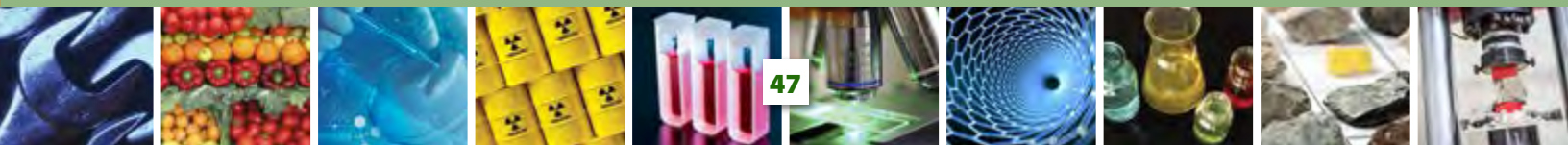


# Standard Reference Materials for Chemical Composition

## Food & Agriculture



# Chemical Composition

## Food & Agriculture

### Foods and Beverages - Macro and Micronutrients

These SRMs are for validation of analytical procedures and calibration of apparatus used in the analysis of trace elements and other analytes in foods and related products.

SRM	Description	Unit of Issue
1546a	Meat Homogenate	4 cans x 85 g
1548b	Typical Diet	2 x 5 g
1549a	Whole Milk Powder	5 pouches x 10 g each
1566b	Oyster Tissue	25 g
1567b	Wheat Flour	50 g
1568b	Rice Flour	50 g
1570a	Trace Elements in Spinach Leaves	60 g
1577c	Bovine Liver	20 g
1845a	Whole Egg Powder	5 pouches x 10 g each
1849a	Infant/Adult Nutritional Formula I (milk-based)	10 pouches x 10 g each
1869	Infant/Adult Nutritional Formula II (milk/whey/soy-based)	10 pouches x 10 g each
1946	Lake Superior Fish Tissue	5 x 7-9 grams
1947	Lake Michigan Fish Tissue	5 x 8 grams
2383a	Baby Food Composite	4 x 70 g
2384	Baking Chocolate	5 x 91 g
2385	Slurried Spinach	4 x 70 g
2386	Avocado Powder	5 x 10 g

SRM	Description	Unit of Issue
2387	Peanut Butter	3 x 170 g
3035	Arsenic Species in Apple Juice	5 x 1.5 mL
3233	Fortified Breakfast Cereal	60 g each
3234	Soy Flour	50 g
3235	Soy Milk	10 x 10 mL
3252	Protein Drink Mix	5 pouches x 10 g each
3253	Yerba Mate Leaves	2 x 10 g
3254	Green Tea ( <i>Camellia sinensis</i> ) Leaves	5 x 3 g
3255	Green Tea ( <i>Camellia sinensis</i> ) Extract	5 x 1 g
3281	Cranberry (Fruit)	5 x 6 g
3282	Low-Calorie Cranberry Juice Cocktail	5 x 1.2 mL
3287	Blueberry (Fruit)	5 pouches x 5 g each
3290	Dry Cat Food	5 pouches x 10 g each
3530	Iodized Table Salt (Iodide)	1 bottle x 200 g
8256	Wild-caught Coho Salmon	2 jars, 6 g to 8 g
8257	Aquacultured Coho Salmon	2 jars, 6 g to 8 g
8258	Wild-caught Shrimp	2 jars, 6 g to 8 g
8259	Aquacultured Shrimp	2 jars, 6 g to 8 g
8260	Infant Nutritional Formula (hydrolyzed milk-based)	400 g
8261	Adult Nutritional Formula (high-protein)	400 g

See [Table 110.1](#) on the website for more information.







# Food & Agriculture

## Foods and Beverages - Other Components of Potential Interest

These SRMs are for validation of analytical procedures and calibration of apparatus used in the analysis of trace elements and other analytes in foods and related products.

SRM	Description	Unit of Issue
1548b	Typical Diet	2 x 5 g
1565	Mycotoxins in Corn	2 x 60 g
1566b	Oyster Tissue	25 g
1849a	Infant/Adult Nutritional Formula I (milk-based)	10 pouches x 10 g each
1869	Infant/Adult Nutritional Formula II (milk/whey/soy-based)	10 pouches x 10 g each
1946	Lake Superior Fish Tissue	5 x 7-9 grams
1947	Lake Michigan Fish Tissue	5 x 8 grams
2386	Avocado Powder	5 x 10 g
2387	Peanut Butter	3 x 170 g
3233	Fortified Breakfast Cereal	60 g each
3234	Soy Flour	50 g
3235	Soy Milk	10 x 10 mL
3253	Yerba Mate Leaves	2 x 10 g
3254	Green Tea ( <i>Camellia sinensis</i> ) Leaves	5 x 3 g
3255	Green Tea ( <i>Camellia sinensis</i> ) Extract	5 x 1 g

See [Table 110.1](#) on the website for more information.

## Wheat Hardness (kernel form)

This RM is intended primarily for calibrating instruments used to determine the hardness of bulk or single kernel wheat. RM 8441a was prepared and analyzed by the Federal Grain Inspection Service program, Grain Inspection Packers and Stockyards Administration of the United States Department of Agriculture.

SRM	Description	Unit of Issue
8441a	Wheat Hardness (kernel form)	set (50)

See [Table 110.6](#) on the website for more information.

## Food Contaminants and Allergens

SRM	Description	Unit of Issue
1566b	Oyster Tissue	25 g
1946	Lake Superior Fish Tissue	5 x 7-9 g
1947	Lake Michigan Fish Tissue	5 x 8 g
1953	Organic Contaminants in Non-Fortified Human Milk	5 x 5 mL
1954	Organic Contaminants in Fortified Human Milk	5 x 5 mL
2387	Peanut Butter	3 x 170 g
3256	Green Tea-Containing Solid Oral Dosage Form	5 x 2.5 g
8238	Glyphosphate in Oat Flour (High Level)	100 g
8239	Glyphosphate in Oat Flour (Low Level)	100 g
8404	Almond Flour for Allergen Detection	3 x 170 g
8405	Hazelnut Flour for Allergen Detection	5 x 8 g
8642a	FDA Saxitoxin Dihydrochloride Solution	5 x 1.2 mL

See [Table 110.2](#) on the website for more information.

## Agricultural Materials (powder form)

SRM	Description	Unit of Issue
1515	Apple Leaves	50 g
1547	Peach Leaves	50 g
1570a	Trace Elements in Spinach Leaves	60 g
1573a	Tomato Leaves	50 g
1575a	Trace Elements in Pine Needles ( <i>Pinus taeda</i> )	50 g

See [Table 110.4](#) on the website for more information.

## Food & Agriculture

### Fertilizers (powder form)

These SRMs are intended for use in the fertilizer industry as working standards.

SRM	Description	Unit of Issue
120c	Phosphate Rock (Florida)	90 g
193	Potassium Nitrate	90 g
194a	Ammonium Dihydrogen Phosphate	90 g
200b	Potassium Dihydrogen Phosphate (Fertilizer Standard)	90 g
694	Phosphate Rock, Western	90 g
695	Trace Elements in Multi-Nutrient Fertilizer	70 g
2429	Flue Gas Desulfurization Gypsum	200 g

See [Table 110.5](#) on the website for more information.

### Tobacco-Related Materials

SRM	Description	Unit of Issue
3222	Cigarette Tobacco Filler	20 x 10 g

See [Table 110.10](#) on the website for more information.

### Dietary Supplement Materials (includes nutraceuticals and herbs)

SRM	Description	Unit of Issue
3232	Kelp Powder ( <i>Thallus laminariae</i> )	3 x 5 g
3235	Soy Milk	10 x 10 mL
3246	<i>Ginkgo biloba</i> (Leaves)	5 x 3 g
3247	<i>Ginkgo biloba</i> (Extract)	5 x 1 g
3248	Ginkgo-Containing Tablets	5 x 1 g
3250	Saw Palmetto ( <i>Serenoa repens</i> ) Fruit	5 x 6 g
3251	Saw Palmetto ( <i>Serenoa repens</i> ) Extract	5 x 1 mL
3254	Green Tea ( <i>Camellia sinensis</i> ) Leaves	5 x 3 g
3255	Green Tea ( <i>Camellia sinensis</i> ) Extract	5 x 1 g
3256	Green Tea-Containing Solid Oral Dosage Form	5 x 2.5 g

SRM	Description	Unit of Issue
3262	St. John's Wort ( <i>Hypericum perforatum</i> L.) Aerial Parts	5 x 3.3 g
3268	Kudzu ( <i>Pueraria montana</i> var. <i>lobata</i> ) Extract	5 x 1 g
3275	Omega-3 and Omega-6 Fatty Acids in Fish Oil	3 ea 2 x 1.2 mL
3279	Chromium Dietary Supplement	5 x 6 g
3281	Cranberry (Fruit)	5 x 6 g
3282	Low-Calorie Cranberry Juice Cocktail	5 x 1.2 mL
3283	Cranberry Extract	5 x 2.5 g
3284	Cranberry-Containing Solid Oral Dosage Form	5 x 2.5 g
3285	Mixed-Berry Containing Solid Oral Dosage Form	5 x 2.5 g
3289	Multivitamin Tablets	30 x 5 bottles
3291	Bilberry Extract	5 x 1 g
3294	Multielement Tablets	30 x 5 bottles
3299	Ground Turmeric ( <i>Curcuma longa</i> L.) Rhizome	5 x 3 g
3300	Curcumin Extract of Turmeric ( <i>Curcuma longa</i> L.) Rhizome	5 x 1 g
3384	Ground Asian Ginseng ( <i>Panax ginseng</i> C.A. Meyer) Rhizome	5 x 3 g
3385	Asian Ginseng ( <i>Panax ginseng</i> ) Extract	5 x 1 g
3389	Ginsenosides Calibration Solutions	5 x 1 mL
3398	Ginger ( <i>Zingiber officinale</i> ) Rhizome	5 x 1.6 g
3530	Iodized Table Salt ( <i>Iodide</i> )	1 x 200 g
8037	Krill Oil	3 x 4.5 mL
8183	Omega-3 and Omega-6 Fatty Acids in Botanical Oils	4 x 1.2 mL
8186	Soy Protein Isolate	5 x 10 g
8187	Soy Protein Concentrate	5 x 10 g
8188	Soy-Containing Solid Oral Dosage Form	5 x 2.6 g
8650	Ground Kudzu ( <i>Pueraria montana</i> var. <i>lobata</i> ) Rhizome	5 x 3 g
8644	Ginseng-Containing Solid Oral Dosage Form	5 x 2.6 g
8666	Ginger ( <i>Zingiber officinale</i> ) Extract	5 x 3 g

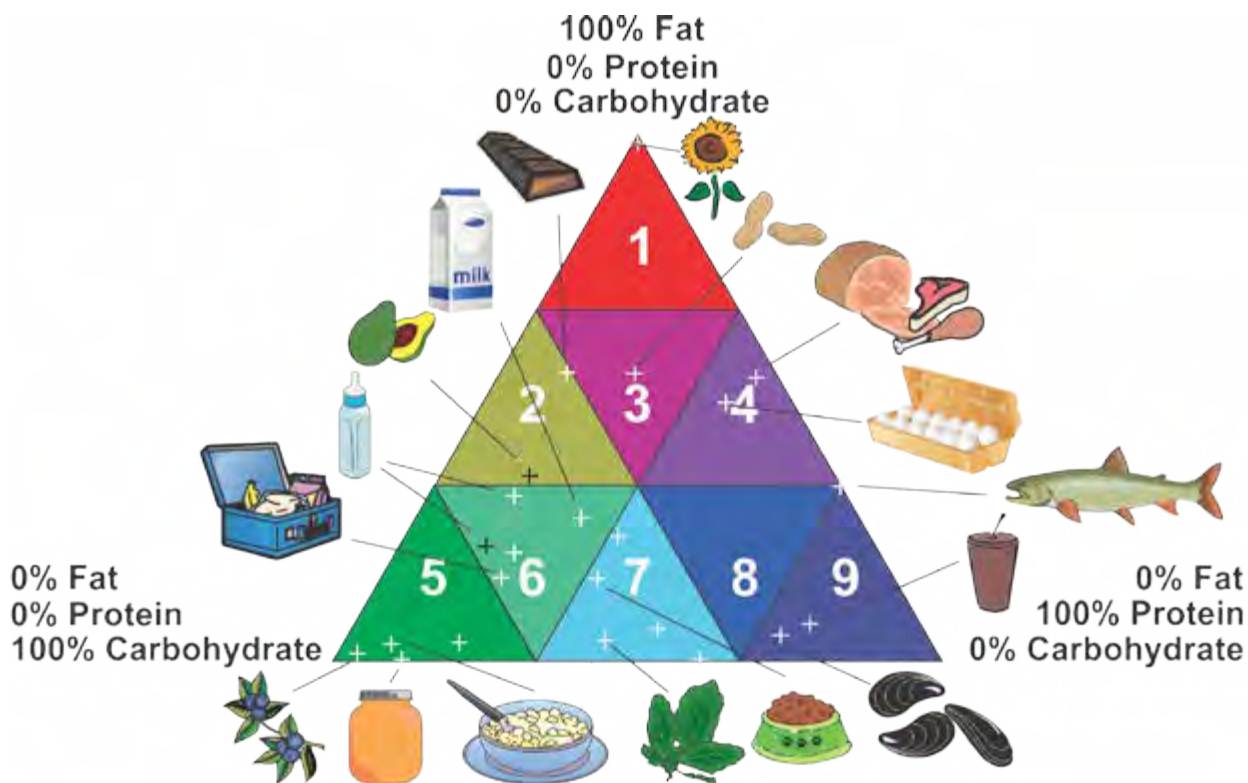
See [Table 110.9](#) on the website for more information.





## Food & Agriculture

### Distribution of SRMs in the AOAC Food Triangle



NIST classifies food-matrix SRMs based on fat, protein, and carbohydrate content using a triangle developed by AOAC INTERNATIONAL<sup>1</sup>, based on the supposition that foods (and thus reference materials) within each sector will have similar properties and therefore will pose similar challenges in determination of the same nutrient. Preparation of food-matrix SRMs has been based on the distribution of foods from a typical US diet in the AOAC triangle, with a majority of common foods and SRMs categorized in sectors 5 and 6 (e.g., fruits, vegetables, cereals, and grains). Conversely, only a small fraction of foods and SRMs are categorized in sectors 1 through 4 (higher-fat foods like meats and nuts). Additional materials are also prepared based on suggestions from user communities.

- |   |   |   |   |
|---|---|---|---|
| 1 | SRM 1588c Organics in Fish Oil<br>SRM 3275 Fatty Acids in Fish Oils   | 6 | SRM 1548b Typical Diet<br>SRM 1549a Whole Milk Powder<br>SRM 1849a Infant/Adult Nutritional Formula                               |
| 2 | SRM 2384 Baking Chocolate<br>SRM 2386 Avocado Powder  | 7 | SRM 1566b Oyster Tissue<br>SRM 2385 Slurried Spinach<br>SRM 3234 Soy Flour<br>SRM 3290 Dry Cat Food                               |
| 3 | SRM 2387 Peanut Butter  | 9 | SRM 1946 Lake Superior Fish Tissue<br>SRM 1947 Lake Michigan Fish Tissue<br>SRM 2974a Mussel Tissue<br>SRM 3252 Protein Drink Mix |
| 4 | SRM 1546a Meat Homogenate<br>SRM 1845a Whole Egg Powder   |   |   |
| 5 | SRM 1568b Rice Flour<br>SRM 2383a Baby Food Composite<br>SRM 3233 Fortified Breakfast Cereal<br>SRM 3287 Blueberries<br>SRM 1869 Infant/Adult Nutritional Formula |   |   |

<sup>1</sup> W.R. Wolf, K.W. Andrews (1995) *Fresenius J. Anal Chem* 352:73-76.





## RM 8404 Almond Flour for Allergen Detection and RM 8405 Hazelnut Flour for Allergen Detection

Food allergies affect millions of Americans every year. Though medications can treat allergy symptoms, preventative measures such as accurate food labeling and stopping cross-contact with potential allergens during food preparation can help ensure people are not exposed to foods that might cause an allergic reaction.

To support these preventative measures, researchers from the National Institute of Standards and Technology (NIST) have developed tree nut reference materials — hazelnut and almond flours — that will help ensure accurate and consistent results for test kits that regulators and food manufacturers can use to detect tree nut allergens.

“The main purpose of these test kits is to ensure that a food product hasn’t unintentionally come into contact with allergens while it was being made,” said NIST chemist Melissa Phillips. In contrast with the more advanced regulatory tools for wheat and gluten, “there isn’t a test to say if something is hazelnut free,” she said. “Promoting awareness of cross-contact is the perspective we’re coming from with these reference materials.”

The U.S. Food and Drug Administration (FDA) regulates and provides guidance on assessing and managing allergens in food. Currently, the FDA recognizes eight food allergens: milk, eggs, fish, shellfish, soybeans, wheat, peanuts, and tree nuts. A law was signed last year that declared sesame as the ninth food allergen, but the addition will not become effective until the beginning of 2023.

Tree nut allergies affect an estimated 0.5% to 1% of the total U.S. population. As the name implies, tree nuts come from trees that produce walnuts, hazelnuts, almonds, pistachios, pecans, cashews, Brazil nuts, and other common nuts.

Symptoms of tree nut or other food allergies can range from mild, such as breaking out in hives, to severe, including sudden drops in blood pressure, breathing difficulties and even death. The root causes of food allergies are often unknown, but the allergic reaction itself is caused when the body’s immune system responds to proteins in that food. [NIST’s Food Protein Allergen Program](#) crafted the first tree nut reference materials with numerous end users in mind, ranging from individual food scientists and test kit manufacturers to entire research organizations such as the Association of Official Analytical Collaboration (AOAC) International, which hosts a Gluten and Food Allergens Program for many different groups, some of which provided input and feedback on these reference materials. “The reference materials support agreement of results within the food allergen community for tree nut detection,” said NIST chemist Ashley Beasley Green.

Current food packaging typically includes statements such as “contains milk” or “contains nut products” instead of listing how much of an allergen protein is present. To take the reporting of food allergens to the next level, the NIST program aims to support measurements of how much of a specific allergen protein is present, for example X amount of a specific almond protein. Knowing which specific proteins are present in a food can help physicians better understand and diagnose food allergies.

With the instruments and standards available now, determining the total amount of proteins by measuring each individual protein would be prohibitively time-consuming and expensive, so NIST researchers took an indirect approach that provided reasonable levels of accuracy. They worked with collaborators to measure the mass fraction of nitrogen atoms in the sample, which relates to how much of the hazelnut or almond proteins are in the sample. Researchers also confirmed that all of the proteins were from a single food source, and there was no cross-contact. Among other uses, the materials could help test kit manufacturers measure the total number of hazelnut and almond protein allergens in different food products and even compare their amounts.

Each reference material consists of a small pouch of five grams of the almond or hazelnut flour, with five pouches in a box. To produce them, researchers bought almond and hazelnut flour from different local stores and then tested it to ensure it did not have cross-contact with other tree nuts or contain other common allergens such as peanut and soy, said NIST chemist David Bunk.

Such cross-contact can frequently occur during the harvesting of tree nuts and at production plants through the use of shared equipment. For example, farmers could use the same agricultural equipment to harvest hazelnuts as they would pistachios, or a manufacturer could fail to properly clean equipment between making different types of flour.

The researchers worked with a company to properly package the reference material without creating additional risks of cross-contact. They then sent the materials to test kit developers who conducted their own tests on the reference materials, compared their results against a NIST-provided analysis, and provided feedback on their results and the tests they used. This feedback process helped NIST validate its own process and ensure the quality of the final product.

**RM 8404 Almond Flour for Allergen Detection and RM 8405 Hazelnut Flour for Allergen Detection** are available at NIST.

Organizations wishing to purchase the reference materials can visit the [NIST Standard Reference Materials page](#).