Application Note

Determination of Protein Content in Raw Sunflower Seeds Using a Cooling Water-Free Fully Automatic Kjeldahl Nitrogen Analyzer

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Reference standard

- [1] GB 5009.5-2016 National Food Safety Standard - Determination of Protein in Foods [S].

Testing with GDANA N810 Cooling Water-free Fully Automatic Kjeldahl Nitrogen Analyzer



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Application Note

I、 Introduction

Raw sunflower seeds generally refer to the seeds of the sunflower plant (Helianthus annuus), rich in nutrients such as protein, fat, minerals, and vitamins. This experiment utilized the Kjeldahl method for sample analysis. This method features strong universality (applicable to various organic nitrogen-containing samples), classic reliability, relatively low equipment cost, the ability to verify its accuracy through spiked recovery experiments, and controllable blank values. This facilitates the precise determination of total nitrogen/crude protein content in samples, providing a reliable basis for subsequent protein content calculation.

II、 Instruments and Reagents

2.1 Instruments

N810 Cooling Water-Free Fully Automatic Kjeldahl Nitrogen Analyzer, NDS-20 Graphite Digestion Furnace (20-position), Analytical Balance (0.0001g precision), High-Speed Grinder, etc.

2.2 Reagents

Sulfuric Acid (Analytical Reagent Grade), 20g/L Boric Acid Solution, Bromocresol Green-Methyl Red Mixed Indicator, 400g/L Sodium Hydroxide Solution, Mixed Catalyst (3g K_2SO_4, 0.2g $CuSO_4$) or Catalyst Tablets, 0.1mol/L Hydrochloric Acid Standard Titration Solution.

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2.3 Sample

Powdered raw sunflower seeds ground using a high-speed grinder.

III、Experimental Procedure

3.1 Sample Preparation

After grinding, homogenize the sample. Weigh 0.3g (accurate to 0.1mg). Wrap the sample using weighing paper and place it into a digestion tube. Add 2 mixed catalyst tablets (or 3.2g mixed catalyst powder), followed by adding 10mL concentrated sulfuric acid along the wall of the digestion tube.

Note: To ensure consistency between the sample and blank sample digestion contents, add a piece of weighing paper to the blank sample digestion tube for digestion together.

3.2 Digestion

Place the digestion tubes containing the samples and reagents onto the digestion furnace. Cover with the exhaust hood. Set the digestion furnace parameters as shown in Table 1:

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Table 1 Digestion Parameter Settings

Stage	Temperature	Digestion Time
1	230℃	40min
2	420℃	120min

3.3 Instrument Testing

After digestion is complete, allow the digestion tubes to cool to room temperature before removal. Check the sufficiency of reagents in the nitrogen analyzer. Perform an instrument blank test simultaneously. Once the instrument blank stabilizes, the digested samples can be tested on the instrument. The nitrogen analyzer parameter settings are shown in Table 2:

Table 2 Nitrogen Analyzer Parameter Settings

Boric Acid	Dilution Water	Alkali Solution	Distillation Time	Protein Factor	Titration Acid Concentration
30mL	30mL	50mL	5min	6.25	0.1001mol/L

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IV. Results Analysis and Discussion

4.1 Experimental Results

The selected raw sunflower seed samples underwent digestion, distillation, and titration. The experimental results are shown in Table 3:

Table 3 Protein Content Test Results

Sample Name	Sample Weight (g)	Blank Volume (mL)	Titration Volume (mL)	Protein Content (%)	Average (%)	RSD/%
Raw Sunflower Seeds	0.3108	0.0661	9.8356	27.53	27.35	0.56
	0.2937		9.2105	27.27		
	0.2937		9.2063	27.26		

4.2 Conclusion

The mean protein content of the raw sunflower seed samples tested using the N810 Cooling Water-Free Fully Automatic Kjeldahl Nitrogen Analyzer was 27.35%, with an RSD value of 0.56%. The experimental results show good parallelism.

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Precautions

When grinding samples, avoid running the grinder for extended periods to prevent overheating.

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