

GRAS Flavoring Substances 32

32. GRAS Flavoring Substances. This list of substances will appear in the 32nd 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.

FEMA EXPERT PANEL

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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 32. 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.

The FEMA Expert Panel has well-defined and published procedures to protect against potential bias and conflicts of interest in its evaluations of substances whose uses may be determined to be “generally recognized as safe” (GRAS) for use as flavor ingredients (Marnett et al., 2013). The uses of the flavor ingredients in this report that were determined to be GRAS were evaluated by the Expert Panel in accordance with the Panel’s bias and conflict of interest procedures. No conflicts or sources of potential bias were declared by any Panel members, or otherwise identified by the Expert Panel’s Legal Advisor, in the course of the evaluations of the uses of the flavor ingredients described in this report.

Marnett L.J., Cohen S.M., Fukushima S., Gooderham N.J., Hecht S.S., Rietjens I.M.C.M., Smith R.L., Adams T.B., Hallagan J.B., Harman C., McGowan M.M. and Taylor S.V. GRAS flavoring substances 26. Food Technology. 67(8), 38. 2013.

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Change in GRAS Status of Propyl Paraben (FEMA 2951) and 2-Phenylphenol (FEMA 3959)

The FEMA GRAS statuses of propyl paraben (FEMA No. 2951) and 2-phenylphenol (FEMA No. 3959) under their conditions of intended use as flavor ingredients were reviewed. There is little evidence that either propyl paraben or 2-phenylphenol are used for the technical effect of flavoring. Based on this lack of evidence, the Panel concluded that both should be removed from the FEMA GRAS list.

Corrections and Errata to previous GRAS Publications

Primary Name of FEMA 3089. The primary name of FEMA 3089, Turpentine steam distilled (*Pinus palustris* Mill. and other *Pinus* spp.), has been changed to Pine resin oil (*Pinus palustris* Mill. and other *Pinus* spp.).

Primary names of FEMA 3105 and 3106. In GRAS 3 (Hall and Oser, 1965), the botanical names for FEMA 3105, Vanilla extract, and FEMA 3106, Vanilla oleoresin, were listed as (*Vanilla planifolia* Andrews, *V. tahitensis* J.W. Moore). The botanical *Vanilla pompona* is also considered FEMA GRAS under the identities of FEMA 3105 and FEMA 3106.

Primary Name of FEMA 4878. The primary name of FEMA 4878, *Cordyceps sinensis* fermentation product, has been changed to mushroom mycelia fermentation product.

Primary Name and Identity Description of FEMA 4949. The primary name of FEMA 4949, *Corynebacterium ammoniagenes* fermentation product, has been changed to *Corynebacterium stationis* cell free fermentation broth. Additionally, the identity description of FEMA 4949 has been updated to: “no more than 65% miscellaneous nitrogen-containing compounds (nucleotides); <10% of amino acids; <10% of minerals; <7% of simple carbohydrates, typically monosaccharides; The material may be standardized with an appropriate carrier such as dextrans”

Identity Description of FEMA 4964. The identity description of FEMA 4964, *Corynebacterium glutamicum* cell free fermentation product, has been updated to: “no more than 70% glutamic acid; <10% simple carbohydrates; <10% sum of other individual amino acids; <15% minerals; The material may be standardized with an appropriate carrier such as dextrans.”

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

FEMA No.	Primary Names and Synonyms
5030	4-(1-Menthoxy)-2-methyl-2-butanol
5035	Brazzein
5038	(±)-Hexahydro-6a,7-dimethyl-2,5-methano-2H-cyclopenta[b]furan
5040	<i>Eucalyptus citriodora</i> oil
5042	Heat-treated Glucosylated Steviol Glycosides 35% with Steviol Glycosides 10%
5044	Sakura flower extract <i>Prunus serrulata</i> flower extract <i>Cerasus serrulata</i> flower extract
5045	Sakura flower distillate <i>Prunus serrulata</i> flower distillate <i>Cerasus serrulata</i> flower distillate
5046	Sakura leaf distillate Oshima zakura cherry leaf distillate <i>Prunus speciosa</i> leaf distillate <i>Cerasus speciosa</i> leaf distillate
5047	Sansho pepper extract Japanese pepper extract Chopinamu extract <i>Fagara piperita</i> L. extract Sanshou pepper extract Sansyo pepper extract Kona-zanshō extract
5048	Sansho pepper distillate Japanese pepper distillate Chopinamu distillate <i>Fagara piperita</i> L. distillate Sanshou pepper distillate Sansyo pepper distillate Kona-zanshō distillate
5050	1-(tert-Butyl)-N-(4-methoxyphenyl)cyclohexane-1-carboxamide
5054	Rosemary extract, rosmarinic acid 80%
5060	Rosemary extract, rosmarinic acid 15%
5061	Juniperberry oil terpeneless (<i>Juniperus communis</i> L.)
5062	Celery seed oleoresin (<i>Apium graveolens</i> L.)
5064	Cumin oleoresin (<i>Cuminum cyminum</i> L.)
5066	4-(4-Methylpent-3-en-1-yl)thiophen-2(5H)-one
5067	<i>alpha</i>-Bisabolene <i>(E)</i> - <i>alpha</i> -bisabolene <i>trans</i> - <i>alpha</i> -bisabolene 1-Methyl-4-[(2 <i>E</i>)-6-methyl-2,5-heptadien-2-yl]cyclohexene 4-(1,5-Dimethyl-1,4-hexadienyl)-1-methyl cyclohexene 6-Methyl-2-(4-methylcyclohex-3-enyl)hept-2,5-diene Cyclohexene, 4-(1,5-dimethyl-1,4-hexadienyl)-1-methyl- Cyclohexene, 4-[(1 <i>E</i>)-1,5-dimethyl-1,4-hexadien-1-yl]-1-methyl
5069	Rebaudioside M 70%

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

5072	Heat-treated Glucosylated Steviol Glycosides 15% with Steviol Glycosides 5%
5073	<i>Corynebacterium glutamicum</i> Fermentation product
5074	Enzymatically modified rebaudioside A 85%
5077	<i>alpha</i> -Humulene (±)-α-Humulene
5081	<i>Corynebacterium glutamicum</i> Fermentation savory product
5082	<i>Corynebacterium stationis</i> Fermentation product

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)

	4-(1-Methoxy)-2-methyl-2-butanol	Brazein	(±)-Hexahydro-6a,7-dimethyl-2,5-methano-2H-cyclopenta[b]furan	<i>Eucalyptus citriodora</i> oil	Heat-treated glucosylated steviol glycosides 35% with steviol glycosides 10%	Sakura flower extract
Category/FEMA No.	5030	5035	5038	5040	5042	5044
Baked Goods		7/7	0.5/5		50/100	
Beverages Type I, Non-Alcoholic	1/5	7/7	0.1/1	280/280	50/100	
Beverages Type II, Alcoholic	1/5	7/7	0.1/1	315/315	50/100	1200/6000
Breakfast Cereals		7/7	0.1/1		50/100	
Cheeses			0.2/2		50/100	
Chewing Gum	1/10	30/30	5/50		50/100	
Condiments and Relishes		7/7	0.2/2		50/100	
Confections and Frostings		7/7	0.5/5		50/100	
Egg Products					50/100	
Fats and Oils			1/10		50/100	
Fish Products					50/100	
Frozen Dairy		7/7	0.1/1		50/100	
Fruit Ices		7/7	0.2/2		50/100	
Gelatins and Puddings		7/7	0.5/5		50/100	
Granulated Sugar			0.1/1			
Gravies	1/5		0.2/2		50/100	
Hard Candy		7/7	0.5/5		50/100	
Imitation Dairy Products		7/7			50/100	
Instant Coffee and Tea	1/5	7/7			50/100	
Jams and Jellies		7/7	0.2/2		50/100	
Meat Products					50/100	
Milk Products		7/7	0.1/1		50/100	
Nut Products		7/7	0.2/2		50/100	
Other Grains		7/7	0.1/1		50/100	
Poultry Products					50/100	
Processed Fruits		7/7	0.2/2		50/100	
Processed Vegetables			0.1/1		50/100	
Reconstituted Vegetable Protein			0.5/5		50/100	
Seasonings and Flavors		7/7	1/10		50/100	
Snack Foods		7/7	0.1/1		50/100	
Soft Candy	1/5	7/7	0.5/5		50/100	
Soups	1/5	7/7	0.1/1		50/100	
Sugar Substitutes						
Sweet Sauces		7/7	0.1/1		50/100	

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	Sakura flower distillate	Sakura leaf distillate	Sansho pepper extract	Sansho pepper distillate	1-(tert-Butyl)-N-(4-methoxyphenyl)cyclohexane-1-carboxamide	Rosemary extract, rosmarinic acid 80%
Category/FEMA No.	5045	5046	5047	5048	5050	5054
Baked Goods					0.05/20	80/200
Beverages Type I, Non-Alcoholic					0.15/10	55/150
Beverages Type II, Alcoholic	400/1000	0.3/3.2	80/400	120/620		55/150
Breakfast Cereals						50/100
Cheeses					0.1/15	80/150
Chewing Gum					0.05/100	200/500
Condiments and Relishes					0.05/40	100/200
Confections and Frostings						55/100
Egg Products					0.05/50	55/100
Fats and Oils						55/100
Fish Products					0.05/40	100/200
Frozen Dairy					0.05/20	25/125
Fruit Ices						50/100
Gelatins and Puddings						50/100
Granulated Sugar						
Gravies					0.05/50	80/200
Hard Candy						100/150
Imitation Dairy Products					0.125/15	55/100
Instant Coffee and Tea					0.05/20	55/100
Jams and Jellies						100/150
Meat Products					0.05/40	100/200
Milk Products					0.075/40	50/100
Nut Products						100/200
Other Grains						100/200
Poultry Products					0.05/40	100/200
Processed Fruits						55/100
Processed Vegetables						100/200
Reconstituted Vegetable Protein					0.05/50	100/250
Seasonings and Flavors					0.25/50	500/1000
Snack Foods					0.25/50	100/200
Soft Candy					0.05/20	80/150
Soups					0.15/15	60/200
Sugar Substitutes						
Sweet Sauces					0.05/20	

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)

	Rosemary extract, rosmarinic acid 15%	Juniperberry oil terpeneless (<i>Juniperus communis</i> L.)	Celery seed oleoresin (<i>Apium graveolens</i> L.)	Cumin oleoresin (<i>Cuminum cyminum</i> L.)	4-(4-Methylpent-3-en-1-yl)thiophen-2(5H)-one	<i>alpha</i> -Bisabolene
Category/FEMA No.	5060	5061	5062	5064	5066	5067
Baked Goods	60/200	4.4/7		0.5/50	0.01/0.1	10/50
Beverages Type I, Non-Alcoholic	50/120	20/23			0.001/0.01	5/25
Beverages Type II, Alcoholic	50/120	13/48			0.001/0.01	10/50
Breakfast Cereals	50/80				0.01/0.1	5/25
Cheeses	60/100				0.1/1	
Chewing Gum	200/400	0.5/0.5			0.1/1	10/50
Condiments and Relishes	100/150					
Confections and Frostings	50/100				0.01/0.1	10/50
Egg Products	60/100				0.01/0.1	
Fats and Oils	60/100				0.1/1	5/25
Fish Products	100/200					
Frozen Dairy	20/80	1/2			0.01/0.1	7/35
Fruit Ices	40/80				0.01/0.1	10/50
Gelatins and Puddings	40/80	1/3			0.01/0.1	5/25
Granulated Sugar						
Gravies	60/200				0.1/1	
Hard Candy	60/150	2/2			0.01/0.1	10/50
Imitation Dairy Products	40/100				0.01/0.1	
Instant Coffee and Tea	40/100				0.001/0.01	
Jams and Jellies	40/100					5/25
Meat Products	100/200	0.5/10	17/80		0.01/0.1	
Milk Products	40/80				0.001/0.01	
Nut Products	60/120					
Other Grains	80/200				0.01/0.1	
Poultry Products	80/200					
Processed Fruits	40/100				0.01/0.1	7/35
Processed Vegetables	60/200				0.01/0.1	
Reconstituted Vegetable Protein	80/250				0.01/0.1	
Seasonings and Flavors	500/1000			10/100	0.1/1	
Snack Foods	100/250			10/100	0.01/0.1	
Soft Candy	60/100	2/5			0.01/0.1	10/50
Soups	60/150		100/120	5/100	0.01/0.1	
Sugar Substitutes						
Sweet Sauces					0.01/0.1	5/25

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)

	Rebaudioside M 70%	Heat-treated Glucosylated Steviol Glycosides 15% with Steviol Glycosides 5%	<i>Corynebacterium glutamicum</i> fermentation product	Enzymatically modified rebaudioside A 85%	<i>alpha</i> -Humulene
Category/FEMA No.	5069	5072	5073	5074	5077
Baked Goods		50/350	4400/4400	100/120	10/50
Beverages Type I, Non-Alcoholic	15/20	50/350		100/120	5/25
Beverages Type II, Alcoholic	15/20	50/350		100/120	10/50
Breakfast Cereals		50/350	4400/4400	100/120	
Cheeses		50/350	4400/4400		
Chewing Gum	15/20	50/350		100/120	
Condiments and Relishes		50/350	5000/5000	100/120	
Confections and Frostings		50/350		100/120	10/50
Egg Products		50/350	2800/2800		
Fats and Oils		50/350	5000/5000		7/35
Fish Products		50/350	3600/3600		2/10
Frozen Dairy	15/20	50/350		100/150	
Fruit Ices	15/20	50/350		100/120	10/50
Gelatins and Puddings		50/350		100/120	
Granulated Sugar					
Gravies		50/350	2500/2500		
Hard Candy		50/350		100/120	
Imitation Dairy Products	15/20	50/350	4400/4400	100/100	
Instant Coffee and Tea	15/20	50/350		100/120	
Jams and Jellies		50/350		100/120	
Meat Products		50/350	2700/2700		2/10
Milk Products	15/20	50/350		100/100	
Nut Products	15/20	50/350	1600/1600	100/120	
Other Grains		50/350		100/120	
Poultry Products		50/350	2700/2700		2/10
Processed Fruits	15/20	50/350		100/120	7/35
Processed Vegetables		50/350		100/120	
Reconstituted Vegetable Protein		50/350		100/120	
Seasonings and Flavors	15/20	50/350	4000/4000	100/120	
Snack Foods	15/20	50/350	4000/4000	100/120	
Soft Candy		50/350		100/120	
Soups		50/350	2500/2500	100/120	
Sugar Substitutes					
Sweet Sauces	15/20	50/350		100/120	

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 glutamicum</i> fermentation savory product	<i>Corynebacterium stationis</i> fermentation product
Category/FEMA No.	5081	5082
Baked Goods	4400/4400	3800/3800
Beverages Type I, Non-Alcoholic		
Beverages Type II, Alcoholic		
Breakfast Cereals	4400/4400	2500/2500
Cheeses	4400/4400	3800/3800
Chewing Gum		
Condiments and Relishes	5000/5000	5000/5000
Confections and Frostings		
Egg Products	2800/2800	2500/2500
Fats and Oils	5000/5000	5000/5000
Fish Products	3600/3600	2500/2500
Frozen Dairy		
Fruit Ices		
Gelatins and Puddings		
Granulated Sugar		
Gravies	2500/2500	5000/5000
Hard Candy		
Imitation Dairy Products	4400/4400	4000/4000
Instant Coffee and Tea		
Jams and Jellies		
Meat Products	2700/2700	5000/5000
Milk Products		
Nut Products	1600/1600	5000/5000
Other Grains		
Poultry Products	2700/2700	5000/5000
Processed Fruits		
Processed Vegetables		
Reconstituted Vegetable Protein		
Seasonings and Flavors	4000/4000	5000/5000
Snack Foods	4000/4000	5000/5000
Soft Candy		
Soups	2500/2500	5000/5000
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

	4-Ethylguaiacol	Furfural	Heptanal	Methylcyclopentenolone	Tartaric acid (D-, L-, DL-, Meso-)
GRAS Publication	3	3	3	31	29
Category/FEMA No.	2436	2489	2540	2700	3044
Baked Goods	14/18	42/50	8/12	12/27	0.9/1300
Beverages Type I, Non-Alcoholic	2/4 ^a	23/29	3/5	5 ^a /30 ^a	1/960
Beverages Type II, Alcoholic	1.2 ^a /4 ^a	3 ^a /20 ^a	4/4	0.9/9	5000/10000
Breakfast Cereals	1.2 ^a /4 ^a	3 ^a /20 ^a	0.3 ^a /1 ^a	40/100	
Cheeses	1.2 ^a /4 ^a	3 ^a /20 ^a	0.3 ^a /1 ^a	2/15	
Chewing Gum	5/15	50 ^a /200 ^a	3 ^a /10 ^a	690/3560	500/5000
Condiments and Relishes	10/12	3 ^a /20 ^a	0.3 ^a /1 ^a	3 ^a /15	2/10000
Confections and Frostings	3.6 ^a /12 ^a	3 ^a /20 ^a	0.9 ^a /3 ^a	10 ^a /30 ^a	200 ^a /1000 ^a
Egg Products	2.4 ^a /8 ^a	3 ^a /20 ^a	0.6 ^a /2 ^a	5 ^a /15	
Fats and Oils	2.4 ^a /8 ^a	3 ^a /20 ^a	0.6 ^a /2 ^a	3 ^a /15	200 ^a /1000 ^a
Fish Products	1.2 ^a /4 ^a	3 ^a /20 ^a	0.3 ^a /1 ^a	2/15	
Frozen Dairy	2/4 ^a	39/45	3/6	5/17	2/570
Fruit Ices	1.2 ^a /4 ^a	3 ^a /20 ^a	0.9 ^a /3 ^a	5 ^a /15 ^a	100 ^a /500 ^a
Gelatins and Puddings	2/4 ^a	25/33	3/6	5/14	200 ^a /1000 ^a
Granulated Sugar	3.6 ^a /12 ^a	3 ^a /20 ^a	0.9 ^a /3 ^a	10 ^a /30 ^a	
Gravies	2/6	3 ^a /20 ^a	0.3 ^a /1 ^a	4/30	200 ^a /1000 ^a
Hard Candy	3.6 ^a /12 ^a	15/45 ^a	2/3 ^a	17/18	10/5400
Imitation Dairy Products	1.2 ^a /4 ^a	3 ^a /20 ^a	5/50	2/15	60 ^a /300 ^a
Instant Coffee and Tea	1.2 ^a /4 ^a	3 ^a /20 ^a	0.3 ^a /1 ^a	10 ^a /30 ^a	100 ^a /500 ^a
Jams and Jellies	3.6 ^a /12 ^a	3 ^a /20 ^a	0.9 ^a /3 ^a	30 ^a /100 ^a	200 ^a /1000 ^a
Meat Products	3.6 ^a /12 ^a	30/64	3/10	2/15	0.01/0.02
Milk Products	1.2 ^a /4 ^a	3 ^a /20 ^a	0.3 ^a /1 ^a	2/15	60 ^a /300 ^a
Nut Products	3.6 ^a /12 ^a	3 ^a /20 ^a	0.9 ^a /3 ^a	5 ^a /15 ^a	
Other Grains	3.6 ^a /12 ^a	3 ^a /20 ^a	0.9 ^a /3 ^a	5 ^a /15 ^a	0.2/0.2
Poultry Products	1.2 ^a /4 ^a	3 ^a /20 ^a	0.3 ^a /1 ^a	2/15	
Processed Fruits	3.6 ^a /12 ^a	3 ^a /20 ^a	0.9 ^a /3 ^a	10 ^a /30 ^a	10/10
Processed Vegetables	1.2 ^a /4 ^a	3 ^a /20 ^a	0.3 ^a /1 ^a	5 ^a /15 ^a	
Reconstituted Vegetable Protein	3.6 ^a /12 ^a	3 ^a /20 ^a	0.3 ^a /1 ^a	2/15	
Seasonings and Flavors	12 ^a /40 ^a	50 ^a /200 ^a	3 ^a /10 ^a	2/15	
Snack Foods	1.2 ^a /4 ^a	20 ^a /45 ^a	0.3 ^a /1 ^a	15 ^a /50 ^a	
Soft Candy	17/22	47/53	7/9	9/26	200 ^a /1000 ^a
Soups	1.2 ^a /4 ^a	3 ^a /20 ^a	0.3 ^a /1 ^a	2/15	200 ^a /1000 ^a
Sugar Substitutes	3.6 ^a /12 ^a	50 ^a /200 ^a	0.9 ^a /3 ^a	30 ^a /100 ^a	
Sweet Sauces	3.6 ^a /12 ^a	30/30	0.9 ^a /3 ^a	10/30	60 ^a /300 ^a

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

	2,4-Nonadienal	Dimethyl trisulfide	L-Histidine	beta-Caryophyllene oxide	5,7-Dihydroxy-2-(3-hydroxy-4-methoxyphenyl)chroman-4-one
GRAS Publication	29	5	30	22	26
Category/FEMA No.	3212	3275	3694	4085	4313
Baked Goods	2/7	1/1	10/150	5 ^a /45 ^a	
Beverages Type I, Non-Alcoholic	1/4	0.3 ^a /1 ^a	200/200	3 ^a /20 ^a	10/50
Beverages Type II, Alcoholic	0.01/2	0.6 ^a /2 ^a	100 ^a /500 ^a	3 ^a /20 ^a	10/100
Breakfast Cereals	0.2/0.2	0.3 ^a /1 ^a		3 ^a /20 ^a	30/60
Cheeses	0.3 ^a /1 ^a	0.3 ^a /1 ^a		3 ^a /20 ^a	20/150
Chewing Gum	5/10	2/5		50 ^a /200 ^a	
Condiments and Relishes	1/2	1/1	200 ^a /1000 ^a	5/25	10/100
Confections and Frostings	0.9 ^a /3 ^a	0.9 ^a /3 ^a	20/150	3 ^a /20 ^a	408 ^a /816 ^a
Egg Products	0.6 ^a /2 ^a	0.6 ^a /2 ^a		3 ^a /20 ^a	
Fats and Oils	0.6 ^a /2 ^a	0.6 ^a /2 ^a	200 ^a /1000 ^a	3 ^a /20 ^a	
Fish Products	0.3 ^a /1 ^a	0.3 ^a /1 ^a		3/20 ^a	
Frozen Dairy	2/7	0.9 ^a /3 ^a	60 ^a /300 ^a	5/25	20/150
Fruit Ices	3 ^a /3 ^a	0.9 ^a /3 ^a	100 ^a /500 ^a	3 ^a /20 ^a	20/100
Gelatins and Puddings	1/5	0.3 ^a /1 ^a	200 ^a /1000 ^a	3 ^a /20 ^a	10/100
Granulated Sugar	0.9 ^a /3 ^a	0.9 ^a /3 ^a		3 ^a /20 ^a	100/250
Gravies	0.5/2	1/1	200 ^a /1000 ^a	3 ^a /20 ^a	10/100
Hard Candy	0.9 ^a /3 ^a	0.9 ^a /3 ^a		10 ^a /45 ^a	50/100
Imitation Dairy Products	0.3 ^a /1 ^a	0.3 ^a /1 ^a	60 ^a /300 ^a	3 ^a /20 ^a	
Instant Coffee and Tea	0.3 ^a /1 ^a	0.3 ^a /1 ^a	100 ^a /500 ^a	3 ^a /20 ^a	10/50
Jams and Jellies	0.9 ^a /3 ^a	0.9 ^a /3 ^a	200 ^a /1000 ^a	3 ^a /20 ^a	20/50
Meat Products	100/120	1/3 ^a	30/150	10 ^a /45 ^a	
Milk Products	0.3 ^a /1 ^a	0.3 ^a /1 ^a	60 ^a /300 ^a	3 ^a /20 ^a	20/150
Nut Products	0.9 ^a /3 ^a	0.9 ^a /3 ^a		3 ^a /20 ^a	20/50
Other Grains	0.9 ^a /3 ^a	0.9 ^a /3 ^a		3/20 ^a	30/60
Poultry Products	0.3 ^a /1 ^a	0.3 ^a /1 ^a		3 ^a /20 ^a	
Processed Fruits	0.9 ^a /3 ^a	0.9 ^a /3 ^a		3 ^a /20 ^a	20/50
Processed Vegetables	0.3 ^a /1 ^a	0.3 ^a /1 ^a		3 ^a /20 ^a	20/50
Reconstituted Vegetable Protein	0.3 ^a /1 ^a	0.3 ^a /1 ^a		3 ^a /20 ^a	20/50
Seasonings and Flavors	3 ^a /10 ^a	3 ^a /10 ^a		50 ^a /200 ^a	10/100
Snack Foods	0.3 ^a /1 ^a	0.3 ^a /1 ^a		20 ^a /45 ^a	60/120
Soft Candy	2/8	0.9 ^a /3 ^a	200 ^a /1000 ^a	10 ^a /45 ^a	408 ^a /816 ^a
Soups	0.2/0.2	1/1	200 ^a /1000 ^a	3 ^a /20 ^a	10/100
Sugar Substitutes	0.9 ^a /3 ^a	0.9 ^a /3 ^a		50 ^a /200 ^a	100/250
Sweet Sauces	0.9 ^a /3 ^a	0.9 ^a /3 ^a	60 ^a /300 ^a	3 ^a /20 ^a	408 ^a /816 ^a

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

	3-(4-Hydroxy-phenyl)-1-(2,4,6-trihydroxy-phenyl)-propan-1-one	Mushroom mycelia fermentation product	<i>Corynebacterium stationis</i> cell free fermentation broth	<i>Corynebacterium glutamicum</i> cell free fermentation product	Yerba mate extract (<i>Ilex paraguariensis</i> A. St.-Hil.)
GRAS Publication	30	30	30	30	30
Category/FEMA No.	4390	4878	4949	4964	4969
Baked Goods	50/150	30/50	400 ^a /3000 ^a	600 ^a /6000 ^a	400 ^a /1000 ^a
Beverages Type I, Non-Alcoholic	50/100	30/1000			400/1000
Beverages Type II, Alcoholic	15/50	10/1000			400/1000
Breakfast Cereals	50/100	10/100	400 ^a /2000 ^a	600 ^a /6000 ^a	400 ^a /1000 ^a
Cheeses	10/50		800 ^a /3000 ^a	1700 ^a /6000 ^a	400/1000
Chewing Gum		20/100			
Condiments and Relishes	10/100	1/30	1000 ^a /7500 ^a	1700 ^a /10000 ^a	400/1000
Confections and Frostings	156 ^a /312 ^a	1/150 ^a			400/1000
Egg Products		1/30	400 ^a /4000 ^a	600 ^a /4000 ^a	
Fats and Oils					
Fish Products		1/30	1000 ^a /4000 ^a	1700 ^a /5000 ^a	400 ^a /1000 ^a
Frozen Dairy	10/50	10/100			400/1000
Fruit Ices	20/50				400/1000
Gelatins and Puddings	10/100				400/1000
Granulated Sugar	20/100				
Gravies	10/100	10/100	1000 ^a /7500 ^a	1700 ^a /6000 ^a	400/1000
Hard Candy	20/100	1/150 ^a			400/1000
Imitation Dairy Products	50/100	10/150	800 ^a /4000 ^a	1700 ^a /6000 ^a	400/1000
Instant Coffee and Tea	15/50	10/150			400/1000
Jams and Jellies	20/50	10/100			400/1000
Meat Products	50 ^a /150 ^a	16/40	800 ^a /6000 ^a	1700 ^a /6000 ^a	400 ^a /1000 ^a
Milk Products	10/50	15/100			400/1000
Nut Products	20/50	10/150	400 ^a /4000 ^a	600 ^a /2500 ^a	
Other Grains	50/100	50/150			
Poultry Products	50 ^a /150 ^a	10/150	800 ^a /4000 ^a	1900 ^a /4500 ^a	400 ^a /1000 ^a
Processed Fruits	20/50	20/50			400/1000
Processed Vegetables	20/50	10/150			400/1000
Reconstituted Vegetable Protein	50/150	10/150			400/1000
Seasonings and Flavors	10/100	10/1000 ^a	2000 ^a /19500 ^a	11000 ^a /85000 ^a	400 ^a /1000 ^a
Snack Foods	50/100	10/150	400 ^a /4000 ^a	4500 ^a /11000 ^a	400 ^a /1000 ^a
Soft Candy	156 ^a /312 ^a	1/150 ^a			400/1000
Soups	10/100	10/100	1000 ^a /8000 ^a	1900 ^a /11000 ^a	400/1000
Sugar Substitutes	20/100	1/30			400 ^a /1000 ^a
Sweet Sauces	156 ^a /312 ^a	1/30			400/1000

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
5040	<i>Eucalyptus citriodora</i> oil	Prepared from the leaves and twigs of the <i>E. maculata citriodora</i> (syn. <i>Corymbia citriodora</i>) tree by steam distillation; 77-92% Unsaturated linear and branched-chain aliphatic, non-conjugated aldehydes, related primary alcohols, carboxylic acids and esters, including citronellal and citronellol; 2-11% Isopulegol; Up to 5% <i>p</i> -menthane-3,8-diol; Up to 3% eucalyptol
5042	Heat-treated glucosylated steviol glycosides 35% with steviol glycosides 10%	Prepared from enzymatically modified and heated steviol glycosides; >95% of identified constituents inclusive of: supraglucosylated steviol glycosides 30-40%, steviol glycosides not further glucosylated 8-13% with each individually less than 4%, dextrans 25-40%, monosaccharides 3-8%, disaccharides less than 1.5%, water not more than 6%, and other non-volatiles 5-10% including sugar alcohols, amino acids, proteins and lipids
5044	Sakura flower extract	Aqueous ethanol solution of approximately 0.06% Sakura flower extract derived from the water and ethanol extraction of the flowers of <i>Prunus serrulata</i> Lindl. of which the major marker constituents are saturated aliphatic, acyclic, linear primary alcohols, aldehydes, carboxylic acids and related esters, including ethyl acetate and acetic acid.
5045	Sakura flower distillate	Aqueous ethanol solution of approximately 0.02% Sakura flower distillate derived from the water and ethanol extraction of the flowers of <i>Prunus serrulata</i> Lindl. of which the major marker constituents are saturated aliphatic, acyclic, linear primary alcohols, aldehydes, carboxylic acids and related esters, including ethyl acetate, acetaldehyde, methanol and propanol; benzyl derivatives including benzaldehyde.
5046	Sakura leaf distillate	Aqueous ethanol solution of approximately 0.02% Sakura leaf distillate derived from the water and ethanol extraction of the leaves of <i>Prunus speciosa</i> (Koidz.) Nakai. of which the major marker constituents are saturated aliphatic, acyclic, linear primary alcohols, aldehydes, carboxylic acids and related esters, including ethyl acetate, acetaldehyde, methanol and propanol; benzyl derivatives; and aliphatic, alicyclic, alicyclic-fused and aromatic-fused ring lactones.
5047	Sansho pepper extract	Aqueous ethanol solution of approximately 0.02% Sansho pepper extract derived from the water and ethanol extraction of the dried berries of <i>Zanthoxylum piperitum</i> of which the major marker constituents are saturated aliphatic, acyclic, linear primary alcohols, aldehydes, carboxylic acids and related esters, including ethyl acetate; unsaturated linear and branched-chain aliphatic, nonconjugated aldehydes, related primary alcohols, carboxylic acids and esters; aliphatic, alicyclic, alicyclic-fused and aromatic-fused ring lactones; and phenol derivatives.

5048	Sansho pepper distillate	Aqueous ethanol solution of approximately 0.01% Sansho pepper distillate derived from the water and ethanol extraction of the dried berries of <i>Zanthoxylum piperitum</i> of which the major marker constituents are saturated aliphatic, acyclic, linear primary alcohols, aldehydes, carboxylic acids and related esters, including propanol and ethyl laurate; aliphatic linear and branched-chain <i>alpha</i> , <i>beta</i> -unsaturated aldehydes and related alcohols acids and esters, including geraniol; unsaturated linear and branched-chain aliphatic, nonconjugated aldehydes, related primary alcohols, carboxylic acids and esters, including lavandulyl acetate.
5054	Rosemary extract, rosmarinic acid 80%	Prepared from selective extraction of the aerial parts of rosemary (<i>Rosmarinus officinalis</i>); 83-96% Rosmarinic acid, up to 3% of other phenol derivatives and <0.5% of other volatile constituents.
5060	Rosemary extract, rosmarinic acid 15%	Prepared from selective extraction of the aerial parts of rosemary (<i>Rosmarinus officinalis</i>); 29-31% Carbohydrates, 15-16% rosmarinic acid, up to 25-31% of other phenol derivatives, <2% of other volatile constituents, 5-8% ash, 1-4% water, 1-2% protein, <2% fiber and <0.5% fat.
5069	Rebaudioside M 70%	76-77% Rebaudioside M, 16-18% Rebaudioside A, 7-8% Rebaudioside B.
5072	Heat-treated Glucosylated Steviol Glycosides 15% with Steviol Glycosides 5%	Prepared from enzymatically modified and heated steviol glycosides; >95% of identified constituents inclusive of: Supraglucosylated steviol glycosides 8-15%; steviol glycosides not further glucosylated 1-5% with each individually, less than 2%; dextrans 60-70%; monosaccharides 3-8%; water less than 6%; disaccharides less than 1%; and other non-volatiles 5-8% including sugar alcohols, amino acids, proteins, lipids and ash.

5073	<i>Corynebacterium glutamicum</i> fermentation product	75-82% Protein, 9-15% carbohydrates, 3-5% ash, 3-5% water and <0.05% fat.
5074	Enzymatically modified rebaudioside A 85%	>95% Identified constituents inclusive of: Supraglycosylated rebaudioside A derivatives 76-88%; Rebaudioside A <7%; Other steviol glycosides not further glycosylated, each individually, less than 4%; Maltodextrin 5-15%.
5081	<i>Corynebacterium glutamicum</i> fermentation savory product	73-76% Protein (composed of amino acids such as glutamic acid and lysine), 14-17% carbohydrates, <8% moisture, <5% ash, and <1% sodium.
5082	<i>Corynebacterium stationis</i> fermentation product	59-63% Protein (composed of amino acids such as glutamic acid, alanine and leucine), 15-20% carbohydrates, <5% moisture and <2% sodium. Disodium inosinate (IMP) content at 20-25%.
Corrections of FEMA GRAS Identity Descriptions		
4949	<i>Corynebacterium stationis</i> cell free fermentation broth	No more than 65% miscellaneous nitrogen-containing compounds (nucleotides); <10% of amino acids; <10% of minerals; <7% of simple carbohydrates, typically monosaccharides; The material may be standardized with an appropriate carrier such as dextrans.
4964	<i>Corynebacterium glutamicum</i> cell free fermentation product	No more than 70% glutamic acid; <10% simple carbohydrates; <10% sum of other individual amino acids; <15% minerals; The material may be standardized with an appropriate carrier such as dextrans.