PALM OIL
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CHINA AND PAKISTAN - THE LARGEST PALM OIL IMPORTERS

PORLA figures show that China and Pakistan were the largest importers of Malaysian palm oil. They imported 1 341 248 tonnes and 1 140 716 tonnes of palm oil respectively in 1994, representing 37.3% of the total palm oil export from Malaysia.

Source: PORLA January 1995

IN THIS ISSUE

ASSURING THE QUALITY OF MALAYSIAN PALM OIL PRODUCTS

by

F P Wee*

Palm oil, as produced, must meet contractual requirements, but it must also then be stored and loaded with careful attention to quality standards. Poorly-coated or rusty land tanks, pipeline contamination, previous cargo contamination, cross contamination, and poor temperature control will all result in deterioration of oil quality, and strict control measures must be observed to prevent these problems.

With this in mind, it is the quality policy of Felda-Johore Bulkers Sdn Bhd to ensure users of their bulking facilities that the quality of processed palm oil is not jeopardized.

Felda-Johore Bulkers Sdn Bhd (FJB) is located at Pasir Gudang Port. It started its operations in 1975 with 23 tanks with an annual throughput of 200 000 tonnes. At that time its primary activity was handling and shipment of crude palm oil. With the establishment of refineries in Pasir Gudang Industrial Estate, FJB has expanded its facilities to meet the requirements of the refineries. At present, the installation has 186 tanks with a total storage capacity of 210 000 tonnes. Annual throughput exceeds 3.0 million tonnes.

Over the years, FJB has not only handled palm oil, both crude and refined, but also other oils like soyabean, rapeseed, corn, coconut and sunflowerseed. FJB also constructed a dedicated tank yard which was completed in September 1992 for the handling of oleochemicals.

To ensure that quality is maintained at all times, close monitoring of oils is carried out at every stage . Beginning at the sampling bays, samples of oils are taken, recorded and sent to the laboratory for analysis. Samples are also taken during storage and shipment. FJB has its own laboratory, which is approved by the Palm Oil Registration and Licensing Authority (PORLA). Its primary function is to carry out quality analysis of oils. The party concerned will be advised officially by fascimile if an oil does not meet specifications.

* *Felda-Johore Bulkers Sdn Bhd*

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To minimize deterioration in quality, all refined oils are stored in coated or stainless steel tanks. Most tanks have agitators to ensure that the oil is evenly heated and well homogenized, which will also prevent skin overheating. All the tanks are fitted with an automatic tank gauging system. The movements in each individual tank together with the temperature readings of the oils are centrally monitored at the control room. The tanks are calibrated by independent surveyors and approved by SIRIM. To reduce the risk of contamination further, the tanks have dedicated pipeline systems.

The common modes of transport by which the installation receives the various types of vegetable oils are as follows:-

- Truck tankers
- Ships
- The pipeline transfer system

The pipeline transfer system is the main form of transport used in the Pasir Gudang area. As most of the palm oil refineries are located in the Pasir Gudang Industrial Estate, this system, which was set up in 1988, enables direct transfer of oils to FJB from the refineries or vice versa. The advantages of the pipeline transfer system are:

- Savings in transport costs and a reduction in the use of truck tankers;
- Product quantity and quality are preserved as the factors affecting them are kept under close control; and
- Pilferage and wastage are minimized as the movement of oil is enclosed from the point of origin to the point of delivery, *i.e.* between the refineries and the installation.

To minimize cross contamination, segregated pipelines are used for each product, *e.g.* for olein, stearin or crude oils. The network of pipelines from refineries to the installation and up to the loading points at the jetties, have pigging facilities to clean up and clear the line before each cargo of oil is handled; the shippers have independent surveyors to collect oil samples at the various stages from storage to shipment.

In 1985, FJB constructed stainless steel storage tanks with nitrogen blanketing facilities to handle special oils produced by Palmaju Edible Oils, for the Fuji Oil Co. Ltd. of Osaka, Japan.

The special quality oils, called SQ-PO, are shipped under nitrogen blanketing and on reception at Hannan are transferred to storage tanks also under nitrogen blanketing. Confirmation received from the Fuji Oil Company in Osaka indicated that:

a) The special quality oils require no reprocessing at the Hannan factory.

TABLE 1. COMPARISON BETWEEN OIL QUALITY AT SHIPMENT OUT FROM FJB AND ON RECEPTION AT HANNAN

Voyage Number	Source of samples analysed	Tank Number	FFA %	PV meq/kg	Colour (5 1/4") R Y	M&I %	Taste (arbitrary units)
	Palmaju	155	0.013	Nil	1.1 x 12	0.02	9.70
66		158	0.014	Nil	1.1 x 12	0.02	9.68
	Hannan	511	0.014	0.10	1.1 x 10	-	9.54
	Palmaju	155	0.014	Nil	1.1 x 11	0.01	9.67
67		158	0.015	Nil	1.0 x 10	0.01	9.67
	Hannan	510	0.019	0.08	1.0 x 10	0.01	9.54
	Palmaju	155	0.008	Nil	0.8 x 7.0	0.02	9.70
68		158	0.009	Nil	0.7 x 8.0	0.02	9.65
	Hannan	511	0.009	0.05	0.9 x 9.0	-	9.52

TABLE 2. ANALYSIS OF SQ PALM OIL HANDLED AT FJB FOR A REFINERY

Oil		Test Results		
Type	Parameters	Factory	Surveyor	Buyer
Palm Oil	FFA %	0.04	0.04	-
	M&I %	0.02	0.02	-
	PV, meq/kg	0.15	-	-
	Colour (5 1/4")	0.9R 9.0Y	0.9R 9.0Y	-
Palm Olein	FFA %	0.05	0.03	-
	M&I %	0.04	0.02	-
	PV, meq/kg	0.28	n.d.	-
	Colour (5 1/4")	2.3R 23Y	2.1R	-
Palm Stearin	FFA %	0.03	0.03	0.03
	M&I %	0.04	0.02	0.01
	PV, meq/kg	n.d.	n.d.	0.11
	Colour (5 1/4")	0.7R 6.0Y	0.7R 4.7Y	0.7R 7.0Y
Palm Oil	FFA %	0.03	0.03	-
	M&I %	0.03	0.02	-
	PV, meq/kg	0.26	-	-
	Colour (5 1/4")	1.0R 10Y	0.9R 10Y	-
Palm Stearin	FFA %	0.02	0.02	0.02
	M&I %	0.02	0.02	0.01
	PV, meq/kg	n.d	0.2	0.81
	Colour (5 1/4")	0.8R 7.0Y	1.0R 8.0Y	0.8R 8.0Y

Note : n.d. = not determined.

TABLE 3. REPORT OF ANALYSES ON GLYCERINE HANDLED AT FJB

	Buyer's Specification	Refiner's Analysis	FJB's Analysis
Glycerine (%)	99.5 min	99.6	99.6
SG (20/20°C)	1.2630	1.2631	1.2630
Colour (ALPHA)	20 max.	< 15	< 15
Ash (%)	0.01 max	0.004	0.005
Fatty Acid & Ester (0.5N NaOH) ml	1 max.	0.4	0.4
Chlorides (ppm)	10 max.	5	5
Sulphates (ppm)	20 max.	< 20	< 20
Arsenic (ppm)	1.5 max.	< 1.5	< 1.5
Heavy Metals (ppm)	5 max.	< 5	< 5
Chlorinated Compounds (ppm)	10 max.	< 10	< 10

b) There is no change in quality of oil during shipment as shown below:

FFA	-	No change
PV	-	Nil - to trace
Colour	-	No change
M&I	-	No change
Taste	-	Good

Table 1 shows a comparison between the quality of the oil shipped out from FJB and its quality as received at Hannan; *Table 2* shows the analysis of SQ-PO handled in FJB for another refinery.

The oleochemicals industry in Malaysia has expanded considerably over the last couple of years. With the establishment of oleochemical plants in Pasir Gudang in 1991, FJB constructed a dedicated stainless steel tank farm which consists of 20 tanks with a storage capacity of 10 500 tonnes to meet the requirements of the refiners. FJB is the only installation in the world to have such oleochemicals handling facilities.

The various grades of oleochemicals handled range from the triple pressed stearic acids to lauric acid and even 99.5% pure glycerine. To date, the installation has handled more than five parcels of glycerine in bulk. With such high quality and high value products, there is a need for extra care and precautions in the handling procedure, and in fact oleochemicals require a totally different method of handling as compared to processed palm oil and its products.

Table 3 shows the results from analyses on glycerine handled at FJB.

FJB's operators are constantly trained to upgrade their skills so that the quality requirements of the shippers are met. The facilities of FJB's installation will also be continuously upgraded in keeping with the company's policy on quality, which is based on a commitment to customers' satisfaction.

PALM OLEIN BLENDS : TECHNICALLY PRACTICABLE AND NUTRITIONALLY ADVANTAGEOUS

by

Johari Minal

Palm olein, the liquid fraction of palm oil has excellent frying properties like the parent oil, and is widely used for industrial frying and household cooking, either unmixed or blended with other oils.

In tropical countries, palm olein is used unmixed as frying oil. However, small amounts of blended palm olein are also produced to cater for a small market segment which has a preference for a particular flavour. For instance, palm olein blended with groundnut oil has a similar taste to pure groundnut oil. Such a blend, marketed under the brand name 'Dhara', is popular with housewives in India as a substitute for the more expensive groundnut oil.

Similarly, in China palm olein is blended with either groundnut or sesame oil. Blends of 95% palm olein with 5% or 3% groundnut oil and 2% sesame oil have proved very popular.

In Malaysia, blended oils appear to have an image of premium quality and healthfulness. An example is the brand 'Daisy', a blend of palm olein with sunflower oil and canola. It has a high content of monounsaturated fatty acids (59%). An investigation at PORIM by Teah Yau Kun in 1992 found that a common blend formulation in Malaysia is 95% palm olein with 3% groundnut oil and 2% sesame oil. Blends containing corn, palm and soyabean oils are also available. *Table 4* shows the fatty acid composition of some Malaysian cooking oils.

In temperate countries, palm olein could be blended with locally available vegetable oils and used as general purpose cooking oils. Such blends would have cold stability and the cost benefit and technical and nutritional advantages could also be fully exploited. It has been suggested by the American Heart Association that for optimum nutritional benefits, the ratio of fatty acids in the diet as a whole should be 1:1:1 for saturated : monounsaturated : polyunsaturated acids. Rice bran oil, with the fatty acid composition as shown in *Table 5*, when blended with olein achieved a ratio of about 1:1:1 (Boso Cooking Oil). (It is of interest to note that a blend of equal parts of palm oil and soyabean oil also has saturated, monounsaturated and polyunsaturated fatty acids in the ratio 1:1:1. This blend was used by Nesaretnam, Hayes and Sundram in a nutritional study of monkeys reported in 1993 in ELAEIS, 5(2), 115-121).

In Italy, Unilever and Salino SRL have introduced blends of palm olein with sunflower and groundnut oils under the brand names FRIOL and FRIMAX respectively. These blends are sold at about half the price of olive oil and have been very well received.

TABLE 4. FATTY ACID COMPOSITION (%) OF MALAYSIAN COOKING OILS

Fatty Acids		Palm Olein	Peanut/Palm Olein	Palm Olein/ Peanut/ Sesame
Lauric	C12:0	-	Trace	0.3
Myristic	C14:0	1.1	1.2	1.1
Palmitic	C16:0	34.8	33.0	32.7
Palmitoleic	C16:1	Trace	0.2	0.3
Stearic	C18:0	7.2	6.7	6.6
Oleic	C18:1	45.3	44.5	45.4
Linoleic	C18:2	11.5	13.6	13.2
Arachidic	C20:0	-	0.7	0.3

Source : Teah Y K, 1992; Characteristics of Palm Oil Products and Utilization in Food Systems in Selected Reading of Palm Oil.

TABLE 5. FATTY ACID COMPOSITION OF RICE BRAN OIL AND BLEND

		Rice Bran Oil	Boso Cook -ing Oil
Cloud Point		-5.0°C	46°C
Fatty Acid Composition			
Lauric	12:0	-	0.1
Myristic	14:0	0.4	0.6
Palmitic	16:0	7.1	25.8
Palmitoleic	16:1	0.3	0.1
Stearic	18:0	1.6	2.4
Oleic	18:1	42.6	42.5
Linoleic	18:2	34.0	25.7
Linolenic	18.3	1.5	0.9
Arachidic	20:0	0.8	0.5
Total Saturates (S)		20.8	29.8
Total Monounsaturates (M)		45.5	43.5
Total Polyunsaturates (P)		35.5	26.6
S.M.P. ratio		1.0:2.2:1.7	1.1:1.6:1.0

Source : Teah, Y K 1992; Characteristics of Palm Oil Products and Utilization in Food Systems in Selected Reading of Palm Oil.

Blending with palm olein is an alternative solution to partial hydrogenation of polyunsaturated oils. The blends have a better frying performance as compared with polyunsaturated oils alone. Blending improves quality and stability, including heat stability, reducing primary and secondary oxidation and the formation of polymers and polar compounds.

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BREAKING INTO ALGERIA : PORIM'S EXPERIENCE

by

Mat Rasid Mat Jaais

A one year contract signed between a Malaysian supplier and Entreprise Nationale des Corps Gras (ENCG), Ministere des Industries Legeres, of Algeria in 1992 was the beginning of a breakthrough for Malaysian palm olein into the liquid oil market in North Africa.

The contract called for the supply of 200 000 tonnes of palm oil products for one year from August 1992 to August 1993. The first consignment of 5500 tonnes of normal RBD palm olein and 2000 tonnes of RBD palm kernel oil was shipped in September 1992. PORIM has been directly involved from the beginning until the present, to monitor the quality changes of the Malaysian palm oil products exported to Algeria. When consignments arrived at Algerian ports, PORIM experts were called to advise on the handling and processing of the oil received.

ENCG used the palm olein for the production of cooking oils with the brand name NAKHILA. Palm kernel oil was used to replace coconut oil in their soap formulations.

The palm olein-based cooking oil, NAKHILA, is packed in 1, 2.5 and 5 litre plastic bottles. Two types of cooking oils are actually produced, a multipurpose oil and a frying oil. The multipurpose oil is a blend of 30% palm olein and 70% colza oil. The frying oil is a blend of 50% palm olein with 50% colza oil.

The quality standards of ENCG's non-olive cooking oils are :-

FFA (as oleic)	=	0.2% max
PV (meg/kg)	=	5 max
Colour (1 1/4"cell)	=	1R + 4Y + OB
Soap	=	NIL

The ship, Pina Vento, which carried the first consignment, arrived at the Algerian port of Bejaya on 23 September, 1992. During transport, the RBD palm olein (5495 tonnes) in the consignment and the RBD palm kernel oil (2033 tonnes) were stored in twelve stainless steel tanks. On arrival, the temperatures of the oils in the tanks were recorded as between 28°C and 40°C. The composite samples collected by the surveyor, both during loading

and unloading, were analysed to check the quality. The results are as shown in *Tables 6* and *7*.

TABLE 6. RESULTS OF ANALYSES ON FIRST CONSIGNMENT OF RBD PALM OLEIN SHIPPED TO ALGERIA

Quality Parameters	At Malaysian Ports (Average)	At Algerian Ports (Average)
FFA % (as palmitic)	0.07	0.11
PV (meg/kg)	0.8	2.1
M&I	0.02	0.03
IV (Wij's)	56.3	57.4
M.Pt (AOCS)	21.7	22.5
Colour (5 1/4" Cell)	2.7R	1.0R + 4.1Y (1 1/4" Cell)

TABLE 7. RESULTS OF ANALYSES ON FIRST CONSIGNMENT OF RBD PALM KERNEL OIL SHIPPED TO ALGERIA

Quality Parameters	At Malaysian Ports (Average)	At Algerian Ports (Average)
FFA% (as palmitic)	0.04	0.05
PV (meq/kg)	0.4	-
M&I (%)	0.02	0.03
IV (Wij's)	18.0	18.0
M. Pt (AOCS Cc 3-25)	26.9	-
Colour (5 1/4" Cell)	0.5R + 5.3Y	0.8R

On 24 September 1992, the consignment was declared free of radiation contamination by the Algerian authority. The RBD palm olein and RBD palm kernel oil were then discharged to the terminal tank and hence to the storage tanks in the refinery complex. In this complex, there are 20 tanks with a total capacity of 18 400 tonnes for storage of oils or fats : 12 tanks for liquid oil, 6 tanks for tallow and 2 tanks for coconut or palm kernel oil.

After this first consignment, the changes in quality of the Malaysian palm oil products were closely monitored from time to time for about two years. A total of 16 shipment samples was collected for quality analysis. The monitoring analysis compared the results from Malaysian ports and Algerian ports. The average values of the results for all palm oil products purchased for more than a year, namely

TABLE 8. RESULTS OF ANALYSES ON RBD PALM OLEIN SHIPPED TO ALGERIA BETWEEN SEPTEMBER 1992 AND DECEMBER 1993

Quality Parameters	At Malaysian Ports (Average)	Algerian Ports (Average)
FFA% (as palmitic)	0.09	0.11
PV (meq/kg)	0.95	2.1
M&I (%)	0.04	0.03
IV (Wij's)	56.5	57.4
Melting Pt. (AOCS)	21.5	22.7
Colour (5 1/4" Cell)	2.9 R+37 Y	3.6R+34Y

TABLE 9. RESULTS OF ANALYSES ON RBD PALM KERNEL OIL SHIPPED TO ALGERIA BETWEEN SEPTEMBER 1992 AND DECEMBER 1993

Quality Parameters	At Malaysian Ports (Average)	At Algerian Ports (Average)
FFA % (as palmitic)	0.05	0.09
M&I	0.02	0.03
IV (Wij's)	18.2	18.0
Colour (5 1/4" Cell)	0.5R + 5Y	0.8R

TABLE 10. RESULTS OF ANALYSES RBD PALM STEARIN SHIPPED TO ALGERIA BETWEEN SEPTEMBER 1992 AND DECEMBER 1993

Quality Parameters	At Malaysian Ports (Average)	At Algerian Ports (Average)
FFA % (as palmitic)	0.08	0.11
M&I (%)	0.03	0.04
IV (Wij's)	36.4	37.9
Melting Pt. (AOCS)	52.1	52.9
Colour (5 1/4"Cell)	2.7 R	3.4 R

RBD palm olein, RBD palm kernel oil and RBD palm stearin, are shown in *Tables 8, 9* and *10* respectively.

These results proved useful to both parties. The quality of the products supplied and received complied with the buyer's specifications and was very satisfactory. As a result, ENCG have continued their contract to purchase palm oil products from Malaysia at the rate of about 200 000 tonnes a year until now.

RESEARCH HIGHLIGHTS

PALM OIL HAS NO HYPERCHOLESTEROLEMIC OR PROTHROMBOTIC EFFECTS

Some Scandinavian workers have recently reported a study on palm oil in the American *Journal of Clinical Nutrition*. As part of this work, the effect of palm oil (high in palmitic acid) on lipoproteins and haemostatic variables (coagulation factors) was investigated in healthy human volunteers in Denmark. They were fed a diet containing 41% of the fat from palm oil and providing 40% of the calories for three weeks. (It is known that steady state concentrations of plasma lipids and lipoproteins are achieved within two to three weeks on an experimental diet.)

The total blood cholesterol level was 7% lower in the volunteers on the palm oil diet than when they were on their habitual diet; the LDL-cholesterol was 9% lower, the LDL-C/HDL-C ratio was 10% lower and the triglyceride concentration 20% lower. All these changes suggests that palm oil does not behave like a saturated fat, but on the contrary has favourable effects on blood lipids.

Factor VII is a vitamin K dependent pro-coagulation protein and factor VII Activity (FVIIC) has been shown to be an independent risk factor for ischaemic heart disease. This was not increased in volunteers on a palm oil diet, suggesting that palm oil is not prothrombotic.

These findings once again lend credence to and confirm earlier reports that a palm oil diet does not have hypercholesterolemic effects and is also not prothrombotic, and accordingly does not increase cardiovascular risk.

Source : J Clin Nutr, 1994
Contributed by Dr N Chandrasekharan

USE OF DECANTERS IMPROVES OIL PROCESSING

Decanters were developed to help reduce production costs and improve the efficiency of processing of palm fruit at the stage of oil clarification. Chemical engineer, En. Mohd. Sulong who tested the 3-phase decanters installed at a palm oil mill, observed the following advantages:-

- Reduction of overall oil losses in the clarification plant.
- Improvement in the quality of effluent discharged from the clarification station of a conventional process by as much as 70 per cent.
- Reduction of the initial biochemical oxygen demand of the effluent discharged because of a reduced content of organic solids.
- Shortening of processing time with a smaller rise in free fatty acid during processing, resulting in better quality oil.

Source : 5th Symposium of Malaysian Chemical Engineers, 1989.
Contributed by Johari Minal

PORIM OIL PALM GENE BANK

A gene bank is a place where collected genetic resources are preserved in the form of seeds, plants or tissues. Recently, PORIM launched an oil palm gene bank with a collection of 60 000 palms collected over a period of about 20 years. The objectives of establishing this gene bank are, firstly, to broaden the genetic base of current oil palm breeding materials and, secondly, to ensure conservation of a wide range of oil palm genetic resources for posterity.

PORIM collected oil palm germplasm in the centres of distribution, namely, *Elaeis guineensis* in West and Central Africa, and *Elaeis oleifera* in Central and South America. The collected materials were shared equally between PORIM and the host countries.

The samples from various parts of the world were planted in the form of open-pollinated families at the PORIM Research Station in Kluang, Malaysia. Detailed data on yield, oil and kernel content, height, fatty acid composition of oil, physiological parameters and flower census were recorded and analysed.

This germplasm collection is being used for direct selection of individual elite palms and for broadening the genetic base. The outstanding palms are being used to initiate an entirely new breeding programme with the objective of producing superior planting materials in the future.

Oil palm germplasm is thus being kept in the form of a field gene bank or living collections. This requires large amounts of land and regular maintenance. One great advantage of the PORIM field gene bank is that the materials are readily available for evaluation and breeding purposes.

Contributed by Dr N Rajanaidu

ANNOUNCEMENT

XI INTERNATIONAL CONFERENCE ON PALM OIL
Barranquilla - Colombia, 7-9 June, 1995

Technical Developments and Modernization of Oil Palm Crops

The XI International Conference on Palm Oil, organized by the National Federation of Oil Palm Growers - FEDEPALMA - will take place in Barranquilla, Colombia on 7-9 June, 1995.

The conference will be discussing the following three main issues which are of interest to the Latin American countries.

- **Marketing and Competitiveness of Palm Oil in Colombia and other Palm Oil Producing Countries** : the issues for discussion include the current palm oil situation in Latin America; case studies on palm oil competitiveness in Africa, Malaysia, Indonesia and Colombia; and support policies for the crop in Malaysia, Indonesia and Colombia.

- **Agronomic Aspects** : issues on bud rot, red ring, stem rot, replanting alternatives, pest control, and harvesting mechanization will be discussed.

- **Palm Oil Mills** : papers discussing palm oil processing developments, energy saving and steam management, enviromental management of palm oil mills effluent and emissions, and palm kernel extraction will be presented.

A technological visit to a local oil palm plantation will take place on Saturday, 10 June, 1995.

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IN BRIEF

Palm Oil has been Consumed for 5000 years

Palm oil had been consumed 5000 years ago, according to Professor Richard Evans Schultes, Director of Harvard University in his review on Taxonomic, Nomenclatural and Ethnobotanic Notes on *Elaeis*. The oil was discoverd in an ancient Egyptian tomb aged 5000 years. It could have been brought from tropical countries to Egypt. Reports by Portuguese and Dutch navigators hundred years ago also noted that palm oil was part of aboriginal diet and several products from the oil were known to the natives. The medicinal value of the oil is also known to the Africans where they were used for intestinal problems, oilments of the ears, a mild laxative for recently delivered women and is given to newborn babies to treat colic. The oil was even known and prescribed medically in the 17th century in Europe.

Source : ELAEIS 2 (1), 1990

We invite readers to send in comments, suggestions and technical news which could be published in this newsletter.

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