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Validation Report: D-Isocitric Acid Assay Kit (cat. no. K-ISOC)**1. Scope**

Megazyme's D-Isocitric Acid Assay Kit (K-ISOC) is an enzymatic method used for the rapid measurement and analysis of D-isocitric acid in fruit juices and foodstuffs and other materials. This method was developed in-house and measures D-Isocitric acid in g/L. Methods based on this principle have been accepted by EN, NEN, NF, DIN, GOST, IFU and AIJN.

2. Planning

The purpose of this report is to verify and validate the current method as detailed by the D-Isocitric Acid Assay Kit (K-ISOC).

3. Performance characteristics

The selectivity, working range, limit of detection, limit of quantification, trueness (*bias*) and precision of this kit is detailed in this report.

3.1. Selectivity

This assay is specific for D-isocitric acid.

Interfering substances in the sample being analysed can be identified by including an internal standard. Quantitative recovery of this standard would be expected. Losses in sample handling and extraction are identified by performing recovery experiments, i.e. by adding D-isocitric acid to the sample in the initial extraction steps.

3.2. Working Range

Assay follows the D-Isocitric Acid Assay Kit (K-ISOC) standard procedure. 0.1 mL of D-isocitric acid standard was used as sample, with a range of concentrations (0.01-0.8 g/L D-isocitric acid) which corresponds to 1-80 µg of D-isocitric acid per assay. Absorbance A₂ was read after 3 min, at 340nm and at 25°C as recommended in the procedure.

The working range is linear between 1-80 µg of D-isocitric acid per assay.



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3.3. LOD and LOQ

The **instrument limit of detection**, as per kit booklet, is 0.354 mg/L, which is derived from an absorbance difference of 0.010 with a sample volume of 2.0 mL.

The **calculated limit of detection (LOD)** and the **calculated limit of quantification (LOQ)** for this report purpose is based on the analysis of samples that have been taken through the whole D-Isocitric Acid Assay Kit (K-ISOC) procedure.

- The LOD is the lowest concentration of the analyte that can be detected by the method. LOD is calculated as $3 \times s'_0$; where s'_0 is the standard deviation of a number of samples A1 reading.
- The LOQ is the lowest level at which the kit's performance is acceptably repeatable. LOQ is calculated as $k_Q \times s'_0$; where s'_0 is the standard deviation of a number of samples A1 reading. The IUPAC default value for k_Q is 10.
- For D-Isocitric Acid Assay Kit (K-ISOC)

LOD – For 2.0 mL of sample (maximum volume)

D-Isocitric Acid = 0.100 mg/L

LOQ – For =2.0 L of sample (maximum volume)

D-Isocitric Acid = 0.350 mg/L

* **Note:** The above detection limits are for samples as used in the assay, i.e. after any required sample preparation (e.g. deproteinisation). The dilution used in pre-treatment must be accounted for while establishing the detection limits for specific samples.

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3.4. Trueness (*Bias*)

Comparison of the mean of the results (x) achieved with the D-Isocitric Acid Assay Kit (K-ISOC) method with a suitable reference value (x_{ref}). For this report, Relative Bias is calculated in per cent as: $b(\%) = x - x_{ref} / x_{ref} \times 100$. The reference material for this purpose is D-isocitric acid supplied with the D-Isocitric Acid Assay Kit (K-ISOC) at 0.3 g/L.

Relative Bias $b(\%)$

	n	Ref Material (g/L)	Mean (g/L)	$b(\%)$
D-Isocitric Acid	20	0.3	0.2979	-0.69

3.5. Precision

This report details the reproducibility of the D-Isocitric Acid Assay Kit (K-ISOC), it is a measure of the variability in results, on different days and by different analysts, over an extended period of time.

For the purpose of this report different lot numbers of the kit standard is used as the reference material.

Reproducibility

	n	Ref Material (g/L)	Mean (g/L)	Standard Deviation	%CV
D-Isocitric Acid	20	0.3	0.2979	0.0036	1.20

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4. Conclusion

The method outlined in this document is a robust, quick and easy method for the measurement of D-isocitric acid in various matrices. It has been used for many years and is fully automatable for high throughput analysis of samples. Data presented in this report verifies and validates that this method is fit for the purpose intended, which is summarised below.

Validation Summary	D-Isocitric Acid
Working range (μg in cuvette)	1-80
LOD (mg/L)	0.100
LOQ (mg/L)	0.350
Relative Bias <i>b</i> (%)	- 0.69
Reproducibility (%CV using D-isocitric acid)	1.20