METHODOLOGY

Should protein-nitrogen factors be changed?

Since their adoption, AOCS methods for determining protein nitrogen usually have specified a factor of 6.25 for converting protein nitrogen to protein. Most AOCS methods for protein nitrogen were adopted in the 1930s and 1940s. Since that time, refinements have been made to protein-nitrogen methods in general and conversion factors for specific commodities have evolved. Because the use of the factor of 6.25 in AOCS protein methods has been challenged on more than one occasion, especially in view of a potential increase in trade with the European Community (EC), the following review on the use of protein conversion factors was prepared by AOCS Uniform Methods Committee Chairman David Firestone before the AOCS 1992 Annual Meeting and Exposition held May 10-14 in Toronto.

The AOCS should review the use of 6.25 as a general conversion factor for calculation of protein content of oilseeds and oilseed meals. The fact that the Federation of Oil, Seeds and Fats Associations International (FOSFA International) specify individual conversion factors for various oilseeds (1) suggests that AOCS should consider citing specific conversion factors listed in Agriculture Handbook No. 8 (2) and cited in the FOSFA Manual.

Following is a partial list of products and conversion factors from USDA Handbook No. 8.

Section 8-11: Corn, Protein (N x 6.25); Corn, flour, whole grain, Protein (N x 6.25); Millet, raw, Protein (N x 5.83); Rice, brown, long grain, Protein (N x 5.95); Wheat, hard red, Protein (N x 5.83).

Section 8-12: Cottonseed kernels, roasted, Protein (N x 5.30); Cottonseed flour, low fat, Protein (N x 5.30); Coconut meat, raw, Protein (N x 5.30); Peanut kernels, dried, Protein (N x 5.46); Peanut flour, defatted, Protein (N x 5.46); Safflower seed kernels, dried, Protein (N x 5.30); Safflower seed meal, partially defatted, Protein (N x 5.30); Sesame seeds, whole, dried, Protein (N x 5.30); Soybean kernels, roasted and toasted, Protein (N x 5.71); Sunflower seed kernels, dried, Protein (N x 5.30); Sunflower seed flour, partially defatted.

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INFORM, Vol. 3, no. 6 (June 1992)
Protein (N x 5.30). Table 1 shows nitrogen-to-protein conversion factors published in Section 8.12 of the USDA handbook.

The origin of the USDA factors noted above is not certain; the traditional conversion factor (6.25) is cited by D. B. Jones (3). AOAC method 988.05 (4) cites 6.25; or 5.7 for wheat grains.

Joel Padmore, state chemist of North Carolina and former AOAC General Referee on Animal Feed, has suggested that one might consider using 6.25 for mixed grains or mixed animal feeds vs. special factors for individual grains. Also, 6.25 could designate "crude protein" whereas the USDA factors could be used for "wheat protein," "soybean protein," etc.

The current proposed action by the AOCS is a revision to the conversion table in AOCS Official Method Aa 5-91, eliminating the protein ("Prot.") column and adding a note paraphrasing page 62 in FOSFA International manual (1):

An estimate of protein content can be obtained by multiplying the nitrogen content by a factor. The traditional factor [Jones, D. B., USDA Circular 183, (1941)] is 6.25, but the use of other factors may be required. The factor for cottonseed cited in Agriculture Handbook No. 8, U. S. Department of Agriculture, Composition of Foods, Section 12, is 5.30.

Accordingly, AOCS Official Method Ab 4-91 (for peanuts) would cite 5.46; AOCS Official Method Ac 4-91 (for soybeans) would cite 5.71; AOCS Official Method Ai 4-91 (for sunflowerseed) would cite 5.30. AOCS Official Method Ba 4d-91 would list the conversion factors for nitrogen to protein from the USDA Table noted above. AOCS Official Method Bc 4-91 would list 5.71 (Soybean flours are not specifically cited in Handbook No. 8, but the flours from other seeds—sunflower, peanut, safflower, cottonseed—have the same factors as the seed).

At some point, it is the intent of the AOCS Seed and Meal Analysis Technical Committee and the AOCS Uniform Methods Committee to combine all of the AOCS Kjeldahl nitrogen methods (using titanium dioxide-copper sulfate catalyst) into one general method. For discussion at the 1992 Toronto meeting of the Uniform Methods Committee, a general draft of a method will be prepared, incorporating the USDA and FOSFA International tables of conversion factors, applicable to oilseeds and oilseed meal and ground cake, cottonseed meats and even high and low fat soybean flours (AOCS Official Method Bc 4-91).

The Uniform Methods Committee will continue to search for available literature citations relating to protein nitrogen conversion factors, including sources for the work of Jones (3) on conversion factors other than USDA Circular 183.

It is the feeling of the Uniform Methods Committee that the analyst will be better served by noting, but not mandating, specific conversion factors rather than simply referring the analyst to the USDA Handbook No. 8.

Anyone with comments on this proposed action should contact the AOCS Technical Director at AOCS headquarters.

Collaborative studies completed

Statistical analysis has been completed on two AOCS collaborative studies. The statistical analysis was performed according to ISO/IUPAC/AOAC protocols using a Lotus-based program supplied to the AOCS Technical Department by David Firestone.

The AOCS studies are the determination of color of sodium linear alkylbenzene sulfonate (LAS), using a Klett-Summersorn colorimeter, and the oxygen stability index (OSI) method, an automated method for determining fat and oil stability, based on conductance as an endpoint. The OSI method is an alternate method to the existing active oxygen method (AOM), AOCS Official Method Cd 12-57. The methods have been drafted into AOCS methods format and are under review by the AOCS Uniform Methods Committee (UMC) for adoption in 1992.

Other methods under review by the UMC include an IUPAC method for the determination of phosphorus in oils by graphite furnace atomic absorption spectroscopy; a procedure listing general guidelines for the determination of oil, protein and moisture by NIR; and an ISO method for slip melting point, intended to replace existing AOCS Method Cc 4-25 for slip point.

If approved, these methods will appear in the 1992 Additions and Revisions to AOCS Methods.

References