



Application Note AN-NIR-085

Quality Control of Palm Oil

Accurate and precise determination of the iodine value

Determination of key quality parameters of palm oil, such as the iodine value (IV), are typically performed using time consuming and costly wet chemical methods.

This application note demonstrates that the Metrohm DS2500 Liquid Analyzer operating in the visible and near infrared spectral region (Vis-

NIR) provides a **cost-efficient and fast solution** for the determination of these quality control parameters in palm oil. With **no sample preparation or chemicals needed**, Vis-NIR spectroscopy allows for the analysis of palm oil in **less than a minute** and **can be used by anyone**.

EXPERIMENTAL EQUIPMENT

Palm oil samples which have been refined, bleached, and deodorized (RBD palm oil) were measured in transmission mode with a DS2500 Liquid Analyzer over the full wavelength range (400–2500 nm). The highly viscous samples were liquefied using the Vial Heater. Reproducible spectrum acquisition was achieved using the built-in temperature control (at 60 ° C) of the DS2500 Liquid Analyzer. For convenience, disposable vials with a path length of 8 mm were used, which made cleaning of the sample vessels unnecessary. The Metrohm software package Vision Air Complete was used for all data acquisition and prediction model development. The measurements were also conducted with a XDS RapidLiquid Analyzer to compare the analytical performance of both instruments.



Figure 1. DS2500 Liquid Analyzer and a palm oil sample present in an 8 mm disposable vial.

Table 1. Hardware and software equipment overview

Equipment	Metrohm number
DS2500 Liquid Analyzer	2.929.0010
XDS RapidLiquid Analyzer	2.921.1410
Vial Heater	2.921.9010
Disposable vials, 8 mm diameter, transmission	6.7402.000
Vision Air 2.0 Complete	6.6072.208

RESULTS

The obtained Vis-NIR spectra (**Figure 2**) were used to create prediction models for quantification of the individual key parameters. The quality of the prediction models was evaluated using correlation diagrams, which

display the correlation between VisNIR prediction and primary method values. The respective figures of merit (FOM) display the expected precision of a prediction during routine analysis.

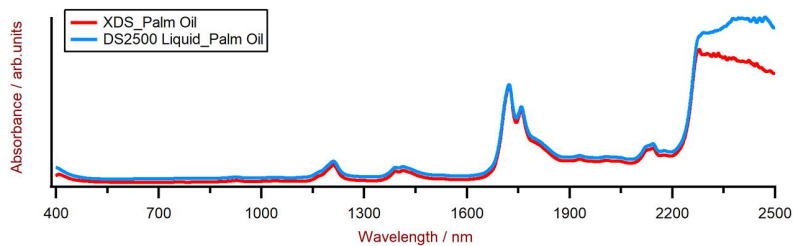


Figure 2. Vis-NIR spectra of palm oil obtained using a DS2500 Liquid Analyzer / XDS RLA and 8 mm disposable vials.

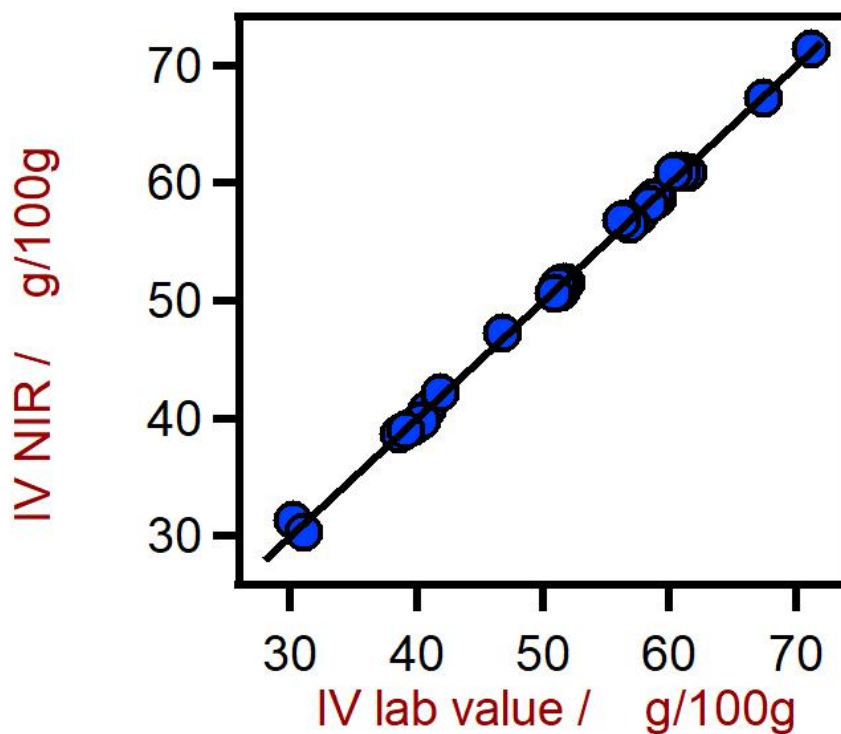


Figure 3. Correlation diagram for the prediction of the iodine value (IV) in palm oil using a DS2500 Liquid Analyzer. The iodine lab value was evaluated using titration.

Table 2. Figures of merit for the prediction of the iodine value (IV) in palm oil using a DS2500 Liquid Analyzer.

Figures of merit	Value
R ²	0.998
Standard error of calibration	0.49 g/100g
Standard error of cross-validation	0.49 g/100g

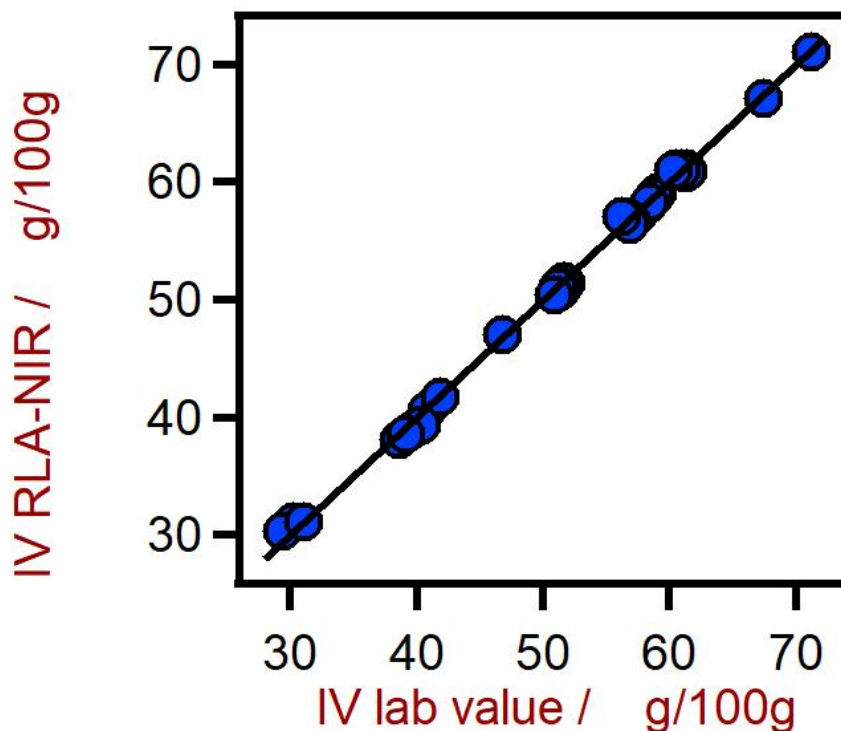


Figure 4. Correlation diagram for the prediction of the iodine value (IV) in palm oil using a XDS RapidLiquid Analyzer. The iodine lab value was evaluated using titration.

Table 2. Figures of merit for the prediction of the iodine value (IV) in palm oil using a XDS RapidLiquid Analyzer.

Figures of merit	Value
R ²	0.998
Standard error of calibration	0.55 g/100g
Standard error of cross-validation	0.54 g/100g

CONCLUSION

This application note demonstrates the feasibility of the DS2500 Liquid Analyzer for the analysis of the iodine value in palm oil. Compared to the older generation XDS RLA, the observed accuracy is slightly better, yet within statistical relevance.

In a previous application note ([AN-NIR-044](#)), the XDS RLA was used to determine **additional**

quality parameters in palm oil, including free fatty acids, moisture content, and the deterioration of bleachability index (DOBI). Due to the demonstrated comparability between the DS2500 Liquid Analyzer and XDS RapidLiquid Analyzer, it is clear that those parameters can also be determined with the DS2500 Liquid Analyzer.

The main advantages of NIR spectroscopy over wet chemical methods are that, **running costs are significantly lower and time-to-result is significantly reduced.**

Internal reference: AW NIR CH-0010-052020

[AN-NIR-044 - Quality Control of Palm Oil – Environmentally friendly determination of FFA content, iodine value, moisture, DOBI, and carotene content](#)

CONTACT

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DS2500 Liquid Analyzer 固耐用的近外光,用于生境和室中的量。

DS2500 Liquid Analyzer 是一成熟且活的解决方案,其用于在整个生中行液体常分析。其固耐用的使 DS2500 Liquid Analyzer 不受灰、潮湿、振的影,因此非常用于在劣的生境中使用。

DS2500 Liquid Analyzer 覆盖 400 至 2500 nm 的整个光范,将品加至 80° C 高温,并与各不同的一次性小瓶和石英比色皿兼容。因此,DS2500 Liquid Analyzer 可的个性化品要求,助在一分内得精和具有可重性的果。借助集成的品架装置和自的 Vision Air 件,保了用能松和安全地行操作。

如果是大的品量,可通将流通池与一个 Metrohm 机器人自器搭配使用的方法著提高生率。



NIRS XDS RapidLiquid Analyzer

快速精地分析各液体和浮液。

NIRS XDS RapidLiquid Analyzer 分析可快速精地分析液体制和物。按下按即可得到精的量果,NIRS XDS RapidLiquid Analyzer 是用于室和工程中量控制的可靠且方便的解决方案。品将被置在可重使用的石英比色皿或一次性玻璃瓶中;可控制温度的品室保可重的分析条件,由此得到精的量果。



NIRS XDS VialHeater 250

NIRS XDS Vial Heater 模可分析温度高 200° C 的品。VialHeater 可与 NIRS XDS Transmission OptiProbe Analyzer 分析用。透射品将在 NIRS XDS VialHeater 中相固定。直径 4 mm 或 8 mm 的 NIRS 一次性玻璃瓶置于 NIRS XDS 品瓶加的个光之。加的温度可至 200° C。有一个罩盖来保品和光不受境光影。通透射来行品的光定。



Vision Air 2.0 Complete

Vision Air – 通用的光分析件。

Vision Air Complete 是用于管范境的先易用的件解决方案。

Vision Air 点一:

- 独特的件用和配的用界面保了直的操作方式
- 操作程的建与方式
- SQL 数据,可安全且地管理数据

Vision Air Complete (66072208) 版本包含所有用于可近外光分析量保程的用:

- 器和数据管理用
- 方法用
- 常分析用

其它 Vision Air Complete 解决方案:

- 66072207 (Vision Air Network Complete)
- 66072209 (Vision Air Pharma Complete)
- 66072210 (Vision Air Pharma Network Complete)