Citrus Fibre

Nature's Smart Solution for Clean Label Innovation

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As consumer preferences shift toward transparency and wellness, the demand for clean label food ingredients is transforming how manufacturers formulate everyday products.

Citrus fibre, derived from the peels of oranges, lemons, and limes, is emerging as a versatile, natural ingredient that meets both functional and consumer-friendly needs.

01 What is Dietary **Fibre?**

Plant-based ingredient obtained from natural citrus peel of lemon, lime and orange, applicable in different food formulations.

Citrus Fibre
A Natural Solution from Citrus Fruit

What makes citrus fibre unique?

Being a clean label ingredient, **CEAMFIBRE** perfectly suits the current strong market demand to avoid E-numbers and other emergent market trends, such as:

01 ***Recognisable ingredient***

02 ***Cost-in-use***

03 ***Waste reduction***
being a revalorised ingredient from industries such as juice and pectin.

04 ***Back to traditional ingredients***
Citrics have been consumed for many years with nutritional, flavour and technological purposes.

05 ***Digestive benefits***
Ceamfibre has more than 85% fibre content.

06 ***Natural***

07 ***Vegan and adapted to all diet restrictions***

Sustainable sourcing and processing

CEAMFIBRE is a unique ingredient obtained from a rigorous peel selection and a natural process that enhances its intrinsic properties.

03

From Peel to Powder
The Citrus Fibre Production Process

Clean label manufacturing

CEAMFIBRE is an easy-to-apply ingredient which ensures a pleasant and indulgent texture in all food applications. Its robust functionality in a wide range of process conditions guarantees versatility of use.

CEAMFIBRE is intended to be used as a multipurpose food ingredient (moisture retention, stabilizer, flavour enhancer, thickening aid, stabilizer of emulsions and processing aid) in baked goods, dairy products, non-carbonated beverages and juice drinks, fruit-based products, confectionery products, frozen food, meat and poultry products, meat analogues, among others.

CEAMFIBRE could be also blended with other food ingredients and hydrocolloids in order to boost its own functionality.

04

Label Declaration
Clean and Consumer-Friendly

Citrus fibre

Vegetable fibre

CLEAN LABEL

NON ALERGENIC

GLUTEN FREE

KOSHER

HALAL

VEGAN

05

Back to the Basics
Traditional Ingredient with Contemporary Value

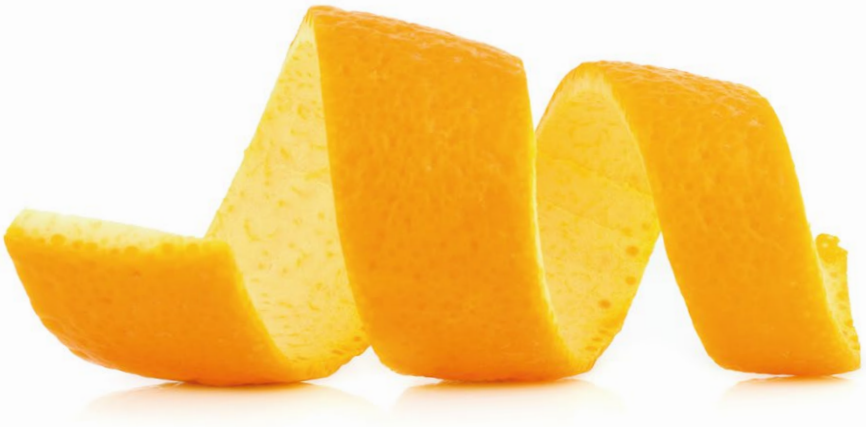
Citrus fruits have a rich cultural and agricultural history, dating back thousands of years.

Their benefits go beyond flavor, offering a complex mix of bioactive compounds like vitamin C, flavonoids, and phenolics that support overall health. Citrus fibre reintroduces these benefits in a form that's relevant for today's food industry.

This ingredient aligns with a back-to-basics movement in food innovation—where simple, recognizable, and natural ingredients take center stage. It helps manufacturers reconnect with traditional ingredients while addressing contemporary demands for functionality and sustainability.

Nutritional information

Dietary Fibre: Higher than 85%
Soluble Fibre: Between 5 and 50%
Insoluble Fibre : Between 40 and 90%



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Nutritional Profile of Citrus Fibre

CEAMFIBRE is a powerful source of both soluble and insoluble fibre, offering more than 85% total dietary fibre. Its balanced composition—5–50% soluble and 40–90% insoluble fibre—allows it to deliver significant nutritional benefits.

Soluble fibre helps regulate blood sugar, lowers cholesterol levels, and promotes gut health by feeding beneficial intestinal bacteria.

It is fermented in the colon, producing short-chain fatty acids that support digestion and immune health. Insoluble fibre, by contrast, passes through the digestive system largely intact, adding bulk to stool and supporting regular bowel movements. It helps reduce constipation, speed up intestinal transit, and support a healthy gut.

Despite these benefits, most people consume far less fibre than recommended. While health guidelines suggest 25–38 grams per day, average intake is only 14–15 grams.

Citrus fibre offers an easy way to enrich processed foods, helping consumers increase their fibre intake without major dietary changes.

Dietary fibres are made up of complex carbohydrates and lignin that resist digestion in the small intestine.

Soluble types—such as pectin and gums—are fully fermented by gut bacteria, while insoluble types like cellulose and lignin are only partially fermented but contribute significantly to stool bulk and digestive health.

Regular fibre consumption is linked to a reduced risk of obesity, heart disease, type 2 diabetes, and gastrointestinal disorders.

It also supports metabolic function, nutrient absorption, and blood pressure regulation. By combining the benefits of both fibre types, citrus fibre delivers a natural, functional solution for improving health through everyday foods.

07

Key Functional Properties of Citrus Fibre

What makes citrus fibre truly unique is its multifunctionality:

- High water binding capacity
- High viscosity
- Oil absorption capacity
- Emulsion stabilization
- Viscosity and water binding independent to PH and temperature
- Gelling agent
- Improvement of texture
- Freeze-thaw stability
- Cost optimization

CEAMSA offers a range of citrus fibre extracts that can be used individually or combined to meet specific functional needs across diverse food applications. The effectiveness of each fibre depends on its ratio of soluble to insoluble components.

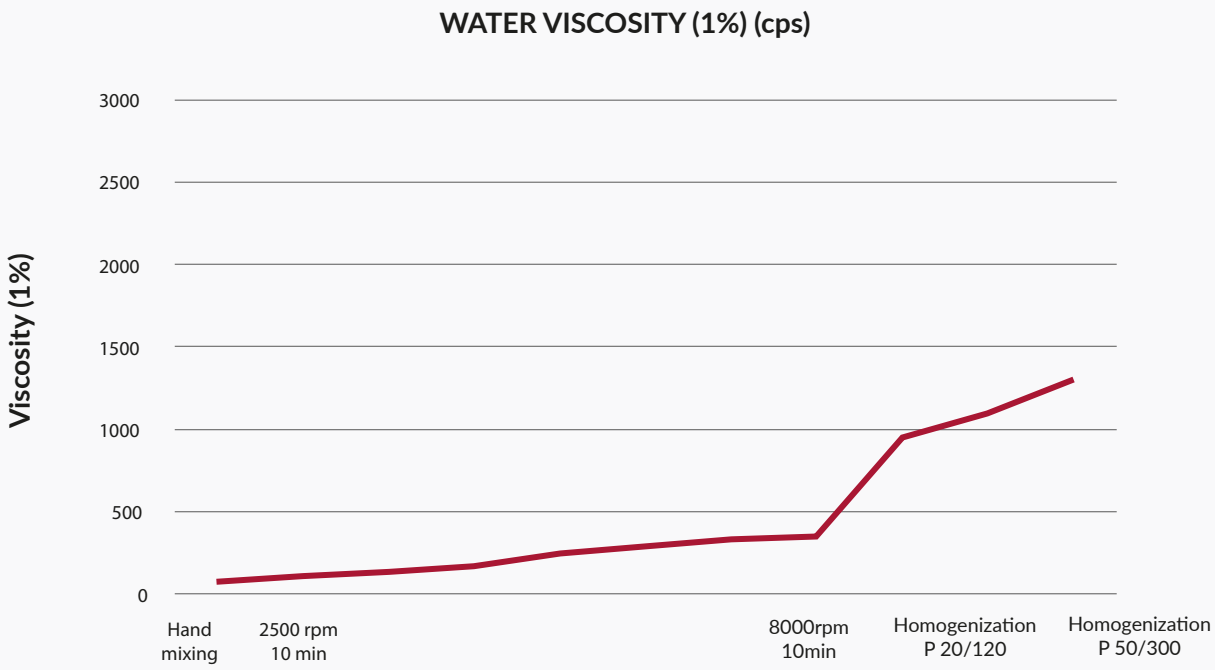
Insoluble fibres are particularly effective at binding water and oil through capillary action, especially when activated by mechanical mixing or homogenization. Ceamfibre is able to absorb until 30 times its weight in water. Soluble fibres contribute to viscosity and gelling, even under low shear, but require sufficient available water to perform optimally.

Particle size also plays a key role. Coarser fibres enhance water retention and are ideal for structured products, while finer particles are better suited for smooth-textured applications like beverages. CEAMSA offers fibres in various sizes, ranging from 75 to 250 microns.

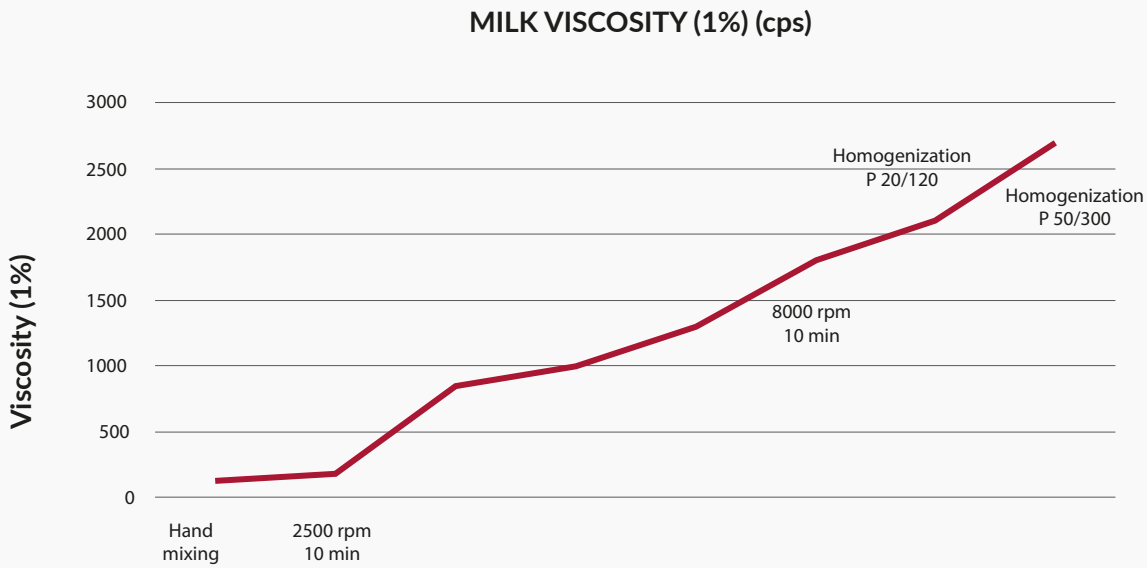
Citrus fibres can also be combined with hydrocolloids such as carrageenan, alginate, or pectin to boost properties like water binding, freeze-thaw stability, viscosity, and texture.

Influence of shearing process in ceamfibre functionallity

The functional performance of CEAMFIBRE is significantly influenced by the mechanical processes used during formulation. In trials conducted with water and milk systems at a 1% dosage, viscosity was measured under varying levels of shear—from gentle mixing to high-intensity homogenization:



Mechanical forces are applied using just Sylverson laboratory mixer and adding homogenization process at different speed for getting more fibre activation



Viscosity is measured with Brookfield RV viscosimeter

Results show that mechanical shearing dramatically enhances the fibre's performance. In fact, high-shear processing can increase viscosity up to 20 times compared to manual mixing. This activation occurs through two mechanisms: the dissolution of the soluble fibre fraction and the opening of capillaries within the insoluble fibre matrix, which allows for greater water absorption.

In milk-based systems, CEAMFIBRE exhibits even higher viscosities than in water, forming thick or pseudogelatinous textures when subjected to high-pressure homogenization. This is particularly valuable in dairy applications where texture, body, and mouthfeel are critical.

When used with gentle mixing, the fibre acts as a thickener—retaining moisture and reducing syneresis during shelf life—achieving smooth texture and limited viscosity.

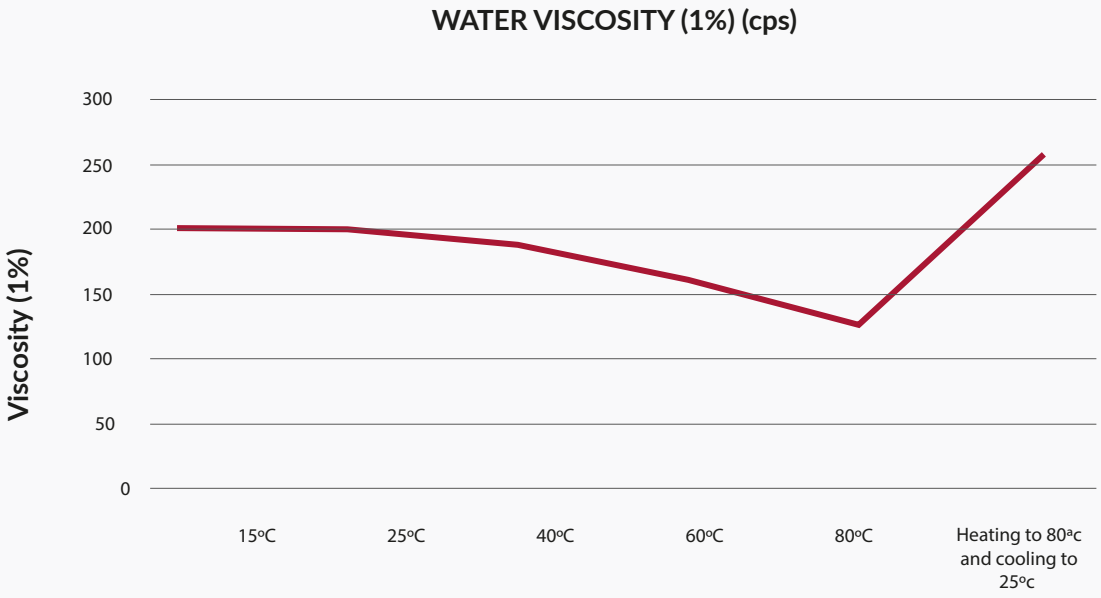
To harness CEAMFIBRE's stabilizing properties in applications like emulsions or juice suspensions, high shear processing is essential.

This mechanical action expands the fibre network, improving structure and stability.

Viscosity stabillity under change of Temperature

In trials conducted in water at 1% dosage, viscosity was measured under the same level of shear:

Mechanical force is applied using Sylverson laboratory mixer
Viscosity is measured with Brookfield RV viscosimeter



CEAMFIBRE maintains stable viscosity across a wide range of temperatures. While there is a slight decrease in viscosity near pasteurization temperatures, it notably increases again upon cooling. This thermal behavior makes CEAMFIBRE suitable for both hot- and cold-processed applications, ensuring reliable performance throughout processing and storage.

08

Versatile Applications Across Food Categories

Citrus fibre proves its versatility across nearly every food category where properties are adapted to maximize functionality within the conditions of use:

CEAMFIBRE IN SAVOURY APPLICATIONS

In savoury applications, such as ketchup or oil-based sauces, CEAMFIBRE replaces modified starch while maintaining texture, gloss, and emulsion stability. It creates a creamy and cohesive consistency with a lower usage rate, making it both functional and cost-effective.

INDUSTRY	APPLICATION	KEY BENEFITS
 SAUCES & SAVOURY	**Tomato paste**	◦ Syneresis control. ◦ Tomato paste reduction in recipe. ◦ Sensorial properties equivalent to 100% tomato paste.
	Table sauces: Mayonnaise, Ketchup, Tomato sauce	◦ Emulsifying effect. ◦ Syneresis control. ◦ Body, creaminess, shine. ◦ Cost in-use.

Ketchup

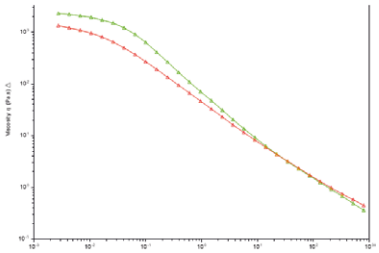
CEAMFIBRE provides a clean label solution for ketchup formulations by replacing pre-gelled starch while maintaining—or even enhancing—key functional properties.

When subjected to high shear and pressure, CEAMFIBRE forms a stable, pre-gelled-like texture that supports process tolerance and consumer appeal.

Comparative rheological analyses were conducted to evaluate performance across several key parameters:

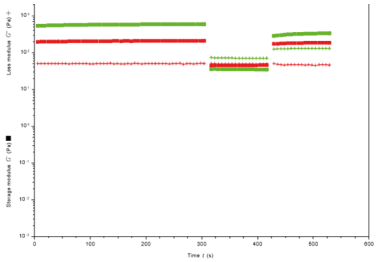
Ketchup Viscosity

Viscosity was measured in a dynamic flow system to assess the product's behavior during transportation. CEAMFIBRE showed comparable resistance to flow as standard starch-based systems.

PRODUCT	DOSAGE	VISCOSITY
CEAMFIBRE	0,5%	
STARCH	3%	

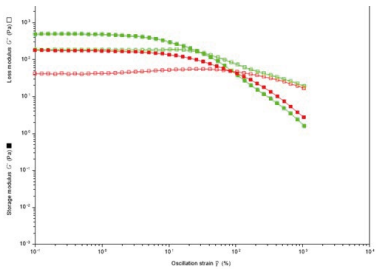
Thixotropy

This test measured how well the product recovered its original structure after mechanical stress. Ketchup samples were analyzed at rest, subjected to shear, and then evaluated for recovery. CEAMFIBRE demonstrated the same structural resilience as starch, with even better recovery after shear, ensuring shelf-life stability.

PRODUCT	DOSAGE	THIXOTROPY
CEAMFIBRE	0,5%	
STARCH	3%	

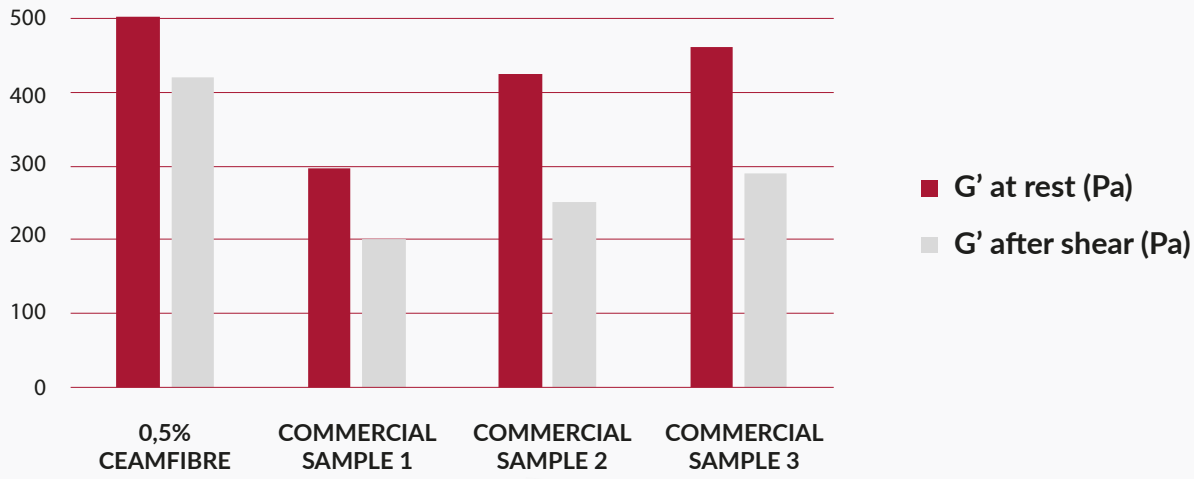
Yield Stress

Yield stress indicates the force required for the product to begin flowing—an important measure of structural robustness. CEAMFIBRE matched the performance of traditional starch, confirming its ability to hold structure during storage and use.

PRODUCT	DOSAGE	YIELD STRESS
CEAMFIBRE 7200 SF	0,5%	
2500 rpm 10 min STARCH	3%	

Across all three rheological tests, CEAMFIBRE at just 0.5% matched the performance of pre-gelled starch used at 3%, delivering equivalent viscosity and structural integrity with label-friendly declaration.

Ceamfibre vs commercial samples



In comparisons with commercial ketchup samples, CEAMFIBRE-based formulations achieved similar texture and viscosity, while outperforming them in structure recovery after shear. This makes CEAMFIBRE a highly effective for ketchup production.

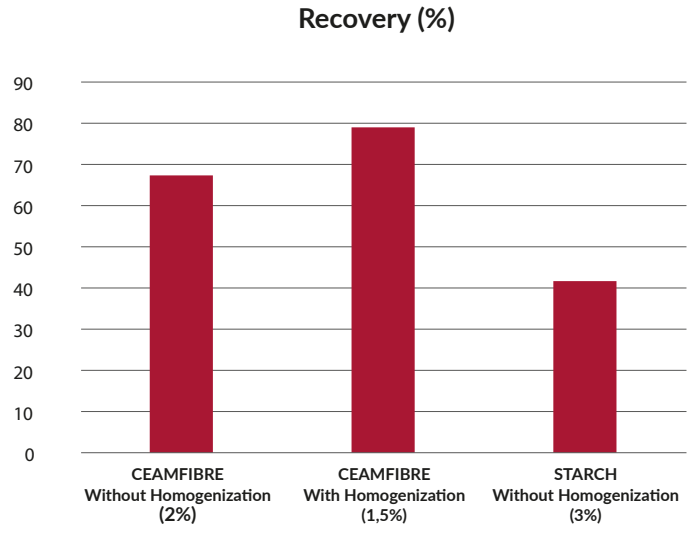
OIL-BASED SAUCES

When formulating fat emulsions or oil-based sauces, CEAMFIBRE offers a clean label solution that delivers excellent stability and texture. Its performance is significantly enhanced when activated through high-shear processing, such as emulsifier mixing or homogenization.

Under high shear, CEAMFIBRE builds a pseudo-gelled network within the emulsion. This expanded fibre structure not only improves viscosity but also strengthens the sauce's resistance to mechanical stress, ensuring better stability during production and throughout shelf life.

CEAMFIBRE also enables the development of mayonnaise-style sauces without egg yolk, offering a plant-based alternative that maintains richness and emulsification. Its functionality remains stable across a wide pH range and is unaffected by temperature, making it suitable for both hot and cold processes.

A comparative rheological test measured how emulsions with 50% fat recovered after shear, showing how CEAMFIBRE and starch respond to mechanical stress.

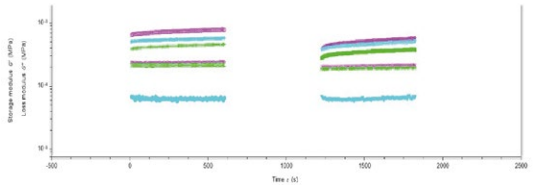


Highlight

In a 50% oil emulsion, CEAMFIBRE outperformed starch-based systems when properly activated. Compared to starch at a typical 3% usage level, CEAMFIBRE achieved comparable results at just 1.5–2%, demonstrating equal viscosity and structural recovery after shear. This allows for more cost-effective formulations without compromising performance.

Thixotropy

In rheological assessments, mayonnaise emulsions containing CEAMFIBRE were evaluated at rest, during shear, and after mechanical recovery. Results showed that CEAMFIBRE-based formulations retained and recovered their structure more effectively than those containing starch, even at lower concentrations.

PRODUCT	DOSAGE (%)	THIXOTROPY
CEAMFIBRE	2%	
CEAMFIBRE WITH HOMOGENIZATION (30-120 Bar)	1,5%	
STARCH	3%	

Mayonnaise 50% fat

CEAMFIBRE, at a use level between 1.5-2%, not only matches the viscosity and recovery properties of traditional starch systems but also delivers improved performance when high shear is applied—making it label-friendly for high-fat sauces.

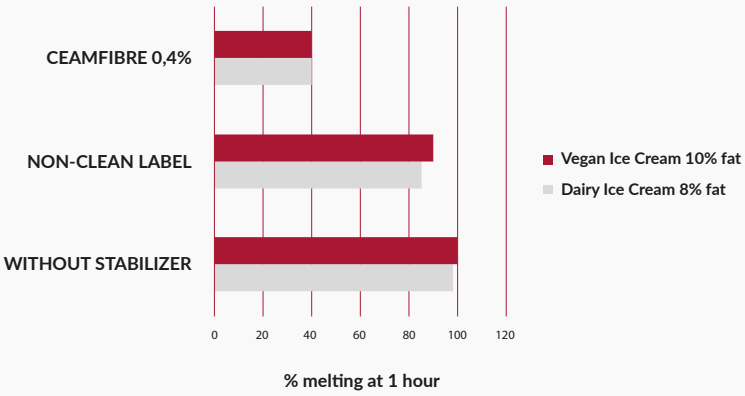
CEAMFIBRE IN DAIRY APPLICATIONS

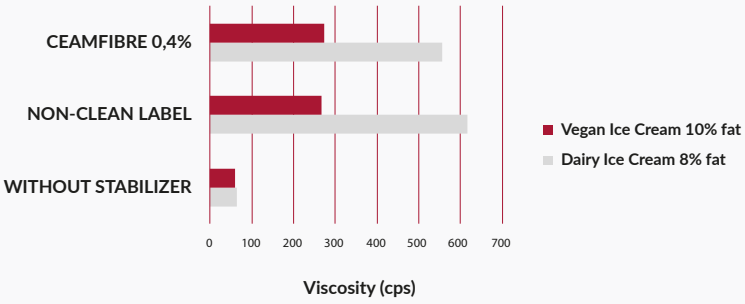
In dairy and plant-based alternatives, citrus fibre helps stabilize acidified milk and yogurt drinks by interacting with proteins and suspending particles. It also improves the texture and melting process of ice cream and cheese, enabling cleaner formulations with fewer E-numbers.

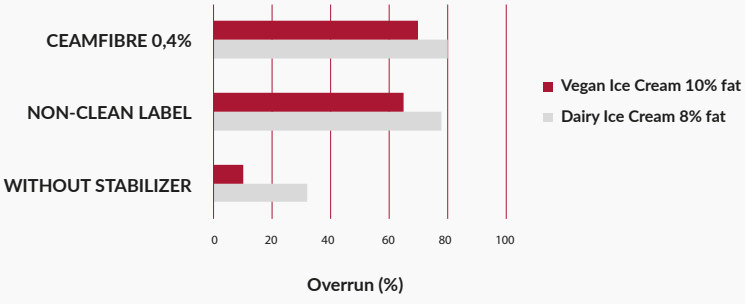
INDUSTRY	APPLICATION	KEY BENEFITS
 DAIRY	**Ice Cream**	◦ Viscosity. ◦ Reduce ice crystallisation. ◦ Slow down of melting.
	Processed Cheese **Cheese sauce & Cream cheese**	◦ Suitable for high heat treatment process direct and indirect. ◦ Improve texture consistency over the shelf life. ◦ Improve fat emulsion stability.
	Custard cream	◦ Viscosity. ◦ Pleasant mouthfeel.
	Yogurt drink	◦ Viscosity. ◦ Protein protection. ◦ Pleasant mouthfeel and flavour.

Ice cream

CEAMFIBRE slows down the melting in Ice Cream and reduces the ice crystallization, improves overall sensorial properties and open the possibility to clean label recipes.





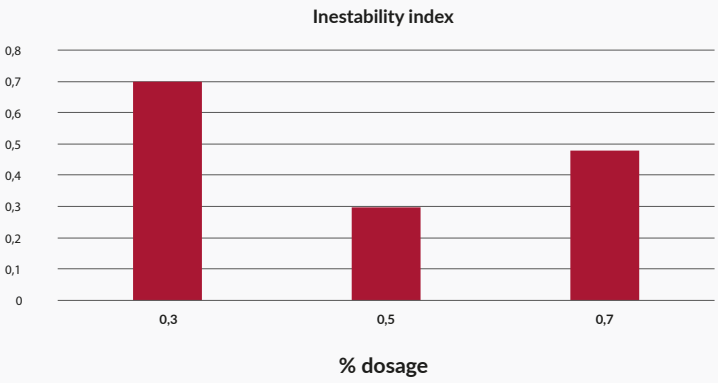


CEAMFIBRE enables the development of ice cream without the use of E-numbers, delivering key benefits such as optimal viscosity, high overrun, and delayed melting. It can also be combined with stabilizers to further enhance melt resistance under challenging consumption conditions.

Acidified milk drinks and yogurt drinks

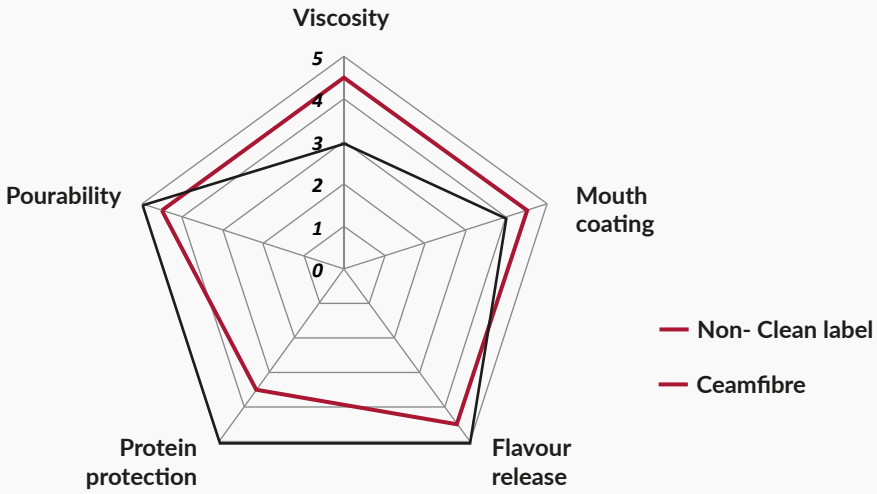
CEAMFIBRE effectively prevents sedimentation in acidified milk drinks by stabilizing casein micelles through a combination of electrostatic interactions, capillarity, and viscosity. At dosages between 0.5% and 1%, it can suspend proteins in both dairy and plant-based formulations containing 0.2% to 2% protein.

The natural pectin (soluble fibre) component interacts with dairy proteins via charge interactions, while the viscosity developed by both soluble and mechanically activated insoluble fibres further stabilizes the suspension. Thanks to its strong thickening and stabilizing properties, CEAMFIBRE is especially well-suited for yogurt drinks that require a rich body and creamy texture.



To determine the optimal CEAMFIBRE dosage, the Lumisizer technique was used to measure instability index in a 0.5% protein drink. The results showed that a 0.5% CEAMFIBRE concentration effectively stabilized the formulation.

UHT Acidified Milk Drinks



CEAMFIBRE IN BAKERY

INDUSTRY	APPLICATION	KEY BENEFITS
BAKERY	**Muffins, Cookies, Cakes, Crackers, Frozen dough, Soft bread**	◦ Ingredients replacement. ◦ Staling speed reduction. ◦ Breakage and crumbling reduction. ◦ Dough handling improvement.
	Gluten free bakery	◦ Reduce dryness. ◦ Improve tenderness. ◦ Shelf life.

The bakery sector benefits from CEAMFIBRE moisture-retaining capability, which reduce staling and improve shelf life. It supports gluten-free formulations by improving dough elasticity and replacing ingredients like eggs and fats.

CEAMFIBRE IN FRUIT PROCESSING AND GUMMY CANDY

In confectionery and fruit preparations, CEAMFIBRE functions as a clean label gelling agent that reduces syneresis and improves mouthfeel. It can form gels under specific conditions— appropriate pH and soluble solids levels—making it an effective alternative in high-sugar jams and gummies.

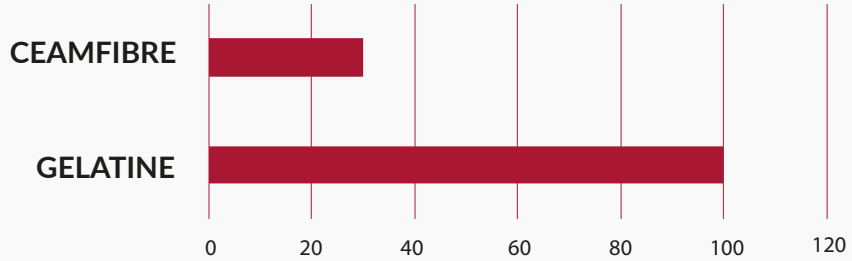
Its compatibility with minerals and vitamins allows for the development of nutraceutical gummies and functional snacks without compromising gelling performance.

INDUSTRY	APPLICATION	KEY BENEFITS
 FRUIT PROCESSING AND CONFECTIONERY	**High sugar jams and spreads**	◦ High consistency and gelling capacity. ◦ Prevent syneresis. ◦ Mouthfeel and flavour release. ◦ Allows to reduce fruit content.
	Confectionary and Healthy fruit snacks	◦ Gelling agent. ◦ Short but smooth texture. ◦ Flavour release.
	Dusting agent for confectionary	◦ Avoid stickiness. ◦ Prevent syneresis. ◦ Improves yield.

CEAMFIBRE IN JELLIES

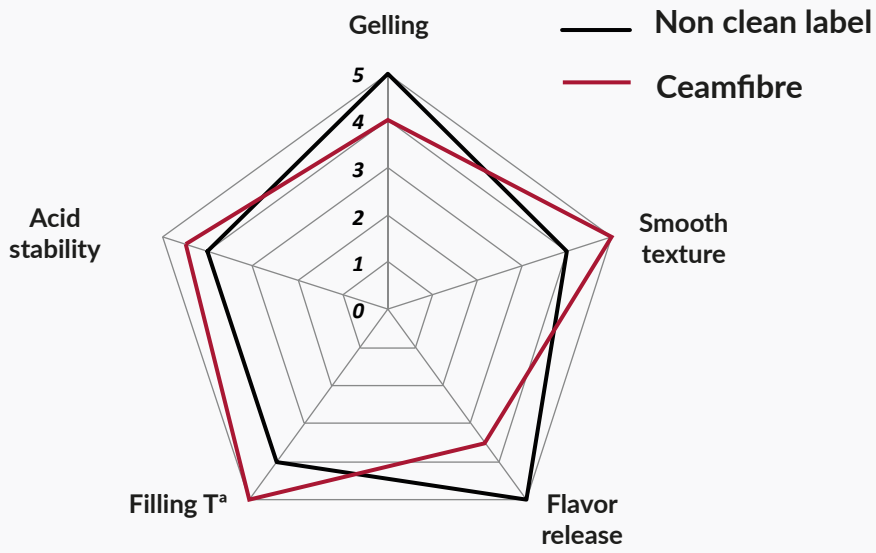
ADVANTAGES vs GELATINE JELLIES

Vegan origin | Thermal resistance over shelf lif | Higher setting temperature | Adapted to all kinds of molds and trays.



Cost in use

CEAMFIBRE IN JAMS & SPREADS



High Sugar Jams

CEAMFIBRE IN JUICES AND BEVERAGES

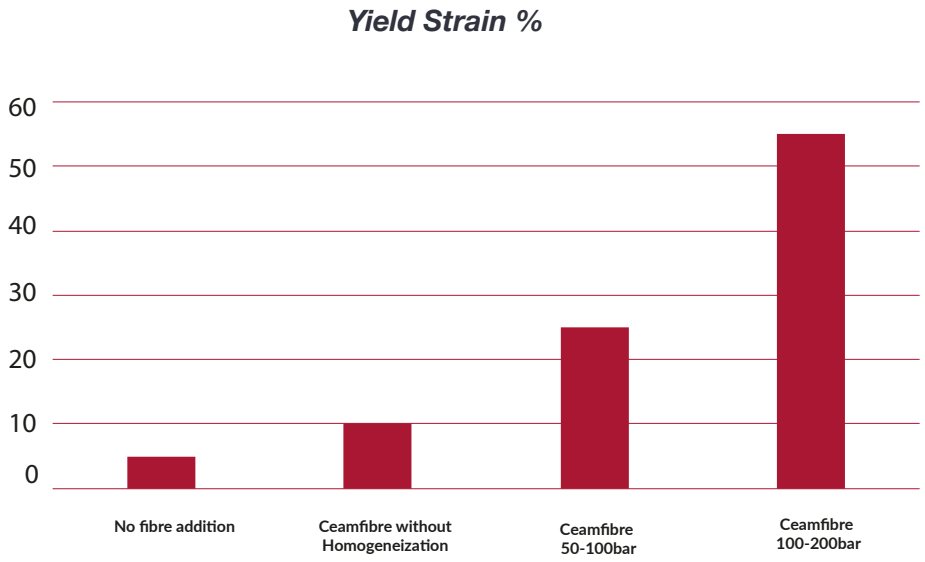
In juices and other beverage applications, CEAMFIBRE enhances body, improves flavour release, and stabilizes suspended pulp or particles. When subjected to homogenization, the fibre network expands significantly, increasing both viscosity and water-binding capacity.

This mechanical activation is particularly effective in low- or no-sugar formulations, where CEAMFIBRE compensates for the body loss typically caused by sugar reduction. Its ability to maintain stability during storage makes it an excellent clean label alternative to traditional thickeners or stabilizers in fruit-based drinks and juices.

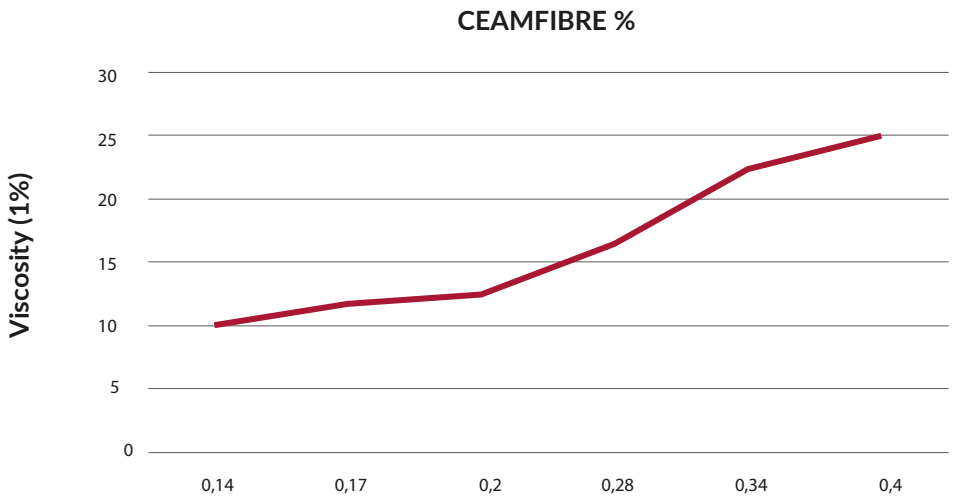
INDUSTRY	APPLICATION	KEY BENEFITS
JUICE	**Juices**	◦ Viscosity. ◦ Flavour release. ◦ Improved body, interesting for sugar free.

Yield stress represents the force necessary for the product to start flowing, serving as a key indicator of structural robustness. Our studies show that when high homogenization pressure is applied, the CEAMFIBRE network formed within the juice becomes particularly strong and stable.

Impact of homogenization on juice stability (CEAMFIBRE 0.2%)



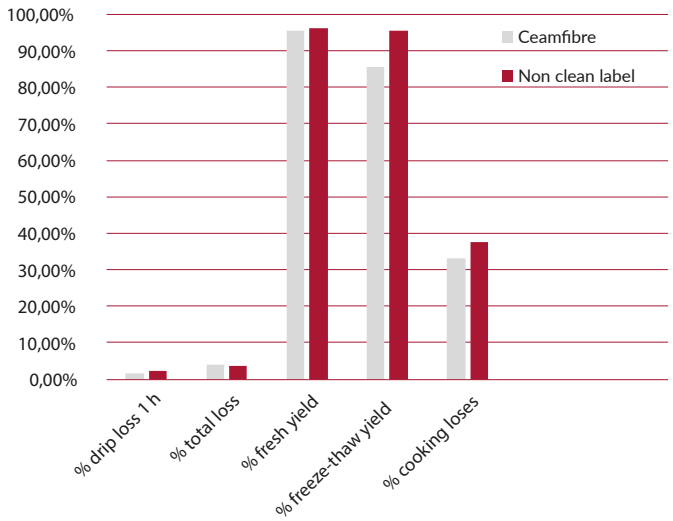
The following graph illustrates the viscosity changes in fruit juices with different levels of CEAMFIBRE. The resulting viscosity is determined by a balance between CEAMFIBRE dosage and the processing conditions applied.



CEAMFIBRE IN MEAT AND PLANT-BASED

In both meat and plant-based formulations, CEAMFIBRE helps stabilize fat and retain moisture, enhancing cooking performance and improving juiciness in the final product. It is particularly effective in applications requiring high water retention without gelling, making it suitable for a variety of textures. Even in high-salt environments, its functionality can be maintained ensuring optimal performance in challenging formulations.

INDUSTRY	APPLICATION	KEY BENEFITS
 MEAT	**Cooked and fresh meat products, other than injected**	◦ Reduction of drip loss and increasing yields. ◦ Improved texture and bite. ◦ Less shrinkage. ◦ Increased juiciness. ◦ Cost savings.
	Cooked Meat: Injection	◦ High suspension in brine. ◦ Increase cooking yield. ◦ Reduce syneresis.



CEAMFIBRE can be used for fresh injections, delivering comparable results to E-number formulations in terms of processing yield and texture, at usage levels between 0.5% and 1%

09

Conclusion
Pioneering the Future with Citrus Fibre

As the food industry continues its evolution toward clean, sustainable, and functional ingredients, citrus fibre stands out as a smart, adaptable solution. With its clean label appeal, nutritional benefits, and robust functional performance, CEAMFIBRE represents a bridge between tradition and innovation.

CEAMFIBRE is not just a trend—but a long-term ally in building healthier, innovative, and highly functional food systems.

CEAMSA

www.ceamsa.com