tr>
<td>NBD Palm Stearin</td>
<td>NBD Palm Kernel Olein</td>
<td>Mynistic Acid</td>
</tr>
<tr>
<td>RBD Palm Olein</td>
<td>NBD Palm Kernel Stearin</td>
<td>Triple Stearic Acid</td>
</tr>
<tr>
<td>Palm Acid Oil</td>
<td>NB Palm Kernel Olein</td>
<td>Fatty Acid</td>
</tr>
<tr>
<td>Palm Fatty Acid Distillate</td>
<td>NB Palm Kernel Stearin</td>
<td>Caprylic Capric Acid B</td>
</tr>
<tr>
<td>Cooking Oil/Double Olein</td>
<td>NBH Palm Kernel Stearin</td>
<td>Palm Stearin Fatty Acid</td>
</tr>
<tr>
<td>RBD Hydrogenated Palm Oil</td>
<td>NBPDH Palm Kernel Stearin</td>
<td>Split Palm Fatty Acid</td>
</tr>
<tr>
<td>RBD Hydrogenated Palm Olein</td>
<td>Palm Kernel Fatty Acid</td>
<td></td>
</tr>
<tr>
<td>Hydrogenated Palm Olein</td>
<td>Palm Kernel Acid Olein</td>
<td></td>
</tr>
<tr>
<td>Hydrogenated Palm Olein</td>
<td>Hydrogenated Palm Kernel Oil</td>
<td>Fatty Acid Methylester</td>
</tr>
<tr>
<td>Hydrogenated Palm Olein</td>
<td>Hydrogenated Palm Kernel Olein</td>
<td>Residue</td>
</tr>
<tr>
<td>RBD Hydrogenated Palm Stearin</td>
<td>Hydrogenated Palm Kernel Stearin</td>
<td>Lauric Fat</td>
</tr>
<tr>
<td>Hydrogenated Palm Stearin</td>
<td>Hydrogenated Palm Kernel Fatty Acid</td>
<td>Palm Fatty Acid Residue</td>
</tr>
<tr>
<td>Hydrogenated Palm Oil</td>
<td>Neutralised Palm Kernel Stearin</td>
<td>Hydrogenated Stearin Fatty Acid</td>
</tr>
<tr>
<td>RBD Hydrogenated Stearin Flake</td>
<td>Bleached Palm Kernel Stearin</td>
<td>Split Hydrogenated Stearin</td>
</tr>
<tr>
<td>Refined Palm Oil</td>
<td></td>
<td>Fatty Alcohol</td>
</tr>
<tr>
<td>Hydrogenated Palm Fatty Acid Distillate</td>
<td></td>
<td>Split Hydrogenated Palm Fatty Acid</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Finished Products</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable, Ghee/Vanaspati</td>
<td>Cocoa-Butter Substitute</td>
<td>Soap</td>
</tr>
<tr>
<td>Margarine</td>
<td>Palm Mid-Fraction</td>
<td>Soap Stocks</td>
</tr>
<tr>
<td>Shortening</td>
<td>Fat Blend</td>
<td>Dough Fats</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soap Noodles</td>
</tr>
</tbody>
</table>
VITAMIN E CONTENTS IN FATS AND OILS

- Lard
- Palm Kernel Oil
- Coconut Oil
- Olive Oil
- Cocoa Butter
- Peanut Oil
- Sunflower
- Cotton Seed Oil
- Corn Oil
- Safflower
- Soyabean Oil
- Palm Oil

F.D. Gunstone (1986)
VITAMIN E IN PALM OIL

- Crude oil and red palm oil- highest content of tocotrienols.
- 70% retained in refined oils.
- Mostly in form of $\gamma$ tocotrienols.
- Antioxidant activity - $\gamma > \delta > \alpha$
- $\alpha$ tocotrienol improve oxidative stability by factor 6.3.
### STABILITY OF PALM OIL

<table>
<thead>
<tr>
<th></th>
<th>PH oil</th>
<th>Rapeseed</th>
<th>Palm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rancimat (120°C)</td>
<td>&gt;35</td>
<td>&lt;2</td>
<td>&gt;10</td>
</tr>
<tr>
<td>Sat %</td>
<td>12</td>
<td>8</td>
<td>38</td>
</tr>
<tr>
<td>Mono %</td>
<td>30</td>
<td>62</td>
<td>47</td>
</tr>
<tr>
<td>Poly %</td>
<td>&lt;1</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>Trans %</td>
<td>58</td>
<td>&lt;1</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>
CHOLESTEROL-MODULATING EFFECTS OF PALM OLEIN AND OLIVE OIL ARE COMPARABLE


Palm olein and olive oil have similar beneficial effects on blood cholesterol.

Voon et al. 2011 AJCN
Palm olein is comparable with sunflower oil on lipid profile

Wood et al. 1993 J Nutr Biochem
CHAPTER 10 OF WHO REPORT:
FAT AND FATTY ACID INTAKE AND METABOLIC EFFECTS
IN THE HUMAN BODY

‘There is possible evidence to suggest that the TC and LDL-C raising effects of palmitic acid are lower for vegetable than animal sources because it is present predominantly in the sn-1 and sn-3 position as opposed to sn-2 position as in animal fats such as lard (Ng et al., 1992; Choudhury et al., 1995; Zhang et al., 1997).

References cited: Ng et al. 1992 JACN; Choudhury et al. 1995 AJCN; Zhang et al. 1997 APJCN
<table>
<thead>
<tr>
<th>Authors</th>
<th>Journals</th>
<th>Title</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patty W Siri-Tarino, Qi Sun, Frank B Hu, and Ronald M Krauss</td>
<td>Am J Clin Nutr. 2010 Mar; 91(3): 535–546. Published online 2010 Jan 13. doi: 10.3945/ajcn.2009.27725</td>
<td>Meta-analysis of prospective cohort studies evaluating the association of saturated fat with cardiovascular disease</td>
<td>A meta-analysis of prospective epidemiologic studies showed that there is no significant evidence for concluding that dietary saturated fat is associated with an increased risk of CHD or CVD.</td>
</tr>
<tr>
<td>Patty W Siri-Tarino, Qi Sun, Frank B Hu, and Ronald M Krauss</td>
<td>Am J Clin Nutr. 2010 Mar; 91(3): 502–509. Published online 2010 Jan 20. doi: 10.3945/ajcn.2008.26285</td>
<td>Saturated fat, carbohydrate, and cardiovascular disease</td>
<td>Particularly given the differential effects of dietary saturated fats and carbohydrates on concentrations of larger and smaller LDL particles, respectively, dietary efforts to improve the increasing burden of CVD risk associated with atherogenic dyslipidemia should primarily emphasize the limitation of refined carbohydrate intakes and a reduction in excess adiposity.</td>
</tr>
<tr>
<td>James J DiNicolantonio</td>
<td>Open Heart 2014;1: doi:10.1136/openhrt-2013-000032</td>
<td>The cardiometabolic consequences of replacing saturated fats with carbohydrates or ω-6 polyunsaturated fats: Do the dietary guidelines have it wrong?</td>
<td>In summary, the benefits of a low-fat diet (particularly a diet replacing saturated fats with carbohydrates or ω-6 polyunsaturated fatty acids) are severely challenged. Dietary guidelines should assess the totality of the evidence and strongly reconsider their recommendations for replacing saturated fats with carbohydrates or ω-6 polyunsaturated fats.</td>
</tr>
<tr>
<td>Aseem Malhotra</td>
<td>BMJ 2013; 347: doi: <a href="http://dx.doi.org/10.1136/bmj.f6340">http://dx.doi.org/10.1136/bmj.f6340</a> (Published 22 October 2013)</td>
<td>Saturated Fat Is Not the Major Issue</td>
<td>Recent prospective cohort studies have not supported any significant association between saturated fat intake and cardiovascular risk. Instead, saturated fat has been found to be protective. It is time to bust the myth of the role of saturated fat in heart disease and wind back the harms of dietary advice that has contributed to obesity.</td>
</tr>
<tr>
<td>Sara Holmgren, Anders Thelin and Eva-Lena Stiernström</td>
<td>Int. J. Environ. Res. Public Health 2009, 6, 2626–2638; doi:10.3390/ijerph6102626</td>
<td>Food Choices and Coronary Heart Disease: A Population Based Cohort Study of Rural Swedish Men with 12 Years of Follow-up</td>
<td>In conclusion, daily intake of fruit and vegetables combined with a medium-high intake of dairy fat was associated with a lower risk of coronary heart disease in this prospective population-based cohort of 1,752 rural men.</td>
</tr>
<tr>
<td>Nathalie Genevieve Puaschitz, et al</td>
<td>J. Nutr. February 1, 2015 np.114.203505</td>
<td>Dietary Intake of Saturated Fat Is Not Associated with Risk of Coronary Events or Mortality in Patients with Established Coronary Artery Disease</td>
<td>There was no association between dietary intake of SFA and incident coronary events or mortality in patients with established CAD.</td>
</tr>
</tbody>
</table>
Facts About Palm Oil

Sustainable
- The only vegetable oil with internationally recognized sustainable certifications – ISCC, RSPO, MSPO

Natural
- Free of GMO, almost organic (minimum use of chemicals)
- Expeller-pressed oil

Versatile
- Semi-solid
- Naturally stable – excellent for frying

Healthy
- Well-balanced natural oil with unique composition of fatty acids (50:50)
- Free of trans fatty acid
- Contains vitamin E, Carotenoids & other phytonutrients
- Cholesterol free

Most cost effective raw material - price and quality

Consistent and abundance in supply
The Premier Oil Palm Event is back!
The Malaysian Palm Oil Board is organising >>

PIPOC 2015
INTERNATIONAL PALM OIL CONGRESS

6 - 8 October 2015
Kuala Lumpur Convention Centre, Kuala Lumpur, Malaysia

The grand MPOB International Palm Oil Congress and Exhibition (PIPOC) with five concurrent conferences will examine and discuss the many facets of the oil palm industry. PIPOC 2013 was attended by more than 2200 participants from 48 countries.

Book your place now to make sure you will be one of them in 2015!

http://pipoc.mpoob.gov.my

www.mpoob.gov.my
Thank you