

# New Evolution of Palm-based Standard Reference Materials

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## INTRODUCTION

Palm oil is one of the most important sources of revenue to Malaysia. Exports of palm oil from the country increased by 41.8% in 2007 compared to that of in 2006. Of this total amount, more than 70% of palm oil exports comprise mainly refined, bleached and deodorized (RBD) palm oil, RBD palm olein and RBD palm stearin. As a leading country in the palm oil business, it is necessary for Malaysia to ensure that palm oil is of good quality. Therefore, harmonization of palm oil test methods is crucial to produce palm oil within the trade specifications. A comparison of the measurement results should be made against the certified values of standard reference materials to ensure the reliability and trueness of the methods used. However, the unavailability of standard reference materials from palm oil products prevents this from being practised. With the emphasis on quality aspects, the Malaysian Palm Oil Board (MPOB) has taken initiatives to develop *Palm-based Standard Reference Materials (SRMs)* to cater for the needs of the industry in monitoring the quality of the palm oil produced. Several studies have commenced on the production of such SRMs.

## WHAT IS THE 'BIG IDEA' BEHIND PALM-BASED SRMs?

Currently, 16 sets of SRMs have been produced, which are meant for certification of the iodine value (IV), slip melting point (SMP), fatty acids composition (FAC) and solid fat content (SFC) of RBD palm oil, RBD palm olein and RBD palm stearin, respectively. Each SRM comes in a 5 ml dark amber glass ampoule and is accompanied by a Certificate of Analysis containing

the certified parameter as well as a statement of uncertainty (Figure 1).

The stability of the Palm-based SRMs can be sustained for at least one year. This signifies that the integrity of the SRMs produced and the validity of the analysis certificates are guaranteed within the specified period under proper transportation and storage conditions. However, the integrity of these products is guaranteed only for the unopened ampoules.

Each Palm-based SRM is priced at RM 100 and is available at the MPOB premise known as the Palm Shoppe (Figure 2). These inexpensive SRMs offer an alternative to the SRMs from other oils and fats



Figure 1. Palm-based SRMs and a Certificate of Analysis.

which are currently available in the market. The high price of the current SRMs prohibits their use and application on a regular basis. It is hoped that the competitive price of the Palm-based SRMs will encourage and also promote the use of such SRMs for analytical purposes. Prices of the Palm-based SRMs and

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TABLE 1. PRICES OF PALM-BASED SRMs AND SRMs OF OTHER OILS AND FATS

SRMs	Certification	Price (RM)	Content
Palm oil	MPOB (iodine value)	100	5 ml
	MPOB (slip melting point)	100	5 ml
	MPOB (fatty acids composition)	100	5 ml
	MPOB (solid fat content)	100	5 ml
Palm olein	MPOB (iodine value)	100	5 ml
	MPOB (slip melting point)	100	5 ml
	MPOB (fatty acids composition)	100	5 ml
	MPOB (solid fat content)	100	5 ml
Palm stearin	MPOB (iodine value)	100	5 ml
	MPOB (slip melting point)	100	5 ml
	MPOB (fatty acids composition)	100	5 ml
	MPOB (solid fat content)	100	5 ml
Rapeseed oil	BCR <sup>®</sup> (oil, moisture, volatile)	752	150 g
Coconut oil	BCR <sup>®</sup> (PAH doped)	804	45 g
	BCR <sup>®</sup> (PAH blank)	267	45 g
Cod liver oil	BCR <sup>®</sup> (OCP)	1 080	5 g
	BCR <sup>®</sup> (PCB)	590	2 g
Lard	BCR <sup>®</sup> (OCP)	1 061.48	3 g
	ERM <sup>®</sup> (PCB blank)	419.36	5 g
	ERM <sup>®</sup> (PCB high level)	694.96	5 g
	ERM <sup>®</sup> (PCB low level)	694.96	5 g

of the SRMs from other oils and fats are listed in *Table 1*.

#### HOW ARE PALM-BASED SRMs PRODUCED AND CERTIFIED?

Some key issues are taken into account when producing high quality Palm-based SRMs. These SRMs are produced using stringent criteria during the selection, preparation and handling of materials, production and packaging, with concurrent homogeneity and storage stability studies, inter-laboratory proficiency and testing programmes, statistical evaluation and certification, documentation and quality assurance, and during the distribution of the SRMs.

RBD palm oil, RBD palm olein and RBD palm stearin are purchased from local refiners. The oils are required to be fabricated in opaque containers and have to be flushed with nitrogen before being transported to MPOB. Initially, the oils are heated until the solid fats are fully liquefied prior to the addition of antioxidant. These solutions are then mixed thoroughly to ensure homogeneity before being pipetted into 5 ml dark amber glass ampoules and sealed under nitrogen blanketing (*Figure 3*). The oil standards are then labelled, packed in the fabricated boxes and stored at -20°C.

Utilization of opaque containers as well as dark amber glass am-



*Figure 2. Palm-based SRMs are available for sale at the Palm Shoppe, Malaysian Palm Oil Board.*



Figure 3. A series of Palm-based SRMs in the 5 ml dark amber glass ampoules.

poules is meant to prevent colour changes and photo-oxidation of the oil standards produced in the presence of light. The addition of an antioxidant and nitrogen blanketing are to ensure that the oxidation rate of the oil standards could be minimized.

The ISO Guide 35: 1999 is applied in the certification of the Palm-based SRMs. Each batch of the SRMs produced is certified through inter-laboratory proficiency testing programmes. Participating laboratories are required to apply the MPOB Test Methods to characterize the IV, SMP, FAC and SFC before sending the results back to MPOB for use in the certification (Figure 4).

Laboratory results are evaluated using a state-of-art certification software, SoftCRM 1.2.0, which was developed by the European Commission and Testing Programmes (Figure 5). The software enables consensus values and their uncertainties to be generated at the 95% confidence interval as the outlying data are eliminated based on Grubb and Cochran Tests. The use of a statistical software abolishes

the need for manual calculation, and thus produces precise, accurate and error-free certified values.

**WHEN ARE PALM-BASED SRMs APPLICABLE?**

**Verification of Method**

The successful application of a valid method is very much dependent on the proper handling of reagents, standards and chemicals, operator skills and instrument suitability and sensitivity. The Palm-

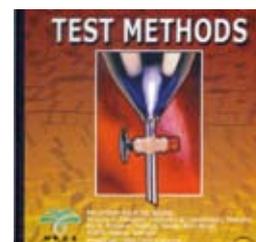
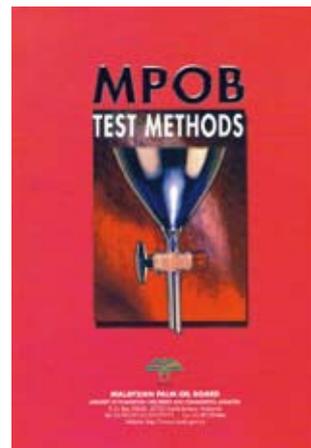


Figure 4. The MPOB Test Methods in hardcopy and CD.

based SRMs can be tooled for training and to counter-check any irregularities in methods. The use

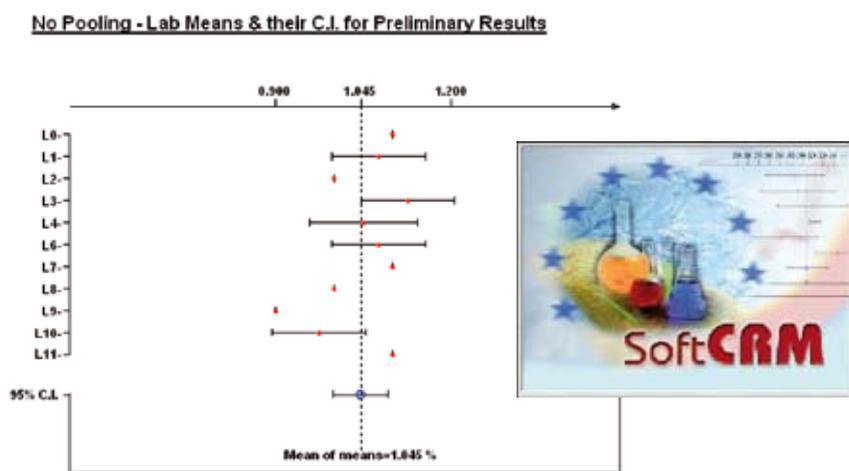


Figure 5. Example of a certified value generated by the SoftCRM 1.2.0 software.

of these SRMs is also significant in facilitating trouble-shooting when unexpected results are obtained.

### **Method Validation and Measurement of Uncertainty**

Occurrence of bias in measurements is one of the most difficult factors in method validation. Bias is defined as a variation of the measured value from the true value. Hence, the use of the Palm-based SRMs can provide useful information by comparing the uncertainty limit of the certified value with the uncertainty limit of the validated method. Estimation of bias differences between two or more methods can also be established by the use of the Palm-Based SRMs.

### **Calibration of the Measurement Device**

The role of the Palm-based SRMs as a calibration tool is focussed on correlating the device 'signal' with the quantitative measurement of the respective analyses. A calibration factor is calculated based on the certified value of the SRMs. The uncertainty associated with the SRMs will contribute to the total uncertainty of the results generated from the measurement device.

### **Quality Assurance**

The Palm-based SRMs are also suitable for assessing the quality assurance of the measurements performed. Their use can be implemented as a control to compare the

measurements made by different models of instruments and from other laboratories. The SRMs are also competent as reference kits, by which the analysts will be able to evaluate and hence, achieve comparability in their measurement results. Reliable measurements can be attained through the use of such SRMs as measurement benchmarks.

### **CONCLUSION**

The Palm-based SRMs produced have been well tested concurrently to ensure good quality and stability for use by industry and in the laboratory. These SRMs were exhibited at the Transfer of Technology Seminars of MPOB in 2005, 2006 and 2007. They are available for use and can be purchased from MPOB.