PALM OIL: A NUTRITIOUS AND COST-EFFECTIVE DIETARY INGREDIENT FOR INDIA

by

Datuk Dr. Choo Yuen May
Director General of MPOB

26TH JUNE 2014
1. An Overview of Palm Oil
2. Nutritional Benefits of Palm Oil
3. Malaysia: Supply of Palm Oil to the World
4. A Sustainable Way Forward of the Malaysian Oil Palm Industry
5. Conclusion
Palm oil has been used in food preparation for more than 5000 years

Source: M.C. Friedel (1897). On fatty materials found in an Egyptian tomb at Abydos. Comptes Rendus Vol. 24, 648-651
VALUE-ADDITION OF PALM OIL IN FOOD APPLICATIONS

- High Nutritional Value
- Genetically Modified Organism (GMO) Free
- Free of Trans-Fatty Acid
- Cholesterol Free
- Competitive Price
- High Stability
- Anti-Oxidant Property
PALM OIL PRODUCTS

Refining process

Crude Palm Oil

Palm Fruit

Palm Kernel

Refining process

Crude Palm Kernel Oil

RBD Palm Oil

Fractionation process

RBD Palm Kernel Oil

RBD Palm Olein

RBD Palm Stearin

RBD Palm Kernel Olein

RBD Palm Kernel Stearin

THE MALAYSIAN PALM OIL BOARD
Palm oil should be clearly distinguished from palm kernel oil and coconut oil because it has lower levels of saturated components with no significant content of capric, lauric and myristic acids.
COMPONENTS OF CRUDE PALM OIL

- Triglycerides
- Diglycerides
- Monoglycerides
- Free Fatty Acids

Minor components (Phytonutrients) ~1%

~99%
VITAMIN E CONTENT IN OILS AND FATS


THE MALAYSIAN PALM OIL BOARD
FUNCTIONAL PROPERTIES OF PALM TOCOTRIENOLS

- Anti-inflammation
- Cardiovascular prevention
- Antioxidant
- Radioprotection
- Cancer prevention
- Neuroprotection
- Skin protection
- Bone protection
- Hormone regulator
- Immune booster
Carotenoids

Pro-vitamin A—solution to vitamin A deficiency

- Anti-cancer effects
- Anti-oxidant
- Stimulation of the immune system
- Cardiovascular protection
- Prevention of cataract
BENEFITS OF PALM CAROTENOIDS

- Improves vitamin A and anti-oxidative status
- Reduces prevalence of Bitot’s spot

Bitot’s Spot
(A sign of Vitamin A deficiency)
Impact of β-carotene Supplementation Through Red Palm Oil


Regional Research Laboratory (Council of Scientific & Industrial Research), Trivandrum, India
Sri Sathya Sai Trust Hospital, Trivandrum, India
Health Action by People, Pettah, Trivandrum, India
Achutha Menon Centre for Health Science Studies (Sri Chitra Tirunal Institute for Medical Sciences and Technology), Trivandrum, India

STUDIES ON PALM CAROTENOIDS IN INDIA


Red palm oil for combating vitamin A deficiency

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Red palm oil as a source of β-carotene for combating vitamin A deficiency

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Received 20 June 1995; accepted in revised form 3 November 1995
Red palm oil to combat vitamin A deficiency in developing countries

C. Rukmini

Abstract

Red palm oil (RPO), besides providing calorie density to the diet, is also the richest natural source of carotene, a precursor of vitamin A and an antioxidant that destroys singlet oxygen and free radicals. Chemical analysis of the fatty acid composition of RPO indicates that it has 50% saturated, 40% mono-unsaturated, and 10% polyunsaturated fatty acids. RPO contains 550 mg/g of total carotenoids, of which 375 mg/g represent β-carotene. It also contains 1,000 mg/g of tocopherols and tocotrienols.

Nutritional values in rats fed 10% RPO in a 10% casein diet were comparable to those fed 10% ground nut oil (GNO) or 10% RBDPO (refined, bleached, deodorized palm oil). Rats fed RPO or RBDPO had significantly lower plasma cholesterol concentrations than those fed GNO. Significant inhibition of microsomal 3-hydroxy-3-methylglutaryl coenzyme A reductase activity was observed in the RPO and RBDPO groups, indicating reduced synthesis of endogenous cholesterol. Toxicological studies also indicate that RPO is safe for human consumption. Indian school children fed supplementary snacks prepared with RPO for 60 days had significant increases in serum retinol levels as well as an increased liver retinol store, suggesting the ready bioavailability of β-carotene.
BIOLOGICAL ACTIVITIES OF OIL PALM PHENOLICS

- Antioxidant
- Anti microbial
- Anti inflammatory
- Anti cancer
- Anti diabetic
- Anti hypertensive
- Anti atherogenic
- Anti obesity
- Anti spasmodic
- Anti thrombotic
- Anti allergenic
- Anti ulcer

- Memory enhancing

confirmed

In vitro, cell culture
whole animal
and
microarray studies

THE MALAYSIAN PALM OIL BOARD
NUTRITIONAL BENEFITS OF PALM OIL
GENERAL MISCONCEPTION ON PALM OIL

PALM OIL

Cheaper than other oils
Therefore
Not as good as other vegetable oils

Contains about 50% of saturated fats
Therefore
Palm oil is a saturated fats which is associated to CHD/CVD risks and obesity
Great strides have been made over the last 25 years in elucidating a number of the health benefits of palm oil and its fractions.

Malaysia has funded numerous nutritional research on palm oil at centers of excellence both local and abroad.

This has resulted in –
- over 200 publications in high impact peer-reviewed journals.
- collaborative projects undertaken at both local and international centres of excellence.
## NUTRITION RESEARCH PROJECTS (1983 – 2013)

<table>
<thead>
<tr>
<th></th>
<th>CHD</th>
<th>Palm Vitamin E</th>
<th>Carcinogenesis</th>
<th>Red Palm Oil</th>
<th>Palm Flavonoids</th>
<th>Other Studies</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>USA / Canada</td>
<td>39</td>
<td>24</td>
<td>10</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>80</td>
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<td>Europe</td>
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<td>Australia</td>
<td>11</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>18</td>
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<tr>
<td>Asia / Middle East</td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
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<td>Africa</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Malaysia - MPOB - Others</td>
<td>13</td>
<td>9</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>36</td>
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<tr>
<td>Total</td>
<td>91</td>
<td>50</td>
<td>22</td>
<td>15</td>
<td>6</td>
<td>6</td>
<td>200</td>
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</table>
OUTCOMES OF PALM OIL NUTRITION RESEARCH

• The Food and Agriculture Organisation (FAO) and World Health Organisation (WHO) have endorsed palm oil as meeting food standards under Codex Alimentarius Commission (CAC) Programme.

• As a balanced vegetable oil, palm oil is a source of energy, it is free of cholesterol and trans fatty acids and packed with health-inducing carotenoids and vitamin E.
Palm olein and olive oil have similar beneficial effects on blood cholesterol.

Choudhury N, Tan L, Truswell S. 1995 AJCN

THE MALAYSIAN PALM OIL BOARD
STUDIES ON LONG-TERM INTAKE:
PALM OLEIN VS OLIVE OIL

Blood lipids (mmol/L)

<table>
<thead>
<tr>
<th></th>
<th>Palm olein</th>
<th>Olive oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>5.0</td>
<td>4.5</td>
</tr>
<tr>
<td>LDL-C</td>
<td>3.0</td>
<td>2.5</td>
</tr>
<tr>
<td>HDL-C</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>LDL-C/HDL-C</td>
<td>1.0</td>
<td>0.5</td>
</tr>
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</table>

Ng et al. 1992 AJCN

Voon et al. 2011 AJCN

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

THE MALAYSIAN PALM OIL BOARD
Palm olein is comparable with groundnut oil on lipid profile.
<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sundram et al. 1995</td>
<td>Palm olein and canola oil exhibited identical results in their effects on total cholesterol, LDL cholesterol and HDL cholesterol levels.</td>
</tr>
<tr>
<td>AJCN</td>
<td></td>
</tr>
<tr>
<td>Zhang et al. 1997</td>
<td>Palm olein lowered total cholesterol, LDL cholesterol, total cholesterol/HDL cholesterol ratio compared to peanut and lard.</td>
</tr>
<tr>
<td>APJCN</td>
<td></td>
</tr>
<tr>
<td>Zhang et al. 1997</td>
<td>Total cholesterol, LDL cholesterol, total cholesterol/HDL cholesterol ratio and plasma thromboxane2/6-keto-prostaglandin-1a ratio were significantly decreased in palm oil group while not appreciably altered in peanut oil group by the end of the test.</td>
</tr>
<tr>
<td>JN</td>
<td></td>
</tr>
<tr>
<td>Truswell et al. 2000</td>
<td>Palm olein and olive oil are similar in lipid profile</td>
</tr>
<tr>
<td>Int J Food Sci Nutr</td>
<td></td>
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</tbody>
</table>
Palm Oil: a healthful and cost-effective dietary component

A.S.H. Ong and S.H. Goh
Institute of Advanced Studies, University of Malaya, Kuala Lumpur, Malaysia

Abstract:
Palm oil is an excellent choice for food manufacturers because of its nutritional benefits and versatility. The oil is highly structured to contain predominantly oleic acid at sn-2 position in the major triacylglycerols to account for the beneficial effects described in numerous nutritional studies.
Unsaturated fatty acids are better absorbed in the form of 2-MAG than FFA.
CHAPTER 10 OF WHO REPORT:
FAT AND FATTY ACID INTAKE AND METABOLIC EFFECTS
IN THE HUMAN BODY

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.

References cited: Ng et al. 1992 JACN; Choudhury et al. 1995 AJCN; Zhang et al. 1997 APJCN
Palm oil contains almost equal amounts of unsaturated and saturated fats. In the body, it behaves more like a monounsaturated fat and has no adverse impact on cholesterol levels.
The recent studies by Gouk et al. (2013) in rats indicated that palm oil lowers fat deposition compared to polyunsaturated fats. It was found that the positional distribution of long-chain saturated fats (i.e. palmitic acid) and not the total saturated fats content exerts a more profound effect on body fat accretion.


TRANS-FAT
CURRENT FACTS ON TRANS-FATTY ACIDS (TFA)

- TFA contributes to increased risk of cardiovascular diseases.
- WHO/FAO (2003-2009) Recommendation: TFA should be limited to < 1% of total daily energy in human diet.
- In most EU countries and North America: 2% TFA limit in dietary oils/fats
Trans fats: Partially hydrogenated oils should be phased out in months, not years, says expert as FDA considers revoking their GRAS status

By Elaine Watson, 07-Nov-2013

Dr Penny Kris Etherton: "This is great news for public health."

Source: http://www.foodnavigator-usa.com
Palm oil, when replacing a major part of the normal fat content in a Dutch diet (hydrogenated and animal fats), may slightly improve the lipid profile.

Sundram et al. 1992 BJN

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Pedersen et al. 2005 APJCN

Palm oil has a more favourable effect on the fibrinolytic system (anti-coagulation) compared to partially hydrogenated soybean oil.
Trans fat increased total cholesterol, LDL cholesterol and lipoprotein (a) and decreased HDL cholesterol compared to the palm olein diet.

Sundram et al. 1997  J Nutr

THE MALAYSIAN PALM OIL BOARD
Palm olein diet increased HDL cholesterol compared to trans fats diet.
The consumption of TFA provides no nutritional benefit and has considerable harmful potential.

In promoting the removal of TFA, particular attention must be given to their replacement; this is a challenge for the food industry.
Palm oil which contains equal amounts of saturated fats and unsaturated fats is a natural and ideal substitute for TFA.

This fatty acid composition enables palm oil to be further fractionated into solid and liquid fractions.

The solid fraction can be used to produce solid fat food products like margarine, shortening, bakery fats etc, without resorting to hydrogenation which produces trans-fatty acid.
Palm oil as a cooking oil

- The unique fatty acid composition and natural antioxidants confer:
  - Good oxidative stability – long shelf life
  - Excellent thermal stability – perfect for shallow and deep frying

- Most other vegetable oils need to be partially hydrogenated to increase stability

- Palm oil is \textit{trans} free
APPLICATIONS IN FOOD & BAKING SECTORS
MALAYSIA: SUPPLY OF PALM OIL TO THE WORLD
<table>
<thead>
<tr>
<th>Balance</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening stock</td>
<td>19,558</td>
<td>20,495</td>
<td>21,901</td>
<td>24,264</td>
<td>27,696</td>
</tr>
<tr>
<td>Production</td>
<td>165,055</td>
<td>172,261</td>
<td>180,072</td>
<td>187,357</td>
<td>189,681</td>
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<tr>
<td>Import</td>
<td>64,394</td>
<td>66,886</td>
<td>68,238</td>
<td>73,289</td>
<td>75,323</td>
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<tr>
<td>Export</td>
<td>64,133</td>
<td>66,493</td>
<td>68,711</td>
<td>72,870</td>
<td>75,796</td>
</tr>
<tr>
<td>Disappearance</td>
<td>164,379</td>
<td>171,840</td>
<td>178,093</td>
<td>184,344</td>
<td>190,973</td>
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<tr>
<td>Closing stock</td>
<td>20,495</td>
<td>21,309</td>
<td>23,407</td>
<td>27,696</td>
<td>25,930</td>
</tr>
</tbody>
</table>

Source: Oil World 2014
## OIL PALM – THE MOST PRODUCTIVE OIL CROP

Average Oil Yield (tha/year)

- Soybean 0.39
- Sunflower 0.56
- Rapeseed 0.70
- Oil Palm* 4.16

Source: Oil World Annual 2013
* Combined tonnage of palm oil and palm kernel oil

<table>
<thead>
<tr>
<th>Oil Crops</th>
<th>Production of oil (Mn T)</th>
<th>% of total production</th>
<th>Total area (Mn Ha)</th>
<th>% of total area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil palm*</td>
<td>62.4</td>
<td>43.4</td>
<td>15.0</td>
<td>8.8</td>
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<tr>
<td>Soybean</td>
<td>41.8</td>
<td>29.6</td>
<td>109.59</td>
<td>64.4</td>
</tr>
<tr>
<td>Rapeseed</td>
<td>24.4</td>
<td>17.4</td>
<td>35.6</td>
<td>20.9</td>
</tr>
<tr>
<td>Sunflower</td>
<td>14.8</td>
<td>9.7</td>
<td>25.0</td>
<td>14.7</td>
</tr>
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</table>
IMPORT OF MAJOR OILS AND FATS IN INDIA IN 2013 (MILLION TONNES)

TOTAL: 11.15 MILLION TONNES

- Palm oil, 8.5 (76.0%)
- Sunflower Oil, 1.1 (9.7%)
- Soybean oil, 1.2 (10.5%)
- Palm kernel oil, 0.3 (3.0%)
- Others, 0.1 (0.7%)

Source: Oil World Annual 2014

THE MALAYSIAN PALM OIL BOARD
WORLD PRODUCTION OF PALM OIL (MILLION TONNES) – 2013

TOTAL: 56.23 MILLION TONNES

- Indonesia, 28.40 (50.1%)
- Malaysia, 19.22 (35.0%)
- Others, 8.62 (14.9%)

Source: Oil World

THE MALAYSIAN PALM OIL BOARD
WORLD EXPORT OF PALM OIL (MILLION TONNES) – 2013

TOTAL: 44.14 MILLION TONNES

- Malaysia, 18.15 (41.1%)
- Indonesia, 21.6 (49.0%)
- Others, 4.37 (9.9%)

Source: Oil World
MALAYSIA: CPO PRODUCTION VS PLANTED AREA

- **CPO Production**
  - 1960: 0.09
  - 1970: 0.69
  - 1980: 2.87
  - 1990: 6.09
  - 2000: 10.84
  - 2001: 11.80
  - 2003: 13.35
  - 2004: 13.98
  - 2005: 14.96
  - 2006: 15.88
  - 2007: 15.82
  - 2008: 17.73
  - 2009: 17.56
  - 2010: 16.99
  - 2011: 18.91
  - 2012: 18.79
  - 2013: 19.20

- **Planted Area**
  - 2000: 12.0
  - 2001: 14.0
  - 2002: 16.0
  - 2003: 18.0
  - 2004: 20.0
  - 2005: 22.0
  - 2006: 24.0
  - 2007: 26.0
  - 2008: 28.0
  - 2009: 30.0
  - 2010: 32.0
  - 2011: 34.0
  - 2012: 36.0
  - 2013: 38.0

**Source:** MPOB

THE MALAYSIAN PALM OIL BOARD
## PALM OIL EXPORTS TO MAJOR DESTINATIONS

### TOTAL:
- 2009: 15.88 mil. tonnes
- 2010: 16.66 mil. tonnes
- 2011: 17.99 mil. tonnes
- 2012: 17.58 mil. tonnes
- 2013: 18.09 mil. tonnes

### Source: MPOB

<table>
<thead>
<tr>
<th>Year</th>
<th>China</th>
<th>Pakistan</th>
<th>EU</th>
<th>India</th>
<th>USA</th>
<th>Others</th>
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<tbody>
<tr>
<td>2009</td>
<td>4,027</td>
<td>1,769</td>
<td>1,892</td>
<td>1,354</td>
<td>859</td>
<td>5,980</td>
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<tr>
<td>2010</td>
<td>3,483</td>
<td>2,135</td>
<td>2,064</td>
<td>1,170</td>
<td>1,028</td>
<td>6,784</td>
</tr>
<tr>
<td>2011</td>
<td>3,982</td>
<td>1,821</td>
<td>2,006</td>
<td>1,668</td>
<td>1,055</td>
<td>7,461</td>
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<tr>
<td>2012</td>
<td>3,502</td>
<td>1,343</td>
<td>2,221</td>
<td>2,640</td>
<td>1,029</td>
<td>6,841</td>
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<tr>
<td>2013</td>
<td>3,699</td>
<td>1,428</td>
<td>2,331</td>
<td>2,325</td>
<td>1,012</td>
<td>7,325</td>
</tr>
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Malaysian palm oil is exported to more than 150 countries worldwide.

**THE MALAYSIAN PALM OIL BOARD**
A SUSTAINABLE WAY FORWARD OF THE MALAYSIAN OIL PALM INDUSTRY
DEVELOPMENT OF MALAYSIAN SUSTAINABLE PALM OIL STANDARD (MSPO)

- Besides profitability, the Malaysian oil palm industry plays an important role in implementing the other 2 pillars of sustainability, that are, planet and people.

- The industry comply to regulations related to the environment and social responsibility.

- Hence, a Malaysian Standard on Sustainable Palm Oil was developed by the industry together with MPOB.
OBJECTIVES OF MSPO

• National standard on sustainability – applicable to all categories of oil palm industry – small, medium and large
• Standard that comply to Malaysian Laws and ratified international laws
• To ensure that oil palm premises in Malaysia are sustainably certified
• Standard based on a balanced three pillars of sustainability
Registered as Malaysian Standard MS 2530:2013

- Contains clauses relevant to sustainability requirements
- Like any other sustainable standard → open to constructive comments and views for continuous improvement
- The standard is now available for download at www.msonline.gov.my
The MSPO document consists of 4 parts:

- **MSPO Part 1: General Principles for Malaysian Sustainable Palm Oil**
- **MSPO Part 2: Malaysian Sustainable Palm Oil Requirements for Independent Small holders**
- **MSPO Part 3: Malaysian Sustainable Palm Oil Requirements for Oil Palm Plantations and Organised Smallholders**
- **MSPO Part 4: Malaysian Sustainable Palm Oil Requirements for Palm Oil Mills**
MSPO vs. RSPO

MSPO is a national interpretation of the RSPO and has all the criteria stated in RSPO:

- Transparency,
- Guidelines of new planting, and
- Commitment to continuous improvement.
CONCLUSION

1. Palm oil is a very important food source and provides needed energy to the world population.

2. It has a wide range of applications in the food industry without the presence of trans fat.

3. The unique fatty acid composition of palm oil makes it a nutritious yet functional oil in various food applications.
4. Palm oil with high monounsaturation at \textit{sn}-2 position behaves like monounsaturated oils e.g. olive oil, canola oil and sunflower seed oil.

5. Evidence has been obtained to suggest that dietary palm oil is neutral to the risk parameters to cardiovascular diseases.

6. The phytonutrients are additional health benefits to the oil.

8. Malaysia is now moving forward in practising the holistic approach of sustainability at national level by introducing the Malaysian Standard on Sustainable Palm Oil.
THANK YOU