



JOINT FAO/WHO FOOD STANDARDS PROGRAMME
CODEx COMMITTEE ON METHODS OF ANALYSIS AND SAMPLING

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APPROACH FOR THE PLACEMENT OF NITROGEN CONVERSION FACTORS

(Prepared by Chile and Brazil)

Introduction

1. The 42nd session of CCMAS (CCMAS42) (2023) recalled its previous decision, where Commodity Committees are responsible for setting conversion factors, but noted that a consistent approach was needed for the positioning of these conversion factors, which could be either in the *Recommended Methods of Analysis and Sampling* (CXS 234-1999) or to be retained in the commodity standard. It was also agreed that Chile and Brazil would prepare a discussion paper to explore the best approach for the positioning of nitrogen conversion factors.¹
2. The determination of the protein content in foods is based on the quantification of the nitrogen contained in the food which is calculated by applying a conversion factor (Nx). In this sense, for laboratories to use a method to establish compliance with Codex requirements regarding the protein content present in food, it is necessary to be clear about the protein conversion factor (Nx) that should be used. Therefore, considering practicability, it is recommended to include in the CXS 234-1999, an annex (see Appendix I or II to this document) in which the country's laboratories can have all the information on the nitrogen to protein conversion factors (Nx) that have been determined by the subsidiary bodies of the Codex Alimentarius Commission.
3. In this way, access to information is facilitated for those who will use the CXS 234 regarding how to perform the respective analytical calculation. The Annex will be consolidated for the different foods that have a provision for protein indicated in the CXS 234, and the factors that are standardized by Codex Committees.
4. There are some standards that do not mention a conversion factor. This makes it impossible to express a result for the provision. There are also some inconsistencies with different conversion factors depending on the standard, which is why our recommendation is to centralize all the information in an Annex to CXS 234.

Recommendations

General Recommendations

5. CCMAS agree to publish conversion factors in CXS234 as recommended in para. 2 above.
6. In order to follow this approach:
 - a) Consider placing all conversion factors (Nx) established and agreed by Codex Commodity Committees in an annex to CXS 234 for ease of use.
 - b) Review the proposed presentations for the conversion factors (Nx) for the Annex specified above, either in a table (Appendix I) or in a list (Appendix II) and establish the best form of presentation to facilitate use of the information.
 - c) Recommend that Codex Commodity Committees determine and report to CCMAS the conversion factor (Nx) they have agreed or established, together with all the criteria set in the proposed Annex to CXS 234, to facilitate the endorsement of analytical methods for protein analysis.

¹ REP23/MAS Paragraph 53 and 57(vi)

Specific Recommendations

7. For consistency, it is important to harmonize the provision name. In the current version of CXS 234-1999, the provision is mentioned as Protein, Protein Crude, Protein content and Milk protein.

8. Members and respective active committees should be consulted regarding the issues listed below. for milk products that do not have conversion factor for protein calculation, there is not a mixture of protein source in the commodities, the proposal is to keep milk factor of 6.38 for the following commodities:

- Blend of evaporated skimmed milk and vegetable fat
- Blend of skimmed milk and vegetable fat in powdered form
- Blend of sweetened condensed skimmed milk and vegetable fat (for products sweetened with sucrose only)
- Reduced fat blend of evaporated skimmed milk and vegetable fat
- Reduced fat blend of sweetened condensed skimmed milk and vegetable fat (for products sweetened with sucrose only)
- Cheese, unripened Including fresh cheese
- Cream and prepared creams
- Evaporated milks
- Milk powders and cream powders
- Sweetened condensed milks (for products sweetened with sucrose only)

9. The commodities listed below don't have a specified factor for protein calculation. The proposal is to use a factor of 6.25 since the major protein source of these products is meat.

- Cooked cured pork shoulder

10. The other meat product without factor defined is the Dried meat in the Standard developed by CCAFRICA (Regional Standard for Dried Meat (CXS 350R-2022) and again the proposal is to use 6.25 since the only protein source is meat.

11. The below commodities and specific Committees should also be consulted with below recommendations:

- Tehena (CCNE) (Regional Standard for Tehena (CXS 259R-21007)) – use factor of 5.71 as product made from sesame seed, vegetal protein.
- Tempe (CCASIA) (Regional Standard for Tempe (CXS 313R-2013)) - to verify if the proposed factor in CXS 234 1999 (5.71) is appropriate.

12. Different decimal places were observed in the factor for vegetal protein – 5.7 and 5.71. CCMAS should suggest to relevant Committees to harmonize the information on 5.71 aligned to the decimal places of other factors.

Commodities identified with different Factors when comparing with CXS 234 1999:

- Wheat protein products (WPP) including wheat gluten (CXS 163-1987): Vital wheat gluten and devitalized wheat gluten (wheat protein in grain)
- Wheat protein products including wheat gluten: Solubilized wheat protein (wheat protein in flour)

13. In the case where the only factor comes from CXS 234-1999, the relevant Commodity Committees should be consulted.

APPENDIX I

NITROGEN TO PROTEIN CONVERSION FACTOR (Nx) FOR COMMODITIES

Commodity	Provision	Nx	Reference standards	Committee	Comments
Degermed maize (corn) meal and maize (corn) grits	Protein	6.25	CXS 155 1985	CCCPL	a dry basis
Durum wheat semolina and durum wheat flour	Protein	5.7	CXS 234-1999 CXS 178-1991	CCMAS CCCPL	a dry basis
Quinoa	Protein	6.25	CXS 234-1999	CCMAS CCCPL	a dry matter basis
Pearl millet flour	Protein	5.7	CXS 170-1989	CCCPL	a dry matter basis
Sorghum flour	Protein	6.25	CXS 173-1989	CCCPL	a dry matter basis
Sorghum grains	Protein	6.25	CXS 172-1989	CCCPL	a dry matter basis
Soy protein products	Crude Protein	6.25	CXS 234 1999 CXS 175-1989	CCMAS CCVP	Soy Protein Products (SPP) covered by this Standard are food products produced by the reduction or removal from soybeans of certain of the major non-protein constituents (water, oil, carbohydrates) in a manner to achieve a protein (N x 6.25)
Vegetable protein products (VPP)	Crude Protein	6.25	CXS 234 1999 CXS 174-1999	CCMAS CCVP	VPP covered by this Standard are food products produced by the reduction or removal from vegetable materials of certain of the major non-protein constituents (water, oil, starch, other carbohydrates) in a manner to achieve a protein (N x 6.25) content of 40% or more. The protein content is calculated on a dry weight basis excluding added vitamins, minerals
Wheat flour	Protein	5.7	CXS 152-1985	CCCLP	a dry weight basis
Wheat protein products (WPP) including wheat gluten: Vital wheat gluten and devitalized wheat gluten (wheat protein in grain)	Protein Crude Protein	5.7 6.25	CXS 234 1999 CXS 163-1987	CCMAS CCCLP	- in case of vital and devitalized wheat gluten, 80 % or more On a dry weight basis excluding added vitamins, minerals, amino acids and optional ingredients

					Wheat Protein Products (WPP) covered by the standard CXS 163-1987 are food products produced by separation from wheat or wheat flour of certain non-protein constituents (starch, other carbohydrates). - Vital wheat gluten is characterized by its property of high viscoelasticity as hydrated. - Devitalized wheat gluten is characterized by its reduced property of viscoelasticity as hydrated due to denaturation. - Solubilized wheat proteins are characterized by their reduced property of viscoelasticity as hydrated due to partial hydrolysis of wheat gluten.
Wheat protein products including wheat gluten: Solubilized wheat protein (wheat protein in flour)	Protein Crude protein	5.7 6.25	CXS 234 1999 CXS 163-1987	CCMAS CCCLP	- in case of solubilized wheat proteins, 60% or more. On a dry weight basis excluding added vitamins, minerals, amino acids and optional ingredients. Wheat Protein Products (WPP) covered by the standard CXS 163-1987 are food products produced by separation from wheat or wheat flour of certain non-protein constituents (starch, other carbohydrates). - Vital wheat gluten is characterized by its property of high viscoelasticity as hydrated. - Devitalized wheat gluten is characterized by its reduced property of viscoelasticity as hydrated due to denaturation. - Solubilized wheat proteins are characterized by their reduced property of viscoelasticity as hydrated due to partial hydrolysis of wheat gluten.
Whole and decorticated pearl millet grains	Protein	5.7.	CXS 169-1989	CCCLP	a dry matter basis
Whole maize (corn) meal	Protein	6.25	CXS 154-1985	CCCLP	a dry weight basis
Special foods	Crude protein	n.i.	CXS 234 1999	CCNFSDU	Method described in CAC/VOL IX-Ed. 1, Part III

Infant formula Infant formula and formulas For special medical purposes intended for infants	Crude protein	[6.25 6.38 5.71] [6.25 6.38 5.71]	CXS 234 1999 CXS 72-1981	CCMAS CCNFSDU	The calculation of the protein content of infant formulas prepared ready for consumption may be based on N x 6.25, unless a scientific justification is provided for the use of a different conversion factor for a particular product. The value of 6.38 is generally established as a specific factor appropriate for conversion of nitrogen to protein in other milk products, and the value of 5.71 as a specific factor for conversion of nitrogen to protein in other soy products
Blend of evaporated skimmed milk and vegetable fat	Milk protein in MSNF	n.i.	CXS 250-2006	CCMMP	
Reduced fat blend of evaporated skimmed milk and vegetable fat	Milk protein in MSNF	n.i.	CXS 250-2006	CCMMP	
Blend of skimmed milk and vegetable fat in powdered form	Milk protein in MSNF	n.i.	CXS 251-2006	CCMMP	
Blend of sweetened condensed skimmed milk and vegetable fat (for products sweetened with sucrose only)	Milk protein in MSNF	n.i.	CXS 252-2006	CCMMP	
Reduced fat blend of sweetened condensed skimmed milk and vegetable fat (for products sweetened with sucrose only)	Milk protein in MSNF	n.i.	CXS 252-2006	CCMMP	
Cheese, unripened Including fresh cheese	Milk Protein	n.i.	CXS 221-2001	CCMMP	
Cream and prepared creams	Milk protein	n.i.	CXS 275-1973	CCMMP	
Edible casein products	Milk protein	6.38	CXS 234 1999 CXS 290-1995	CCMMP	total N x 6.38 in dry matter Protein content is 6.38 multiplied by the total Kjeldahl nitrogen determined.
Evaporated milks	Milk protein in MSNF	n.i.	CXS 281-1971	CCMMP	
Fermented milks	Milk Protein	6.38	CXS 243-2003	CCMMP	Protein content is 6.38 multiplied by the total Kjeldahl nitrogen determined
Milk powders and cream powders	Milk Protein	n.i.	CXS 207-1999	CCMMP	
Sweetened condensed milks (for products sweetened with sucrose only)	Milk protein in MSNF	n.i.	CXS 282-1971	CCMMP	

Whey powders	Milk Protein	6.38	CXS 234 1999 CXS 289-1995	CCMMP	Protein content is 6.38 multiplied by the total Kjeldahl nitrogen determined
Processed meat and poultry products a) Corned beef	Nitrogen/protein	n.i.	a) CXS 88-1981	?	a) It does not mention any factors, but CXS 88-1981 specifies a provision for proteins: "The total protein content in the final product must not be less than 21% m/m."
Cooked cured ham	Protein	6.25 n.i.	CXS 234 1999 CXS 96-1981	CCMMP	For canned products the percentage of meat-protein is calculated on the total content of the can and corrected for gelatine. For products in which the amount of added gelatine is not known, 0.5% protein should be deducted from the percentage protein expressed on a fat-free basis
Cooked cured pork shoulder	Protein	n.i.	CXS 97-1981	CCMMP	For canned products the percentage of meat-protein is calculated on the total content of the can and corrected for gelatine. For products in which the amount of added gelatine is not known, 0.5% protein should be deducted from the percentage protein expressed on a fat-free basis
Gochujang	Crude protein	6.25	CXS 234 1999 CXS 294R-2009	CCASIA	
Non-fermented soybean products	Protein content	5.71	CXS 234 1999 CXS 322R-2015	CCMAS CCASIA	
Tehena	Protein content	n.i.	CXS 259R-2007	CCNE	
Tempe	Protein content	5.71 n.i.	CXS 234 1999	CCMAS CCASIA	
Dried meat (*)	Crude protein	n.i.	CXS 350R-2022	CCAFRICA	
Milk products containing a minimum of 50% of milk protein (m/m)	Milk protein	6.38	CXS1-1985		in dry matter Kjeldahl nitrogen × 6.38 Calculation of milk protein content: Kjeldahl nitrogen × 6.38

n.i - no information neither in CXS 234 or commodities committees (*) no method mentioned in CXS 234

APPENDIX II

**NITROGEN TO PROTEIN CONVERSION FACTORS FOR COMMODITYS APROVED BY
COMMODITIES COMMITTEES****Animal Protein Source**

Milk and milk protein -6.38

Meat- 6.25

Cook cured ham 6.25

Infant formula -The calculation of the protein content of infant formulas prepared ready for consumption may be based on N x 6.25, unless a scientific justification is provided for the use of a different conversion factor for a particular product. The value of 6.38 is generally established as a specific factor appropriate for conversion of nitrogen to protein in other milk products, and the value of 5.71 as a specific factor for conversion of nitrogen to protein in other soy products.

Vegetable Protein Source

Wheat, wheat protein products- 5.71

Soya and non-ferment soybean products- 5.71

Maize- 6.25

Quinoa- 6.25

Sorghum- 6.25

Tempe- 5.71

Gochujang- 6.25

Products produced by separation from wheat and soya grains and flours of certain non-protein constituents (starch, other carbohydrates)- 6.25.