

GRAS Flavoring Substances 31

31. GRAS Flavoring Substances. This list of substances will appear in the 31st publication authored by the Expert Panel of the Flavor and Extract Manufacturers Association on recent progress in the consideration of flavoring ingredients “generally recognized as safe” (GRAS) under conditions of their intended use in food flavorings in accordance with the 1958 Food Additives Amendment to the Federal Food, Drug and Cosmetic Act. For more information on FEMA GRAS see “About the FEMA GRAS Program” on the FEMA website.

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The Expert Panel of the Flavor and Extract Manufacturers Association of the United States (FEMA) has evaluated substances for GRAS status under their conditions of intended use as flavoring substances since the early 1960s. The regulations of the U.S. Food and Drug Administration (FDA), and U.S. law, require that determinations that flavor substances and other food ingredients are “generally recognized as safe” (GRAS) be done in such a way that all information related to GRAS determinations is publicly available. The FEMA Expert Panel has met this requirement by publishing the identity of all flavoring substances determined to be GRAS by the Panel, and submits all information related to the GRAS reviews on these substances to the FDA. The key findings related to the GRAS evaluations of these substances will be available in GRAS 31. The Expert Panel also publishes separate extensive reviews of scientific information on all FEMA GRAS flavoring substances in the peer-reviewed scientific literature on the safety of structurally-related groups of flavoring substances. These important actions assure that there is “general recognition” of the safety of these substances when used as flavors.

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3-Acetyl-2,5-dimethylfuran DeGRAS

The FEMA GRAS status of 3-acetyl-2,5-dimethylfuran (FEMA 3391) under conditions of intended use as a flavor ingredient was reviewed. The Panel concluded that additional data are required. Such data would include comprehensive metabolism and toxicity data as well as in-depth evaluation of the mechanism of action for potential effects observed in toxicity and genotoxicity studies. Until such data are available for review, the flavor ingredient 3-acetyl-2,5-dimethylfuran has been removed from the FEMA GRAS list.

Estragole (FEMA 2411) Data Request

During its February 2023 meeting, the FEMA Expert Panel reviewed the relevant data for added as such estragole (FEMA 2411), including updated calculations of reference points for the chemically-defined substance. As a result, the FEMA Expert Panel determined that additional studies are needed to probe the relevance of estragole-derived DNA adducts in humans and their possible accumulation. The FEMA Expert Panel will consider the availability of such data during their May 22-24, 2023 meeting and will likely determine at that meeting if estragole added as such continues to meet the requirements for FEMA GRAS status.

Corrections and Errata to previous GRAS Publications

Identity Description of FEMA 4845. In Supplementary Information 1 for GRAS 28, the identity description for FEMA 4845 erroneously omitted “inclusive of supraglucosylated steviol glycosides 50-70%”. The full identity description for FEMA 4845 is: “At least 80% total steviol glycosides inclusive of supraglucosylated steviol glycosides 50-70%, not more than 10% Rebaudioside A, not more than 4% Rebaudioside C, not more than 5% stevioside, and no individual steviol glycosides further glucosylated \leq 3%. Maltodextrin <20%.”

Primary Name of FEMA 4711. The primary name of FEMA 4711, Luo Han Fruit Concentrate, has been corrected to Luo Han Fruit Extract.

Table 1. Primary names (in boldface) Synonyms (in lightface)

FEMA No.	Primary Names and Synonyms
4981	8-Methyl-4-methylenenon-7-en-2-one
4982	4-(4-Methylpent-3-en-1-yl)-5,6-dihydro-2H-pyran-2-one
4983	4-Mercapto-1-octanol
4984	2,11-Tetradecadienal 2,11-Tetradecadien-1-al
4985	4,9-Dodecadienal 4,9-Dodecadien-1-al
4986	Hyaluronic acid, sodium salt Polymeric structure of sodium salt of (2 <i>S</i> ,3 <i>S</i> ,4 <i>R</i> ,5 <i>R</i> ,6 <i>R</i>)-3-[(2 <i>S</i> ,3 <i>R</i> ,5 <i>S</i> ,6 <i>R</i>)-3-acetamido-5-hydroxy-6-(hydroxymethyl)oxan-2-yl]oxy-4,5,6-trihydroxyoxane-2-carboxylate Poly[(1→3)-2-acetamido-2-deoxy-β-d-glucose-(1→4)-β-d-glucopyranosyluronic acid] sodium salt Hyaluronan sodium Sodium hyaluronate
4991	<i>Persea americana</i> oil hydrolyzed fraction
4992	Rubusosides enriched Glucosylated Steviol Glycosides
*5000	Prepared Mixture of Chloride Salts of Potassium, Magnesium and Calcium
5003	2,6-Octadienal 2,6-Octadien-1-al
5004	2-Methyloctan-4-olide
5005	3-Hydroxyhexanoic acid
5006	3-Methyl-3-butene-1-thiol
5010	Thaumatococin II Thaumatococin 2
5012	Ethyl 5-acetoxyoctadecanoate
5021	S-(3-Methylbut-3-en-1-yl) 4-(formyloxy)butanethioate
5022	S-Butan-2-yl 4-(formyloxy)butanethioate
5027	Fennel oleoresin (<i>Foeniculum vulgare</i> Miller)
5028	Nutmeg oleoresin (<i>Myristica fragrans</i> Houtt.)
5029	<i>Corynebacterium casei</i> fermentation product

* The molar composition of the chloride salts of potassium, magnesium and calcium in this mixture is 5:3:3. FEMA 5000 is considered GRAS as a liquid concentrate or a solid blend. The use levels for FEMA 5000 in Table 2 reflect the intended conditions of use for the liquid concentrate in finished food. The solid blend of FEMA 5000 is intended to be used at use levels consistent with providing the same final concentration of the constituent salts as would be provided from the liquid concentrate.

Table 2. Average Usual Use Levels (ppm)/Average Maximum Use Levels (ppm) for new FEMA GRAS Flavoring Substances on which the FEMA Expert Panel based its judgments that the substances are generally recognized as safe (GRAS)

	8-Methyl-4-methylenenon-7-en-2-one	4-(4-Methylpent-3-en-1-yl)-5,6-dihydro-2H-pyran-2-one	4-Mercapto-1-octanol	2,11-Tetradecadienal	4,9-Dodecadienal	Hyaluronic acid, sodium salt
Category/FEMA No.	4981	4982	4983	4984	4985	4986
Baked Goods	0.2/1	0.05/0.5		5/50	5/50	500/500
Beverages Type I, Non-Alcoholic	1/5	0.01/0.1	0.1/1	2/20	2/20	100/500
Beverages Type II, Alcoholic	5/25	0.05/0.5	0.1/1	2/20	2/20	150/500
Breakfast Cereals		0.05/0.5		5/50	5/50	200/500
Cheeses	0.1/0.5	0.01/0.1		1/10	1/10	
Chewing Gum	1/5	0.01/0.1	1/10	10/100	10/100	
Condiments and Relishes	0.5/2.5		1/10	2/20	2/20	
Confections and Frostings			1/10	2/20	2/20	
Egg Products		0.01/0.1		1/10	1/10	
Fats and Oils		0.01/0.1		5/50	5/50	200/500
Fish Products		0.01/0.1				
Frozen Dairy	0.1/0.5	0.01/0.1	1/10	2/20	2/20	200/500
Fruit Ices		0.01/0.1	1/10	2/20	2/20	
Gelatins and Puddings		0.01/0.1	1/10	2/20	2/20	
Granulated Sugar				5/50	5/50	
Gravies	0.1/1		0.1/1	2/20	2/20	
Hard Candy	0.5/2.5	0.01/0.1	1/10	5/50	5/50	
Imitation Dairy Products		0.01/0.1		2/20	2/20	200/500
Instant Coffee and Tea		0.05/0.5	1/10	5/50	5/50	100/500
Jams and Jellies		0.01/0.1	1/10	2/20	2/20	
Meat Products	0.1/0.5	0.01/0.1	1/10	1/10	1/10	200/500
Milk Products		0.05/0.5	1/10	2/20	2/20	200/500
Nut Products		0.01/0.1	1/10	2/20	2/20	
Other Grains		0.01/0.1	0.1/1	2/20	2/20	
Poultry Products			0.1/1			
Processed Fruits		0.01/0.1	0.1/1	1/10	1/10	
Processed Vegetables			0.1/1			
Reconstituted Vegetable Protein				2/20	2/20	
Seasonings and Flavors		0.5/5	0.1/1	10/100	10/100	200/500
Snack Foods		0.05/0.5	0.1/1	2/20	2/20	200/500
Soft Candy	0.5/2.5	0.01/0.1	1/10	2/20	2/20	
Soups		0.01/0.1	0.1/1	2/20	2/20	200/500
Sugar Substitutes		0.01/0.1		5/50	5/50	
Sweet Sauces		0.01/0.1		2/20	2/20	

Table 2. Average Usual Use Levels (ppm)/Average Maximum Use Levels (ppm) for new FEMA GRAS Flavoring Substances on which the FEMA Expert Panel based its judgments that the substances are generally recognized as safe (GRAS)

	<i>Persea americana</i> oil hydrolyzed fraction	Rubosides enriched Glucosylated Steviol Glycosides	Prepared Mixture of Chloride Salts of Potassium, Magnesium and Calcium	2,6-Octadienal	2-Methyloctan-4-olide	3-Hydroxyhexanoic acid
Category/FEMA No.	4991	4992	*5000	5003	5004	5005
Baked Goods	3/15	50/170		0.02/0.2		0.15/1
Beverages Type I, Non-Alcoholic		50/170	1424/1424	0.005/0.5	0.001/0.1	0.05/0.3
Beverages Type II, Alcoholic		50/170	1424/1424	0.005/0.5	0.001/0.1	0.05/0.3
Breakfast Cereals	3/15	50/170		0.02/0.2		0.15/1
Cheeses	3/15	50/170		0.05/0.5		0.05/0.5
Chewing Gum		50/170		0.05/0.5		0.15/1
Condiments and Relishes	5/15	50/170		0.05/0.5		0.1/0.5
Confections and Frostings		50/170		0.05/0.5		0.1/0.5
Egg Products		50/170		0.02/0.2		
Fats and Oils		50/170		0.1/1		0.05/0.3
Fish Products	3/15	50/170		0.1/1		
Frozen Dairy	3/15	50/170		0.05/0.5	0.001/0.1	0.05/0.3
Fruit Ices		50/170	1424/1424	0.05/0.5		0.05/0.3
Gelatins and Puddings		50/170		0.05/0.5		0.05/0.3
Granulated Sugar				0.1/1		
Gravies	3/15	50/170	1424/1424	0.1/1		0.15/1
Hard Candy		50/170		0.1/1		0.05/0.3
Imitation Dairy Products	3/15	50/170		0.05/0.5	0.001/0.1	0.05/0.3
Instant Coffee and Tea		50/170		0.05/0.5	0.001/0.1	0.05/0.3
Jams and Jellies		50/170	1424/1424	0.05/0.5		0.05/0.3
Meat Products	3/15	50/170		0.05/0.5		0.05/0.3
Milk Products	3/15	50/170		0.02/0.2	0.1/1	0.05/0.3
Nut Products	3/15	50/170		0.1/1	0.1/1	
Other Grains	3/15	50/170		0.1/1		
Poultry Products	3/15	50/170		0.5/5		0.05/0.3
Processed Fruits		50/170				0.05/0.3
Processed Vegetables	3/15	50/170		0.05/0.5		
Reconstituted Vegetable Protein	5/25	50/170		0.1/1		
Seasonings and Flavors	5/25	50/170		1/10	0.1/1	0.15/1
Snack Foods	3/15	50/170		0.1/1	0.1/1	0.1/0.5
Soft Candy		50/170		0.01/0.1		0.1/0.5
Soups	3/15	50/170		0.1/1	0.001/0.1	0.1/0.5
Sugar Substitutes			1424/1424	0.01/0.1		
Sweet Sauces		50/170	1424/1424	0.05/0.5		0.05/0.3

*Use levels for FEMA 5000 as a liquid concentrate in finished food

Table 2. Average Usual Use Levels (ppm)/Average Maximum Use Levels (ppm) for new FEMA GRAS Flavoring Substances on which the FEMA Expert Panel based its judgments that the substances are generally recognized as safe (GRAS)

	3-Methyl-3-butene-1-thiol	Thaumatococin II	Ethyl 5-acetoxyoctadecanoate	S-(3-Methylbut-3-en-1-yl) 4-(formyloxy)butanethioate	S-Butan-2-yl 4-(formyloxy)butanethioate	Fennel oleoresin (<i>Foeniculum vulgare</i> Miller)	Nutmeg oleoresin (<i>Myristica fragrans</i> Houtt.)
Category/FEMA No.	5006	5010	5012	5021	5022	#5027	#5028
Baked Goods	0.1/1	7/7	0.5/50	0.1/2	0.1/2	65/100	39/45
Beverages Type I, Non-Alcoholic	0.01/0.1	7/7	0.05/10	0.01/0.2	0.01/0.2	45/60	7/7
Beverages Type II, Alcoholic	0.01/0.1	7/7	0.1/10	0.01/0.2	0.01/0.2	200/230	75/75
Breakfast Cereals	0.1/1	7/7	0.05/50	0.1/2	0.1/2		
Cheeses	0.05/0.5	7/7	0.1/10	0.05/1	0.05/1		
Chewing Gum			0.5/50	0.1/2	0.1/2	5/10	
Condiments and Relishes	0.1/1	7/7	0.1/50	0.1/2	0.1/2	100/200	75/75
Confections and Frostings	0.01/0.1	7/7	0.1/50	0.01/0.2	0.01/0.2		
Egg Products		7/7	0.05/50	0.1/2	0.1/2		
Fats and Oils		7/7	0.05/50	0.1/2	0.1/2		
Fish Products		7/7		0.1/2	0.1/2		
Frozen Dairy	0.01/0.1	7/7	0.05/50	0.01/0.2	0.01/0.2	120/140	18/18
Fruit Ices		7/7	0.1/10	0.01/0.2	0.01/0.2		
Gelatins and Puddings	0.02/0.2	7/7	0.1/10	0.02/0.4	0.02/0.4	100/120	11/11
Granulated Sugar			0.01/1	0.01/0.2	0.01/0.2		
Gravies	0.1/1	7/7	0.1/50	0.1/2	0.1/2	50/50	
Hard Candy	0.1/1	7/7	0.5/50	0.1/2	0.1/2	1/22	2/6
Imitation Dairy Products		7/7	0.05/50	0.05/1	0.05/1		
Instant Coffee and Tea	0.1/1	7/7	0.05/10	0.1/5	0.1/5		
Jams and Jellies	0.1/1	7/7	0.1/10	0.1/2	0.1/2		
Meat Products	0.1/1	7/7	0.1/50	0.1/2	0.1/2	155/400	22/22
Milk Products	0.1/1	7/7	0.05/50	0.1/2	0.1/2		
Nut Products	0.1/1	7/7	0.05/50	0.1/2	0.1/2		
Other Grains	0.01/0.1	7/7	0.05/50	0.01/0.2	0.01/0.2		
Poultry Products	0.1/1	7/7	0.05/50	0.1/2	0.1/2		
Processed Fruits	0.01/0.1	7/7	0.05/50	0.01/0.2	0.01/0.2		
Processed Vegetables		7/7	0.01/1	0.05/1	0.05/1		
Reconstituted Vegetable Protein		7/7	0.05/50	0.05/1	0.05/1		
Seasonings and Flavors	0.1/1	7/7	0.05/50	0.1/2	0.1/2		
Snack Foods	0.1/1	7/7	0.1/50	0.1/2	0.1/2		
Soft Candy	0.1/1	7/7	0.5/50	0.1/2	0.1/2	50/75	75/75
Soups	0.1/1	7/7	0.05/50	0.1/2	0.1/2	4/100	
Sugar Substitutes			0.01/1	0.01/0.2	0.01/0.2		
Sweet Sauces		7/7	0.1/10	0.1/2	0.1/2		

For more information, please see: <https://doi.org/10.1016/j.fct.2023.113643>.

‡ For more information, please see: <https://doi.org/10.1016/j.fct.2023.113646>.

Table 2. Average Usual Use Levels (ppm)/Average Maximum Use Levels (ppm) for new FEMA GRAS Flavoring Substances on which the FEMA Expert Panel based its judgments that the substances are generally recognized as safe (GRAS)

	<i>Corynebacterium casei</i> fermentation product
Category/FEMA No.	5029
Baked Goods	
Beverages Type I, Non-Alcoholic	
Beverages Type II, Alcoholic	
Breakfast Cereals	
Cheeses	2000/4500
Chewing Gum	
Condiments and Relishes	4000/10000
Confections and Frostings	
Egg Products	2000/4500
Fats and Oils	
Fish Products	2000/4500
Frozen Dairy	
Fruit Ices	
Gelatins and Puddings	
Granulated Sugar	
Gravies	4000/10000
Hard Candy	
Imitation Dairy Products	2000/4500
Instant Coffee and Tea	
Jams and Jellies	
Meat Products	2000/4500
Milk Products	
Nut Products	
Other Grains	
Poultry Products	2000/4500
Processed Fruits	
Processed Vegetables	
Reconstituted Vegetable Protein	2000/4500
Seasonings and Flavors	4000/15000
Snack Foods	4000/10000
Soft Candy	
Soups	2000/4500
Sugar Substitutes	
Sweet Sauces	

Table 3. Updated Average Usual Use Levels/Average Maximum Use Levels

Average Usual Use Levels (ppm)/Average Maximum Use Levels (ppm) for flavoring substances previously recognized as FEMA GRAS

a represents a change from previous FEMA GRAS publications

	Basil oil (<i>Ocimum basilicum</i> L.)	Basil oleoresin (<i>Ocimum basilicum</i> L.)	Estragon oil (<i>Artemisia dracunculus</i> L.)	Mace oil (<i>Myristica fragrans</i> Houtt.)	Mace oleoresin (<i>Myristica fragrans</i> Houtt.)	Methylcyclopentenolone
GRAS Publication	3	3	3	3	3	3
Category/FEMA No.	‡2119	‡2120	‡2412	‡2653	‡2654	2700
Baked Goods	5 ^a /5 ^a	28/29 ^a	2 ^a /2 ^a	15 ^a /15 ^a	39/43 ^a	12/27
Beverages Type I, Non-Alcoholic	0.8 ^a /0.8 ^a	5/5 ^a	0.3 ^a /0.3 ^a	2 ^a /3 ^a	7 ^a /7 ^a	2/11
Beverages Type II, Alcoholic	2 ^a /8 ^a	6/48 ^a	3 ^a /3 ^a	25 ^a /25 ^a	70 ^a /70 ^a	0.9/9
Breakfast Cereals						40/100
Cheeses						2 ^a /15 ^a
Chewing Gum	83 ^a /83 ^a		5/25 ^a	32/39		690/3560
Condiments and Relishes	8 ^a /8 ^a	15/48 ^a	3 ^a /3 ^a	25 ^a /25 ^a	70 ^a /70 ^a	
Confections and Frostings						
Egg Products						
Fats and Oils	16 ^a /17 ^a		5 ^a /5 ^a			
Fish Products			0.1/0.8 ^a			2 ^a /15 ^a
Frozen Dairy	1/2 ^a	2/11 ^a	0.6 ^a /0.6 ^a	6 ^a /6 ^a	17 ^a /17 ^a	5/17
Fruit Ices						
Gelatins and Puddings	1 ^a /1 ^a	7 ^a /7 ^a	0.4 ^a /0.4 ^a	4 ^a /4 ^a	10 ^a /10 ^a	5/14
Granulated Sugar						
Gravies			3 ^a /3 ^a	2/3		4 ^a /30 ^a
Hard Candy	1/8 ^a		0.9/3 ^a	23/25 ^a	2/6	17/18
Imitation Dairy Products						2 ^a /15 ^a
Instant Coffee and Tea						
Jams and Jellies						
Meat Products	3 ^a /3 ^a	15 ^a /15 ^a	0.8 ^a /0.8 ^a	7 ^a /8 ^a	21 ^a /21 ^a	2/15 ^a
Milk Products			0.8 ^a /4 ^a			2 ^a /15 ^a
Nut Products						
Other Grains			0.01 ^a /4 ^a			
Poultry Products						2 ^a /15 ^a
Processed Fruits						
Processed Vegetables	1/1 ^a		0.2 ^a /4 ^a	2/3		
Reconstituted Vegetable Protein						2 ^a /15 ^a
Seasonings and Flavors						2 ^a /15 ^a
Snack Foods	8 ^a /8 ^a					2 ^a /15 ^a
Soft Candy	6/8 ^a	14/49 ^a	3 ^a /3 ^a	25 ^a /25 ^a	70 ^a /70 ^a	9/26
Soups	1 ^a /1 ^a					2 ^a /15 ^a
Sugar Substitutes						
Sweet Sauces						10/30

‡ For more information, please see: <https://doi.org/10.1016/j.fct.2023.113646>.

Table 3. Updated Average Usual Use Levels/Average Maximum Use Levels

Average Usual Use Levels (ppm)/Average Maximum Use Levels (ppm) for flavoring substances previously recognized as FEMA GRAS

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	Nutmeg oil (<i>Myristica fragrans</i> Houtt.)	Parsley Oil (<i>Petroselinum crispum</i> (Miller) Nyman (<i>P. sativum</i> Hoffm.))	Parsley oleoresin (<i>Petroselinum crispum</i> (Miller) Nyman (<i>P. sativum</i> Hoffm.))	Snakeroot Canadian oil (<i>Asarum canadense</i> L.)	L-Cysteine
GRAS Publication	3	24 & 25	3	3	5
Category/FEMA No.	‡2793	‡2836	‡2837	‡3023	3263
Baked Goods	13 ^a /20 ^a	19/24	100 ^a /100 ^a	2 ^a /2 ^a	100/100
Beverages Type I, Non-Alcoholic	3 ^a /3 ^a	1/2	10/16 ^a	0.4 ^a /0.4 ^a	100/100
Beverages Type II, Alcoholic	10 ^a /34 ^a	1/2	9/18	4 ^a /4 ^a	
Breakfast Cereals					100/100
Cheeses					
Chewing Gum	12/340 ^a	500 ^a /500 ^a			
Condiments and Relishes	6/34 ^a	45/64	160 ^a /160 ^a	1/4	100/100
Confections and Frostings	2/29 ^a				
Egg Products					
Fats and Oils					
Fish Products					
Frozen Dairy	8/8 ^a	0.9/1	10/10	0.8 ^a /0.8 ^a	
Fruit Ices					
Gelatins and Puddings		7/10	25 ^a /25 ^a		
Granulated Sugar					
Gravies	5 ^a /34 ^a	2/6			
Hard Candy	19/34 ^a	10 ^a /10 ^a		4 ^a /4 ^a	
Imitation Dairy Products					
Instant Coffee and Tea					
Jams and Jellies					
Meat Products	10 ^a /10 ^a	38/63	50 ^a /50 ^a		800 ^a /1200 ^a
Milk Products	3 ^a /5 ^a				100/100
Nut Products					
Other Grains	0.002 ^a /5 ^a				
Poultry Products					
Processed Fruits					
Processed Vegetables		0.8/1			
Reconstituted Vegetable Protein					800 ^a /3000 ^a
Seasonings and Flavors					
Snack Foods					
Soft Candy	8/34 ^a	3/6	30/50	4 ^a /4 ^a	
Soups	0.1 ^a /5 ^a	33/66	25 ^a /25 ^a		
Sugar Substitutes					
Sweet Sauces	12/34 ^a				

‡ For more information, please see: <https://doi.org/10.1016/j.fct.2023.113646>.

Table 3. Updated Average Usual Use Levels/Average Maximum Use Levels

Average Usual Use Levels (ppm)/Average Maximum Use Levels (ppm) for flavoring substances previously recognized as FEMA GRAS

a represents a change from previous FEMA GRAS publications

	4-Aminobutyric acid
GRAS Publication	23
Category/FEMA No.	4288
Baked Goods	50/300
Beverages Type I, Non-Alcoholic	20/100
Beverages Type II, Alcoholic	30/200
Breakfast Cereals	30/100
Cheeses	10 ^a /100 ^a
Chewing Gum	100/500
Condiments and Relishes	
Confections and Frostings	30/100
Egg Products	
Fats and Oils	30/100
Fish Products	10 ^a /100 ^a
Frozen Dairy	
Fruit Ices	20/100
Gelatins and Puddings	20/100
Granulated Sugar	
Gravies	
Hard Candy	40/300
Imitation Dairy Products	10 ^a /100 ^a
Instant Coffee and Tea	20/100
Jams and Jellies	
Meat Products	20/200
Milk Products	30/100
Nut Products	
Other Grains	
Poultry Products	10 ^a /100 ^a
Processed Fruits	
Processed Vegetables	
Reconstituted Vegetable Protein	10 ^a /100 ^a
Seasonings and Flavors	
Snack Foods	10/100
Soft Candy	20/200
Soups	30/200
Sugar Substitutes	
Sweet Sauces	

Table 4. Identity for Natural Flavor Complexes as Evaluated by the FEMA Expert Panel

FEMA No.	FEMA Primary Name	The Identification Description as Reviewed by the FEMA Expert Panel
4991	<i>Persea americana</i> oil hydrolyzed fraction	Polyhydroxylated fatty alcohols (PFAs) typically measured as 60-80% avocadene and avocadyne; 10-30% Polyhydroxylated fatty alcohols - acetates (PFA acetates); 10-15% Citrates
4992	Rubusosides enriched Glucosylated Steviol Glycosides	Total steviol glycosides inclusive of glycosylated steviol glycosides 70-85%, glucosylated rubusosides 55-65%, rubusoside 9-13%, rebaudioside A <4%, stevioside <0.5%, not further glycosylated steviol glycosides individually <3%; Maltodextrin 10-20%
#5027	Fennel oleoresin (<i>Foeniculum vulgare</i> Miller)	Fennel Oleoresin (FEMA 5027) is prepared by solvent extraction of the seeds of the plant (<i>Foeniculum vulgare</i> Mill.) with an organic solvent followed by the removal of the solvent. The oleoresin is standardized with food grade diluents, preservatives, antioxidants and other substances consistent with GMP (see Food Chemical Codex) and contains 3 - 20% volatile oil in conformance with applicable residual solvent regulations.
#5028	Nutmeg oleoresin (<i>Myristica fragrans</i> Houtt.)	Nutmeg Oleoresin (FEMA 5028) is prepared by solvent extraction of the seeds of the plant (<i>Myristica fragrans</i> Houtt.) with an organic solvent followed by the removal of the solvent. The oleoresin is standardized with food grade diluents, preservatives, antioxidants and other substances consistent with GMP (see Food Chemical Codex) and typically contains 25 - 90% volatile oil in conformance with applicable residual solvent regulations.
5029	<i>Corynebacterium casei</i> fermentation product	27-36% Amino acids, including 20-30% glutamic acid; 4-7% Heat-killed bacterial cells; 5-7% Minerals; Not more than 4% moisture; Not more than 3% of other non-volatiles such as carbohydrates, nucleic acids and lipids; Not more than 50% maltodextrin

For more information, please see: <https://doi.org/10.1016/j.fct.2023.113643>.

‡ For more information, please see: <https://doi.org/10.1016/j.fct.2023.113646>.