

No Magic Bullet in Stevia Masking

As beverage applications increase, customized masking and enhancing solutions come to the fore

The US and global stevia markets topped \$100 million and \$500 million in 2009, respectively, and sales of stevia products (including stand-alone stevia products) may exceed \$2 billion by 2011, according to a recent Mintel report, "Stevia and Other Natural Sweeteners." The report adds that 11% of US survey respondents have already used stevia or purchased foods and beverages that contain the natural sweetener. Since the US Food and Drug Administration's GRAS recognition of stevia extract rebaudioside A in 2008, flavor houses have launched a flurry of stevia-enhancing/masking initiatives, particularly in the beverage category.

Comax Flavors' masking technologies date back to the mainstreaming of soy milk, says Agneta Weisz, vice president of flavors and technologies.^a "Everybody was launching soy milk beverages," she says, "and they had this dry, green taste. The first masking flavor I made was soy masking flavor." Since that time, the company has continued masking research technology and currently sells more than 20 types of masking flavors.

Troubleshooting Stevia in Beverages

As consumers continue to demand healthier beverages without sacrificing flavor and mouthfeel, stevia presents both a solution and multiple technical hurdles. "The product causes issues with taste and requires highly customized masking," Weisz explains. "For best results we can't make general masking. There are interactions among the aroma components, the taste components, the texture and other facets." As a result, she says, a case-by-case solution is typically ideal and can involve solutions for several issues simultaneously—bitter blocking, acid reduction and caffeine masking. She adds that due to price constraints, most of the company's stevia work has taken place in the beverage category.^b

^aWeisz, a senior flavorist, oversees applications and analytical and QC labs. In addition, she trains the company's flavorists and acts as an advisor to the marketing and regulatory departments. Weisz has been with Comax Flavors for more than 15 years and previously held positions with Monsanto Flavor Essence, Globe Extracts, Florasynth, Felton International, Borthwicks Flavors and Manheimer.

^bTo a lesser extent, stevia is also applied in the bakery category, typically mixed with another sweetener.



For Weisz, the addition of stevia extracts to a beverage necessitates a two-pronged approach: 1) improved sweetness (rounding, enhancing for taste and cost targets), and 2) masking bitterness and off-notes. In addition, the flavorist must account for other factors: Will the product be added to an acidic environment? Will the product be heated? Will the stevia be used in concert with another sweetener such as sugar or high-fructose corn syrup? What grade of stevia is being used? This last point is crucial; the lower the grade used, the more finesse that is required. "Different grades of stevia have different types of taste," says Weisz. "I find that the purest stevia is easier to use and mask." Different brands of stevia taste a little different. It is best to customize the masking flavor to the food and to the type of stevia being used."

Last year Comax added stevia-masking technology to its growing list of flavor technologies. The customizable technology is applied to formulations to cut stevia-related bitterness and mute the product's inherent clinging sweetness.

"This changes the profile to make it more like sugar," says Weisz, "and gives it a little bit more mouthfeel. It brings up the intensity in the front and [cuts down on] the bitterness in the end."

Because stevia is relatively expensive, flavor companies have also pursued sweetness-enhancing solutions that work in concert with masking technologies. Comax, for example, has launched a sweetness enhancer aimed at enhancing mouthfeel and lowering overall Brix level (particularly in fruit and alcoholic beverage applications) and rounding out the sweet impression (no aftertaste, "fast clean out") with about half the calories of a sugar equivalent.

Because the understanding of the physiology of human taste buds is incomplete and existing theories are at times contradictory, Weisz stresses that there is no single solution to stevia-containing formulations. "Stevia works, as with any highly intense sweetener, differently depending on what type of food it's used in," she notes. "I don't think there's any magic masking technology for all kinds of taste issues. For stevia, it's a different sweetness from sugar—and it has a bitter aftertaste. We know, through our experience as flavorists, that certain chemicals mask certain bitter flavors. What we do is play with the levels

Beyond Stevia

Stevia allows for lower calorie formulations and natural claims, but its relatively high cost has limited its widespread application outside beverage and bakery categories. As a result, some in the flavor industry argue that the stevia boom is plateauing, while others are eyeing the next sweetener innovation.

"I see an interesting horizon in terms of natural sweeteners, along the lines of turbinado sugar or agave," says Kimberly Carson, director of the beverage solutions group at Sensient Flavors. "Things like that might start making their way onto the marketplace. There are some challenges with those types of things in terms of cost, usage and things like that, but I think that's something that is definitely going to be happening."

Meanwhile, the US Food and Drug Administration has granted GRAS status to BioVittoria's branded Fruit-Sweetness *luo han guo* (monk fruit; *Siraitia grosvenorii*) concentrate, which has application as both a sweetener and flavor enhancer. The zero-calorie product is reportedly 300 times sweeter than sugar.

In an official announcement, BioVittoria CEO David Thorrold said, "Monk fruit has been a traditional food in Southeast Asia for hundreds of years, but the existing technology for cultivating and processing the fruit could not provide the volume, product consistency and taste quality needed in a natural sweetener for the food and beverage industry. BioVittoria made advances in plant varieties, seedling cultivation, growing methods and fruit processing, creating a vertically integrated monk fruit supply chain."

"We'll have to see how this affects the marketplace," says Agneta Weisz, vice president of flavors and technologies, of new natural sweeteners. She notes that *luo han guo*, like stevia, will present its own set of formulation challenges in terms of achieving a balanced flavor profile in applications. Weisz adds that it remains to be seen whether the newcomer will be used in combination with other sweeteners and if varying grades will reach the marketplace, necessitating a variety of solutions. She expects to begin work on *luo han guo* prototype formulations in the near future with an eye

toward developing masking solutions for the novel sweetener.

Alternative natural sweeteners notwithstanding, is stevia actually plateauing? "Customers are well aware of the fact that stevia is expensive," says Weisz. "Sometimes they say, 'Can you use just *this* much stevia and make it sweeter with something else?' I find that some of them are thinking that stevia is going to come down in price because there's a lot of competition, new suppliers coming out."

Even as this gamble is underway, new research from Redpoint Bio claims that stevia component rebaudioside C (known internally as RP44) is a sweetness enhancer—not a sweetener. The ingredient is derived from a side

stream product of rebaudioside A production. According to an official release, the material "imparts no sweet taste of its own when used in a product" and acts "by amplifying the existing sweet taste of caloric sweeteners such as sugar or high fructose corn syrup." The company notes that rebaudioside C could potentially allow for reduced levels of sweetener without any sacrifice of "clean sweet taste" associated

with sugar-containing applications." Redpoint Bio has filed patent applications covering rebaudioside C's sweetness enhancing capabilities.

In model food and beverage applications, according to Redpoint Bio, rebaudioside C has allowed for an up to 25% reduction of caloric sweetener content with no sacrifice in sweetness or flavor character. These model applications have employed sucrose, fructose, high-fructose corn syrup and rebaudioside A. In combination with the latter, caloric content can be cut by as much as 50%. The official release concluded, "This result suggests that RP44 could add flexibility to all-natural sweetener blends in reduced-calorie sweetener systems. The worldwide sweetener market is estimated to be in excess of \$50 billion with sugar being the second most common ingredient used in food and beverages after water." The ingredient can be used in products such as fruit juice, soft drinks, sweet snacks, cereals, sweetened milk products and other calorie-dense products. Redpoint Bio is pursuing GRAS status and examining the viability of large scale production.



and use different combinations of things, depending on how they seem to work, to come up with optimal levels among these ingredients. We have to adjust our masking flavors to the [application]."

Despite the specificity of solutions required by stevia-containing beverages, Comax does offer general stevia maskers because there are instances in which the customer does not wish to share its application/intellectual property or simply does not have time for a more in-depth product development process. "They may not be optimal,

but they do work if they're used at the right level," says Weisz. In all cases the customers provide basic parameters, specifying, for instance, if the application is a protein beverage and what protein type is being used.

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