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The new method for determining the Iodine Value in oils and fats

Validation tests of the new analysis for the determination of Iodine Value with CDR FoodLab®.

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The iodine value is an important parameter to be defined when there is a need to identify the characteristics of an oil or mixture of oils of animal or vegetable origin. As a measure of the number of unsaturation contained in fatty acids, it is used to demonstrate the purity and quality of an oil/fat. The iodine value corresponds to the amount of iodine expressed in grams that chemically reacts with 100 grams of any fat by saturating its double bonds. The higher the amount of iodine reacting with the fat, the higher the number of double bonds in the sample.

Measuring the iodine value of a fat is crucial to characterise the type of product: the higher the iodine value, the more liquid the fat consistency and the less oxidation-stable the product will be, since oils with high iodine value contain more unsaturated fatty acids which are more subject to rapid degradation reactions such as autoxidation or polymerisation.

Measurement methods:

The standard method for carrying out iodine value determination is the Wijs method [1].

The fatty substance to be tested, dissolved in carbon tetrachloride or chloroform, is then treated with a known volume of Wijs' reagent (Iodine trichloride solution). After the established contact time has expired, the iodine excess that has not reacted with the unsaturations in the sample is titrated with a sodium thiosulphate solution. Performing this time-consuming method requires a qualified operator who is able to use the necessary equipment and know how to handle the different reagents and solvents used.

Unlike the standard procedure, the CDR FoodLab® method is very simple and fast (the instrument allows analysis of the iodine value of an oil or fat in about 3 minutes).

CDR FoodLab® analysis system consists of an analyser based on photometric technology, dedicated pipettes and ready-to-use pre-filled reagents developed by the CDR research laboratories. It uses micro-quantities of sample.

It does not require the use of solvents dangerous to health, and no equipped laboratory or specialised personnel are needed. CDR FoodLab® needs no calibration and is ready to be used to carry out the measurement. The instrument is also very easy to use because the operator is guided by detailed instructions visible on the instrument's touch screen.

Evaluation of the method's accuracy:

The accuracy of the method developed by CDR is evaluated by determining the correlation between the results obtained from the analysis of 14 oils and fats of various types with CDR FoodLab® and those obtained with the Wijs method as per the reference method ISO 3961:2018, based on the official AOCS Cd 1c-85 method.

Table 1 lists the results obtained with the two methods and the uncertainty related to the results obtained with the reference method. The measurement uncertainty shown in the table is expressed as uncertainty spread over a 95% confidence interval with coverage factor k=2.

	Sample	CDR FoodLab®	Standard Method	Standard method error
1	Soybean oil	125.4	120.6	± 4.85
2	Peanut oil	86.0	79.4	± 3.52
3	Sunflower oil	125.8	127.1	± 4.86
4	High-oleic sunflower oil	84.8	81.2	± 3.48
5	Sesame oil	112.4	108.4	± 4.42
6	Rapeseed oil	110.3	111.0	± 4.35
7	Lard	63.0	66.8	± 2.7
8	Corn oil	123.0	121.8	± 4.77
9	Palm oil	51.5	49.9	± 2.28
10	Hazelnut oil	87.0	90.7	± 3.55
11	Used oil	120.0	122.3	± 4.67
12	Olive oil	79.1	83.2	± 3.28
13	Olive + rapeseed oil	96.5	102.3	± 3.88
14	Tallow	32.5	35.5	± 1.54

Table 1: Results achieved with the official and CDR FoodLab® methods

CDRFoodLab®

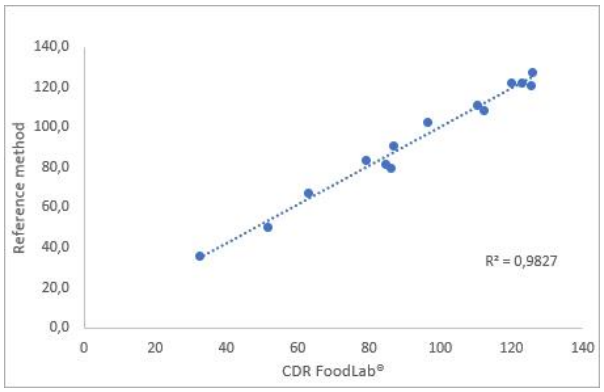

Fig 1: Correlation between the reference and CDR FoodLab® methods

The two methods provided highly correlated results (R^2= 0.983).

Evaluation of the method's repeatability:

The repeatability of the CDR FoodLab® method was evaluated through the analysis of two oil samples.

In particular, samples 3 (sunflower oil) and 9 (palm oil) were selected in order to test the repeatability of the method for both low and high levels of iodine value. A total of 10 consecutive analyses were performed for each sample.

The data obtained are reported as follows:

Repetitions	Sample 3	Sample 9
1	125.4	51.2
2	124.1	51.5
3	126.9	51.5
4	123.1	51.9
5	125.4	52.2
6	125.6	52.0
7	126.8	50.9
8	126.3	50.5
9	125.6	51.8
10	124.8	51.6
Average	125.4	51.5
Standard deviation	0.7	0.6

Reporting the results according to the laboratory (95% confidence interval), the results obtained with CDR FoodLab® are 125.4 IV ± 1.4 IV for sunflower oil and 51.5 IV ± 1.2 IV for palm oil.

Conclusions:

The CDR FoodLab® system provided results that were statistically correlated with the ones obtained with the official method and a better reproducibility of the analyses than the one obtained with the standard method.

The instrument proves to be very easy to use, does not need calibration and is ready to be used to perform the measurement with a significantly reduced consumption of both sample and reagents in comparison to the corresponding official method.

CDR FoodLab® proves to be a valuable aid for quickly measuring and monitoring the iodine value of fats and oils, without the need for expert personnel, complex instrumentation or a well-equipped laboratory.

Bibliography:

[1] Official Methods of Analysis of AOAC International, AOAC International, Arlington, 1984 AOAC Official Method 28.023, Iodine Absorption Number Wijs Method.

Useful links:

- Determination of iodine value in oils and fats
- Analyses of oils and fats with CDR FoodLab®