

Tentative Translation

JAS
0019

JAPANESE AGRICULTURAL
STANDARD

Textured soy protein products

Date of Establishment: 2022-2-24

Ministry of Agriculture, Forestry and Fisheries

Precautions for using English version of JAS

This English translation has been made by the drafting party etc., based on the original text (Japanese version), and has been posted on the website of the Food and Agricultural Materials Inspection Center (FAMIC), Incorporated Administrative Agency, with permission of the publisher of the original text (Ministry of Agriculture, Forestry and Fisheries).

The translation is made in consideration of technical contents, but it is aimed to provide information when using JAS original text, and is not recognized as having the same effects as the original text.

If there is any doubt in the translation, please follow the original.

FAMIC is not responsible for inconvenience by using only the translation.

Food and Agricultural Materials Inspection Center, Incorporated Administrative Agency

Contents		Page
1	Scope.....	1
2	Normative references.....	1
3	Terms and definitions	1
4	Methods of production	2
5	Labeling.....	3
Annex A.....		4
Annex B.....		7

Foreword

This Japanese Agricultural Standard has been established by the Minister of Agriculture, Forestry and Fisheries through deliberations at the Council for the Japanese Agricultural Standards as the result of the proposal for establishment of Japanese Agricultural Standard submitted by the Otsuka Foods Co., Ltd. with the original bill being attached, based on the provision of Article 4, paragraph (1) of the Act on Japanese Agricultural Standards.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, published patent application or utility model rights. The Minister of Agriculture, Forestry and Fisheries and the Council for the Japanese Agricultural Standards are not responsible for identifying any of such patent rights, published patent application or utility model rights.

Textured soy protein products

1 Scope

This document specifies textured soy protein foods and prepared textured soy protein foods (hereinafter referred to as “textured soy protein products”).

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

textured soy protein food

processed food produced to meet the requirements of 4.1.1 and 4.2

3.2

prepared textured soy protein food

processed food produced to meet the requirements of 4.1.2 and 4.2

3.3

animal ingredient

ingredient derived from livestock (cattle, pigs, horses, sheep and goats), domestic rabbits, poultry, wildlife used for food, aquatic animals, reptiles, insects or other animals

Note 1 to entry: Aquatic animals include fish, shellfish and marine mammals.

Note 2 to entry: Animal ingredients include milk and edible poultry eggs.

3.4

processed soybean product

product prepared by processed soybeans, which does not contain animal ingredients or processed products thereof

Note 1 to entry: The term does not include textured soy protein products.

Note 2 to entry: Examples of processed soybean products are soy flour, tofu, tofu skin, etc.

3.5

textured soy protein ingredient

either of the following:

- a) substance from soybeans or processed soybean products with process such as increasing the protein content percentage (see Annex A);
- b) substance formed into powder, paste, granules, fibers, etc. by the physical actions of such as heating or pressurizing a);
- c) substance prepared by adding plant ingredients (excluding soybeans), edible vegetable oils and fats, salt, starch, quality-improving agents, emulsifiers, antioxidants, coloring agents, flavoring agents,

seasonings, etc. (excluding those derived from animal ingredients) to a) or b)

3.6

recipe

document with necessary information (blending percentage of ingredients, manufacturing methods, etc.) for manufacturing textured soy protein products

4 Methods of production

4.1 Designing of the recipe

4.1.1 Textured soy protein foods

The recipe shall be designed to meet the following matters:

- a)** Products shall be processed to have the product-specific meat-like qualities, using the textured soy protein ingredients;

Note 1 Examples of the product-specific meat-like qualities are textural qualities, such as a meat-like granular and fibrous texture, morphological qualities, such as minced, filet, sliced and block-like, and the mixed qualities thereof.

Note 2 Confirmation that the products have the product-specific meat-like qualities is considered to be carried out by, for example, producing the products on trial, according to the designed recipe, and carrying out the sensory evaluation on the trial products.

- b)** The textured soy protein ingredients whose amino acid score (see Annex B) is 100 shall be used;
- c)** On the first ingredients to the third ingredients, the following substances shall not be used as ingredients. Here, the first ingredients are those used directly by the business operators who manufacture textured soy protein foods, the second ingredients are those used directly by the business operators who manufacture the first ingredients, and the third ingredients are those used directly by the business operators who manufacture the second ingredients:

- 1)** animal ingredients;
- 2)** processed foods of 1);

Note 3 Confirmation of the ingredients is identified by, for example, obtaining the information retroactively to the business operators who manufactured the third ingredients.

- d)** The content percentage of soy protein (see Annex A) shall be 10 % or more. It shall be calculated as follows:
- 1)** The content percentage of soy protein shall be calculated as follows: determine the mass of soy protein, which is contained in the textured soy protein ingredients, as a percentage of the total mass of textured soy protein food, and round it down to the nearest integer; provided, however, that the mass of soy protein contained in the seasonings in the textured soy protein ingredients shall not be included in the calculation;
 - 2)** In the case of a product that is marketed both with and without added sauce, etc. (e.g., hamburger steaks and meatballs), when the product is with added sauce, etc., the content percentage of soy protein shall be calculated excluding the mass of sauce, etc.;
 - 3)** The protein conversion factor (see Annex A) shall be 6,25.

4.1.2 Prepared textured soy protein foods

The recipe shall be designed to meet the following matters:

- a)** Products shall be processed to have the product-specific meat-like qualities, using the textured soy protein ingredients;

Note 1 Examples of the product-specific meat-like qualities are textural qualities, such as a meat-like granular

and fibrous texture, morphological qualities, such as minced, filet, sliced and block-like, and the mixed qualities thereof.

Note 2 Confirmation that the products have the product-specific meat-like qualities is considered to be carried out by, for example, producing the products on trial, according to the designed recipe, and carrying out the sensory evaluation on the trial products.

- b) On the first ingredients to the third ingredients, the following substances shall not be used as ingredients. Here, the first ingredients are those used directly by the business operators who manufacture prepared textured soy protein foods, the second ingredients are those used directly by the business operators who manufacture the first ingredients, and the third ingredients are those used directly by the business operators who manufacture the second ingredients:

- 1) animal ingredients (excluding milk and edible poultry eggs);
- 2) processed foods of 1) (excluding seasonings.);

Note 3 Confirmation of the ingredients is identified by, for example, obtaining the information retroactively to the business operators who manufactured the third ingredients.

- c) The content percentage of soy protein (see Annex A) shall be 1 % or more. It shall be calculated as follows:
- 1) The content percentage of soy protein shall be calculated as follows: determine the mass of soy protein, which is contained in the textured soy protein ingredients, as a percentage of the total mass of prepared textured soy protein food, and round it down to the nearest integer; provided, however, that the mass of soy protein contained in the seasonings in the textured soy protein ingredients shall not be included in the calculation;
 - 2) The protein conversion factor (see Annex A) shall be 6,25.

4.2 Management of the manufacturing process and separation management during the manufacturing process

4.2.1 Management of the manufacturing process in accordance with the recipe

The manufacturing process shall be managed in accordance with the designed recipe.

4.2.2 Separation management of textured soy protein products during the manufacturing process

Textured soy protein products during the manufacturing process shall be managed separately so that they will not be mixed with products which are being or have been manufactured not in accordance with the recipe for the textured soy protein products.

5 Labeling

On textured soy protein foods, “大豆ミート食品” (which means “a textured soy protein food” in Japanese) or “大豆肉様食品” (which means “a meat-like soy foods” in Japanese), and on prepared textured soy protein foods, “調製大豆ミート食品” (which means “a prepared textured soy protein food” in Japanese) or “調製大豆肉様食品” (which means “a meat-like prepared soy foods” in Japanese) shall be declared on a clearly visible place of their containers or packages; provided, however, that, on the processed foods for business use set forth in Article 2 of the Food Labeling Standards (Cabinet Office Ordinance No. 10 of 2015), they may be declared on their invoices, statements of delivery, etc. or on their specifications, etc.

And, to avoid misleading consumers, an explanation that the referenced products is not meat shall be declared on a clearly visible place of their containers or packages.

Note Examples of an explanation that the referenced product is not meat are “肉を使用していません” and “肉不使用” (both of which means “meat free” in Japanese).

Annex A (informative)

Content percentage of soy protein

A.1 General

The purpose of this Annex is to provide information on content percentage of soy protein as a reference.

A.2 Criteria for content percentage of soy protein in textured soy protein products

This document classifies textured soy protein products into two categories: textured soy protein foods and prepared textured soy protein foods. For textured soy protein products, there are criteria for the content percentage of soy protein in the product, and it is specified to be 10 % or more for textured soy protein foods and 1 % or more for prepared textured soy protein foods.

A.3 Calculation method of content percentage of soy protein

Although the total amount of protein in a product can be analyzed by the Kjeldahl method and the combustion method, it is theoretically and technically impossible to analyze only the amount of soy protein. Therefore, the content percentage of soy protein is calculated as follows: determining the percentage of the mass of soy protein contained in the textured soy protein ingredients relative to the product mass, and rounding down the value to the nearest integer. The mass of soy protein contained in the textured soy protein ingredient is calculated based on: the recipe of the product (the blending percentage of the ingredient), the content percentage of soy protein of the soybean-derived ingredient in the textured soy protein ingredients, the total nitrogen content, etc.

However, the mass of soy protein contained in the seasoning of the textured soy protein ingredient is not included in the calculation. This is to prevent the content of soy protein from being padded by intentionally blending seasonings containing a large amount of soy protein. In the case of products such as hamburger steaks and meatballs, which are marketed both with and without added sauce, etc., the mass of the sauce, etc. is excluded in the calculation. The reason for this is that the content percentage of soy protein of the products with added sauce, etc. is lower than that of the products without added sauce, etc., so the products should be compared fairly.

As for the protein conversion factor, CXS 234-1999 (Recommended methods of analysis and sampling) adopts a conversion factor of 6,25 for soy protein products. JAS 0838 (Vegetable protein) also adopts a conversion factor of 6,25 for products whose main ingredients are soybeans or defatted soybeans. Therefore, the protein conversion factor of 6,25 is also used in this document.

A.4 Example of Calculating the content percentage of soy protein

Table A.1 shows a specific example of calculating the content percentage of soy protein in the case of manufacturing soy meatballs (product mass 200 g) as shown in Figure A.1.

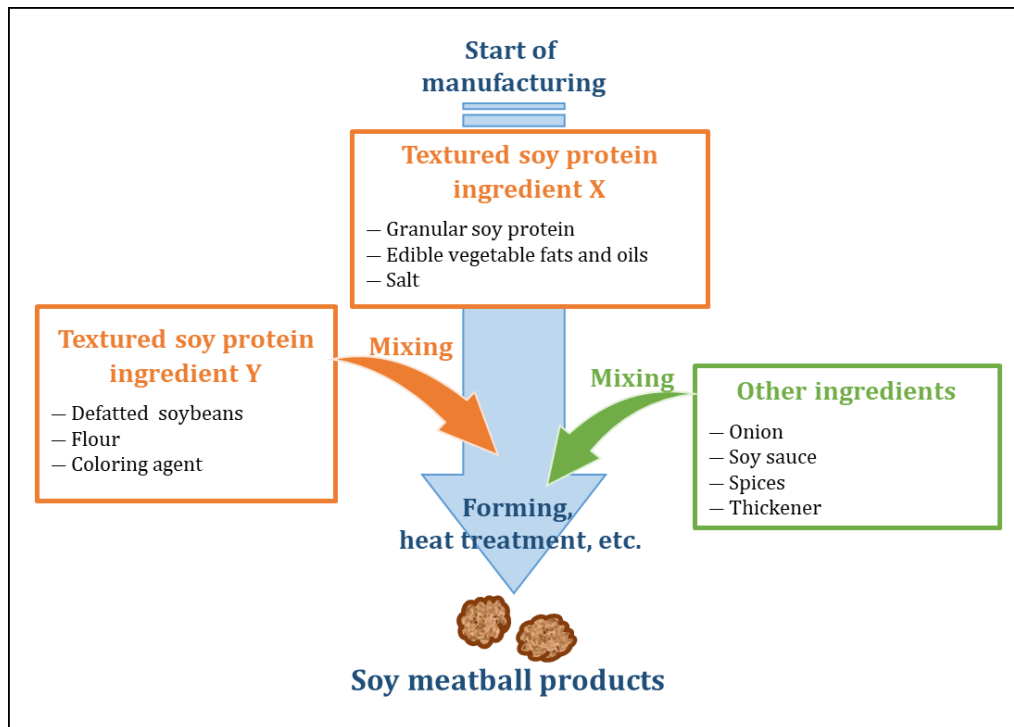


Figure A.1 — Example of manufacturing soy meatballs

Table A.1 — Specific example of calculating the content percentage of soy protein for a soy meatball product

Ingredients		A	B	C	D	E	F
Textured soy protein ingredient X	Granular soy protein	28,0	60,0		16,8		11,4
	Edible vegetable fats and oils						
	Salt						
Textured soy protein ingredient Y	Defatted soybeans	20,0		4,8		6,0	
	Flour						
	Coloring agent						
Other ingredients	Onion						
	Soy sauce						
	Spices						
	Thickener						

Symbol Description

- A:** Mass of soybean-derived ingredients in textured soy protein ingredients (g)
- B:** Content percentage of soy protein of soybean-derived ingredients in textured soy protein ingredients (%)
- C:** Total nitrogen content of soybean-derived ingredients in textured soy protein ingredients (%)
- D:** Mass of soy protein of soybean-derived ingredients in textured soy protein ingredients (g)
(if data of B are available)
- E:** Mass of soy protein of soybean-derived ingredients in textured soy protein ingredients (g)
(if data of C are available)
- F:** Content percentage of soy protein of the product (%)

When there are data on the content percentage of soy protein (B), such as granular soy protein contained in textured soy protein ingredient X, the mass of soy protein contained in granular soy protein (D) is obtained by multiplying the mass of granular soy protein (A) by the content percentage of soy protein of granular soy protein (B) and dividing by 100.

When there are data on the total nitrogen content (C), such as defatted soybeans contained in textured soy protein ingredient Y, the mass of soy protein contained in defatted soybeans (E) is obtained by multiplying the mass of defatted soybeans (A) by the total nitrogen content of defatted soybeans (C) and dividing by 100, and then multiplying by the protein conversion factor (6,25).

Finally, the content percentage of soy protein (F) of the product is obtained by adding the mass of soy protein contained in granular soy protein (D) and the mass of soy protein contained in defatted soybeans (E) and dividing by the product mass and multiplying by 100. In addition, the calculated value is rounded down to the nearest integer and compared with the reference value. In the case of the example of a soy meatball product shown in Figure A.1, the calculated content percentage of soy protein is 11 %, which meets the criteria of 10 % or more of the content percentage of soy protein of textured soy protein foods.

Annex B (informative)

Amino acid score

B.1 General

The purpose of this Annex is to provide information on amino acid scores as a reference.

B.2 Amino acid score

The amino acid score is the minimum value among the values (percentages) obtained by comparing the content of individual essential amino acids in the protein of a food with their amino acid scoring pattern.

B.3 Essential and non-essential amino acids

Amino acids constituting proteins include 9 essential amino acids (isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, valine and histidine) that cannot be synthesized in the human body and 11 non-essential amino acids [glycine, alanine, serine, aspartic acid, glutamic acid, asparagine, glutamine, arginine, cysteine (cystine), tyrosine and proline] that can be synthesized in the human body from carbohydrates and lipids. As essential amino acids cannot be synthesized in the human body, they need to be obtained from food.

B.4 Amino acid scoring pattern

Table B.1 shows the amino acid scoring pattern (1985, for 2-5 years old, before school age) published by the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO) and the University of the United Nations (UNU) in 1985, which is now widely used as the amount of essential amino acids required for the human body.

Table B.1 — Amino acid scoring pattern (1985, for 2-5 years old, before school age)

Essential amino acids	Amino acid scoring pattern
Isoleucine	180
Leucine	410
Lysine	360
Sulfur-containing amino acids ^{a)}	160
Aromatic amino acids ^{b)}	390
Threonine	210
Tryptophan	70
Valine	220
histidine	120
Note ^{a)} Sulfur-containing amino acids are the sum of methionine and cysteine (cystine) synthesized from methionine in the body. Note ^{b)} Aromatic amino acids are the sum of phenylalanine and tyrosine synthesized from phenylalanine in the body.	

B.5 Calculation of the amino acid score

Among the nine essential amino acids, the amino acid with the lowest amino acid score is called the "first limiting amino acid." The amino acid score is calculated by the formula (B.1). If the calculated value is higher than 100, the amino acid score is considered to be 100.

$$A = \frac{B}{C} \times 100 \dots\dots\dots(B.1)$$

where

- A* is the amino acid score;
- B* is the amino acid content in food proteins (mg/gN);
- C* is the amino acid content in the amino acid scoring pattern (mg/gN);

Foods with an amino acid score of 100 for all essential amino acids are considered to contain all essential amino acids in good balance. This is generally known as "the barrel theory of essential amino acid uptake" as shown in Figures B.1 and B.2. This theory is based on the idea that the essential amino acid (the first limiting amino acid) with the lowest amino acid score is the shortest stave, and the amount of water that goes into the barrel is determined by comparing the nine essential amino acids to the nine staves that make up the sides of the barrel. No matter how large the amount of essential amino acids other than the first limiting amino acid is, the amount of the first limiting amino acid limits the amount of protein that the body can synthesize and determines the total amount of protein. In the example in Figure B.1, all essential amino acids are 100, so any essential amino acid will not become the limit, so the balance is good. In contrast, in the example in Figure B.2, the amount of lysine, the first limiting amino acid, determines the total amount of protein that can be synthesized in the body, so the balance is not good.

In the case where all ingredients used for a textured soy protein ingredient are soybeans or soybean-derived ingredients, its amino acid score is theoretically 100. Therefore, analysis, etc. is unnecessary. Analysis, etc. is also unnecessary in the case where plants or plant-derived ingredients (excluding soybeans) are used for a textured soy protein ingredient and its amino acid score can be proved to be 100 by calculation based on the content of each essential amino acid in the ingredients and their blending percentage. However, if none of these cases applies, the amino acid score of a textured soy protein ingredient is obtained from first analyzing the amino acids content in the textured soy protein ingredient by an analytical method using an instrument such as a fully automatic amino acid analyzer or a high-performance liquid chromatograph, and then using the resulting value in the formula (B.1).

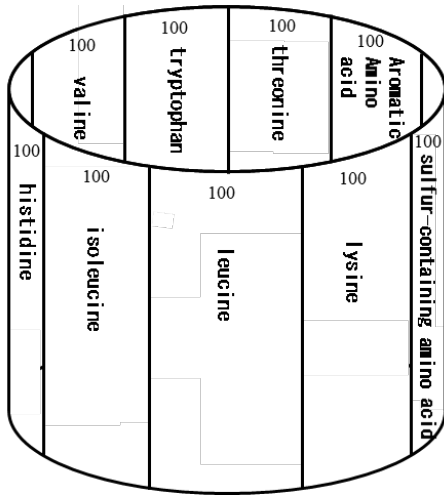


Figure B.1 — Example 1 of an essential amino acid barrel

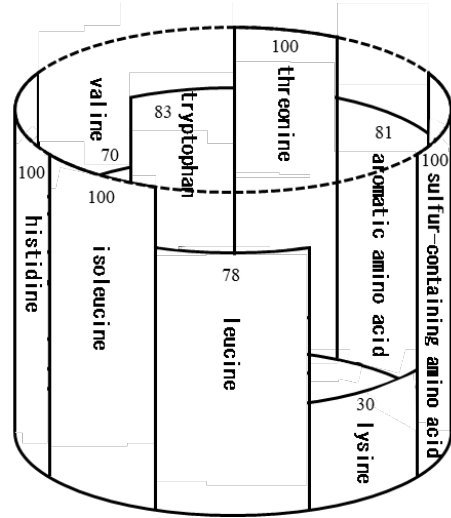


Figure B.2 — Example 2 of an essential amino acid barrel

B.6 Background of determining the reference values for amino acid scores

Table B.2 shows the amount of protein, amino acid score and the first limiting amino acid of major foods.

Table B.2 — Protein, amino acid score and the first limiting amino acid of major foods

Food ^{a)}	The amount of protein per 100 g of edible portion (g) ^{b)}	Amino acid score ^{c)}	first limiting amino acids
Ground beef (beef, ground meat, raw)	17.1	100	-
Ground pork (pork, ground meat, raw)	17.7	100	—
Ground chicken (chicken, secondary item, ground meat, raw)	17.5	100	—
Chum salmon (fish, salmon and trout, chum salmon, raw)	22.3	100	—
Egg (eggs, hen, whole, raw)	12.2	100	—
Milk (liquid milk, whole milk)	3.3	100	—
Soybean (soybeans, mature seeds, whole, yellow seed coats, domestic, raw)	33.8	100	—
Broad bean (broad beans, mature seeds, whole, raw)	26.0	75	Sulfur-containing amino acid
Pea (peas, mature seeds, green seed coats and cotyledons, whole, raw)	21.7	83	Tryptophan
Wheat (common wheat, hard flour, first grade)	11.8	31	lysine
Rice (rice, paddy rice, non-glutinous, well-milled, raw)	5.1	58	lysine
Note ^{a)}	The names of foods in the "Standard Tables of Food Composition in Japan 2020 (8th revision)" are shown in parentheses.		
Note ^{b)}	The amount of protein (g) per 100 g edible portion was quoted from the values published in Chapter 2 of the "Standard Tables of Food Composition in Japan 2020 (8th revision)".		
Note ^{c)}	The amino acid content (mg/gN) of food proteins used for the calculation of the amino acid score was quoted from the values listed in Chapter 2, Table 2, "Table of Amino Acid Composition per 1 g of Standard Nitrogen" of the "Standard Tables of Food Composition in Japan 2020 (8th revision)".		

The amount of protein per 100 g of edible portion of ground beef, ground pork, ground chicken, and chum salmon is 17.1 g to 22.3 g, while the amount protein per 100 g of edible portion of soybeans, broad beans, peas, wheat, and rice, which are often used as plant-derived protein sources, is 33.8 g, 26.0 g, 21.7 g, 11.8 g, and 5.1 g, respectively, in particular, soybeans, broad beans and peas contain a large amount of protein.

In addition, when the amino acid scores of these foods are compared, only soy protein has an amino acid score of 100 among plant-derived proteins, while all animal-derived foods have an amino acid score of 100. However, when protein derived from soybeans is blended with protein derived from broad beans, peas, wheat or rice, and the percentage of the blended protein increases, the amino acid score falls below 100.

In this document, it is important from the viewpoint of appealing to consumers that all essential amino acids can be obtained in a balanced manner for the purpose of proposing to consumers a new way to consume soy protein. Therefore, among textured soy protein products, for textured soy protein food with a

high content of soy protein, a criterion of “using textured soy protein ingredients with an amino acid score of 100” was established. On the other hand, for prepared textured soy protein food, this criterion was not established so that products with an amino acid score of below 100 in textured soy protein ingredients would also be covered by this document.