
N/Protein Determination in Cheese according to the Kjeldahl method

Reference: **IDF 20-1, ISO 8968-1 Second Edition 2014-02-01** Milk and milk products - Determination of nitrogen content; **AOAC 991.20** Nitrogen (Total) in Milk

Tested with:

VELP Scientifica DKL 20 Automatic Digestion Unit (S30100210)

VELP Scientifica UDK 169 Automatic Distillation Unit with AutoKjel Autosampler (S30200160)

VELP Scientifica KS 1000 Scrubber (F307A0660)



Introduction

Milk and dairy products play a role of primary importance in the human food, and are essential to the balance and the adequacy of the food ration. It is possible finding on the market, different kind of dairy products of different animal species, like sheep whole milk, goat whole milk and cheese, dried milk products including milk-based infant formulae.

Commonly, it can be processed for the production of butter and cheese, such as the Greek "Feta" and the Italian "Caprino cheese". Recently, this dairy product market has grown rapidly, because, for example, goat milk is very appreciated by lactose-intolerant people, due to low lactose content.

In order to create typical sensory features of these dairy products, it is important to know the attitude of the raw milk, depending also on its protein content. Due to the greater demand and consumption of goat/sheep dairy products, protein analysis has become more and more important to ensure food safety, food quality and fairness in international trade.

Protein Determination in Goat Cheese according to the Kjeldahl Method

Kjeldahl is nowadays the most used method for determining nitrogen and protein contents in foods and feeds, thanks to the high level of precision and reproducibility and to its simple application.

The modern Kjeldahl method consists in a procedure of catalytically supported mineralization of organic material in a boiling mixture of sulfuric acid and sulfate salt at with digestion block temperature at 400 °C. During the process the organically bonded nitrogen is converted into ammonium sulfate. Alkalizing the digested solution liberates ammonia which is quantitatively steam distilled and determined by titration.

Sample

Italian Goat Cheese

Protein labeled content: 10-12% according to the batch production

Sample Digestion

Homogenize the cheese manually with a spoon.

Weigh 1,000 g of sample into a nitrogen-free weighing boat (code CM0486000) and place it into a 250 ml test tube.

For each sample, add in the test tube:

- 2 catalyst tablet VTCT (code A00000281; 3.5 g K₂SO₄, 0.105 g CuSO₄ x 5H₂O 0.105 g TiO₂)
- 12 ml concentrated sulphuric acid (96-98%)

Prepare some blanks with all chemicals and without the sample.

Connect the Digestion Unit to the KS 1000 Scrubber to neutralize the acid fumes created during digestion phase.

Digest the samples for 15 minutes at 150 °C, plus 15 minutes at 250 °C and 40 minutes at 420 °C according to the method "milk and derived products" (n° 1 on DKL 20).

Distillation and Titration

Let the test tubes cool down to 50-60 °C.

Condition the **UDK 169 with Autokjel Autosampler** unit by performing the Automatic Check-up and Wash-down in the Menu-System.

Distill the samples according to the following parameters (pre-defined method n°1):

- H₂O (dilution water): 50 ml
- NaOH (32 %): 50 ml
- H₃BO₃ (4 % with indicators): 30 ml
- H₂SO₄ (0.1 N) as titrant solution
- Protein factor: 6.38

Distillation & Titration analysis time: from 4 minutes for one test.

VELP titanium condenser ensures that distillate temperature always remains below the safe threshold value (35 °C), as indicated in the IDF 20-1 and ISO 8968-1.

Typical Results on Goat Cheese

The results are automatically calculated by UDK 169 as a percentage of nitrogen and percentage of proteins. This is "protein" on a total nitrogen basis.

Sample quantity (g)	Nitrogen %	Protein %
1.007	1.606	10.245
1.015	1.631	10.407
1.037	1.622	10.351
1.022	1.633	10.421
1.039	1.638	10.452
1.027	1.606	10.247
1.021	1.628	10.389
0.952	1.644	10.488
1.042	1.639	10.457
1.003	1.634	10.427
Average ± SD%	1.628 ± 0.012	10.390 ± 0.079
RSD% *	0.756	0.758

Protein Content: 10-12%

Protein Factor: 6.38

* RSD% = (Standard Deviation * 100) / Average

The complete procedure was verified by using 5 ml of glycine standard solution (3%) containing 28 mg of nitrogen, as reference substance. The obtained recovery was >99%.

Conclusion

The obtained results are reliable and reproducible in accordance with the expected values, with a low relative standard deviation (RSD < 1%), that means high repeatability of the results.

Benefits of Kjeldahl method by using DKL Digestion units and UDK Distillation units are:

- High level of precision and reproducibility
- Maximum productivity and full automation
- Worldwide official method
- Reliable and easy method
- Time saving
- Moderate running costs

VELP solutions

Tested with	Other VELP solutions				
DKL 20	DKL 8	DKL 12	DK 6	DK 8	DK 20
UDK 169	UDK 129	UDK 139	UDK 149	UDK159	