A Micro Method for the Determination of Protein and Screening of Added Water in Meat and Meat Products*

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The capability of the automatic Dumas method in the analysis of total nitrogen in more homogeneous materials such as plant materials, fertilizers, soil, and feeds is well recognized. Meat and meat products are rather non-homogenous materials, and it is generally necessary to use a large sample for an accurate result by the macro-Kjeldahl method. However, with limited laboratory space and manpower in our meat quality control laboratory, it is difficult to set up 20—30 samples a day for routine Kjeldahl determinations. We need to screen a large number of samples for consumer protection. It was hoped that the use of the nitrogen analyzer would resolve this problem.

This study was under-taken to determine if the automatic Dumas method is useful as a screening procedure to determine protein and added water in meat and meat products. Those which indicate added water present to be confirmed by the macro-Kjeldahl method.

Experimental

Equipment and Materials**

Coleman Model 29A Nitrogen Analyzer II
Combustion catalyst — platinized cuprox (CuO)

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** Mention of a vendors name does not constitute an endorsement of any manufactures product.
Cuprin (Cu)
Causticon (45% KOH solution)
Cobalt oxide (Co₂O₃)
Acetanilide
Quartz tubing, 14 mm. o. d.
Aluminum combustion boats, #29—412

All the above items supplied by Coleman Instruments Corp. Maywood, Illinois.

Procedure

Thoroughly ground meat (200—300 mg) was dispensed from a disposable syringe into an aluminum combustion boat. Approximately double this volume of cobalt oxide was added to the boat and mixed with a small length of capillary tubing with the meat sample. The capillary tubing used for mixing was left in the boat, the top of the boat was pinched together using tweezers, and the boat was dried for two hours at 125°. The dried boat was then inserted into a quartz combustion tube and the tube was filled with platinized copper oxide. The prepared tube was then positioned in the instrument and the sample was combusted at 850°. The post heater was maintained at a temperature of 650°. At the start of each day, a blank value was determined by running complete cycles of the instrument using quartz combustion tubes containing only platinized copper oxide.

After suitable reproducible blanks were obtained, an acetanilide standard was analyzed to assure proper functioning of the instrument. After 60 determinations, the nitrometer was refilled with fresh 45% potassium hydroxide solution. The post heater tube was refilled with copper and platinized copper oxide when the color of golden copper began to show gray. The platinized copper oxide used for these analyses was regenerated at 700° for 2 hours in a muffle furnace.

Total moisture and total fat were determined according to the regular AOAC (Association of Official Analytical Chemists) procedure. Added water was determined by using the formula; total water equals the % meat protein times protein multiplier with no added water. Protein multiplier is a ratio of total water and meat protein. It has been determined statistically and may vary from 3.6 to 5.8 for different meat products as indicated in the chemistry guidebook of the U. S. Department of Agriculture. For instance, 3.8 was used for ground beef or hamburger, and 4.0 was used for pork sausage.