IDENTITY CHARACTERISTICS OF MALAYSIAN PALM OIL PRODUCTS

Keywords: Iodine value; Slip melting point; Cloud point; Apparent density; Refractive index

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The identity characteristics, iodine value, slip melting point, cloud point, apparent density and refractive index were determined on a total of 244 samples representing 333, 840 metric tons of refined palm oil, 238 samples representing 338, 816 metric tons of palm olein, and 205 samples representing 234, 108 metric tons of palm stearin. A comparison of the results with the identity characteristics of palm oil products surveyed in 1981 showed some slight changes.

INTRODUCTION

The identity characteristics of crude and refined Malaysian palm oil and of its fractionated products, oleins and stearins, were documented in *PORIM Technology 3* and *4* respectively by Tan and Oh (1981a, 1981b). These publications reported the results obtained from surveys carried out in 1980. The identity characteristics reported have been accepted as those of Malaysian palm oil products in the Malaysian Standards.

The rapid growth and development of the palm oil industry has resulted in new technologies of refining and fractionation, such as the use of thin film technology deodorization, and membrane press filters in fractionation. In view of such changes, there is a need to update existing data in order to assess any possible effects of technological changes, planting materials or even the ageing of the palms on the properties of the oil.

The present survey investigates, first the identity characteristics of refined palm oil products at export locations *i.e.* from bulking installations and port prior to shipment. The characteristics documented in this paper are iodine value, slip melting point, cloud point, refractive index, and apparent density. The second part of the survey on palm oil products covers data for fatty acid composition, triglyceride composition and solid fat content which we intend to report in a later paper.

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METHODS

Iodine value, slip melting point, refractive index, apparent density, and cloud point were determined using the PORIM Test Methods (1988). The refractive index and apparent density measurements were carried out on palm oil samples at 50°C, on palm olein at 40°C, and on palm stearin at 60°C.

RESULTS AND DISCUSSION

Palm Oil

The mean iodine value (IV) of palm oil is 52.07 with a range of 50.09 - 54.91 (*Table 1*). A skewed distribution was observed, with most samples falling within the range 51-52.9 and a small number having an IV of 53 or above (*Figure 1*). The mean is notably lower than the value observed in the 1980 survey, which was 53.3 (Tan and Oh, 1981a). The narrow range of the iodine values shows that the oil palm planting materials are homogeneous. The IV mean and range are in line with the data for palm oil obtained from a variety of geographical locations by King and Sibley (1984), who reported a mean of 52.1 with a range of 50.1-53.9. The mean slip melting point (SMP) of 36.72°C correlates with the present lower iodine value. The frequency distribution graph (*Figure 2*) shows that a large proportion of oil has an SMP of 36.5°C-37.5°C.

The average apparent density of the oil is 0.8899 and the average refractive index at 50°C is 1.4548.

Palm Olein

The mean iodine value of palm olein is 56.75 (*Table 2*), which is considerably lower than that observed in 1980 by Tan *et al.* (1981b). The range observed previously was 56.1- 60.6 compared with 55.6-61.9 at present. Three samples which were out of the trading specifications at below 56.0, had high slip melting points and cloud point values as shown below:

IV	SMP	C.P.
55.92	22.2	11.5
55.95	22.6	11.1
55.57	21.6	10.0

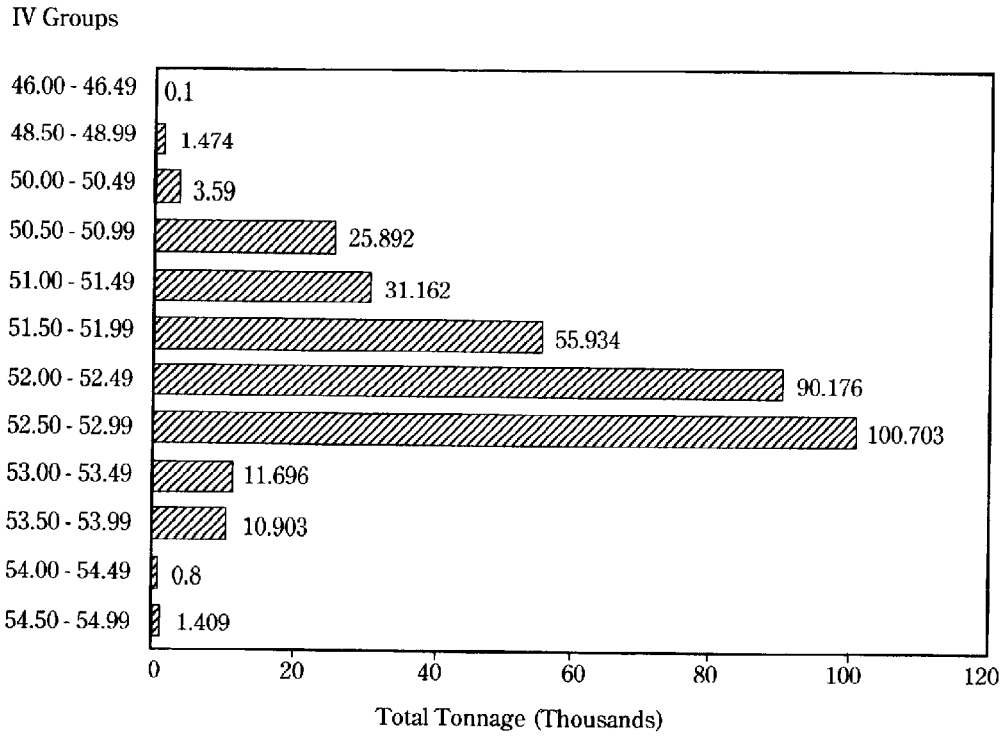

Figure 1. Palm Oil : Distribution of IV.

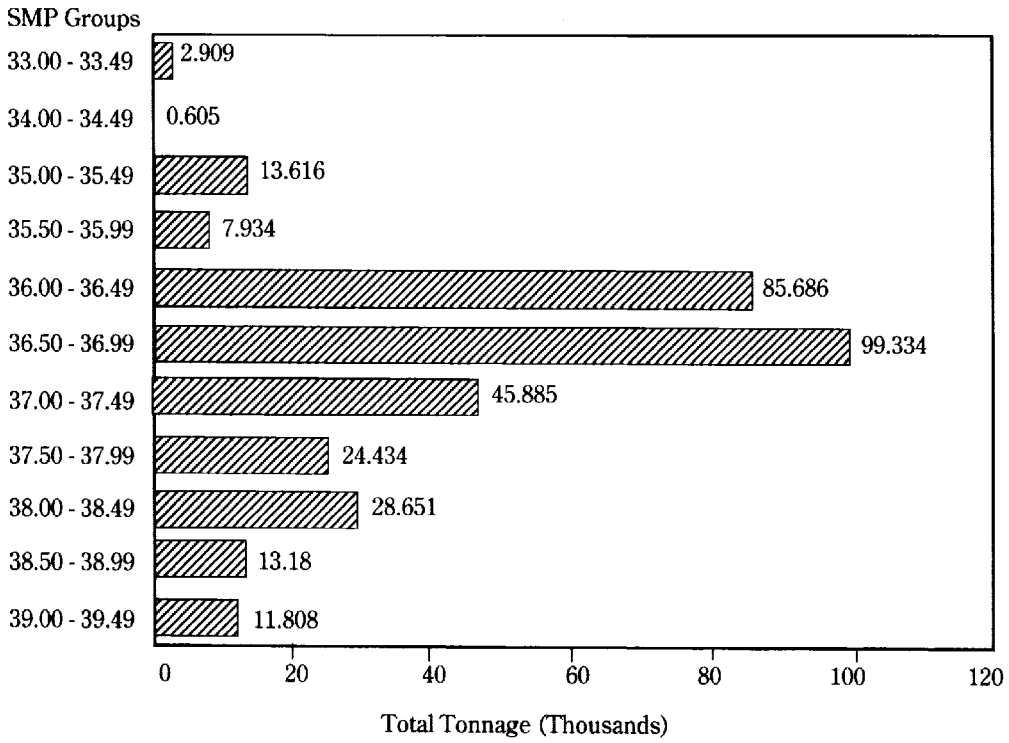

Figure 2. Palm Oil : Distribution of Slip Melting Point (SMP)

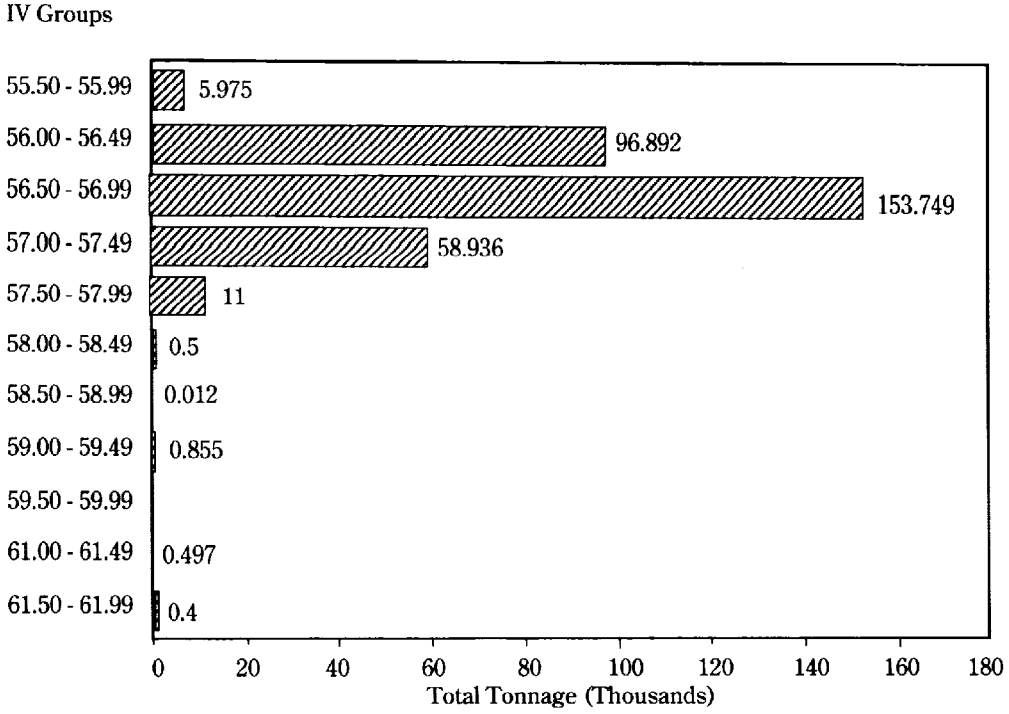

Figure 3. Palm Olein: Distribution of IV.

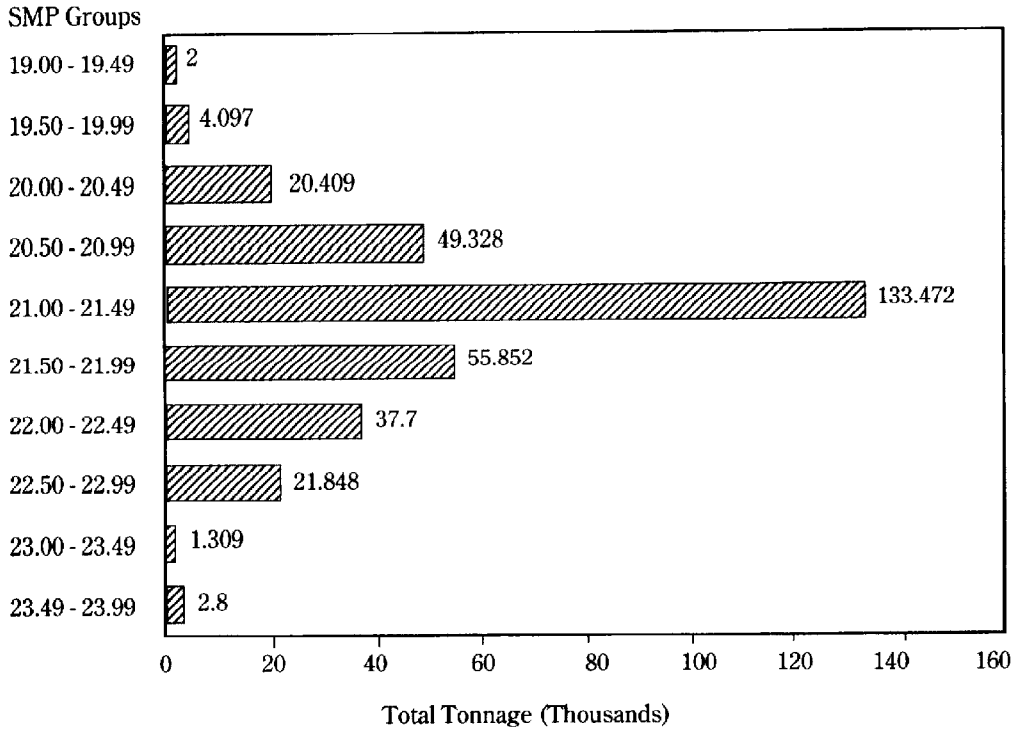

Figure 4. Palm Olein : Distribution of Slip Melting Point (SMP)

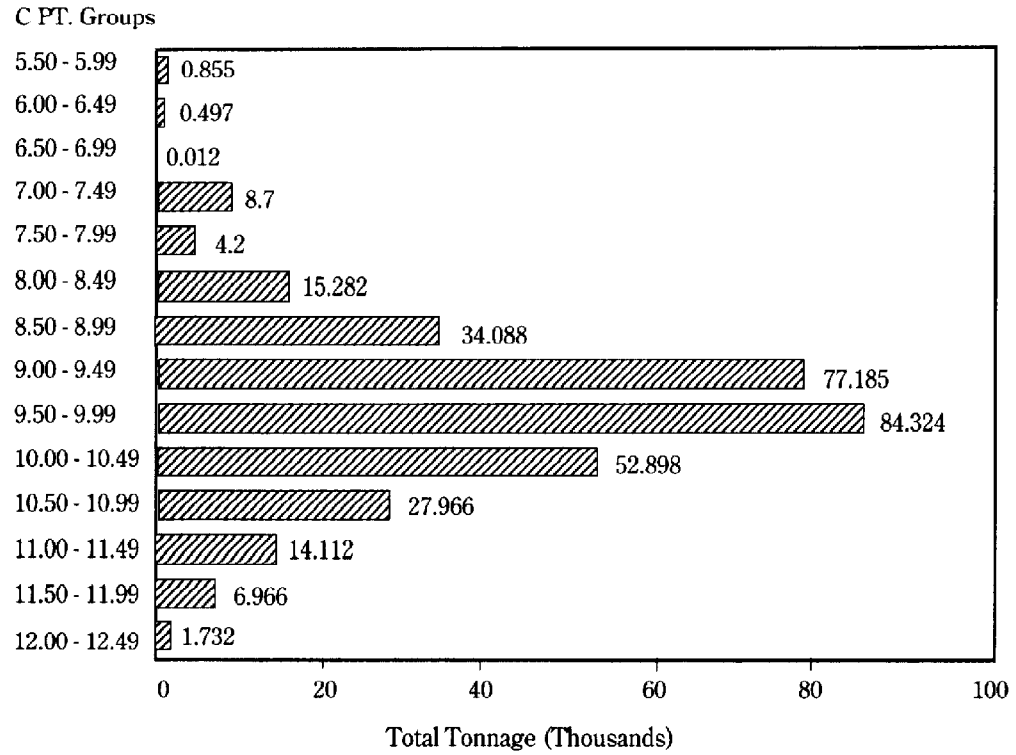

Figure 5. Palm Olein : Distribution of Cloud Point (C PT.)

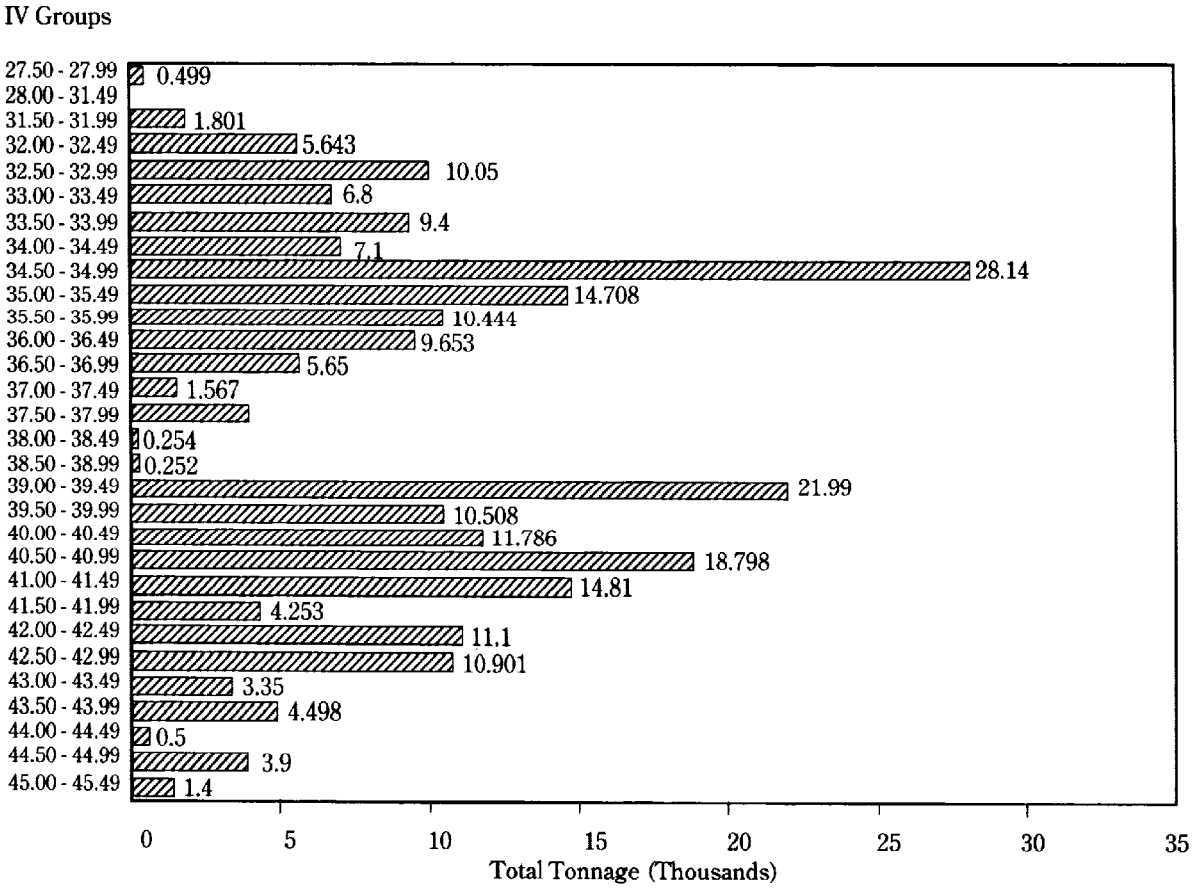

Figure 6. Palm Stearin: Distribution of IV.

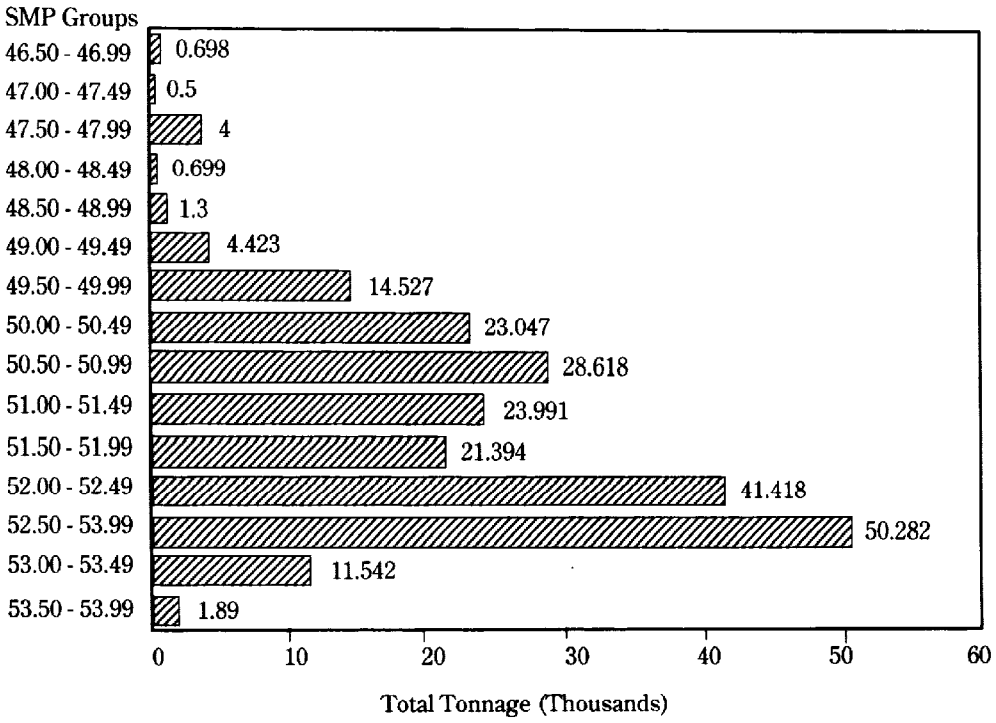

Figure 7. Palm Stearin :Distribution of Slip Melting Point (SMP)

TABLE 1. CHARACTERISTICS OF REFINED PALM OIL

	Iodine Value	Slip Melting Point (°C)	Refractive Index (n_D^{50})	Apparent Density (g/ml) 50°C
Mean	52.07	36.72	1.4548	0.8899
Median	52.19	36.70	1.4548	0.8900
Weighted Average	52.14	36.89	1.4548	0.8901
Range	4.82	6.0	0.0006	0.0014
S D	0.79	1.05	0.0001	0.0002
CV(%)	1.53	2.86	0.01	0.02
Min.	50.09	33.0	1.4544	0.8896
Max.	54.91	39.0	1.4550	0.8910

TABLE 2. CHARACTERISTICS OF REFINED PALM OLEIN

	Iodine Value	Slip Melting Point (°C)	Refractive Index (n_D^{40})	Apparent Density (g/ml) 40°C	Cloud Point (°C)
Mean	56.75	21.45	1.4589	0.8972	9.68
Median	56.69	21.40	1.4590	0.8972	9.60
Weighted Average	56.73	21.35	1.4590	0.8972	9.57
Range	6.30	4.40	0.0041	0.0008	6.70
S D	0.62	0.76	0.0003	0.0001	1.05
CV(%)	1.09	3.53	0.02	0.01	10.87
Min.	55.57	19.20	1.4589	0.8969	5.60
Max.	61.87	23.60	1.4592	0.8977	12.30

The frequency distribution graph (*Figure 2*) shows that most of the olein samples had IV between 56 and 58, with only a miniscule number above 58. Among these were a few with IV as high as 60-61. The slip melting point average is 21.45°C, compared with 21.6°C in 1980. The frequency distribution is normal (*Figure 4*).

The cloud point average is 9.7°C, with a range of 5.6°C to 12.3°C. Although this seems rather wide, the distribution chart (*Figure 5*) shows that most of the samples are actually between 8.0°C and 10.9°C.

Palm Stearin

The IV range was wider in the 1980 survey (21.6-49.4) than for the stearin observed in the present survey (27.8-45.1) (*Table 3*). The IV distribution graph (*Figure 6*) shows two distinct groups with IV between 27.5 and 38.0 and with IV between 38.5 and 45.5.

In line with the IV, the SMP range noted is narrower, 46.6°C-53.8°C, against 44.5°C-56.2°C in the

TABLE 3. CHARACTERISTICS OF REFINED PALM STEARIN

	Iodine Value	Slip Melting Point (°C)	Refractive Index (n_D^{60})	Apparent Density (g/ml) 60°C
Mean	37.74	51.44	1.4493	0.8822
Median	36.98	51.80	1.4491	0.8822
Weighted Average	37.95	51.34	1.4493	0.8823
Range	17.29	7.20	0.0019	0.0031
S D	3.53	1.30	0.004	0.0005
CV(%)	9.35	2.54	0.03	0.06
Min.	27.84	46.60	1.4482	0.8813
Max.	45.13	53.80	1.4501	0.8844

1980 survey. The SMP's are also distributed in two groups, *i.e.* 49.0°C-51.9°C and 52.0°-53.9°C, with a small number of samples showing SMP below 49.0°C (*Figure 7*).

CONCLUSIONS

This survey of identity characteristics shows that there is little variation in Malaysian palm oil.

The narrow range obtained for the iodine value indicates the consistency of the oil, which is advantageous for the end user. Similarly, samples of palm olein from single fractionation processes fall within a narrow range of iodine values, with a few exceptions. Palm stearins of different characteristics are available, reflecting differences in the fractionation processes, in this case the end users have a wide choice of products.

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