

Application Notes Reflectometry – Nitrate in Soil Samples

Reflectometric determination after reduction to nitrite and reaction with Griess reagent

Reagents:

Catalog No. **116971** Reflectoquant® Nitrate Test
 Catalog No. **116995** Reflectoquant® Nitrate Test
 Catalog No. **117246** Reflectometer RQflex® 20

This application note pertains to RQflex®20 and all discontinued instruments (RQflex® 10, RQflex® plus)



RQflex® 20 Reflectoquant®

Sample preparation:

Homogenize ca. 100 g (exactly weighed) of soil sample with 100 ml of 0.01 M CaCl₂ solution by shaking for 30 minutes. Filter through nitrate-free folded filter.

Analysis:

Press the reflectometer START key and simultaneously dip the test strip into the sample (15 - 30 °C) for ca. 2 seconds, ensuring that both reaction zones are immersed. Allow excess liquid to run off via the long edge of the strip on to an absorbent paper towel.

Wait 60 seconds and then measure the strip in the reflectometer. The value [mg/l] will be stored automatically.

(Please refer to the RQflex® operating instructions and the package insert of the Reflectoquant® Nitrate Test.)

Calculation:

$$\text{Nitrate content [mg/kg]} = \frac{\text{Measured value [mg/l]} \times \text{Vol. CaCl}_2 \text{ sol. [ml]}}{\text{Weight of sample [g]}}$$

Conversion to kg Nitrate-N/hectare (layer of soil):

$$\text{kg Nitrate-N/ha} = A \times \text{BF} \times 3 \times D \times 0.226$$

where:

A = Measured value
 BF = Factor for wetness of soil and extraction BF = 1.41 at an extraction ratio of 1+1 and 83 %dry mass
 3 = For a 30-cm thick layer of soil
 D = Soil density (1.5 kg/dm³)
 0.226 = Conversion factor NO₃ into NO₃-N

Results - comparison with standard method (photometry):

Sample	Reflectoquant® [kg Nitrate-N/ha]	Standard method [kg Nitrate-N/ha]
1	92	97
2	89	93
3	86	94
4	100	99
5	46	44
6	34	33
7	48	45
8	46	43
9	31	28
10	32	28
11	36	32
12	30	33
13	39	39
14	76	77
15	44	42
16	61	63
17	39	37
18	66	68
19	44	42
20	68	69
21	48	45
22	87	84
23	46	45
24	53	51
25	116	110
26	111	110

Influence of the extraction medium on the nitrate recovery

Extraction medium	Required value [mg/l]	Measured value [mg/l]	Mean [mg/l]	Recovery [%]
Distilled water	25	25 27 27 24	25.8	103
	80	85 84 82 83	83.5	104
0.015 M KCl	25	25 26 24 25	25.0	100
	80	80 81 80 83	81.0	101
0.025 M KCl	25	25 22 26 25	24.5	98
	80	81 80 81 79	80.3	100
0.1 M KCl	25	17 18 17 17	17.0	68
	80	53 55 56 58	55.5	69
0.01 M CaCl ²	25	24 24 24 24	24.0	96
	80	80 77 81 80	79.5	99
Lactate extract	25	24 23 24 23	23.5	94
	80	74 77 74 78	75.8	95

Preparation of lactate extract:

Dissolve 15.4 g Calcium lactate in 250 ml distilled water.

Dissolve 7.9 g Calcium acetate in 250 ml distilled water.

Dissolve 18.75 g glacial acetic acid in 150 ml distilled water.

Mix the solutions and make up to 1 l.

Reagents:

Catalog No. **104936** Potassium chloride

Catalog No. **102103** Calcium lactate

Catalog No. **109325** Calcium acetate hydrate

Catalog No. **100063** Acetic acid 100 %

Materials

Product #	Description
1.00063	Acetic acid (glacial) 100% anhydrous for analysis EMSURE [®] ACS,ISO,Reag. Ph Eur anhydrous for analysis EMSURE [®] ACS,ISO,Reag. Ph Eur
1.09325	Calcium acetate hydrate [about 94% Ca(CH ₃ COO) ₂] for soil testing [about 94% Ca(CH ₃ COO) ₂] for soil testing
1.02103	Calcium lactate for soil tests
1.16971	Nitrate Test Method: reflectometric with test strips 5 - 225 mg/l NO ₃ Reflectoquant [®]
1.16995	Nitrate Test Method: reflectometric with test strips 3 - 90 mg/l NO ₃ Reflectoquant [®]
1.04936	Potassium chloride for analysis EMSURE [®] for analysis EMSURE [®]
1.17246	Reflectometer