

# Stevia sweetens the deal

**Overcoming off-notes and mastering low-calorie drinks.**

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Although Valentine's Day has passed, stevia is still "whispering sweet nothings" into consumers' ears. As a natural, zero-calorie sweetener that's sweeter than sugar, stevia is capitalizing on consumer demand for natural and healthy beverages. As this demand continues to increase, stevia's popularity will rise as well, according to a January 2013 presentation by Chicago-based Euromonitor International titled "Functionality, Naturalness and Stevia Key to Developing Beverages to Fit Today's Trends." Between 2011 and 2016, consumption of stevia ingredients is expected to more than double, increasing by a little more than 2 million pounds, it reports.

Adding to its growth, the European Union's approval of steviol glycosides with 95 percent purity in 2011 opened many doors for the ingredient, according to Euromonitor's October 2012 presentation titled "Ingredients: How Will Stevia Change the Sweeteners Market?" And late last year, Health Canada approved stevia as an additive in food and beverage products.

"Stevia launches in beverages drove a large percentage of the over 1,000 stevia launches we saw globally in 2012," says Jason Hecker, vice president of global marketing and innovation for PureCircle, Oak Brook, Ill. "We expect this to continue as the world's largest beverage manufacturers continue to launch with stevia in more markets and across several brands."

James Kempland, vice president of marketing for Sweet Green Fields, Bellingham, Wash., adds that stevia-based products have increased in the triple digits percentage-wise. Chicago-based market research firm Mintel also forecasts the U.S. sales of products containing stevia to exceed \$1.3 billion by the end of 2014, he says.

## Sweet blends

Although stevia is gaining ground, it's not necessarily taking a meaningful share from other high-intensity sweeteners, suggests Euromonitor's October presentation. Stevia can be used to complement rather than replace sugar, putting less focus on dieting and more on natural health, it states.

By itself, stevia does not provide the full sweetness of conventional beverages, but it works well in less-sweet beverages, such as sports drinks and flavored waters, or together with other sweeteners, explains Melanie Goulson, Truvia stevia leaf extract applications manager for Cargill Inc., Minneapolis. Stevia pairs particularly well with bulk sweeteners such as sugar or high-fructose corn syrup (HFCS) in reduced-sugar applications, she notes. To keep a natural claim, beverage-makers can blend stevia with erythritol, which is a zero-calorie, natural bulk sweetener that boosts the total sweetness quality and impact, she adds.

Cargill's RA50 is an economical grade of Truvia stevia leaf extract that is particularly suited for sugar reduction, Goulson says. It combines more than 50 percent Reb A with other glycosides to provide quality sweetness with approximately 10 percent less potency than its RA95 and RA80 grades, she adds.

Likewise, Sweet Green Fields recently expanded its product portfolio with Optesse HPX and Optesse HPS Reb A sweeteners. Optesse HPX is ideal for formulations with more complex flavor systems, or for zero- or very-low-calorie products, the company says. Optesse HPS is ideal for 33 to 50 percent reduced-sugar blended formulations, it adds. Sweet Green Fields also plans to launch an organic, high-purity stevia extract line, Kempland says.

The latest innovation from PureCircle is its Stevia 3.0, which enables a range of calorie reductions across a variety of beverage applications, Hecker says. The customized solution moves beyond Reb A to proprietary ingredients like PureCircle Alpha and PureCircle Flavors, he notes.

There is a new wave happening with mid-calorie sodas, and stevia works particularly well when blended with sugar and HFCS, says Breah Ostendorf, global commercial manager for Truvia. John Simons, vice president of sales and marketing for Robertet Flavors, Piscataway, N.J., adds that there are a number of companies currently testing mid-calorie beverages. Euromonitor's October presentation affirms these observations, stating that stevia is likely to find most success in the mid-calorie, reduced-sugar range. In the beverage industry, stevia already is helping to create a new generation of drinks with 30 to 50 percent less sugar than standard, it adds.

"There seems to be a major effort right now to come back in and test the mid-calorie market to see if the consumer is truly interested in that," Robertet Flavors' Simons says. "We do a lot of work to try to build mid-calorie back to full-calorie and to make zero-calorie taste as close to full-calorie as possible."

By blending stevia with sugar, manufacturers can produce great-tasting drinks with less than half the calories, Sweet Green Fields' Kempland adds. In the future, the movement toward stevia-sweetened carbonated drinks is likely to gain momentum as consumers are looking for an alternative between highly caloric sugar and artificial, zero-calorie sweeteners, he adds.

Steviva Brands Inc., Portland, Ore., recently introduced a stevia-based syrup blend of SteviaSweet 95/60 stevia extract powder; genetically-modified-organism-free erythritol; fructooligos-accharides; acacia gum; guar gum; and all-natural, organic brown sugar flavoring. The blend was designed to replace HFCS in beverages, the company says.

"The challenge for beverage manufacturers has been to cut calories and deliver the flavor and mouthfeel of traditional soft drinks," said Thom King, president of Steviva Brands Inc., in a statement. "Flavor matching, including replicating the

sweetness temporal profile of HFCS, is critical for consumers to switch from regular sodas to diet drinks. Because this syrup is optimized to provide sweetness and body, it is a no-added-sugar ‘magic bullet’ for sweetening beverages.”

Fruit juice concentrates or fruit juices also pair well with stevia because of their naturally occurring sugars, says Jim Hamernik, director of research and development for Flavorchem, Downers Grove, Ill. The flavors of the juices can help to mask stevia’s off-notes, he says.

When it comes to formulating a beverage with stevia, Virginia Dare generally tries to counsel manufacturers into either blending stevia with natural, zero-calorie sweeteners or blending it with natural sugar for a low-calorie beverage, says Robert Bent, food technologist with the Brooklyn, N.Y.-based company. Formulating a high-sweetness beverage with natural sweeteners and zero calories is a tall order, so one of the challenges in working with stevia is aligning with the manufacturers’ expectations, he explains.

“People have a perception that stevia’s a great replacement for sugar; like you can just replace sugar with stevia and it works out really well, and so what we’ve found is that generally, with the current stevia technology ... [stevia] works well as the minor ingredient in a multi-part sweetener system,” Bent says.

A bittersweet ingredient

Manufacturers also need to know how to “take the bitter with the sweet,” as the saying goes. According to experts, the most common off-notes of stevia are bitterness, licorice and a lingering aftertaste.

“When you taste sugar, it’s a very well-rounded sweetness; you get it right away and it persists throughout the whole tasting,” Flavorchem’s Hamernik says. “But with stevia, you don’t get it right up front — all of a sudden it hits you and then you have that lingering sweetness that gives an aftertaste.”

In addition to stevia’s slow onset and lingering aftertaste, middle notes consist of bitterness or licorice or metallic tastes, depending on the individual’s sensory capabilities, Robertet Flavors’ Simons says.

The intensity of these off-notes also depends on the concentration of stevia in a beverage, notes Virginia Dare’s Bent. “When you use more [stevia], you’re going to get more of stevia’s characteristic taste,” he says. “There tends to be a threshold effect where up to a certain point you’ll get a relatively proportional increase in sweetness and off-notes coming together, and then as you add more stevia, the taste of stevia seems to increase at a rate higher than that of the sweetness.”

However, using too little stevia comes with its own problems, according to Jim May, founder and chief executive officer of Wisdom Natural Brands, Gilbert, Ariz.

“If too little is used, the beverage will not taste sweet, but if too much is used, it can result in a bitter aftertaste,” he explains. “Stevia extract is 300 times sweeter than sugar. If too much is used, it activates the bitter taste receptors in the mouth. When the right amount is used — and it has not been extracted from the leaves with chemicals and methanol — the result is a delightfully sweet taste.”

The mouthfeel of stevia also is different from sugar, experts say. Therefore, another major challenge when working with stevia is building back the mouthfeel so that the product matches the consistency of full-calorie drinks and doesn't taste watery or light, Robertet's Simons says.

Despite the challenges that arise when formulating with stevia, masking technologies and certain flavors can provide solutions.

Wixon Inc. offers a line of flavor modifiers including products specifically designed to make stevia taste like sugar, says Mariano Gascon, vice president of research and development for the Milwaukee-based company. David Michael & Co.'s Bitter Masking and Sweetness Advantage technologies help to mask stevia's bitter off-notes and fill in the gaps in its sweetness profile, respectively, says Laura Ennis, senior beverage innovation technologist with the Philadelphia-based company.

According to Virginia Dare's Bent, there are two ways to deal with off-notes: One way is to try to work with them by taking advantage of the base flavor of the beverage; the other way is to work against the flavor profile of the beverage. For example, when stevia is found in a beverage application with a bitter flavor profile, consumers already are expecting the beverage to have some bitterness, so the bitterness from stevia would not seem out of place, he explains. However, stevia also can be used in a drink with a flavor profile that naturally complements or masks the off-notes of the stevia, such as a mixed berry drink, he adds. Because the flavor itself has the perception of sweetness, it can help mask the off-notes of stevia, he notes.

When stevia is the only sweetener used in a beverage application, masking its off-notes can be more difficult, Flavorchem's Hamernik says. “Sometimes it's as easy as adding certain flavor compounds to it that hit your taste buds at about the same time as the stevia does, and it kind of interferes with your taste buds and masks it a little bit,” he says. “Other times, it does get a little more complicated because you have to use certain ingredients that might be more proprietary and more of that technology-based product, but a lot of times it's as simple as adding flavors and certain flavor compounds to help with the sweetness and mask the flavor of it.”

Oftentimes, when developing solutions for masking stevia, other problems are brought to light, notes Wixon's Gascon. “Even though most requests are originally to help consumers to decrease the bitter aftertaste, in most instances we have found out that it is an imbalance between the sweetness and the acidity and saltiness levels in the finished product. That's when we can help customers not only to optimize the level of stevia and remove its bitterness, but

to help them optimize the entire formulation to compensate for the removal of sugar.”

#### Complementary pairings

Although each beverage application requires a unique solution, generally berry flavors work well in masking bitterness, says David Michael & Co.’s Ennis. A creamy vanilla flavor also works well in rounding out and covering up the aftertaste of stevia, she adds.

A high level of tartness or acidity tends to exacerbate the perception of stevia’s off-notes, Virginia Dare’s Bent adds. Likewise, flavors like licorice and root beer have similar flavor notes to stevia and, therefore, tend to enhance stevia’s off-tastes, Flavorchem’s Hamernik says. Cola is a difficult flavor to work with, Cargill’s Ostendorf adds. However, stevia works well with citrus- and fruit-based beverages, she adds. It also is effective with astringent notes such as tea-based drinks, Goulson says.

“Vanilla, citrus and other natural flavors are used with most, if not all, high-intensity sweeteners to balance sweetness and taste,” Sweet Green Fields’ Kempland says. “Salt is a wonderful taste modulator with stevia to enhance the sweetness and maximize flavor.”

Although there are specific flavors that complement stevia sweeteners best, the ingredient also works better in some beverage categories than others, experts note. According to Euromonitor’s January presentation, beverage categories such as carbonates, functional bottled waters and ready-to-drink (RTD) teas are most suited to stevia’s use.

PureCircle’s Hecker affirms that stevia launches in juices and RTD teas have been strong successes. Carbonated soft drinks (CSDs) and flavored milks hold great potential for development with stevia because they are both under pressure to reduce calories and sugar levels, he adds. Several mainstream CSD manufacturers have already launched brands with stevia, he says.

“Before stevia, there wasn’t a mass scale natural sweetener available to suit industry needs,” Hecker says. “Similarly, there has not been an acceptable sweetening solution for flavored milks, which are often scrutinized for high sugar and calorie content. PureCircle’s consumer insights have shown that stevia is acceptable as a natural sweetening ingredient for the whole family and could help improve the nutrition profile of flavored milks.”

Although the ingredient excels in some categories more than others, it can be used across all types of beverages, according to experts.

“Right now in the marketplace, you are seeing stevia in a variety of beverage categories,” Cargill’s Ostendorf says. “It essentially could be used in any beverage application; it just depends on what the target is.”

According to Wisdom Natural Brands' May, stevia enhances the flavor of any food or beverage to which it is added. It is ideal for reducing or eliminating the sugar or artificial sweetener content of soft drinks, he notes.

Typically, stevia has been used in zero-calorie and reduced-calorie sodas, flavored waters, reduced-sugar teas, fruit drinks and energy drinks, Ostendorf says. Alcohol beverages is a new category for the ingredient, she adds.

The ingredient also works well in the coffee drink category and categories that rely more on a functional benefit, Steviva Brands' King says. "Drinks that do not rely on pleasing profiles, such as energy drinks where effect is more important, they have started using stevia," he says.

As consumers put more focus on wellness instead of diet, the adoption of products sweetened with stevia and other natural ingredients will continue to increase, Sweet Green Fields' Kempland says.

The natural piece is just huge right now, so until the next natural high-potency sweetener comes along, stevia is the focus right now," Robertet Flavors' Simons says.