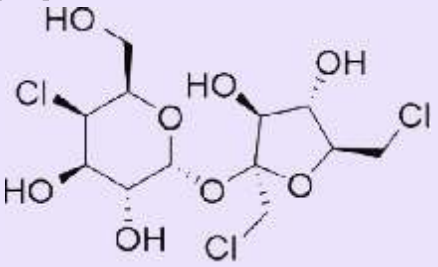
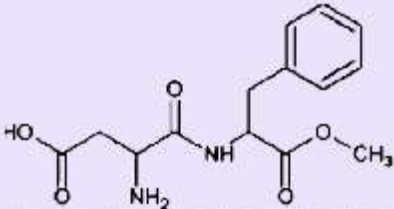
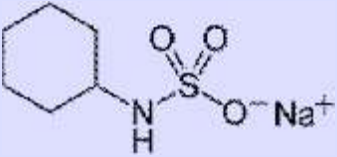
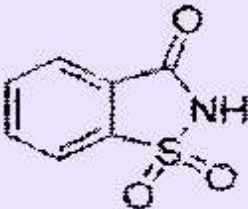


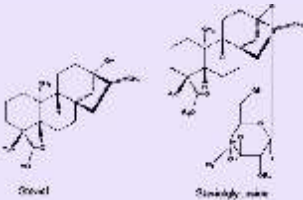
Low-Calorie/ Non-Nutritive Sweeteners

September 15, 2015

Chemical Composition/Plant source, Acceptable Daily Intake (ADI), Sweetness Compared to Sugar, Global & Regulatory Status.

Name of Low Calorie-Non Nutritive Sweetener	Chemical Composition/ Plant Source	Acceptable Daily Intake (ADI)**	Sweetness Compared to Sugar	Global Status* As approved by Codex for use in Foods, Beverages, Table Top Sweeteners*	Indian Regulatory Status#
<p>Sucralose Discovered in 1976¹</p>	<p>Sucralose is a disaccharide made from sucrose, by a process that substitutes three chlorine molecules for three hydroxyl groups on the sucrose molecule.^{2,3}</p> 	<p>As per JECFA, ADI is 15 mg/kg of body weight.⁴</p>	<p>Sucralose has a sweetness that is approximately 600 times greater than that of sucrose, and contributes almost no calories when added to foods and beverages.⁵</p>	<p>Sucralose is approved for use in foods and beverages, or as a tabletop sweetener in nearly 80 countries including Japan, Canada, Australia and New Zealand by regulatory authorities.⁶⁻⁸</p>	<p>Allowed by FSSAI in carbonated water & non carbonated water based beverages: 300 ppm, biscuits, cakes: 750 ppm, Indian sweets: 750 ppm, still beverages: 300 ppm, jams jellies: 450 ppm, ready to serve tea and coffee based beverages: 600 ppm, ice lollies/candies: 800 ppm, confectionery: 800 ppm-1500 ppm.⁹</p>
<p>Acesulfame-K (Ace-K) Discovered in 1967¹⁰</p>	<p>The low-calorie sweetener acesulfame-potassium, or Ace-K, is a combination of an organic acid and potassium.¹¹⁻¹³</p>	<p>As per JECFA, ADI is 15 mg/kg of body weight.⁴</p>	<p>It is 200 times sweeter than sucrose. And provides no calories.^{5,14}</p>	<p>Ace-K is approved for use in nearly 90 countries including US, UK, Canada and Australia and is allowed in numerous food products, beverages as well as table top sweetener.^{7,8}</p>	<p>Allowed by FSSAI in carbonated water and non carbonated waterbased beverages: 300 ppm, biscuits, cakes etc.: 1000 ppm, Indian sweets: 500 ppm, sugar based/free confectionery: 3500 ppm, still beverages: 300 ppm, ready to serve tea and coffee based beverages: 600 ppm.⁹</p>

Name of Low Calorie-Non Nutritive Sweetener	Chemical Composition/ Plant Source	Acceptable Daily Intake (ADI)**	Sweetness Compared to Sugar	Global Status* As approved by Codex for use in Foods, Beverages, Table Top Sweeteners*	Indian Regulatory Status#
Aspartame Discovered in 1965 ¹⁵	Aspartame is a low calorie sweetener consisting of a methyl ester of two amino acids, aspartic acid and phenylalanine. ¹⁶ 	As per JECFA, ADI 40 mg/kg of body weight. ⁴	Aspartame is approximately 180 times sweeter than sucrose. Aspartame provides four calories per gram. However, it is used in very small amounts, contributing negligible calories to the diet. ¹¹⁻¹³	Aspartame is approved as table top sweetener and is used in foods and beverages in more than 100 countries worldwide including Australia, Canada, US. ^{7,8,17}	Allowed by FSSAI in carbonated water: 700 ppm, non carbonated water based beverages: 600 ppm, biscuit, bread, cakes: 2200 ppm, Indian sweets: 200 ppm, jams jellies: 1000 ppm, sugar based/free confectionery: 10000 ppm, chocolates: 2000 ppm, ice cream: 1000 ppm, flavored milk: 600 ppm, RTE cereal: 1000 ppm, still beverages: 600 ppm. ⁹
Cyclamate Discovered in 1937 ¹⁸	Cyclamate is a low-calorie sweetener. The term "Cyclamate" refers to three different compounds: cyclamic acid, calcium cyclamate and sodium cyclamate. ¹⁹ 	The ADI set by JECFA is 11 mg/kg of body weight. ⁴	Cyclamate is a no-calorie sweetener that is also 30 times sweeter than sucrose. ¹⁹	Cyclamate is used to sweeten foods and beverages and as table top sweetener. It is permitted in more than 100 countries, including regions such as Asia, Africa, Central and South America, and Europe. ¹¹	N.A.
Saccharin Discovered in 1878 ¹⁸	The saccharin molecule is an organic acid, most often found as the sodium salt form called sodium saccharin. ^{3,4,11,12} 	As per JECFA, ADI is 5 mg/kg of body weight. ⁴	It is 300 times sweeter than sucrose, and provides a sweet taste to products without contributing calories. ⁵	It is approved in more than 100 countries, as a tabletop sweetener, and in foods and beverages. ¹⁸	Allowed by FSSAI in carbonated water: 100 ppm, chocolates & Indian traditional sweets: 500 ppm, sugar based/sugar-free confectionery & chewing gum/bubble gum; 3000 ppm. ⁹

Name of Low Calorie-Non Nutritive Sweetener	Chemical Composition/ Plant Source	Acceptable Daily Intake (ADI)**	Sweetness Compared to Sugar	Global Status* As approved by Codex for use in Foods, Beverages, Table Top Sweeteners*	Indian Regulatory Status#
<p>Stevia Sweeteners Discovered in 1900s.²⁰ Approved for use by JECFA in 2009</p>	<p>The stevia plant (<i>Stevia rebaudiana</i>) is indigenous to South America. The sweetness is found in the leaves, from a group of compounds called steviol glycosides. High purity stevia leaf extract, the ingredient form approved for food and beverage use, contains 95% or more of these steviol glycosides and generally, “stevia sweeteners” refer to this approved, high purity leaf extract.^{20,21}</p> 	<p>As per JECFA, ADI value for steviol glycosides is expressed as 4 mg of steviol equivalents per kilogram of body weight per day.⁴</p> <p>This equates to approximately 12 mg of high purity stevia extracts per kilogram of body weight per day.⁴</p>	<p>250 times sweeter than sucrose, contains no calories.⁵</p>	<p>Stevia sweeteners are approved as table top sweetener and for addition to foods and beverages in approximately 49 countries including U.S., Japan, Brazil, Paraguay and EU.²⁰⁻²²</p>	<p>Available as table top sweetener, under approval process for Foods and Beverages.</p>
<p>Neotame Discovered in mid-1980a</p>	<p>Neotame is a derivative of aspartic acid and phenylalanine.²³</p>	<p>As per JECFA, ADI is 2 mg/kg of body weight.⁴</p>	<p>It is approximately 7,000 to 8,000 times sweeter than sugar, although some report a sweetening power of up to 13,000 times that of sugar.⁶</p>	<p>Neotame is approved for consumption in over 40 countries including most parts of Eastern Europe, Australia, Russia, Mexico and several South American countries.</p> <p>Neotame is used as table top sweetener and in beverages and food products.¹¹</p>	<p>Allowed by FSSAI in carbonated water & soft drink: 33 ppm.⁹</p>

* Contact ILSI India for detailed information.

The Indian regulations allow the use of low calorie / non nutritive sweeteners mentioned here. The specifications about their use is taken from food additives regulations issued by Food Safety and Standards Authority of India. This is an illustrative list and more details can be obtained from FSSAI website: www.fssai.org.

** About ADI or Acceptable Daily Intake: ADI indicates acceptable daily intake. ADI is a measure of the amount of a specific substance in food or drinking water that can be ingested over a lifetime without an appreciable health risk. Measurement is usually expressed in milligrams of sweetener per kilogram of body weight (mg/kg BW). The amount is usually set at 1/100 of the maximum level at which no adverse effect was observed in animal experiments. The independent experts who are members of the JECFA (Joint Expert Committee of the FAO and WHO on food additives) recommend ADIs and standard specifications of food additives. This may involve several rounds of discussions and deliberations over a number of years. The national authorities use them for guidance while deciding specifications for food additives under their regulations.

Sources

1. Knight, I. The development and applications of sucralose, a new high-intensity sweetener. Canadian journal of physiology and pharmacology, (1994). 72(4), 435-439.
2. International Food Information Council Foundation. The Lowdown on Low-Calorie Sweeteners Continuing Professional Education (CPE) module (June 2009). http://www.foodinsight.org/Resources/Detail.aspx?topic=The_Lowdown_on_Low_Calorie_Sweeteners_CPE_Program.
3. International Food Information Council Foundation. US Food and Drug Administration. Food Ingredients and Colors. (June 2010). http://www.foodinsight.org/Resources/Detail.aspx?topic=Food_Ingredients_Colors.
4. AHA/ADA Scientific Statement. Nonnutritive Sweeteners: Current Use and Health Perspectives. Circulation July 24, 2012 vol. 126 no. 4 509-519.
5. Position of the Academy of Nutrition and Dietetics: use of nutritive and nonnutritive sweeteners. Fitch C, Keim KS, Academy of Nutrition and Dietetics. J Acad Nutr Diet. 2012 May; 112(5):739-58. Epub 2012 Apr 25.
6. Tandel, Kirtida R. Sugar substitutes: Health controversy over perceived benefits. Journal of pharmacology & pharmacotherapeutics 2.4 (2011): 236.
7. Health Canada. Available at: <http://www.hc-sc.gc.ca/fn-an/securit/addit/list/9-sweetener-edulcorant-eng.php>.
8. Consumption of intense sweeteners in Australia and New Zealand: Available at: http://www.foodstandards.gov.au/publications/documents/Intense_sweetener_Report_feb04.pdf
9. FSSAI, <http://www.fssai.gov/>.
10. Mitchell, H. (Ed.). (2008). Sweeteners and sugar alternatives in food technology. John Wiley & Sons.
11. International Food Information Council Foundation. Facts about low-calorie sweeteners. (March 2010). http://www.foodinsight.org/Content/5438/LCS%20Fact%20Sheet_rev%202.pdf.
12. International Food Information Council Foundation. IFIC Review, Low-Calorie Sweeteners and Health (October 2000). http://www.foodinsight.org/Resources/Detail.aspx?topic=IFIC_Review_Low_Calorie_Sweeteners_and_Health_.
13. International Food Information Council Foundation. Everything you need to know about Acesulfame-K (October 2009). <http://www.foodinsight.org/Content/6/Everything-You-Need-to-Know-About-Acesulfame-Potassium.pdf>.
14. American Diabetes Association. The Truth about Artificial Sweeteners or Sugar Substitutes How Much Is Too Much?. 2004. Presented by the ADA Evidence Analysis Library.
15. Magnuson, B. A., et al. Aspartame: a safety evaluation based on current use levels, regulations, and toxicological and epidemiological studies. Critical reviews in toxicology 37.8 (2007): 629-727.
16. European Food Safety Authority. 2011. FAQ on Aspartame. <http://www.efsa.europa.eu/en/faqs/faqaspartame.htm>.
17. Gardner, Christopher, et al. Nonnutritive Sweeteners: Current Use and Health Perspectives A Scientific Statement from the American Heart Association and the American Diabetes Association. Diabetes care 35.8 (2012): 1798-1808.
18. Goldberg, Israel, and Richard Williams. Biotechnology and food ingredients. Springer Science & Business Media, 1991.
19. US FDA. Available at: <http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=189.135>.
20. Stevia University-The Stevia Foundation. Available at: <http://www.steviauniversity.com/health-benefits-of-stevia/53-history>.
21. Carakostas M.C., Curry L.L., Boileau A.C., Brusick D.J. Overview: The history, technical function and safety of rebaudioside A, a naturally occurring steviol glycoside, for use in food and beverages. Food and Chemical Toxicology. 2008; 46:S1-S10.
22. <http://www.steviafirst.com/stevia/about-stevia>.
23. Neotame as a sweetener and flavour enhancer[1] - Scientific Opinion of the Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food. Link: <http://www.efsa.europa.eu/en/efsajournal/pub/581.htm>.

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