

REVIEW ARTICLE

A REVIEW OF PALM OIL ADULTERATED AGAINST HEART ATTACKS

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ABSTRACT:

Adulterated palm oil, often mixed with cheaper oils or other substances, can pose significant health risks. Its consumption may elevate the risk of heart attacks, mainly due to its high saturated fat content. Diets rich in saturated fats can raise cholesterol levels, leading to atherosclerosis and other cardiovascular issues. Choose Quality: Select pure, high-quality palm oil or healthier alternatives like olive or canola oil. Limit Intake: Reduce your overall saturated fat intake and aim for a balanced diet filled with fruits, vegetables, whole grains, and lean proteins. Stay Informed: Pay attention to food labels and sources to avoid adulterated products.

KEYWORDS: Palm Oil, Heart Attacks, Adulterated

INTRODUCTION:

Palm Oil

Origin and Production

Palm oil is a vegetable oil extracted from the fruit of the oil palm tree (*Elaeis guineensis*). It's known for its versatility and is used in various applications, including food, cosmetics, and industrial products [1].

Types of Palm Oil

- **Crude Palm Oil:** This oil is derived from the fleshy part of the fruit, characterized by its reddish hue due to high levels of carotenoids.
- **Palm Kernel Oil:** Extracted from the seed, this oil contains a higher concentration of saturated fats.

Nutritional Profile

- **Fat Composition:** Palm oil consists of about 50% saturated fats, 40% unsaturated fats (mainly monounsaturated), and 10% polyunsaturated fats.
- **Vitamins:** It is a source of vitamins A and E, which provide antioxidant benefits.
- **Caloric Content:** Similar to other oils, palm oil is calorie-dense, with approximately 120 calories per tablespoon.

Health Implications

- **Saturated Fats:** Diets high in saturated fats may elevate LDL (bad) cholesterol levels, potentially increasing heart disease risk.
- **Moderation:** When consumed in moderation as part of a balanced diet, palm oil may not pose significant health risks, but it's important to avoid excessive amounts [2].
- **Adulteration:** Low-quality or adulterated palm oil can contain harmful substances, making it essential to choose reputable sources.

Uses of Palm Oil

- **Food Products:** Commonly found in baked goods, margarine, cooking oils, and processed foods.
- **Non-Food Products:** Also prevalent in cosmetics, soaps, detergents, and biodiesel.

Environmental Concerns

- **Deforestation:** The growth of palm oil plantations is a leading cause of deforestation in tropical regions, threatening biodiversity and natural habitats.
- **Greenhouse Gas Emissions:** Deforestation and changes in land use contribute to significant greenhouse gas emissions.
- **Sustainability Initiatives:** Organizations like the Roundtable on Sustainable Palm Oil (RSPO) are working to promote sustainable practices in palm oil production [3].

Economic Aspects

- **Global Trade:** Palm oil is one of the most widely traded vegetable oils, predominantly produced in Indonesia and Malaysia.
- **Economic Impact:** It provides livelihoods for millions of smallholder farmers and plays a crucial role in local economies, though there are ongoing concerns about labor practices and land rights.



Elaeis guineensis aerial part

Elaeis guineensis

1. Taxonomy

- **Kingdom:** Plantae
- **Clade:** Angiosperms
- **Clade:** Monocots
- **Order:** Arecales
- **Family:** Arecaceae
- **Genus:** *Elaeis*
- **Species:** *E. guineensis*

2. Description

- **Physical Characteristics:** The oil palm is a tall, slender tree that can grow up to 20 meters high. It features a smooth trunk and large, feathery leaves that can reach lengths of up to 3 meters.
- **Fruit:** The tree produces clusters of small fruits that are orange to red in color. Each fruit contains a single seed (kernel). The pulp of the fruit is processed to extract crude palm oil, while the kernel is used to produce palm kernel oil [4].

3. Cultivation

- **Growing Conditions:** *E. guineensis* thrives in tropical climates characterized by high rainfall, humidity, and well-drained soils. It is predominantly cultivated in regions near the equator.
- **Planting:** Typically, oil palms are planted at densities of about 143 to 200 trees per hectare, and they begin to bear fruit within three to four years of planting.

- **Harvesting:** The fruits are harvested by cutting down the ripe bunches from the tree. The extraction of oil involves a process that includes sterilization, pressing, and refining.

4. Uses

- **Culinary:** The main use of *E. guineensis* is for its oil, which is widely used in cooking, baking, and various processed food items.
- **Non-Culinary:** Palm oil is also utilized in products like cosmetics, soaps, detergents, and as a biofuel.
- **By-products:** The palm kernel and other by-products are valuable for animal feed and can be converted into biodiesel [5].

5. Ecological Significance

- **Biodiversity:** While oil palm plantations can support certain species, the prevalence of monoculture often leads to reduced biodiversity in the surrounding ecosystems.
- **Soil and Water Conservation:** When cultivated sustainably, oil palm can aid in soil conservation and improve water quality management.

6. Economic Importance

- **Global Industry:** *E. guineensis* is a key player in the global oil crop market and is crucial to the economies of producing nations, notably Indonesia and Malaysia.
- **Employment:** The industry provides livelihoods for millions of people, from cultivation to processing stages.

7. Challenges and Controversies

- **Deforestation:** The expansion of oil palm plantations is a leading cause of deforestation, especially in Southeast Asia, resulting in habitat loss for numerous species, including those that are endangered [6].
- **Greenhouse Gas Emissions:** Changes in land use and deforestation related to oil palm cultivation contribute significantly to greenhouse gas emissions.
- **Sustainable Practices:** There is a push towards sustainable palm oil production that emphasizes reducing environmental impacts and ensuring fair labor practices. Organizations such as the Roundtable on Sustainable Palm Oil (RSPO) are working to certify sustainable methods.

8. Research and Development

Research efforts continue to focus on enhancing cultivation methods, improving disease resistance, and promoting sustainable practices within the palm oil industry.

Adulterated Oils

1. Definition of Adulterated Oils

Adulterated oils refer to oils that have been mixed with cheaper or lower-quality oils, additives, or substances to cut production costs. Common adulterants include less expensive vegetable oils, mineral oils, and synthetic ingredients.

2. Common Types of Adulterated Oils

- **Palm Oil:** Frequently blended with lower-cost oils or recycled oils to maximize profit.
- **Olive Oil:** Often diluted with soybean, sunflower, or canola oil to reduce expenses.
- **Vegetable Oils:** Various vegetable oils can be mixed with lower-quality fats or oils.

Health Implications

1. Nutritional Impact

Adulterated oils may lack essential nutrients and beneficial compounds typically found in high-quality oils. For example, extra virgin olive oil is rich in antioxidants and healthy fats, while adulterated versions often do not provide the same health benefits [7].

2. Saturated and Trans Fats

Adulterated oils may contain higher amounts of saturated and trans fats, which can lead to:

- **Increased LDL Cholesterol:** Elevated levels of LDL (low-density lipoprotein) cholesterol can contribute to atherosclerosis, a condition characterized by narrowed arteries due to plaque buildup.
- **Reduced HDL Cholesterol:** These oils may also lower levels of HDL (high-density lipoprotein) cholesterol, which helps protect against heart disease.

Contributing Factors to Heart Disease

1. Dietary Patterns

A diet high in processed foods that often include adulterated oils can lead to obesity, hypertension, and diabetes, all of which are significant risk factors for heart attacks.

2. Inflammation

The consumption of adulterated oils can trigger inflammation within the body, which is associated with cardiovascular diseases. Chronic inflammation may damage blood vessels and facilitate plaque formation.

3. Oxidative Stress

Low-quality oils may contain impurities that increase oxidative stress, leading to cellular damage and contributing to heart disease development.

Preventive Measures

1. Choose Quality Oils

- **Research and Labels:** Always verify the authenticity of oils by looking for certification seals or labels indicating quality, such as "100% pure" or "extra virgin."
- **Trusted Sources:** Purchase oils from reputable brands that adhere to quality control standards.

2. Limit Processed Foods

Reducing the intake of processed foods, which may contain adulterated oils, can help decrease heart disease risk. Focus on consuming whole, unprocessed foods instead.

3. Balanced Diet

Emphasize a diet rich in fruits, vegetables, whole grains, and lean proteins. Include healthy fats from sources like avocados, nuts, and high-quality oils [8].

4. Regular Health Check-ups

Keep track of cholesterol levels, blood pressure, and overall heart health through regular check-ups, facilitating early detection and prevention of heart disease.

Identifying Parameters of Adulteration in Oils Analysis

1. Physical Parameters

- **Color:** The color can provide insights into the oil's purity. For example, pure olive oil typically appears golden to green, while adulterated oils may display unusual colors due to additives.
- **Odor:** High-quality oils usually have a distinct and pleasant aroma. In contrast, adulterated oils may emit off-odors or lack the characteristic scent associated with pure oils.
- **Taste:** A sensory evaluation can reveal adulteration; pure oils have distinct flavor profiles, whereas adulterated oils may taste bland or altered.

2. Chemical Parameters

- **Acid Value:** This measures the concentration of free fatty acids in the oil. High acid values can indicate degradation and lower quality, often linked to adulteration.
- **Peroxide Value:** This parameter assesses the level of oxidation in the oil. Elevated peroxide values may suggest rancidity and the presence of adulterants.
- **Saponification Value:** This value indicates the amount of alkali needed to saponify a specific quantity of oil. Variations from expected saponification values can signal adulteration.
- **Iodine Value:** This measures the degree of unsaturation in the oil. Deviations from normal iodine values can indicate the presence of saturated fats or inferior oils.
- **Refractive Index:** This optical measurement helps assess the composition of the oil. Significant deviations from typical refractive indices may indicate adulteration.

3. Spectroscopic Analysis

- **Infrared Spectroscopy:** This technique identifies the chemical composition of oils by comparing the spectral fingerprints of pure and adulterated oils.
- **Nuclear Magnetic Resonance (NMR):** NMR spectroscopy provides insights into the molecular structure of oils, aiding in the identification of adulteration and compositional changes.

4. Chromatographic Techniques

- **Gas Chromatography (GC):** This method separates volatile components in oils, allowing for the detection of specific fatty acids and the identification of adulterants.

- **High-Performance Liquid Chromatography (HPLC):** HPLC analyzes non-volatile compounds, which helps in detecting synthetic additives or lower-quality oils.

5. Thin Layer Chromatography (TLC)

TLC is used to separate and identify various components in oils, making it particularly effective for detecting specific adulterants and confirming oil purity.

6. Detection of Specific Adulterants

- **Qualitative Tests:** Simple tests can help identify specific adulterants. For instance, adding a few drops of water to the oil can reveal cloudiness, indicating the presence of cheaper oils. Mixing the oil with alcohol may show separation, suggesting adulteration.
- **Laboratory Analysis:** Advanced testing methods can pinpoint specific adulterants, such as assessing the ratio of palm oil to olive oil through isotope analysis [9].

7. Regulatory Compliance

- **Standard Specifications:** Oils must adhere to national and international standards established by organizations like the Codex Alimentarius and the Food and Drug Administration (FDA). Compliance with these standards is essential for evaluation.

8. Sensory Evaluation

- **Organoleptic Assessment:** A trained panel can evaluate the sensory characteristics of the oil, including flavor, aroma, and texture, to detect inconsistencies that may indicate adulteration.

Uses of Palm Oil

1. Culinary Uses

- **Cooking Oil:** Palm oil is favored for frying, sautéing, and baking due to its high smoke point and stability at elevated temperatures. Its neutral flavor allows it to complement various dishes without overpowering them.
- **Processed Foods:** Commonly found in processed foods, palm oil is used in margarine, snacks, baked goods (such as cookies and cakes), and ready-to-eat meals, enhancing texture and extending shelf life.
- **Confectionery:** In the chocolate and candy industry, palm oil improves mouthfeel and stability, contributing to a creamy texture [6].

2. Non-Culinary Uses

- **Cosmetics and Personal Care Products:** Palm oil is a key ingredient in soaps, shampoos, and lotions, serving as a moisturizer and emollient that helps retain skin moisture.
- **Household Products:** Many cleaning products and detergents incorporate palm oil due to its surfactant properties, enhancing their cleaning effectiveness.
- **Biodiesel Production:** Increasingly, palm oil is utilized as a feedstock for biodiesel, a renewable energy source. Its high yield per hectare makes it an attractive alternative to fossil fuels.

3. Industrial Applications

- **Lubricants:** Derivatives of palm oil are used to create biodegradable lubricants, offering an eco-friendly substitute for petroleum-based options.
- **Pharmaceuticals:** The oil acts as a carrier for various medicinal compounds, improving the absorption of active ingredients.
- **Plastics and Polymers:** Palm oil derivatives can be employed in producing biodegradable plastics, promoting sustainability in packaging materials [7].

4. Nutritional Uses

- **Dietary Supplements:** Rich in tocotrienols (a form of vitamin E) and carotenoids, palm oil is valued for its antioxidant properties and is often included in health supplements.
- **Animal Feed:** By-products from palm oil extraction, such as palm kernel meal, are utilized as high-protein feed for livestock and aquaculture, supporting these industries.

5. Cultural and Traditional Uses

- **Traditional Medicine:** In some cultures, palm oil is used in traditional remedies, believed to offer health benefits, including anti-inflammatory properties.
- **Culinary Traditions:** In many tropical regions, palm oil is integral to traditional cooking, enhancing the flavor and texture of local dishes.

6. Sustainability and Ethical Considerations

- **Sustainable Practices:** Initiatives like the Roundtable on Sustainable Palm Oil (RSPO) promote responsible production methods to mitigate environmental impacts, such as deforestation and habitat loss.
- **Consumer Awareness:** Growing consumer awareness regarding the origins of palm oil is driving demand for sustainably sourced products, encouraging ethical consumption.

7. Economic Importance

- **Global Trade:** Palm oil is among the most traded vegetable oils worldwide, with significant production in countries like Indonesia and Malaysia, playing a crucial role in their economies.
- **Employment:** The palm oil sector provides millions of jobs across the supply chain, from cultivation to processing, supporting rural livelihoods [8].

CONCLUSION:

Adulterated palm oil presents significant health risks and challenges related to consumer safety and food quality. The practice of mixing palm oil with cheaper or inferior oils can result in adverse health effects, such as elevated levels of saturated and trans fats. These fats are linked to increased LDL cholesterol and a heightened risk of heart disease.

The presence of adulterants not only diminishes the nutritional benefits of pure palm oil—such as its antioxidant properties and essential fatty acids—but also erodes consumer trust in food products.

To reduce these risks, it is vital for consumers to stay informed about the oils they purchase. Selecting high-quality, certified products and paying attention to labeling can help ensure the consumption of pure palm oil. Furthermore, advocating for stricter regulations and promoting transparency within the palm oil supply chain are essential steps in combating adulteration and encouraging sustainable practices [9].

In summary, tackling the issue of adulterated palm oil requires a collaborative effort among consumers, producers, and regulatory bodies to guarantee safety, quality, and sustainability within the palm oil industry [10].

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