# Sweet Cravings, on Natural & Processed Sweeteners

## Part 3: Natural Stevia, Xylitol, and Artificial Sweeteners

by Catherine Haug

There are so many sweeteners on the market, and so much information about the benefits and potential harm of each, that it is really bewildering. Of course, when we are really being honest, we know that we should be minimizing our consumption of all sweeteners. But it's so hard to do when 'sweet' tastes so good.

So, what is one to believe? Which is the best choice for your own health and that of your children, when it comes to sweeteners?

See also:

**Part 1**: Natural Sugar Sweeteners; **Part 2**: Corn Syrups, Agave Nectar & *Aguamiel*

## Stevia

*(photo of Stevia herb with flowers from Wikipedia(9))*

Unlike all of the sweeteners described above, stevia is not a sugar. It is the *Stevia rebaudiana* herb that contains sweet substances (collectively 200-300 times sweeter than sucrose) known as steviosides. And because it is not a sugar, its metabolism is totally different. Note that it cannot be used like sugar for food preservation.

### Growing stevia in Montana

A perennial native to central and south America, stevia can be grown as far north as southern Canada, but in colder climes such as ours, it will likely not survive the winter outdoors. Instead, after harvesting, move the scaled-back plant indoors for the winter (5).

See The EssentiaList: Growing Stevia for details.

### Using the leaves

The steviosides are found in the leaves of the stevia plant. These leaves are collected and dehydrated for storage. You can use the fresh leaves, but properly dried leaves are sweeter, and will remain sweet for several years if stored properly in an air-tight container, such as a glass canning jar. (7)

**To dry**: use a screen or net. Air circulation is more important than heat. Choose a moderately warm fall day and quick-dry in full sun in about 12 hours (which can be difficult in late September Montana). A home dehydrator on low heat can also be used, although sun drying is the preferred method. (5)

**To use** dried leaves, simply crush them by hand, or grind them in a coffee or herb grinder; crushing/grinding helps to release the sweetness of the leaves.

Whether fresh or dried, one stevia leaf is enough to sweeten a cup of tea or coffee, or a glass of lemonade. You can also add them to baked beans, sauces, salad dressings, soups and stews, just as you would with other herbs. (6)

Note: the sweetness is not consistent from leaf to leaf, so it is difficult to quantify how much to use. A good rule of thumb: use 3 - 4 teaspoons of green stevia powder in place of 1 cup table sugar. Note that the conversion rate varies according to the recipe. (4)

Dried green stevia may not be attractive in most baked goods, and it has a licorice flavor which needs to be considered (tinctures and white powders do not have this flavor).

## Stevia extract (tincture)

As with other herbs, an extract can be obtained as a tincture of alcohol or glycerin. This is perhaps the best way to use stevia because it is minimally processed. It is especially useful for sweetening beverages such as lemonade, coffee and tea.

However, it is difficult to be consistent from batch to batch when you make your own, so it is hard to know how much to use in recipes such as baked goods where you cannot taste the final product until after it is cooked. Keep records of each batch to help you hone your skills toward achieving consistency.

To make your own extract (1):

> *"A liquid extract can be made form the whole stevia leaves or from the green herbal stevia powder. Simply combine a measured portion of stevia leaves or herbal powder with pure USP grain alcohol (brandy or scotch will also do) and let the mixture sit for 24 hours.*
>
> *A pure water extract can be similarly prepared, but will not extract quite as much of the sweet glycosides as with alcohol. Water or alcohol extract can be cooked down and concentrated into a syrup [at a simmer - do not boil].*
>
> *Filter the liquid from the leaves or powder residue and dilute to taste using pure water. If desired, the alcohol content can be reduced by very slowly heating (not boiling) the extract and allowing the alcohol to evaporate off.*

## Stevia extract (powder)

The concentrated stevia extract can also be dried and purified to produce a fine white powder containing the full spectrum of steviosides (unlike the commercial Rebiana sweeteners - Truvia and PureVia - derived from stevia; see Artificial Sweeteners, below).

Although this is not something you can do in your own kitchen, it could be an entrepreneurial opportunity for an adventurous chemist.

This is primarily the form of stevia I use in cooking and baking, as it gives the best consistent results from batch to batch. You don't need much however: 1 teaspoon of commercial stevia powder is the sweetness of 1 cup of sugar! (Homemade, dehydrated extract will have varying levels of sweetness).

Stevia extract powder can also be bulked with inulin, dextrose or sugar alcohols to give it a sugar-like consistency for sweetening beverages; this form is often sold in packets. However, it takes more than 48 (or more) teaspoons of bulked stevia to equal 1 cup of sugar, so this is not a practical form for baking.

## Using stevia extracts

The liquid extract is great for sweetening beverages. The powdered extract is easier to use in baked goods. However, use the pure powder, not the bulked powder for beverages; other wise the equivalencies indicated here will not apply.

A small 1-oz container of pure stevia extract powder may cost a bit, but remember that it is equivalent to at least 500 cups of sugar! (That's 44 five-pound bags of sugar).

Refer to my ESP post: Cooking with Stevia for tips on using stevia in recipes.

This equivalency chart (right) is from stevia.com (1). Note that the stevia liquid concentrate is a commercial product with a standardized concentration. If you make your own stevia tincture, it will likely not match this.

*From "The Stevia Cookbook," copyright 1999 Ray Sahelian and Donna Gates*

| Sugar amount | Equivalent Stevia powdered extract | Equivalent Stevia liquid concentrate |
|---|---|---|
| 1 cup | 1 teaspoon | 1 teaspoon |
| 1 tablespoon | 1/4 teaspoon | 6 - 9 drops |
| 1 teaspoon | 1 pinch to 1/16 teaspoon | 2- 4 drops |

If you are seriously interested in converting from sugar to stevia in some of your recipes, we suggest you purchase one of the cookbooks available for additional guidance. Additionally check the website for a specfic products conversions as they will vary.

## Stevia Metabolism

Research on stevia metabolism is quite young. A 1986 study of dietary steviosides indicate that steviosides are not absorbed into the blood, but are metabolized in the gut by probiotic bacteria, to steviol and glucose. The steviol is excreted in the feces; the glucose is absorbed and metabolized normally. (2)

There is evidence that moderate consumption of stevia improves insulin sensitivity, but the mechanism is not known. Other studies indicate that stevia can increase insulin production in type-2 diabetic rats. (3)

I've not been able to find any long term studies on the effects of long-term use of stevia.

Several studies have reported negative findings regarding stevia use, but their conclusions are open to dispute. Bear in mind that such studies and conclusions may be biased by conflicts of interest in favor of commercial sweeteners such as aspartame or HFCS.

## Bottom line on stevia

Ground dried herb and homemade stevia extracts, using herbs grown in your own herb garden, are the best forms from a sustainability viewpoint, and the best choice of alternative sweeteners. It's the one I would recommend for diabetics. Stevia extract powder is a bit more processed, making it a second choice.

Nevertheless, as with all sweeteners, stevia should be used in moderation.

# Xylitol

Many of the sugar alcohols are used as sweeteners: sorbitol, manitol, erythritol and xylitol are the most common. I only have experience cooking/baking with xylitol, so that is the only one I will discuss here.

Of all the sugar alcohols, it has the fewest side effects, and even has some exciting health benefits (11, 12):

- Improves oral health by preventing dental cavities and gum disease by creating an unfriendly environment for bad bacteria;
- Inhibits growth of bacteria that cause ear infections, especially in children;
- Inhibits growth of *Candida albicans*, the organixm responsible for 'yeast infections;'
- Plays a role in reversing bone loss. in part by increasing calcium absorption from the gut;
- Will not raise insulin levels, and improves insulin sensitivity, by being very slowly metabolized and thus stabilizing blood sugar; and
- Helps reduce estrogen production in estrogen dominant people, and excessive male hormone production in women.

The makers of xylitol say it comes from the birch tree. And of course it can be obtained form birch, as the Scandinavians did during the lean years in the late 1800s (and perhaps even earlier); but most common commercial source is corn, and especially GMO corn. It can also be found in many other fruits and veggies, including berries, plums, oats and mushrooms. (10)

It is a 5-carbon sugar-like molecule, with molecular formula $(CHOH)_3(CH_2OH)_2$, and unlike the sugar xylose to which it is related, and from which is is commercially made, it cannot form a ring.

Advocates of xylitol are quick to point out that we even make xylitol in our own bodies as part of normal energy pathways. (10)

Xylitol is about the same sweetness as table sugar and can be used as a direct substitute, except it cannot be used to make caramel. In my experience, it helps baked goods retain moisture. However, I don't use it as an all-purpose sweetener, preferring stevia for most uses. I use it only in baked goods such as cookies, where sugar is an essential contributor to the structural texture of the food.

## Metabolism of xylitol

Xylitol is absorbed from the gut far more slowly than glucose and fructose, because the gut wall lacks a specific xylitol transport mechanism. About ⅔ of the ingested xylitol is instead broken down by probiotic flora in the large intestine, converting it to short-chain fatty acids beneficial to the liver.

Most of the absorbed xylitol is metabolized in the liver via normal sugar metabolism pathways, to glucose for immediate energy needs, or to glycogen for energy storage. (10)

### Bottom line on xylitol

Despite all the good news, as with all sweeteners, it should be used with moderation. It is highly refined, and may be made from GMO corn. Used in excess, it can cause gas, constipation and other side effects.

From a sustainability viewpoint, commercial xylitol is not good because it is highly refined and requires large amounts of energy to produce. Small-scale extraction from birch, as the Scandinavians have done in times of want, is more sustainable.5

## Artificial Sweeteners

- **Saccharine** was found to be carcinogenic in large doses, but has less potential for harm than aspartame when used in moderation.
- **Aspartame** (Nutrasweet, Equal) is now known to be a neurtoxin. DO NOT USE in foods that will be heated. There are over 92 documented side effects from use of aspartame, including muscle spasms, headaches, fibromyalgia and Parkinsons. (14)
- **Sucralose** (Splenda) produces many of the same neurotoxic symptoms as aspartame in many people (8). It resembles a glucose molecule, except the OH groups are replaced with Cl (chlorine). This type of chemistry is very similar to pesticides.

  Research conducted by the manufacturer prior to its approval for general use indicated that it caused shrinkage of the thymus (a hormone gland), and enlargement of the liver and kidneys of test rats.

  Sucralose is also bulked with dextrose (glucose) or sugar-like substances including sugar alcohols to give the crystalline appearance of sugar, but that may have deleterious side effects. When bulked with dextrose, it causes the same effect on blood sugar as sugar - because dextrose is glucose. (13)
- **Rebiana** (Truvia, PureVia), a refined version of Rebaudioside A, one of the steviosides in stevia herb, is too new on the market to know if there are health concerns. Rebiana is also bulked with sugar alcohols to give the crystalline appearance of sugar, but that may have deleterious side effects. (9)

### Bottom line on artificial sweeteners

From a sustainability viewpoint, none of these are good because they are all industrially produced, requiring large amounts of energy and producing environmental pollution.

From a health standpoint: buyer beware!

# Sources & References:


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