VITAMIN A FORTIFICATION OF PALM COOKING OIL:
Continuing Issues & controversies

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VITAMIN A FORTIFICATION OF PALM COOKING OIL: A CONTINUING CONTROVERSY

Keywords

i. Vitamin A Fortification
ii. Vitamin A Fortification of Palm Cooking Oil
iii. Controversy
i. **Vitamin A Fortification**

More than half of world population → (i) Iron deficient, (ii) Vitamin A & Iron deficient, and (iii) Iodine, Vitamin A & iron deficient

---

i. Vitamin A Fortification

Vitamin A deficiency in Indonesia:
Xerophalmia is rare, BUT, sub-clinical Vitamin A deficiency is remain HIGH!

## i. Vitamin A Fortification

Vitamin A deficiency in Indonesia:
Xerophthalmia is rare, BUT, sub-clinical Vitamin A deficiency is remain HIGH!

### Subjects | Prevalensi VAD (Sub Clinical)
--- | ---
Source 1: |  
Children, 5-15 yrs | 53.0%

Source 2: |  
Children, 5-15 yrs | 57.5%
Breast-feeding mother | 10.2%

Source 2:  
Pregnant women & breast feeding mother | 10.4 to 17.0%

i. Vitamin A Fortification

At the second Copenhagen Consensus in 2008, fortification with micronutrients (vitamins and minerals) was ranked among the top three international development priorities.*

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Vitamin A Fortification of Palm Cooking Oil

In 2012, GOI has issued Indonesia National Standard on Palm Cooking Oil, which required palm cooking oil to be fortified with Vitamin A (SNI 7709-2012)
ii. Vitamin A Fortification of Palm Cooking Oil

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Objectives of SNI 7709-2012:

- To protect consumers;
- To assure responsible and fair trade;
- To support development and diversification of palm cooking oil industry; and
- To improve nutritional status through fortification.
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (1)
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (1)

3 Istilah dan definisi

minyak goreng sawit
bahan pangan dengan komposisi utama trigliserida berasal dari minyak sawit, dengan atau tanpa perubahan kimia, termasuk hidrogenasi, pendinginan dan telah melalui proses pemurnian dengan penambahan vitamin A.
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (1)

Tabel 1 - Syarat mutu minyak goreng sawit

<table>
<thead>
<tr>
<th>No</th>
<th>Kriteria uji</th>
<th>Satuan</th>
<th>Persyaratan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Keadaan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Bau</td>
<td>-</td>
<td>normal</td>
</tr>
<tr>
<td>1.2</td>
<td>Rasa</td>
<td>-</td>
<td>normal</td>
</tr>
<tr>
<td>1.3</td>
<td>Warna (loving 5,25&quot; cell)</td>
<td>merah/kuning</td>
<td>maks. 5,0/50</td>
</tr>
<tr>
<td>2</td>
<td>Kadar air dan bahan menguap (b/b)</td>
<td>%</td>
<td>maks. 0,1</td>
</tr>
<tr>
<td>3</td>
<td>Asam lemak bebas (dihitung sebagai asam palmitat)</td>
<td>%</td>
<td>maks. 0,3</td>
</tr>
</tbody>
</table>
### Tabel 1 - Syarat mutu minyak goreng sawit (ii)

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter</th>
<th>Unit</th>
<th>Batas</th>
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<tbody>
<tr>
<td>4</td>
<td>Bilangan peroksida</td>
<td>mck O₂/kg</td>
<td>maks. 10*</td>
</tr>
<tr>
<td>5</td>
<td>Vitamin A</td>
<td>IU/g</td>
<td>min. 45*</td>
</tr>
<tr>
<td>6</td>
<td>Minyak pelikan</td>
<td></td>
<td>negatif</td>
</tr>
<tr>
<td>7</td>
<td>Cemaran logam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>Kadmium (Cd)</td>
<td>mg/kg</td>
<td>maks. 0,2</td>
</tr>
<tr>
<td>7.2</td>
<td>Timbal (Pb)</td>
<td>mg/kg</td>
<td>maks. 0,1</td>
</tr>
<tr>
<td>7.3</td>
<td>Timah (Sn)</td>
<td>mg/kg</td>
<td>maks. 40,0/250,0**</td>
</tr>
<tr>
<td>7.4</td>
<td>Merkuri (Hg)</td>
<td>mg/kg</td>
<td>maks. 0,05</td>
</tr>
<tr>
<td>8</td>
<td>Cemaran arsen (As)</td>
<td>mg/kg</td>
<td>maks. 0,1</td>
</tr>
</tbody>
</table>

**CATATAN**

* pengambilan contoh di pabrik
** dalam kemasan kaleng
### iii. Vitamin A Fortification of Palm Cooking Oil ➔ Controversy

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### iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (2)

<table>
<thead>
<tr>
<th>No</th>
<th>Specification</th>
<th>Unit</th>
<th>Limit</th>
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<tbody>
<tr>
<td>4</td>
<td>Bilangan peroksida</td>
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** dalam kemasan kaleng
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (2)

ABSTRACT

Name : Chairunisa
Program Study : Pharmacy
Title : Quality Test Of Frying Oil By Food Sellers Around UIN Syarif Hidayatullah Jakarta Campus.

Frying oil is primary foods consumed by Indonesian people. But people, especially food sellers used frying oil many times until damaged and danger to health. The purpose of this research was to evaluation quality of frying oil in food sellers around UIN Syarif Hidayatullah Jakarta campus. The sampling method of this study used purposive sampling. This research has characteristic quality of frying oil: water content of 0.218%-0.194%, acid value of 1.4361 to 0.8583 mgKOH/g, peroxide value of 15.11 to 11.45 meqO₂/kg, iodine value of 7,501-15.81 gI₂/100g oil, cadmium metals contamination of 0.0005 to 0.0001 mg/kg and lead metals contamination from 0.0019 to 0.0004 mg/kg. Five food sellers prove that no qualified to quality cooking oil on SNI 01-3741-2013 and AOAC International except on cadmium and lead metals contamination.

Keyword: frying oil, food sellers, water content, acid value, peroxide value, iodine value, metals contamination.
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (2)

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Keyword: frying oil, food sellers, water content, acid value, peroxide value, iodine value, metals contamination.
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (2)

Study of Seafast center*):

• Peroxide value (PV) of cooking oil: between 0 and 8.94 mEq/kg
• Mostly: 2-3 mEq/kg

Vegetable oil of poor quality is limiting the success of fortification with vitamin A in Egypt

Arnaud Laillou, Saeb A. Hafez, Amal H. Mahmoud, Mohamed Mansour, Fabian Rohner, Sonia Fortin, Jacques Berger, Nabih A. Ibrahim, and Regina Moench-Pfanner
Vegetable oil of poor quality is limiting the success of fortification with vitamin A in Egypt

Abstract

Background. .....................

Objectives. To estimate vitamin A losses in oil with different chemical characteristics.

Methods. Samples of fortified oils with different chemical characteristics were collected from two Egyptian companies (oil A and B) and stored for 1 month. .............

Results. Fortified oil B, with a high peroxide value (5.8 mEq/kg), exposed to sunlight had significantly higher losses of vitamin A after 4 weeks than fortified oil A, with a low peroxide value (0.4 mEq/kg): 31.1% vs. 19.7% (p < .001), respectively. In semidark conditions, the vitamin A losses after 4 weeks in fortified oil B and fortified oil A were significantly different: 26.1% and 0.7% (p < .001), respectively. In an accelerated storage test, the vitamin A loss in 8 days was 48.3% for fortified oil B and 4.2% for fortified oil A (p < .001).
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Abstract

Background. ....................
Objectives. ......................
Methods. .........................
Results. ...........................

Conclusions. This study shows a significant effect of peroxide level (one indicator of the quality of oil) on the stability of vitamin A, regardless of storage conditions. To optimize and sustain vitamin A levels in fortified oil, governments and industries should minimize the peroxide level to less than 2 mEq/kg at production.
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (3)

Purwiyatno Hariyadi, Direktur Southeast Asian Food and Agricultural Science and Technology (SEAFAST)

SNI, DISKRIMINASIKAN MINYAK GORENG SAWIT

Bapak setuju dengan tujuan fortifikasi vitamin A untuk penambahan gizi?

Latar belakang fortifikasi digunakan memperbaiki gizi yang membutuhkan usaha signifikan dari pemerintah dan industri. Mesti disadari, masalah ini harus ditangani secara serius supaya bebannya tidak

Kalau dari awal prosesnya minyak goreng menyimpan betakaroten. Kenapa tidak diperbaiki saja prosesnya?

Kalau menurut saya dapat diperbaiki prosesnya tetapi karena ada regulasi yang mendefinisikan seperti diatas maka akan mempersulit industri. Oleh karena itu, definisi betakaroten.

Artinya industri minyak goreng sawit berpeluang mengembangkan produk dengan kandungan vitamin A?
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (3)
iii. Vitamin A Fortification of Palm Cooking Oil ➔ Controversy (3)
iii. Vitamin A Fortification of Palm Cooking Oil ➔ Controversy (3)

Definition of Palm Oil?

Pasal 1

Dalam Peraturan Menteri ini yang dimaksud dengan:

1. Minyak Goreng Sawit adalah bahan pangan dengan komposisi utama trigliserida berasal dari minyak sawit, dengan atau tanpa perubahan kimia, termasuk hidrogenasi, pendinginan dan telah melalui proses pemurnian dengan penambahan vitamin A.
### iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (3)

#### Pasal 3

Memberlakukan Standar Nasional Indonesia Minyak Goreng Sawit SNI 7709:2012 secara wajib terhadap Minyak Goreng Sawit dengan nomor Pos Tarif dan uraian barang sebagai berikut:

<table>
<thead>
<tr>
<th>No Pos Tarif/HS</th>
<th>Uraian Barang</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex. 1511.90.92.00</td>
<td>RBD Palm Olein dalam kemasan berat bersih tidak melebihi 20 kg.</td>
</tr>
<tr>
<td>Ex. 1511.90.99.00</td>
<td>RBD Palm Olein dalam kemasan berat bersih melebihi 20 kg.</td>
</tr>
<tr>
<td>Ex. 1516.20.98.00</td>
<td>Hidrogenasi RBD Palm Olein dalam kemasan berat bersih tidak melebihi 20 kg dan melebihi 20 kg.</td>
</tr>
</tbody>
</table>
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (3)

Pasal 4

(1) Minyak Goreng Sawit sebagaimana dimaksud dalam Pasal 3 wajib dikemas dengan kemasan.

(2) Kemasan sebagaimana dimaksud pada ayat (1) yang kontak langsung dengan Minyak Goreng Sawit harus tara pangan, kecuali kemasan dalam bentuk truk tangki dan kapal tanker.

(3) Kemasan sebagaimana dimaksud pada ayat (2) merupakan kemasan dengan kapasitas sampai dengan 1000 (seribu) kg.

(4) Minyak Goreng Sawit dengan kemasan sebagaimana dimaksud pada ayat (3) yang beredar wajib mengandung kadar vitamin A minimal 40 IU.
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (3)

Pasal 10

(1) *Minyak Goreng Sawit* sebagaimana dimaksud dalam Pasal 3 yang berasal dari hasil produksi dalam negeri yang tidak memenuhi ketentuan sebagaimana dimaksud dalam Pasal 4, Pasal 5 dan Pasal 7 dilarang beredar.

(2) *Minyak Goreng Sawit* sebagaimana dimaksud dalam Pasal 3 yang telah beredar di pasar yang berasal dari produksi dalam negeri yang tidak memenuhi ketentuan sebagaimana dimaksud dalam Pasal 4, Pasal 5 dan/atau Pasal 7 harus ditarik dari peredaran oleh Produsen yang bersangkutan.
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (4)

Palm $\beta$-carotene?

Red Palm oil:

- Rich in carotenoids and tocopherols.
- Contribute to the stability and nutritional value of this edible oil.
- The concentration of carotenes: $\sim 300 - 500$ mg/kg.
- The major carotenoids of crude palm oil are $\alpha$- and $\beta$-carotenes, which constitute about 90% of the total carotenoids → Pro-Vitamin A.
iii. Vitamin A Fortification of Palm Cooking Oil \( \rightarrow \) Controversy (4)

Palm \( \beta \)-carotene?

- Dietary \( \beta \)-Carotene
  - Excreted
  - \( \beta \)-carotene
  - Vitamin A
    - VAD
    - Enough VA
  - Blood
    - Vitamin A Status
    - \( \beta \)-carotene
      - Excreted
      - Enough VA

iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (4)

Palm β-carotene?

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

R. MANORAMA¹*, G.N.V. BRAHMAM² & C. RUKMINI³

¹ Post Graduate and Research Centre, A.P. Agricultural University, Rajendranagar, Hyderabad – 500 030, India; ² National Institute of Nutrition, Indian Council of Medical Research, Hyderabad – 500 007, A.P. India; ³ National Institute of Nutrition, No. 5, Presidential Drive, East Plain View, New York 11803, U.S.A. (*author for correspondence)
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (4)

Palm β-carotene?

**Review Article**

*A place for palm fruit oil to eliminate vitamin A deficiency*

A J Spinnler Benadé, DSc

*Nutritional Intervention Research Unit, Medical Research Council, Parow, South Africa*

There is general consensus that food-based approaches are viable and sustainable options for addressing vitamin A deficiency in populations. One such example is the fortification of food which, if properly monitored, could make a significant contribution towards improving the vitamin A status of populations throughout the world. Red palm fruit oil (RPO) with its high content of natural carotenoids, lends itself exceptionally well to this purpose at both household and commercial level. Results are now available from several feeding trials incorporating RPO into diets at household level or into commercially manufactured products. RPO in the maternal diet was shown to improve the vitamin A status of lactating mothers and their infants. Consumption of RPO incorporated in a sweet snack or biscuits significantly improved plasma retinol concentrations in children with subclinical vitamin A deficiency. There is evidence that if only 35-50% of the recommended daily intake for vitamin A were to be provided by RPO, it may be sufficient to prevent vitamin A deficiency (hypovitaminosis A). Red palm oil has a highly bioconvertible form of alpha- and beta-carotene, a long shelf life, and a higher cost/benefit ratio when compared to other approaches such as high-dose-vitamin A supplements and fortification of foods with retinyl ester fortificants. Consumption of RPO is safe and cannot produce hypervitaminosis A. Considering all the current information about RPO, the initiation of food-based interventions involving its use in developing countries with an endemic vitamin A deficiency problem, appears to be a logical choice.

**Key Words:** red palm oil, vitamin A deficiency, fortification, developing countries, food-based approaches
Review Article

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Key Words: red palm oil, vitamin A deficiency, fortification, developing countries, food-based approaches
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (4)

Palm β-carotene?

How about using RPO as fortificant?

- Red Palm Oil
  - 300 ppm
  - Or
  - 400 mcg β-carotene/g

- Palm Cooking Oil commercial
  - ~0 ppm
  - or
  - 0 mcg β-carotene/g

- Palm Cooking Oil “rich in carotene”
  - ~30 ppm
  - or
  - 30 mcg β-carotene/g

~10%

~90%
iii. Vitamin A Fortification of Palm Cooking Oil \(\rightarrow\) Controversy (4)

FACTORS FOR VITAMIN A CONVERSION

Where values for vitamin A were expressed in terms of International Units (I.U.), to convert to micrograms the following factors were applied:

One I.U. = 0.3 mcg. of retinol

= 0.6 mcg. of beta-carotene

= 1.2 mcg. of other total mixed carotenoids with vitamin A activity

How about using RPO as fortificant?

Palm Cooking Oil "rich in carotene"

~ 30 ppm
or
30 mcg \(\beta\)-carotene/g

= 50 IU
iii. Vitamin A Fortification of Palm Cooking Oil → Controversy (4)

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How about using RPO as fortificant?

Palm Cooking Oil “rich in carotene”
~ 30 ppm
or
30 mcg β-carotene/g

= 50 IU
iii. Vitamin A Fortification of Palm Cooking Oil ➔ Controversy (5)

Imported Vitamin A?

• Fortification of vegetable oil with Vitamin A (Retinyl Palmitate) ➔ additional cost to industry is ~ USD 1.71/MT*).

• Vegetable oil fortification with retinyl palmitate is recognized as cost-effective and simple to implement

• Domestic consumption of palm cooking oil: 4jt MT – 5jt MT/year

• Cost of Vitamin C Fortification: 6.84 – 8.55 Million USD/year

End the Controversy!

Revision of Definition is Needed

Pasal 1

Dalam Peraturan Menteri ini yang dimaksud dengan:

1. Minyak Goreng Sawit adalah bahan pangan dengan komposisi utama trigliserida berasal dari minyak sawit, dengan atau tanpa perubahan kimia, termasuk hidrogenasi, pendinginan dan telah melalui proses pemurnian dengan penambahan vitamin A.
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End the Controversy!

Explore the optimum utilization of palm carotene

- **Instead of** specifying palm cooking oil to be added with Vitamin A ((Retinyl Palmitate) up to minimum of 45 IU → **having vitamin A activity minimum of 45 IU** → Red Palm Oil may be used as a fortificant.

- Mandatory fortification should be applied to all cooking oils.
End the Controversy!

Evaluating Global Barriers to the Use of Red Palm Oil as an Intervention Food to Prevent Vitamin A Deficiency

Betty J. Burri

Abstract: Vitamin A deficiency (VAD) is an important cause of blindness and premature death. Red palm oil (RPO) is the richest food source of VA-forming carotenoids. RPO carotenoid concentration and bioavailability were evaluated and this data used to estimate the amount of RPO needed to meet VA requirements. Amounts ranged from 6.7 to 29.2 g/d (1.5 to 6.5 tsp/d), which are easily consumed. The amount of RPO needed to supply recommended dietary intakes of VA for all 208100000 individuals most in danger for VAD worldwide for 1 y is 0.80 million metric tons, a fraction of annual world palm oil production. Despite its abundance, RPO has seldom been used for VAD prevention on a national level. Pareto charts were constructed to highlight the variables that influence the ability of RPO to prevent VAD on the national level. The most important variable by far was refining method. Most refining methods are designed to remove color and flavor from RPO, resulting in a bland product that lacks carotenoids. Thus, the important barriers to the use of RPO as a food-based intervention to prevent VAD appear to be that: (1) RPO requires refining, limiting its profitability and availability for small farmers. (2) The goal of most refining methods is to create a low-cost bland, odorless, and colorless fat which requires removal of carotenoids. (3) Cost, since RPO use competes with high-dose VA supplements, which are heavily subsidized. It appears that RPO could prevent VAD in many food-deficit countries if carotenoids were conserved during oil refining, and costs were low enough to make it an attractive alternative to nutritional supplements.
THANK YOU
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