

Application note

Version 1

Determination of Nitrate in Vegetables

Overview	
Parameter	Nitrate
Test	QUANTOFIX® Nitrate 250 (REF 91366)
General Information	The determination of nitrate in vegetables is necessary for the food processing industry in order to detect and, if necessary, remove undesirable nitrate levels. In order to obtain correct results with the QUANTOFIX® Nitrate 250 test strip, we recommend an adapted measuring method for measurements in vegetable samples.



Sample Preparation, Procedure, and Calculation of Results

General Information	
Since different vegetable samples can vary significantly in their properties, general instructions for sample preparation are provided here. The weights and volumes used, depending on the sample material, can be found in Table 1 on page 2.	
Procedure	
Crush a representative amount of the sample to be tested, e.g., using a mixer, in a quantity of distilled water and then boil for approx. 15 minutes. Fill the cooled sample with distilled water to the final volume of the sample and filter through a pleated filter (e.g., REF 534015). The filtrate represents the sample to be examined.	
Evaluation	
Visual Evaluation	- dip the test strip into the sample for 3 s. - shake off excess liquid. - wait for 60 s. - compare the test strip to the color scale and recalculate. Due to the sometimes-strong coloration of the solutions, visual evaluation is often difficult. In this case, it is necessary to consider each case individually.
On the QUANTOFIX® Relax (version 3)	- select method NO₃ 250. - dip the test strip into the sample for 3 s. - shake off excess liquid. - place the test strip on the strip holder (with an activated reaction time of 60 s). - read the test result once the reaction time has elapsed and recalculate.

Calculation:

$$\text{nitrate content [mg/g]} = \frac{\text{test result [mg/L]} \times \text{final sample volume [mL]}}{\text{sample weighing [g]}} = \text{test result [mg/L]} \times \text{factor}$$

table 1: List of possible sample materials and required volumes.

sample material	sample weighing [g]	amount of distilled water [mL]	final sample volume [mL]	factor
broccoli	10	50	100	10
carrot	10	40	50	5
chicory	10	40	50	5
cucumber	10	50	100	10
iceberg lettuce	10	50	100	10
lamb's lettuce	5	50	100	20
lettuce	10	50	100	10
spinach	2,5	80	100	40
tomato	25	40	50	2
zucchini	10	50	100	10

Various vegetable samples were selected, and their nitrate content was determined using two systems in a direct comparison:

- 1) QUANTOFIX® Nitrate 250 test strips (REF 91365) and QUANTOFIX® Relax device (REF 91346, QR 33555)
- 2) Merck* Reflectoquant® test strips (REF 116971) and Merck* RQflex® 20 device (REF 117246, SN 18010038)

For this purpose, the nitrate content was determined using standard addition (addition of 5, 10, 25, 50, 100, and 250 mg/L NO₃⁻ using a Certipur® Nitrate standard (REF 104613, LOT HC46158813)) in triple determination. The mean values are shown in table 2.

table 2: Comparison of measurement results from different test strips.

sample material	QUANTOFIX® Nitrat 250 (LOT 3662522) [mg/L]	Merck* Reflectoquant® 116971 (LOT 51666966) [mg/L]
broccoli	84	69
carrot	48	39
chicory	135	65
cucumber	73	54
iceberg lettuce	616	369
lamb's lettuce	3532	2818
lettuce	789	599
spinach	recovery rate in spiked spinach samples: 93 – 100%	–
tomato	4,0	8,2
zucchini	1955	1709

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Contact

If you have further questions, please do not hesitate to contact us:

Technical support and customer service:	Tel.:	+49 24 21 969-333
	E-Mail:	support@mn-net.com
For orders (international):	E-Mail:	sales@mn-net.com