



Creating Rich Texture in Reduced-Sugar Frozen Desserts

Think of ice cream, and you'll likely conjure up images of a creamy, smooth, velvety treat. These textural attributes play a critical role in creating a truly decadent frozen dessert.

However, changing consumer attitudes toward sugar have frozen-dessert manufacturers scrambling to deliver the same characteristics in a reduced-sugar formula. It's a tall order, but Cargill's dairy texture specialists insist replicating sugar's influence in these applications is achievable. That doesn't mean it's easy.

Sugar reduction is especially difficult in frozen desserts, because these complex food systems contain all three phases of matter – solid, liquid and gas. To be successful, formulators need to understand how each recipe component interacts with the water, fat and air inherent in a frozen dessert.

Defining Sugar's Role

For its part, sugar affects taste, texture, melting point, freezing-point depression, ice-crystal formation, elasticity and more. "Sugar is so much more than sweetness," explains Brian Surratt, one of Cargill's dairy texture experts. "In ice cream and other frozen desserts, our overall eating experience is heavily predicated on sugar's functional properties."

Consider freezing-point depression. In a traditional ice cream, it's sugar that lowers the freezing point of the liquid... creating the soft, scoopable treat consumers expect. Replace sucrose with another sweetener – whether it's dextrose, a polyol or something else – and it alters the ice cream's hardness.



"Consumers are very attuned to those kind of changes," Surratt notes. "They expect a soft, scoopable product." To compensate in reduced-sugar formulations, he suggests either tempering the product or adding ingredients like emulsifiers and hydrocolloids to modulate the texture and hardness of the final product.

Sugar also creates the smooth, creamy texture characteristic of a quality ice cream. By holding water in place, sugar slows the growth of ice crystals and prevents large crystals from forming. The sweetener even influences the melt-down properties of frozen desserts, affecting how long a dessert can sit out before it begins to melt.

Trendy vegan and vegetarian frozen desserts bring additional complexities to successful sugar reduction.

"Especially in the non-dairy frozen dessert space, many of our customers are aiming for a 'health halo,' and as part of that, they want to keep sugar levels in check," adds Christine Addington, a texturizing specialist for Cargill. "The challenge is that plant proteins create textural differences, impacting hardness and melting properties – attributes we'd typically manage with sugar."

Despite the formulation hurdles, Addington notes one bright spot in the vegan/vegetarian frozen dessert space: consumers of these non-dairy desserts likely have less rigid expectations for taste, texture and eating properties.

It's a different story on the dairy side. Consumers have long-standing expectations as to what hard-packed ice cream should look, taste and feel like. Successful reduced-sugar frozen dairy treats must live up to those ideals.

Replacement Options Abound

Fortunately, there's a growing cast of ingredients ready to fill sugar's functional voids. Fibers, hydrocolloids, emulsifiers, maltodextrins, lecithins and bulk sweeteners are among the options available to mimic sugar's many roles. However, before formulators get started, Addington offers two pieces of advice.

"Successful reformulation starts with reasonable expectations," she counsels, noting that a reduced-sugar claim can be based on modest adjustments in sugar content. "By the same token, you shouldn't expect to replace sugar with a single ingredient. It will likely take blends of texturants and sweeteners to replicate sugar's many contributions to texture and mouthfeel."

The zero-calorie, bulk sweetener **Zerose® erythritol** is often a good place to start. Because of its small molecular size (about one-third that of sugar), erythritol produces a threefold freezing-point depression factor, helping soften reduced-sugar ice creams. While erythritol replaces some of sugar's sweetness, it's usually paired with a high-intensity sweetener, like stevia leaf extract, for best results.

Many reduced-sugar frozen desserts also include **Oliggo-Fiber® chicory root fiber**, as product developers embrace its functional benefits and label-friendly nature. Chicory root fiber comes in a variety of forms, including differing degrees of solubility, polymerization, relative sweetness, fiber content, molecular weight and branching structures. Some are well-suited for fat reduction; others function more like a sugar and aid in freezing-point depression. The fiber can serve as a lower-calorie bulking agent, helping to create a rich, full-bodied product.

Maltodextrin is another option for bulking and solid replacement, but not calorie reduction. It can replace the mass lost when sugar is reduced, helping to achieve the mouthfeel and creaminess consumers expect from a frozen dessert.

Texture Solutions for Reduced-Sugar Dairy

- **Zerose® erythritol**
- **Oliggo-Fiber® chicory root fiber**
- **Maltodextrin**
- **Hydrocolloids**
- **Emulsifiers**

Hydrocolloids, especially locust bean gum and carrageenan, are critical for water management. Due to their branching molecular structure, they trap and hold water, providing freeze-thaw stability and helping to prevent heat shock.

Rounding out the ingredient list, formulators turn to **emulsifiers** to help hold the fat and water portions of the system in place and control overrun. In particular, Cargill's canola and sunflower lecithins, which are available in non-GMO* options and not considered major food allergens, are effective, label-friendly ingredients.

Given this broad ingredient palate, Surratt says formulators can create iconic, reduced-sugar offerings that resonate with consumers. Persistence is the key.

"We may go through 100 formulations before we land on the one that hits all of our product goals," he acknowledges. "Fortunately, there are limitless combinations of ingredients, so if the first attempt falls short, we just try again. Even in a reduced-sugar world, it's still possible to craft a rich, satisfying frozen dessert."

* See Cargill.com for more information on how Cargill defines "non-GMO."

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