TOFU STANDARDS

Recommended by the Standards Committee and

Approved by the Board of Directors and members of the

Soyfoods Association of America

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I. PURPOSE OF STANDARDS

To assure that the soyfoods consumer receives high quality products, to promote honesty and fair dealing in the interest of consumers, to help prevent consumer deception, to establish uniformity and fairness in labeling, and to help disseminate sound nutritional information, the Soyfoods Association of America recommends that all manufacturers, distributors, retailers, and other providers of tofu and tofu products comply with the following voluntary standards for such products.

II. GENERAL DESCRIPTION OF TOFU

A. History. Tofu was first developed in China. Popular Chinese tradition (first recorded in~1587 by Li Shih-chen in the Pen-ts'ao kang-mu) attributes the invention of tofu to Liu An, King of Huai-nan, who lived in north China from 179 to 122 B.C. However, exhaustive searches of early Chinese literature by Shinoda (1971) and others indicate that the earliest known written reference to tofu appeared in 950 A.D. in the Ch'ing I Lu (1). In Japan, the earliest *known reference* to tofu appeared in 1185 A.D. (2). Today, tofu is produced extensively throughout East Asia: there are over 29,000 manufacturers in Japan alone (3). Furthermore, tofu is increasingly produced in the Western World. In January 1984 there were 191 commercial tofu manufacturers in the United States, 75 in Western Europe, and 33 in Canada (4) .

B. Terminology. Historically, tofu has been made by a process whereby soybeans are soaked, ground, mixed with water, heated, filtered, coagulated, and formed into cakes. The most widely used English-language term for this product is now "tofu," although it has been called "soybean curd," "bean curd," or "bean cake." The Soyfoods Association of America discourages use of these latter three awkward and unappetizing terms, which are no longer used by most tofu manufacturers in North America. These terms are not used in any of the 40 books on tofu published in the United States since 1974, nor *in* the 12 books *on* tofu published *in* Canada and Europe since 1979 (4). Moreover, in June of 1985 the Library of Congress changed its "Subject Heading" for this product from "Soybean Curd" to "Tofu" (5). Nevertheless, manufacturers may supplement the "tofu" nomenclature with additional explanatory terms if they feel it would benefit potential customers.

C. Types of Tofu. There are four general types of tofu: standard, silken, soy protein derivative and combination.

III. STANDARD TOFU

A. Ingredients. The basic ingredients in Standard Tofu are whole soybeans, one or more food-grade coagulants (typically a salt, such as magnesium chloride or calcium sulfate, or an acid or acid-forming compound, such as glucono delta-lactone), and water.

Additional technical ingredients (except for spices, flavorings, sweeteners, seasonings, or supplemental protein) may be used, e.g., defoamers, preservatives, or various quality improvers, provided that the ingredient is not a food additive or color additive as defined in section 201 (s) or (t) of the Federal Food, Drug, and Cosmetic Act or is a food additive or color additive as so defined and is used in conformity with regulations established pursuant to section 409 or 706 of the Act.

B. Manufacturing Process.

1) Whole soybeans are ground with or without water, and then cooked with water.
2) The resultant soy slurry goes through an optional filtration process to remove all or part of the soy pulp or fiber.
3) The resulting product, now referred to as Soymilk, is then coagulated to form curds and whey.
4) Whey is then removed before and/or while the curds are pressed.
5) The finished pressed curds may now be referred to as Tofu.

C. Designation According to Consistency and Protein Content*. Standard tofu is divided into four consistencies: soft, regular, firm, and extra firm. These consistencies are classified by the protein content of the tofu immediately after pressing (7). The AOAC method for determining protein content should be used, unless another method is required by the state in which the tofu is made or sold.

1) "Soft Tofu" generally contains from 5.0 to 6.4$ protein.

2) "Regular Tofu", generally contains 6.5 to 9.4$ protein.

3) "Firm Tofu" generally contains 9.5 to 13.9$ protein.

4) "Extra Firm Tofu" generally contains 14$ or more protein.

The Association recognizes that the designations here are guidelines and some manufacturers' products may vary slightly.

Table 1. Representative Composition of Major Tofu Varieties

Variety of Tofu	Food Energy Kcal/100 gm	Moisture 8	Protein ' 8	Fat $	Carbos. Ratio (w/fib r)	Prot/Fat
Soft Tofu	63	88.0	6.0	3.5	1.9	1.7
Tofu	79	84.9	7.8	4.3	2.3	1.9
Firm Tofu	102	79.3	10.6	5.3	2.9	2.0
Extra Firm Silken Tofu*	115	79.3	14.0	5.3	2.9	

* Since "silken" refers primarily to a process for making tofu (see section 4B), all major tofu varieties may be manufactured using that process (soft, firm, etc.), and in each case should meet the representative compositions described in this table for that particular variety.

Sources: 3,7,8 (Calories by computation)

D. Terms Associated with Making Tofu.

1) Tofu is typically sold in "cakes," not "blocks."

2) A "coagulant" (the correct technical term) or "curding agent" (a good popular term) is used to coagulate the proteins in soymilk. It is preferable not to use terms such as "solidifier" or "to precipitate."

3) The major commercial tofu coagulants are nigari, magnesium choloride, calcium sulfate, calcium chloride, and glucono delta-lactone. Ni ari (a Japanese term, whose English equivalent is "bittern") is the major traditional tofu coagulant in Japan and coastal China. Derived from sea salt or sea water, it is composed primarily of magnesium chloride, but in its unrefined form contains many of the other constituents of sea water. Magnesium chloride is refined nigari. Calcium sulfate (the dihydrate form, also correctly called gypsum) has been used in China since ancient times. It produces tofu containing more than 3.5 times as much dietary calcium as that made with nigari. Calcium chloride yields a tofu that closely resembles that made with nigari but contains much more calcium. Glucono delta-lactone, first used in tofu in Japan during the 1960s, is useful primarily in making varieties of silken tofu. A fine, white crystalline powder prepared by fermenting corn starch, it is widely used by the food industry as an acidulant in baking powders and as a coagulant and pH-lowering agent in dairy puddings and cottage cheeses. Lemon juice and vinegar are sometimes used to make tofu at home.

4) A "forming box" is the container in which the tofu curds are formed.

5) A "filter bag" or "pressing sack" is the bag with which the soymilk is filtered.

6) "Fresh soy puree" (go in Japanese) is made by grinding soaked soybeans. When water is added, this becomes "soy slurry."

IV. SILKEN TOFU

A. Ingredients. The basic ingredients in Silken Tofu are whole soybeans, one or more food-grade coagulants (typically a salt, such as magnesium chloride or calcium sulfate, or an acid or acid-forming compound, such as glucono delta-lactone), and water.

Additional technical ingredients (except for spices, flavorings, sweeteners, seasonings, or supplemental protein) may be used, e.g., defoamers, preservatives, or various quality improvers, provided that the ingredient is not a food additive or color additive as defined in section 201 (s) or (t) or the Federal Food, Drug, and Cosmetic Act or is a food additive or color additive as so defined and is used in conformity with regulations established pursuant to section 409 or 706 of the Act.

B. Manufacturing Process.

1) **Whole soybeans are ground with or without water, then cooked with water.**
2) **The resultant soy slurry goes through an optional filtration process to remove all or part of the soy pulp or fiber.**
3) **The resulting product, now referred to as soymilk, is then coagulated to form curds. Whey may or may not be present.**
4) **The process of making silken tofu generally includes forming the product in a container (which may be the same container in which it is sold).**

C. Designation According to Consistency and Protein Content Refer to Table 1 on page 6.

V. SOY PROTEIN DERIVATIVE TOFU

A. Ingredients. The basic ingredients in Soy Protein Derivative Tofu are a protein-rich soybean derivative, unhydrogenated vegetable oil, carbohydrates (if needed), one or more food-grade coagulants, and water.

Additional technical ingredients (except for spices, flavoring, or seasonings) maybe used, e.g. defoamers, preservatives or various quality-improvers, provided that the ingredient is not a food additive or color additive as defined in section 201 (s) or (t) of the Federal Food, Drug, and Cosmetic Act or is a food additive or color additive as so defined and is used in conformity with regulations established pursuant to section 409 or 706 of the Act.

B. Manufacturing Process.

1) The ingredients are dissolved or suspended in water to form a slurry, which may be cooked.
2) The resultant slurry goes through an optional filtration process to remove all or part of any soy pulp or fiber.
3) The resulting product is then coagulated.
4) If whey is present, it may or may not be removed.
5) The resulting product is Soy Protein Derivative Tofu.

C. Designation According _to Consistency and Protein Content*. Soy Protein Derivative Tofu may exist in any of four consistencies: soft, regular, firm, and extra firm in accordance with III C. The AOAC method for determining protein content should be used, unless another method is required by the state in which the tofu is made or sold.

1) "Soft" generally contains from 5.0$ up to 6.4$ protein.

2) "Regular" generally contains 6.5 to 9.4$ protein.

3) "Firm" generally contains 9.5 to 13.9$ protein.

4) "Extra Firm" generally contains 14$ or more protein.

The Association recognizes that the designations here are guidelines and some manufacturers' products may vary slightly.

D. Equivalence. The product must be organoleptically equivalent to Standard or Silken Tofu. In accordance with FDA regulation 21 CFR 101.3 (e), the product either must be nutritionally and compositionally equivalent to standard or silken tofu, or it must be labeled as an imitation of standard or silken tofu.

VI. COMBINATION TOFU

A. Ingredients. The basic ingredients in Combination Tofu are whole soybeans, a protein-rich soybean derivative, one or more food-grade coagulants (typically a salt, such as magnesium chloride or calcium sulfate, or an acid or acid-forming compound, such as glucono delta lactone), and water.

Additional technical ingredients (except for spices, flavoring, and seasonings) may be used, e.g. defoamers, preservatives or various quality-improvers, provided that the ingredient is not a food additive or color additive as defined in section 201 (s) or (t) of the Federal Food, Drug, and Cosmetic Act or is a food additive or color additive as so defined and is used in conformity with regulations established pursuant to section 409 or 706 of the Act.

B. Manufacturing Process. Combination Tofu is manufactured using any of the processes discussed in IIIB, IVB, and/or VB.

C. Designation According to Consistency and Protein Content. Combination Tofu may exist in any of four consistencies: soft, regular, firm, and extra firm in accordance with III C. The AOAC method for determining protein content should be used, unless another method is required by the state in which the tofu is made or sold.

1) "Soft" generally contains from 5.0% to 6.4% protein.

2) "Regular" generally contains 6.5 to 9.9% protein.

3) "Firm" generally contains 10.0 to 13.9% protein.

4) "Extra Firm" generally contains 14$ or more protein.

* The Association recognizes that the designations here are guidelines and some manufacturers' products may vary slightly.

D. Equivalence. The product must be organoleptically equivalent to Standard or Silken Tofu. In accordance with FDA regulation 21 CFR 101.3 (e), the product either must be nutritionally and compositionally equivalent to the standard or silken tofu, or it must be labeled as an imitation of standard or silken tofu.

VII. TOFU PRODUCTS

A. General Description. Tofu Products are either 1) products that contain 50$ or more tofu by weight, or 2) tofus with additional ingredients, including spices, flavorings, sweeteners, or seasonings.

B. Established Varieties. The following are examples of established varieties of Tofu Products:

1. Deep-fried Tofu

2. Deep-Fried Tofu Pouches

3. Tofu Burgers/Tofu Balls/Tofu Frankfurters

4. Grilled Tofu

C. Tofu With Added Ingredients. This is a food where various ingredients not normally present in one of the types of products described in III through VI above (such as spices, flavoring, sweeteners, or seasonings) are mixed with a soy protein-rich liquid before or after such liquid is coagulated and formed. In either case, the soy protein-rich liquid must constitute at least 60$ of the total product by weight, all of the soy protein must be coagulated, and the product, excluding the added spices,' flavorings, sweeteners, and seasonings, or other ingredients approximates in composition one of the four consistencies set forth in Table 1.

VIII. PRODUCTS CONTAINING TOFU

A. Product Description. These are products which contain less than 50$ tofu by weight.

If the word "tofu," "tof...," or some variation of the word "tofu" appears in the name of the product (in a form such as "tofu chocolate parfait," "tofu lasagna," or "Tofrostie") the product must contain at least the following percentage of tofu by weight for the appropriate food category:

25$ Tofu salads, dips, or spreads or cheese analogs) that do not qualify as a Tofu Product.

20$ Dressings, quiches, "cheesecakes," blended puddings, parfaits or mousses.

15$ Non-dairy frozen desserts, prepared entrees, sandwiches, baked goods, soups.

In the alternative, tofu should be substituted for all of a product's typical protein source (e.g. for all of the cheese and/or meat in lasagna).

B. Reconstituted Tofu. When the word "tofu" is used to describe a product that is used as an ingredient, and is made by reconstituting dried tofu, the protein content of the reconstituted tofu must be at least 6.5$ (as in Standard Tofu).

IX MICROBIOLOGICAL GUIDELINES

A. Microbiological Standards. Tofu is a perishable product. Various methods may be used to guard against spoilage and inferior product quality. These methods include, without limitation: sa nitary production procedures, pasteurization, rapid cooling of the product after cooking or pasteurization, storage between 34* and 45* F, and vacuum and aseptic packaging.

The Soyfoods Association of America's Tofu Standards Committee will conduct a series of tests to determine final recommended microbiological guidelines for tofu manufactured or sold in the United States. Until these tests are completed, the Soyfoods Association endorses the following guidelines:

1. None of the following bacteria shall be present in the product: Staphylococcus aureus, Salmonella, enteropathogenic Escherichia coli, Vibrio parahemolyticus, Yersinia enterocolitica.

2. The per gram standard plate count on products shall be consistent with the following chart:

	Coliforms per gram	Standard plate count/gram
At the plant, on the day of production, at 40*F (4.4*C)	less than 10	less than 2000
At the time the tofu is sold:		
a. Excellent product with no sourness	less than 10	less than 100,000
b. Acceptable product	11 to 500	100,001 to 1 million
c. Marginal product	501 to 1,000	above 1 million to 5 million
d. Unacceptable product; sour and probably contaminated: should not be sold	above 1,000	above 5 million

The Soyfoods Association recognizes that tofu manufacturers have little or no control over the refrigeration or handling of their product once it leaves their manufacturing facility. Date of sale microbiological guidelines are intended to assist manufacturers in developing appropriate use date information.

B. Retail Sale of Bulk Products. The Soyfoods Association discourages the retail sale of tofu in open containers

X. GENERAL LABELING AND ADVERTISING REQUIREMENTS

A. General. Tofu products shall be labeled in compliance with all applicable state and federal laws, including the labeling requirements of the Federal Food, Drug, and Cosmetic Act, the Fair Packaging and Labeling Act, and FDA regulations.

B. Statement of Identity.The principal display panel of each retail package of tofu shall bear an informative statement of identity that is truthful and not misleading. For purposes of these standards, the statement of identity shall include:

1. The word "tofu," and

2. the term "soft," "regular," "firm," or "extra firm," as appropriate.

Elements of the statement of identity shall appear together on the principal display panel, in easily legible boldface print or type in distinct contrast to other written, printed or graphic matter, and in a height not less than the larger of the fol lowing alternatives:

1. Not less than one-sixteenth inch in height on packages having a principal display panel with an area of 5 square inches or less, and not less than oneeighth inch in height if the area of the principal display panel is greater than 5 square inches; or

2. Not less than 50$ of the height of the largest type used in the word "tofu," or any fanciful term incorporating the word "tof..."

C. Use Date Labeling. Nonfrozen tofu or tofu products shall bear a prominent statement of the date by which the product should be used, e.g., "Use by [month/day] " or "Best When Used by [month/day]." Use dates should be determined in accordance with the microbiological standards for acceptable product, set forth in these standards. All shelf life claims must be verified by objective laboratory tests.

Frozen products shall bear a production code date and may bear a use date.

D. Refrigeration Information Labeling. Tofu that is not heat sterilized and aseptically packaged may be labeled "fresh," and shall bear on the principal display panel and in boldface type the declaration "PERISHABLE, KEEP REFRIGERATED."

Tofu that is heat sterilized and aseptically packaged may not be labeled "fresh," need not include any refrigeration instructions, and shall include with directions for use, in boldface type, the statement "DISCARD IF PACKAGE IS BLOATED OR BROKEN."

E. Bulk Products. Each bulk container of tofu, whether sold for retail or to a food processor, shall bear prominently the statement of identity, ingredient information, use date information, and refrigeration information described above.

F. Pasteurized Tofu. For tofu to be labeled as "pasteurized," it shall be heated in properly operated equipment to one of the temperatures specified in Table 2 on page 16 and held continuously at or above that temperature for the specified time.

All temperature and time determinations must be based on core temperature readings. Labeling of a product as "pasteurized" is optional.

G. Ingredient Labeling. The Soyfoods Association of America recommends that when tofu is used as an ingredient in a food product, the declaration of ingredients for that food product identify the type of tofu as set forth above in these standards (i.e. tofu, silken tofu, soy protein derivative tofu, or combination tofu), followed in parentheses by a list of all of the ingredients in that tofu, in descending order of predominance by weight, in accordance with FDA regulations 21 CFR 101.4 (b) (2) (i).

H. Substantiation of Advertising Claims. All advertisements for tofu that make objective claims about the properties or benefits of the product should be properly substantiated. Substantiation for all such claims should be in the advertiser's possession before the claims are disseminated to the public.

XI. TOFU STANDARDS COMMITTEE= ADOPTION AND AMENDMENT OF STANDARDS

A. Committee Composition. The Tofu Standards Committee shall consist of at least nine (9) voting members, at least five (5) of whom shall be manufacturers of tofu, and at least two (2) of whom shall be manufacturers of Tofu Products or Products Containing Tofu.

Initially, the President of the Association, with the advice and consent of the Board of Directors, shall appoint a Committee Chairman and ten (10) voting members: five (5) members to serve for a term of one (1) year and five (5) members plus the chairman to serve for a term of two (2) years. Thereafter, the President, with the advice and consent of the Board of Directors, shall appoint a Committee Chairman, the Committee Chairman will appoint persons to fill vacant committee seats, and all terms will be for two (2) years. Voting committee members must be members of the Soyfoods Association, and the Chairman will endeavor to recruit interested and knowledgeable people from a variety of relevant fields, including food technology and nutrition.

B. Amendment of Standards. Amendments to these standards may be initiated by any Committee member or the President of the Association. Amendments shall be adopted by a two-thirds affirmative vote of the committee and by a majority vote of the Board of Directors of the Soyfoods Association.

%II. DEFINITION OF TERMS

A. Principal display panel shall have the same meaning as that set forth in FDA Regulation 21 CFR 101.1, and shall mean that part of the packaged food label that is most 1 ikely to be displayed, presented, shown, or examined under customary conditions of display for retail sale.

B. Protein-rich soybean derivative as used in these standards shall mean protein-rich ingredients derived from whole soybeans through a process other than the manufacture of whole soy flour, or through a process other than or in addition to the process used for the manufacture of soymilk as that term is defined below. Protein rich soybean derivative shall include, without limitation: defatted soyflour, flakes, or meal: soy protein concentrates= and soy protein isolates or isolated soy proteins.

C. Soymilk as used in these standards shall mean the protein-rich liquid obtained through either of the following two processes:

1) **Soaking and grinding whole soybeans with water, cooking the resultant slurry, and filtering all or part of the soy pulp or fiber from the cooked liquid;**

2) **Hydrating whole, non-defatted soy flour, cooking the resultant slurry, and filtering all or part of the soy pulp or fiber, if any, from the cooked liquid.**

D. Protein-rich soybean derivative liquid as used in these standards shall mean the protein-rich liquid made with protein-rich soybean derivatives, unhydrogenated vegetable oil, and carbohydrates. The protein rich liquid must have approximately the same oil, carbohydrate, and nutrient profile as soymilk. At least 20$ of the calories must come from oil/fat, and the oil must be properly homogenized to ensure uniform incorporation into the liquid.

E. Soy protein rich 1 iquid may be either C, D, or a combination thereof.

XIII. REFERENCES

1. Cited in: Shinoda, Osamu. 1971. Tofu-ko ("Thoughts on Tofu"). Sekai. p. 30-37. Translated in: Shurtleff, W. and Aoyagi, A. 1983. History of Tofu. Lafayette, CA: The Soyfoods Center. p. 10.

2. Shinoda 1971; and Shurtleff and Aoyagi 1983, p. 22-23.

3. Shurtleff, W. and Aoyagi, A. 1979. The Book of Tofu. New York: Ballantine Books. p. vii; and Shurtleff and Aoyagi 1983, p. 38-44.

4. Shurtleff, W. and Aoyagi, A. 1984. Soyfoods Industry and Market: Directory and Databook 1984. Lafayette, CA: The Soyfoods Center. p. 5-9, 55.

5. Letter to William Shurtleff of the Soyfoods Center from the Library of Congress.

6. Shurtleff, W. and Aoyagi, A. 1984. Soyfoods Industry and Market. p. 63-64.

7. Based on the standard nutrient composition tables for East Asia (see 8. below) and samplings of various commercial United States tofu products.

8. Norinsho. 1964. Nihon Shokuhin Hyojun Seibunhyo (Food Composition Tables for Japan) Tokyo: Ishiyaku Shuppan K.K. 180 p. or Joshi Eiyo Daigaku Shuppan-bu. 145 p. Slightly revised in 1969, 1976. Or, most recently, Standard Tables of Food Composition in Japan, 4th ed., 1982. Science and Technology Bureau. See also the following:

Watt, B.K. and Merrill, A.L. 1963. Composition of Foods. USDA Food Economics Research Div., Agriculture Handbook No. 8. p. 58-59.

Leung, W.T. et al. 1972. Food Composition Table for Use in East Asia. U.S. Dept. of Health, Education, and Welfare, and Food and Agriculture Organization of the United Nations. p. 18-21.

SIGNIFICANT FOOD PROTECTION AND SANITATION TEMPERATURES

oC	of				
	Temperature.				
	240	CANNING ZONE			
	220				
100	212	212			
	210				
	200	COOKING ZONE			
	180				
	165	161 Milk Pasteurization		180	
74	160	. HT ST -- 15 Sec.			Sanitizing
				170	
60	140	140			
	120				
	100	ZONE OF RAPID			
	80	BACTERIAL			
	60	GROWTH			
7.2	45		45 Maximum cold		
	40		food_temperature		
		COOLING ZONE			
	32	32			
	20				
		FREEZING ZONE			
-17.8	0		0 Frozen food storage		

TEMPERATURES NOT TO SCALE