APPLICATION NOTE

Determination of crude protein / nitrogen in animal feed and pet food – combustion method

Dumas method application – based on standards **AOAC 990.03** - Protein Crude in animal feed**,** **ISO 16634-1** - Food products - Determination of the total nitrogen content by combustion according to the Dumas principle

Introduction

C. Gerhardt Instruments:
- DUMATHERM N Pro

Additional Equipment:
- Analytical balance
- Centrifugal mill
- Personal Computer
- Gas connections

The selection of the right feed is an essential factor in the livestock and poultry industry. The right mix of ingredients, such as proteins, vitamins and minerals, has a strong influence on the growth and health of the animals on the one hand, and on the quality of the end products, such as meat, eggs and milk, on the other. Feed analysis makes a major contribution here in order to monitor feed and adjust it if necessary. The determination of crude protein in feed is one of the most important analyses, as proteins cannot be replaced by any of the other food components. Thus, the crude protein content has a significant influence on the growth of e.g. chickens, cattle, dairy cows or pigs. But the protein content of the diet also plays a major role in the nutrition of pets. Similar to farm animals in the livestock industry, different pets have individual nutrient requirements. Cats, for example, need twice as much (crude) protein as dogs, which must be taken into account in the development and production of dog food. For the determination of crude protein, combustion analysis according to the Dumas method is the ideal solution, as it combines reference analysis with high speed. With the application "Determination of crude protein / nitrogen in feed and pet food" (Based on the international standards **AOAC 990.03** and **DIN EN ISO 16634-1**) a fast and precise analysis is guaranteed.

The method

Sample preparation

Commercially available feed pellets are ground to 1 mm particle size using a centrifugal mill. The milled material is stored in a sealed container and mixed well shortly before weighing. Weighing is done in tin foil. The weight data can be automatically transferred to the instrument software after the foil has been sealed. The samples are then stored in the transfer magazine.

➔ **App note:** Particle sizes smaller or larger than 1 mm result in higher standard deviations and thus in falsification of the results.

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Weighing / Calibration

Peak areas of approx. 52,000 mV*s are achieved when using 150 - 300 mg sample weights. This corresponds to an absolute amount of nitrogen of approx. 13.5 mg. A series of 12 EDTA values at intervals of 20 mg of 10 - 250 mg EDTA is recommended as calibration.

Calculation

The nitrogen content is calculated from the calibration and converted to protein using the corresponding protein factor. On average, protein contains about 16% nitrogen - therefore the factor is 6.25 when converting from nitrogen to protein.

Analytical results for animal feed in ring tests (table 1)

Sample type	Sample amount [mg] +/- 10%	Average value ring test [%] Protein	Result [%] Protein	Standard deviation [%] Protein
Fattening turkey feed	250	31.13	31.29	0.05
Complete feed for broiler chicks	250	22.98	22.60	0.12
Supplementary feed for piglets	250	19.99	20.05	0.06
Complete feed for piglets	250	16.58	16.56	0.13
Supplementary feed for dairy	250	34.81	35.00	0.12
Pig feed	250	15.50	15.64	

Exemplary results for dog food (table 2)

Sample amount [mg]	Protein factor	Nitrogen (N) Weight [mg]	Nitrogen (N) [%]	Protein [%]
305.703	6.25	13.559	4.436	27.72
314.653	6.25	13.886	4.413	27.58
302.789	6.25	13.442	4.433	27.71
306.719	6.25	13.496	4.401	27.51
304.709	6.25	13.469	4.420	27.63

Calibration name and nitrogen range:
EDTA (1 - 23 mg N abs.) (L-L-Q)

Method:
B 1,8

Average	4.421	27.63
Standard Deviation	0.014	0.09
RSD [%]	0.324	0.32

Conclusion

The determination of the crude protein content is a key analysis for producers of feed and pet food in order to compose the ideal feed mix. As an alternative to the well-known Kjeldahl analysis, the determination of the crude protein content according to Dumas can be used. With the automatic DUMATHERM and the application "Determination of crude protein / nitrogen in feed and pet food" based on the standards **AOAC 990.03** and **ISO 16634-1** a precise and fast analysis is possible in only 3 - 5 minutes. The results from the ring tests (table 1) confirm the high analysis quality of the DUMATHERM.

For detailed information or other applications please contact:

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