



THE SCIENCE OF SWEETNESS:

Getting the taste right to
meet consumer expectations

From the clean caramel taste in a cola beverage to the creamy fruit flavor of a frozen yogurt treat, Americans love the taste of sweet foods. However, as they become increasingly aware of the potential health concerns from consuming too much sugary food, consumers are looking for products that contain less of the tasty white stuff.

Food manufacturers, who have long depended on sugar for a variety of functions, have good reason to be concerned. More than three in four Americans now say they are trying to avoid or limit their sugar intake, according to the 2017 Food and Health Survey from the International Food Information Council Foundation (IFIC).¹ As a result, these respondents now say they are taking numerous measures to reduce sugar in their diet, including switching from caloric, sugar-laden foods and beverages to low-calorie and no-sugar products as well as using the Nutrition Facts box to choose foods that contain less sugar.

The significant shift towards reducing sugar consumption is prompting a reformulation frenzy in the food and beverage industry, with brands scrambling to introduce new products and provide new versions of their products with less sugar and fewer calories to address these consumer demands.

But formulators also know that eliminating sugar from many products is not an easy task. They understand that sweetened or not, products still need to meet consumer taste expectations.

In fact, taste continues to be an important product attribute, according to Kris Sollid, senior director of nutrition communications for IFIC. In 2017, the IFIC study showed that more than 84 percent of U.S. consumers consistently say that product taste has the most impact on their decision to buy a food or beverage. “We do know that taste remains the number one purchase driver,” Sollid said. So the question is, can brands meet all the current demands for low-calorie, low-sugar products and match consumer taste expectations? “It’s a big challenge,” he added.

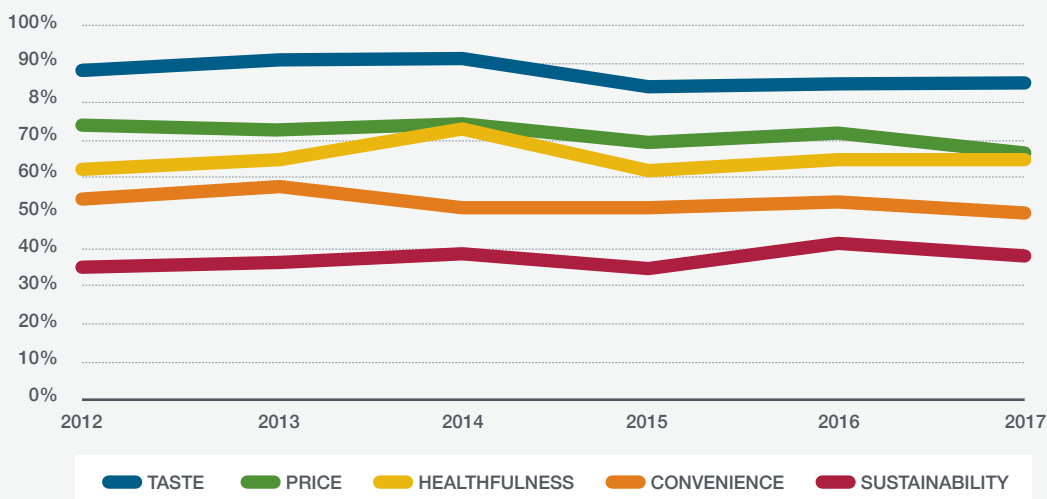
TASTE IS THE TOP PURCHASE DRIVER FOR CONSUMERS¹

Taste, price, healthfulness reign supreme

Convenience relatively steady with half of consumers stating it as top driver

84%
of consumers say taste is a top (4-5 of 5) driver of purchases. Only 35% say the same for brand.

PURCHASE DRIVERS OVER TIME



Source: 2017 Food and Health Survey from the International Food Information Council Foundation

At the same time, consumer perceptions about low-calorie sweeteners are often misinformed, Sollid added. They tend to form opinions about taste and function of sweeteners based on conversations with friends and family rather than scientific evidence.¹ And when it comes to taste, it really depends on priorities. This year's IFIC study shows that consumers still generally prefer the taste of sugar over low-calorie sweeteners, Sollid said. "One big difference is that people who prefer sugar over low-calorie sweeteners do so because of taste. But those who choose low-calorie sweeteners do so because they want to reduce calories and avoid sugar."

Ultimately, there is no easy fix. Formulators have come to depend on sugar for a wide variety of functions beyond the taste, including defining texture and mouthfeel in a product, so replacing sugar with a single ingredient rarely does the job. Reformulating products takes a broad and thoughtful approach and is often application specific.

In bakery items, like snacks and granola bars, for example, sugar provides binding and texture and creates that sponginess in a cake with the right aeration, according to Vince Cavallini, the MRDC food applications manager for Minneapolis-based Cargill. "When you remove sugar, you have to replace it with something that will do all these things, so finding the right ingredients and balance can be challenging," he said.

It is particularly difficult in beverages, Cavallini continued, because they tend to be fairly simplistic systems. "If you think of a soft drink you have flavor, sugar, water and maybe some acid, so only a few ingredients to work with. If you take out sugar and replace it with a high-intensity sweetener, the beverage will be very different. You can't just add in a different sweetener and expect it to taste the same," he said. In a beverage, for example, to create the same mouthfeel, one might need to add hydrocolloids and gum systems to replace some of what the sugar added.

Sugar – The gold standard of sweet

And matching the sweet taste of sugar is a whole other ball of wax. High potency sweeteners have very different qualities and sweetness onset.² Sugar has a very upfront taste, while some sweeteners have a lingering sweetness and others leave a bitter flavor, which can be difficult to work with, Cavallini added, especially if you are trying to make a product taste like it has sugar. "Everyone knows what sugar tastes like, so it's the gold standard," he explained. "Any deviation is easy to recognize, so it's hard to match, even if you are just making a small modification. If you are trying to stay at zero calories or low calories, you need something else to replace sugar."

On the positive side, the need to replicate good taste in low- and no-sugar products is behind much of the innovation now occurring in the food and beverage sector. Soft drinks, in particular, have been an area where many strides are taking place.³ But achieving the right taste is still tricky.

High-intensity sweeteners, such as stevia extracts and polyols, such as erythritol, are proving to be great options for reducing sugar and calories, but stevia at high usage levels, tends to leave a bitter aftertaste that has continued to be a stumbling block in beverage formulations. Sweetener suppliers have been working to address this by studying how steviol glycosides, the sweet components from the stevia plant, interact and how they can be combined to meet both the required sweetness levels as well as sugar reduction targets for a particular product.

Consumers on low-calorie sweeteners

63%

say low- and no-calorie sweeteners help with sugar consumption.

50%

say low- and no-calorie sweeteners help reduce calories.

Source: IFIC Food and Health Survey 2017

Most stevia extracts are made using the traditional Rebaudioside (Reb) A components of the plant that have proven to work well and be a cost-effective solution in low dosages for products where a manufacturer might be trying to replace a small amount of sweetness and sugar. But this is proving to be just a starting point for the capabilities of stevia-based sweeteners. The plant has over 40 of these steviol glycoside components and scientists are now learning that the sweetest compounds are from Reb D and Reb M. However, these compounds are present in less than one percent of the stevia leaf, which makes them very expensive to extract. Suppliers are now developing methods to create Reb M and Reb D more cost effectively by using baker's yeast to convert simple sugars into these compounds.

Cargill is at the forefront of these technologies. It now has a portfolio of stevia ingredients from the traditional Reb A extracts to next-generation Reb D and Reb M ingredients. The Reb A extracts can be used for up to about 30 percent sugar reduction, while the ViaTech® stevia ingredients can provide optimal taste and sweetness at higher usage levels and achieve up to 70 percent sugar reduction targets.

The next-generation EverSweet™ sweetener takes this a step further to attain up to 100 percent sugar reduction in certain applications. To work with all of the stevia extracts, Cargill has developed a proprietary Taste Prediction Model that can determine the best combination of stevia components for a particular product application.

A Holistic Approach

Still, sugar reduction is application-specific, so in some cases, formulators are blending stevia leaf extracts, with an ingredient such as erythritol to produce the sugar reduction targets needed while also meeting taste expectations. In bakery and snack applications, manufacturers are also using chicory root fiber to add mouth feel, bulk and texture. For some applications, Cavallini noted, it takes multiple ingredients to replace the function of sugar. "We look for synergies between ingredients like erythritol, which has an upfront sweetness that rounds out well with stevia leaf extracts."

"Overall, it takes a holistic and balanced approach to reduce the sugar and get the taste right," he added. Cavallini and his team work with customers in many ways on sugar reduction, but start by understanding what the customers' needs are and their end goals. From there, they work to get the appropriate amount of balance for both sweetness and sour taste, while also making sure that acid levels are aligned. On flavor and taste innovation, the flavor team is constantly looking for improvements using the Taste Prediction Model to determine new combinations and push the envelope. Cavallini explained: "The more we understand how all these components work together for flavor, sweetness and texture, the better we are able to provide solutions to our customers."

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References

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