



REBUILDING STRUCTURE AFTER SUGAR

A role-based fiber system for controlling viscosity, water, & stability



FIBER ISN'T A CLAIM – IT'S A SYSTEM

Once sugar is removed from a formulation, structure doesn't disappear—it shifts. And in most systems, that burden falls squarely on fiber. Yet too often, fiber is treated as a label claim rather than what it truly is: a functional engineering tool. The result? Products that look right at launch but fail over time.

This paper reframes fiber as a system, not a single ingredient. Each fiber plays a distinct role—replacing bulk, managing water, stabilizing texture, and determining long-term performance. Success depends on assigning those roles intentionally. Without that structure, formulations don't just struggle—they unravel.

Not all fibers behave the same. Differences in molecular structure, water interaction, viscosity, and tolerance thresholds mean they must be deployed with precision. A role-based approach defines fiber function across three critical dimensions: structure (body, bulk, viscosity), water control (binding, activity, distribution), and tolerance (how much can be used without negative effects).

The paper highlights four key fibers and their strategic roles: inulin for mouthfeel, soluble tapioca fiber as the structural backbone, PHGG as a low-impact fiber booster, and polydextrose for bulk and moisture control. Used together, they form a balanced system where each component contributes without overlap.

Crucially, the paper challenges static thinking. Viscosity evolves over time, and water exists in dynamic states—either bound and stable or free and destabilizing. Many common failures—hardening, staling, separation—are not sweetener issues, but water system failures.

The takeaway is clear: more fiber is not better formulation. “Fibermaxxing” without design leads to tolerance issues and instability. Instead, high-performing systems rely on multiple fibers, clearly defined roles, and application-specific strategies.

Because in reduced-sugar formulation, fiber isn't just part of the system.

It is the system.

***This is part 2 of a 3 part series on fiber.**



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FAST FACTS

Fiber replaces more than sweetness. In reduced-sugar systems, fiber takes over bulk, water control, texture, and structural stability.

Not all fibers behave the same. Differences in molecular structure, viscosity, and water interaction mean fibers must be selected and used intentionally—not interchangeably.

Water control drives success or failure. Bound water stabilizes; free water destabilizes—leading to hardening, staling, or separation.

Viscosity isn't static. Fiber performance shifts with pH, heat, shear, and time—what works at processing may fail on the shelf.

More fiber isn't a better formulation. High-performing systems use multiple fibers with defined roles—not single-fiber overload.

FAQ

1. How do different fiber types influence water activity (aw) and product stability in reduced-sugar systems?

Fibers differ significantly in their ability to bind and immobilize water. Soluble tapioca fiber and polydextrose are particularly effective at reducing free water by increasing water binding and distribution, thereby lowering water activity and improving microbial and textural stability. Inulin contributes to water structuring but is more sensitive to degradation under acidic or thermal conditions, while PHGG has minimal direct impact on water binding. A balanced system is required to control aw without over-constraining moisture or creating undesirable texture shifts.

2. Why does viscosity behavior over time matter more than initial viscosity measurements?

Viscosity is dynamic and influenced by pH, thermal processing, shear forces, and storage time. Inulin, for example, can build early viscosity but degrade under acid and heat, leading to late-stage thinning. In contrast, soluble tapioca fiber and polydextrose provide more stable viscosity profiles over time. Measuring viscosity only at processing conditions fails to capture these shifts, which are often responsible for texture drift, phase separation, or instability during shelf life.

3. How should fiber systems be designed to balance GI tolerance with functional performance?

GI tolerance is dose-dependent and cumulative across fiber types. While PHGG offers high tolerance and can increase total fiber without affecting viscosity, inulin and polydextrose have lower thresholds at which digestive effects become noticeable. A multi-fiber system allows formulators to distribute functional load

while staying within acceptable tolerance ranges, but stacking fibers does not eliminate total load—it simply distributes it. Clinical and sensory validation is essential.

4. What role does fiber play in structural integrity compared to traditional sugars?

Sugars contribute to solids, crystallization behavior, and water activity, all of which support structural integrity. When removed, fiber must replicate these functions through bulk contribution, water binding, and matrix formation. Soluble tapioca fiber often serves as the structural backbone, while inulin contributes to mouthfeel, and PHGG enables fiber fortification without altering texture. Without this coordinated system, products are prone to collapse, hardening, or textural inconsistency.

5. How does fiber selection impact performance across different application systems (RTDs, bars, baked goods)?

Fiber behavior is highly system-dependent. RTDs must account for pH-driven degradation and long-term viscosity stability, while nutrition bars require precise water activity control to prevent hardening or drying. Baked goods pose thermal and moisture-migration challenges that affect fiber performance post-bake. No single fiber performs optimally across all systems; application-specific design is required to align fiber functionality with processing conditions and shelf-life expectations.



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