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ULTRA FRESH® SWEET INTRODUCTION

ULTRA FRESH Sweet

11/18/2013

Discussion

- Ultra Fresh® Sweet origin and supporting science
    - Market perspective – Customer
    - Market perspective – Consumer
    - Science of staling
    - Ultra Fresh® Sweet as the solution
- Validation
    - Industry performance
    - Consumer acceptance

Ultra Fresh® Sweet Origin and Supporting Science

1

Why sustained freshness for sweet goods?

Sweet goods have been subject to quick staling, even with use of additives for extension of freshness

ESL did not work for small cakes

- Recent projects have lead way to ESL and performance enhancement for bread & cake items

Product performance decreases over time

- Product texture changes as product stales
- Consumers notice the difference

Current shelf life standards lead to waste

Commercial Customers

- Total 21 days from manufacture – including 14 days on shelf

Vend Customers

- 30 days

ISB Customers

- 3-4 Days on muffins
- 5-7 days on “cakes”
- 1 day on glazed items

Product waste is expensive

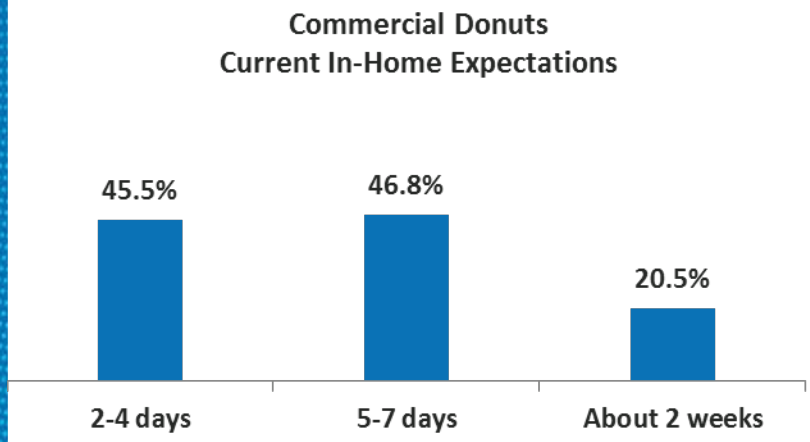
9% in ISB

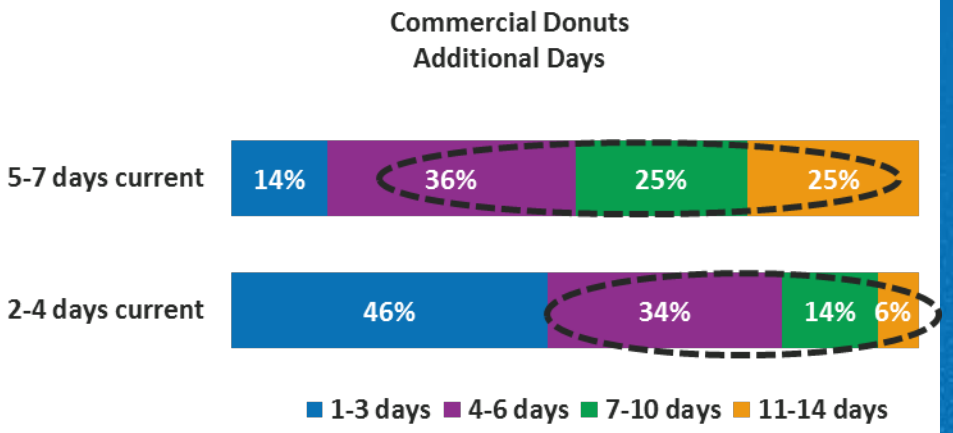
- $126 M annually

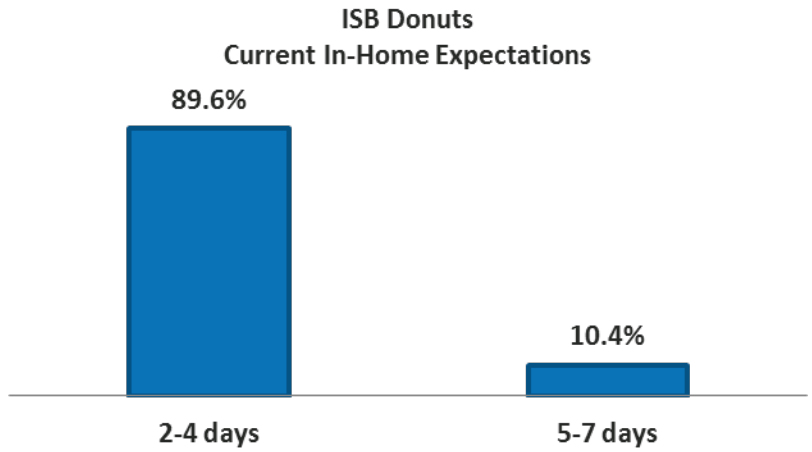
9% In Commercial

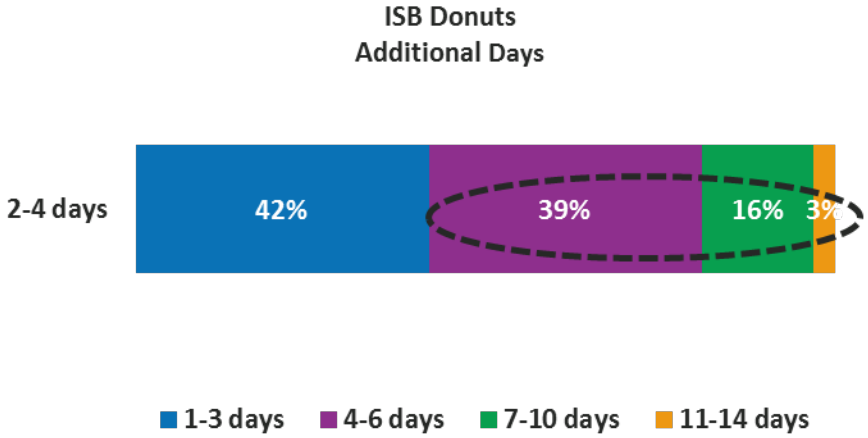
- $504 M annually

Donut consumers are open to extended freshness









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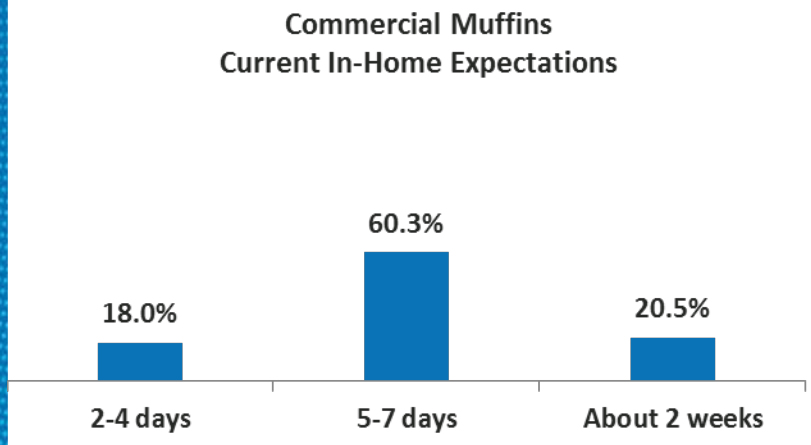
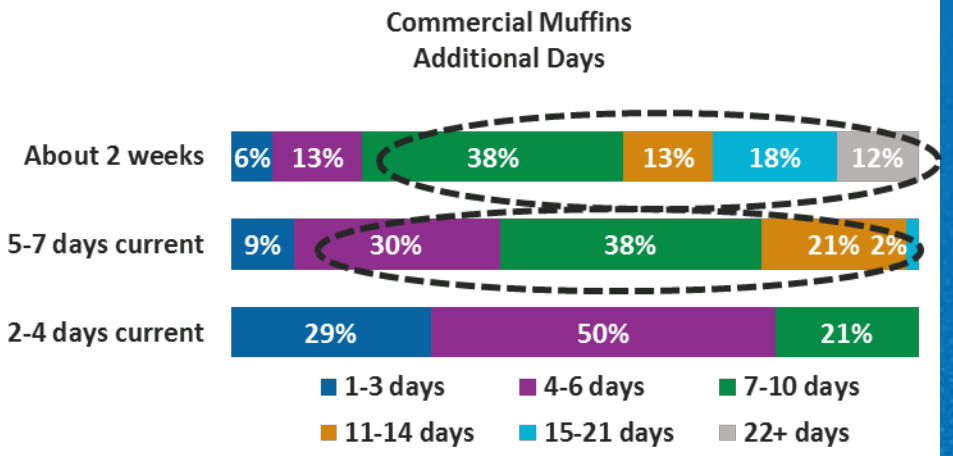
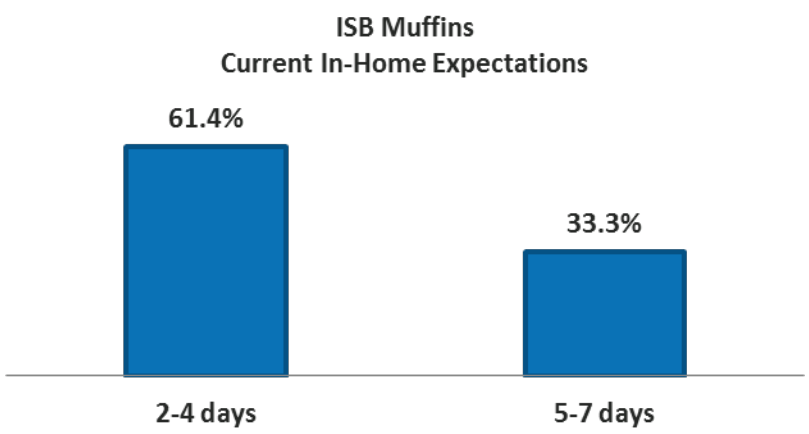
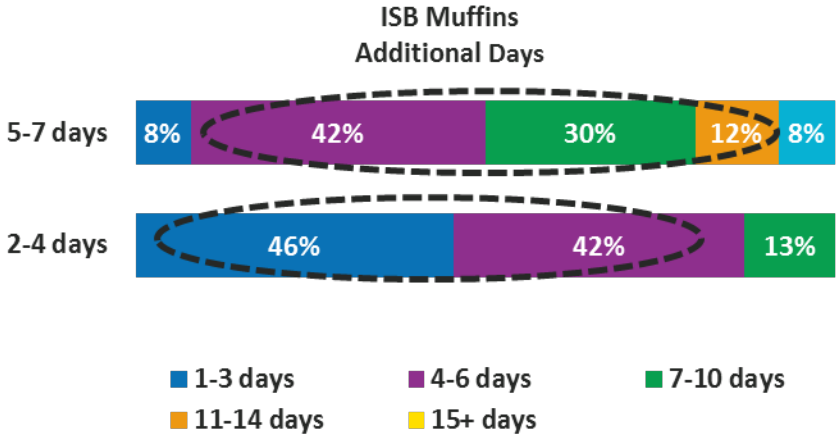
Muffin consumers are open to extended freshness









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Why sweet goods stale

Definition of staling: the changes which a baked product undergoes due to age, causing it to be deemed unacceptable by a consumer

During staling, product is subject to:

- Moisture loss
- Starch retrogradation

Characteristics of staling

- Firmer texture
- Drier mouth-feel
- Grittiness and chalkiness
- Flavor and aroma changes

Small cakes have big challenges

Small cakes and large cakes are not created equal

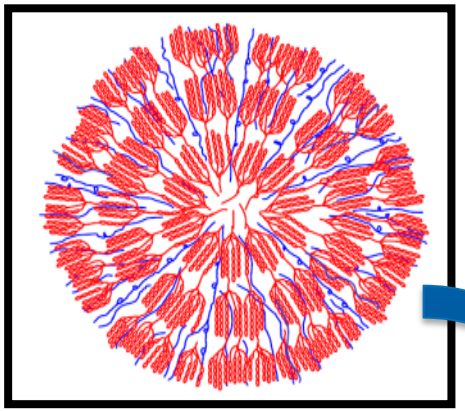
Due to short bake time and high bake temperatures, small cakes require specialized enzyme blends to really unlock the benefits of extended freshness technology

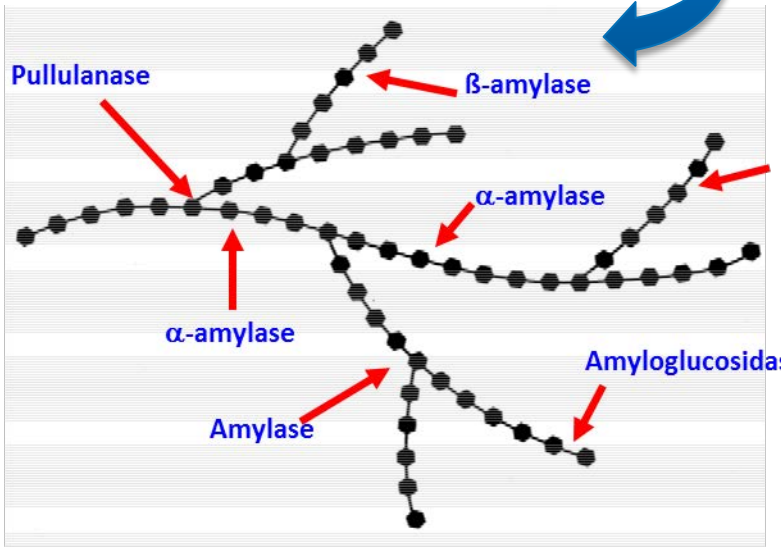
Freshness extension alternatives fall short in small cakes

Option	Action	Limitation
Hygroscopic Ingredients	• Retain water • Chemically bind water	• Water becomes unavailable, limiting other ingredient functionality
Gums	• Increase absorption • Reduce moisture loss/migration • Slow syneresis	• Can cause tough and chewy textures • Require additional strengthening ingredients to maintain finished volume
Starches	• Increase absorption • Reduce water mobility	• Mask flavors (can give "starchy" flavor) • Increases batter viscosity, which can create processing issues • Needs additional strengthening ingredients to maintain volume
Other Enzymes	• Soften product • Increase moist perception	• Very aggressive, lack dosing tolerance • Often cause gummy texture

As an industry, the shelf life and quality of small sweet goods have been extended and enhanced utilizing these ingredient solutions. These solutions have been maxed out and the product quality has reached a limit.

Starch as a substrate





Starch molecules are tightly packed in starch granules

Starch must be gelatinized or modified for enzymes to effect the structure

Corbion is an expert in understanding how different enzymes effect starch

Optimal blends have been developed for superior performance

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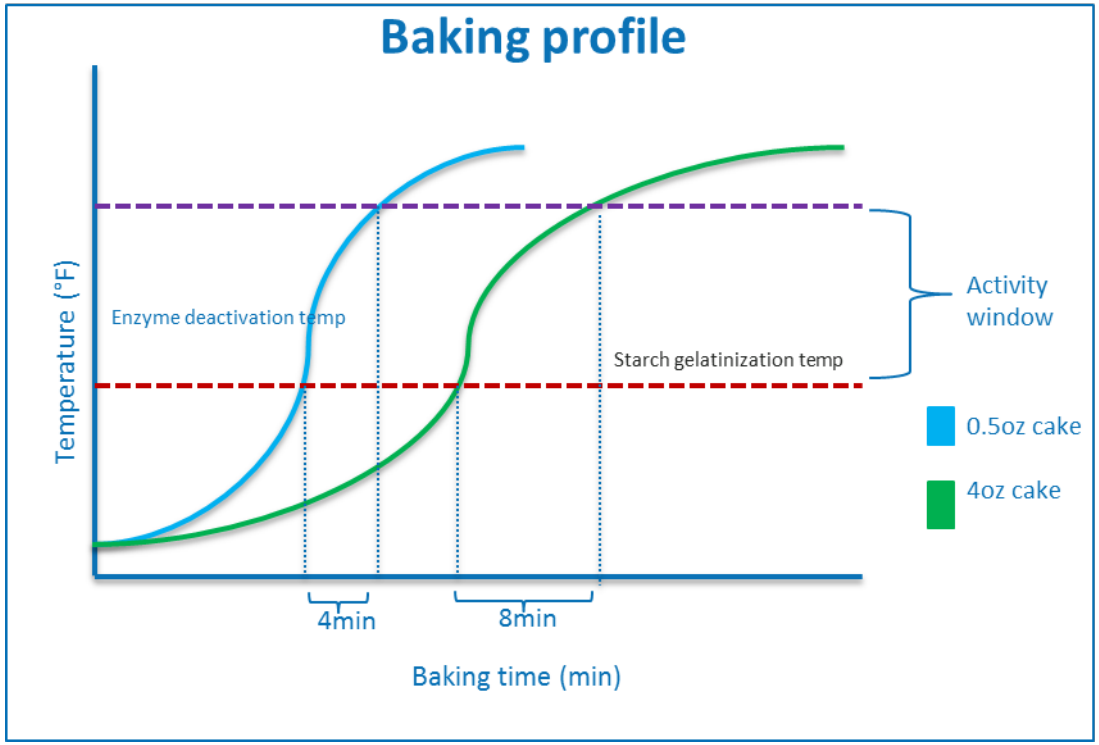
Effect of product size on enzyme activity



Smaller items bake faster

There is a limited activity window for enzymes to work

The activity window for small items is shorter than for large items

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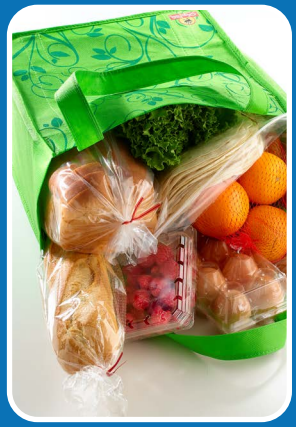
A solution is needed

- Fast acting
- pH stable
- Resists sugar inhibition
- Functions on gelatinized and modified starches

Approaching technology from every direction



Quality Products

- A breadth of products across 6 platforms, including functional blends, emulsifiers, fillings, icings and toppings, fortification, frozen dough and bakery mixes and bases

Research & Development

- Outstanding innovative new products
- State of the art technology
- Customized solutions

Support

- Efficient supply chain
- Excellent customer service
- Knowledgeable bakery technical services

Insights

- Market insights to enhance your business decisions
- Proprietary and syndicated research utilized to understand eating patterns as well as attitudes and usage within the food and beverage industries.

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Ultra Fresh® Sweet keeps sweet goods fresher longer and delivers increased quality over product life cycle

Supreme delivers excellent tolerance and performance

- Creates smooth, tender, resilient crumb texture with improved flavor stability over time
- Extremely tolerant in dosage and production
- Superior eating quality providing +45 days shelf life

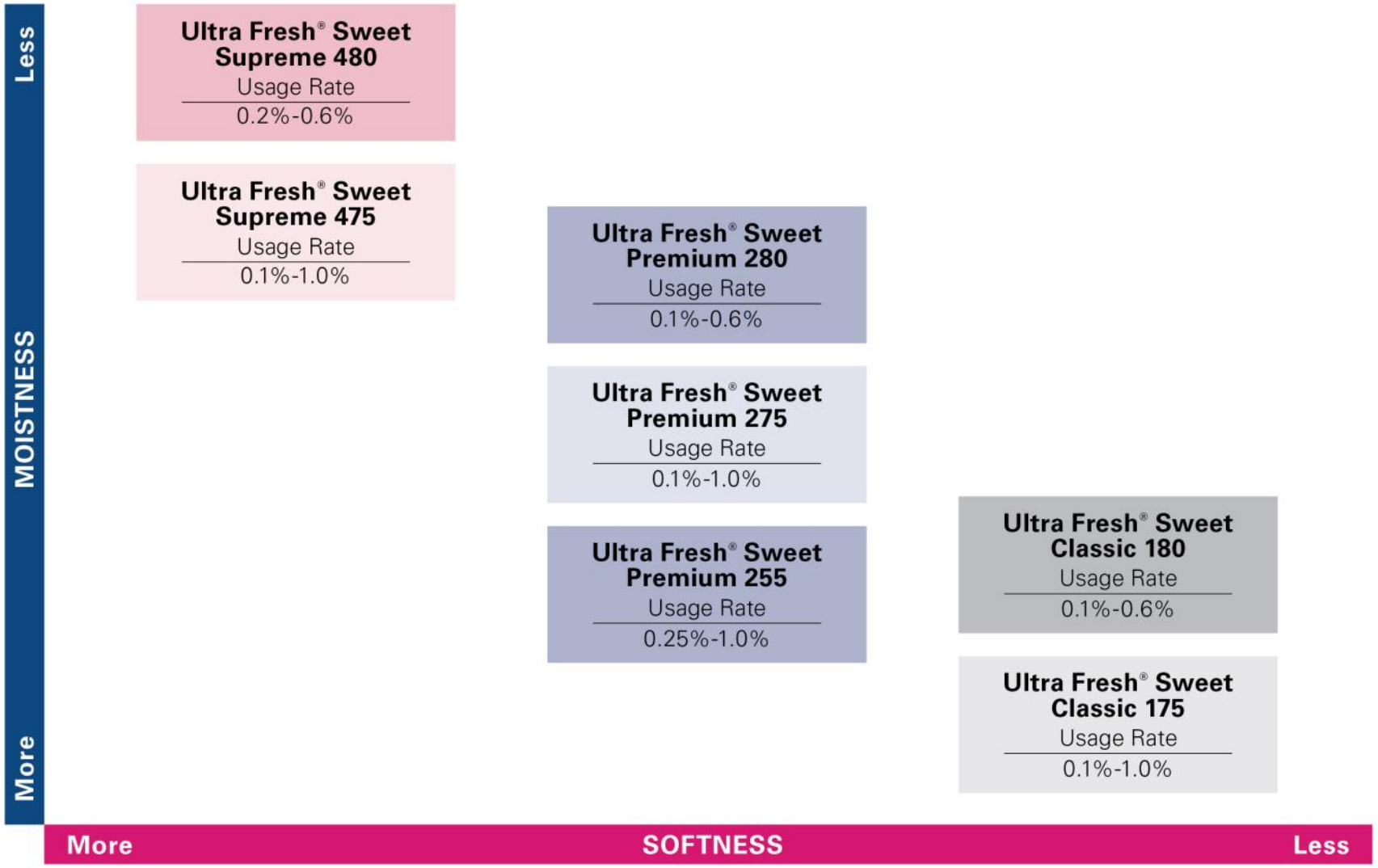
Premium delivers versatility

- Versatile across a variety of applications
- Provides soft, resilient and moist crumb texture
- Consistent freshness up to 45 days
- Optimizes crumb structure in cupcakes, snack cakes, and muffins

Classic allows replacement of gums, starches and sugars

- Economical alternative to gums, starches and sugars
- Increases softness and moistness while reducing crumbling
- Provides consistent freshness up to 15 days

Ultra Fresh® Sweet Texture Comparison



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Ultra Fresh® Sweet performs by:

Optimizing enzyme activity with respect to temperature, pH, time, enzyme inhibitors, substrate availability and moisture

Increasing crumb moistness, softness and resilience

Delivering properly balanced activity creates optimum quality and freshness

Key benefits to manufacturer

- Reduced waste/stales cost
- Distribution expansion opportunity
- Expand product offerings into new categories
- Extended freshness to deliver quality
- Manufacturing/labor efficiencies opportunity
- All-natural and ingredient legend friendly: flour and enzymes
- Allows for full utilization of truck space
- Flexibility to meet varying consumer preferences
- Capitalize on brand essence and portfolio by delivering improved quality and freshness

Ultra Fresh® Sweet Industry
Performance and Consumer Test Results

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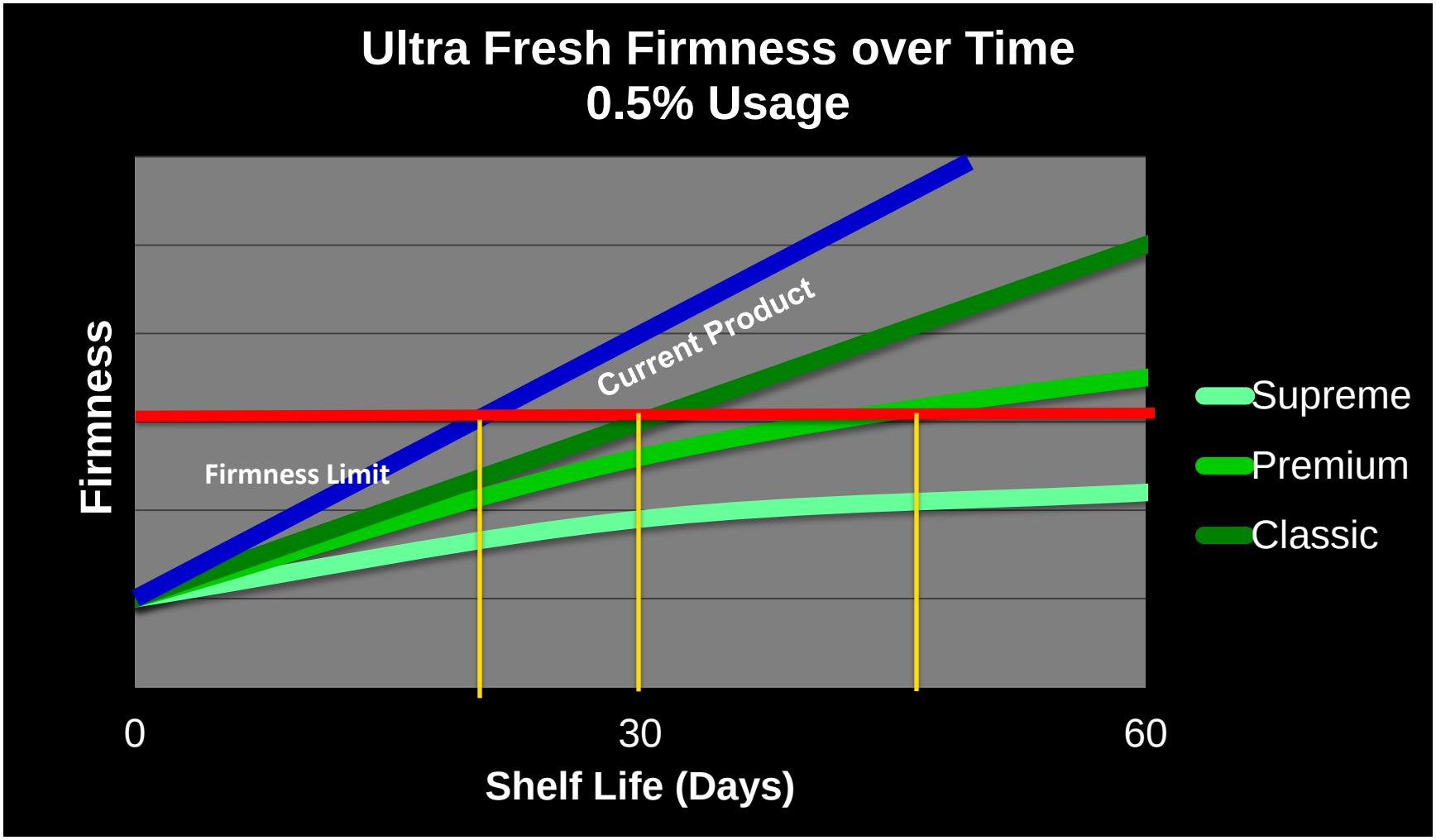
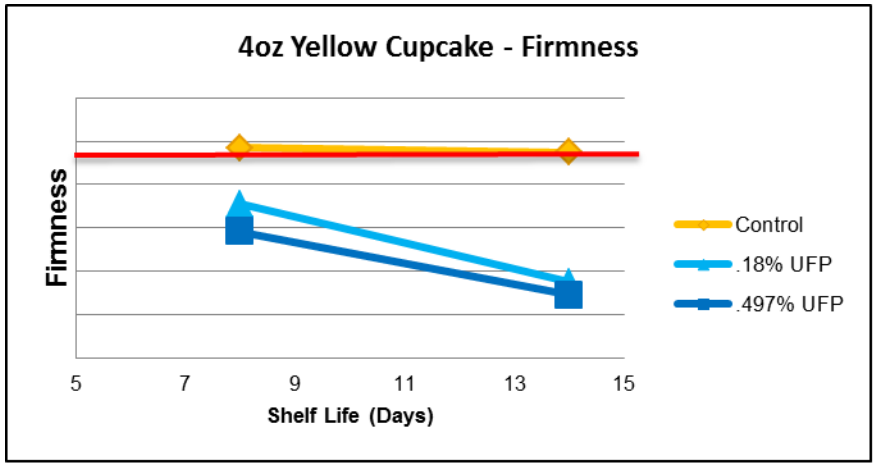
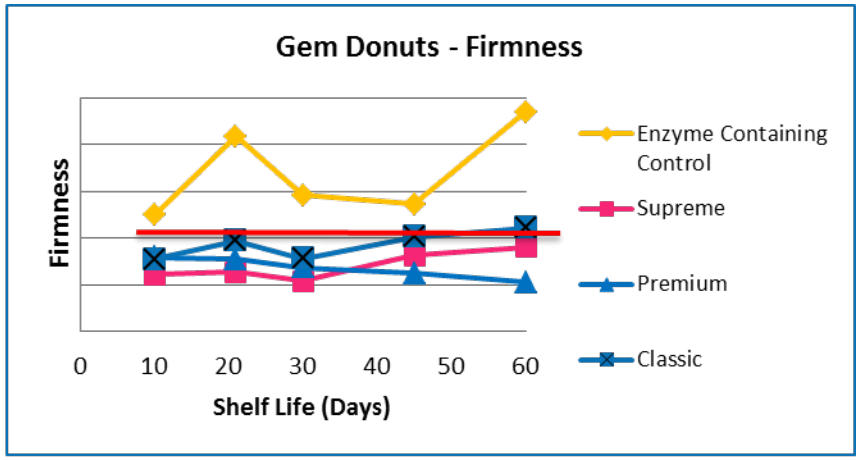
Industry Performance

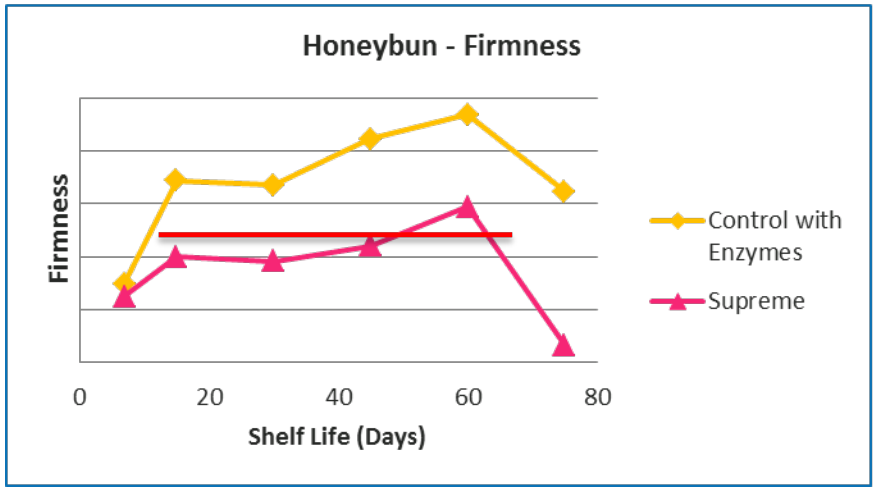
Predictive Model for Shelf Life

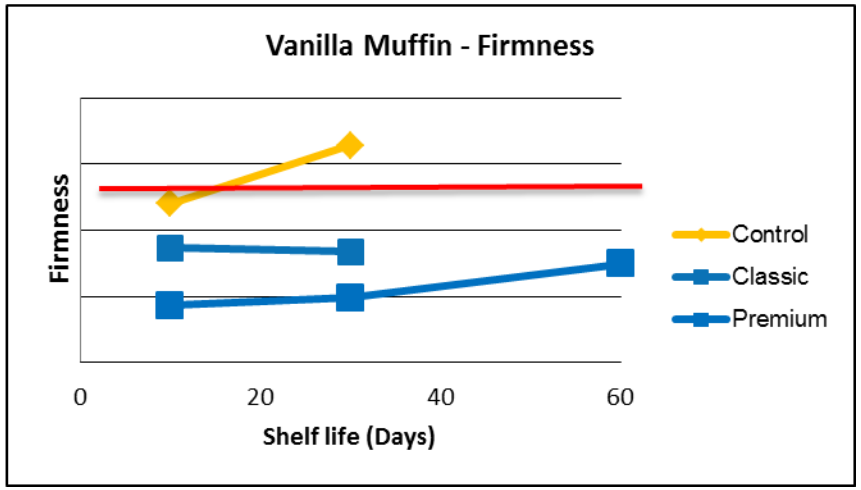


Ultra Fresh® Sweet provides the precision needed to create desired sensory results









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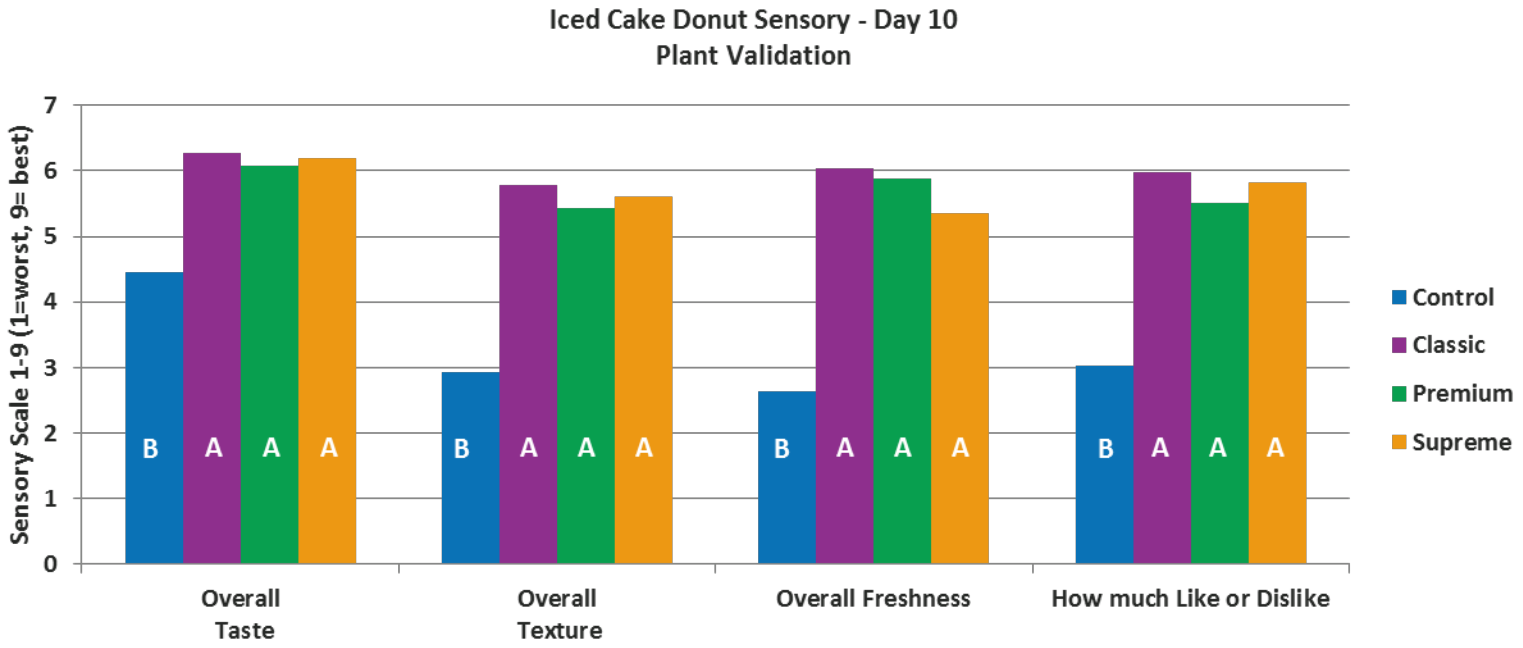
Cake donut internal sensory evaluation

Cake donuts showed great improvement with Ultra Fresh® Sweet

- **Supreme, Premium and Classic all scored significantly higher than the control on day 10**



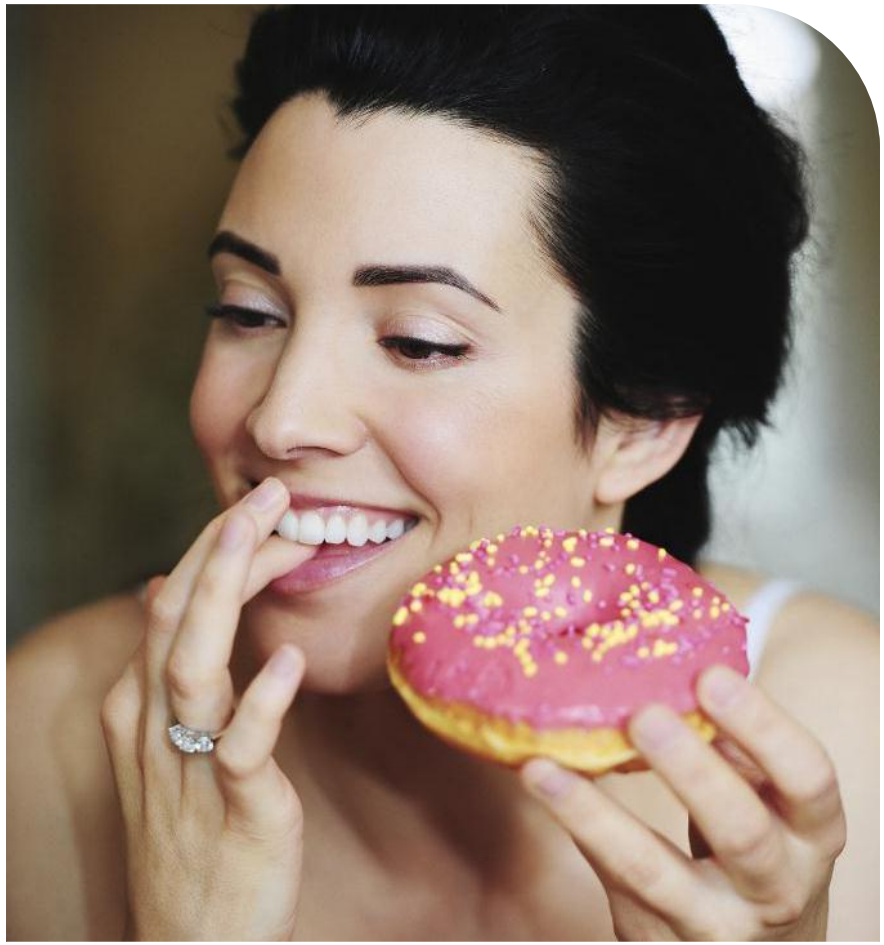
*Data represented by different letter groupings are significantly different from one another.

Consumer test results

Consumer test methodology

Donut and muffin samples tested with 75 consumers

- Consumers were pre-recruited to come to a central facility for testing
- Current category consumers
- Open to longer lasting freshness idea
- Feedback collected on a number of attributes covering taste, texture, freshness and liking



Freshness facts

When purchasing donuts…

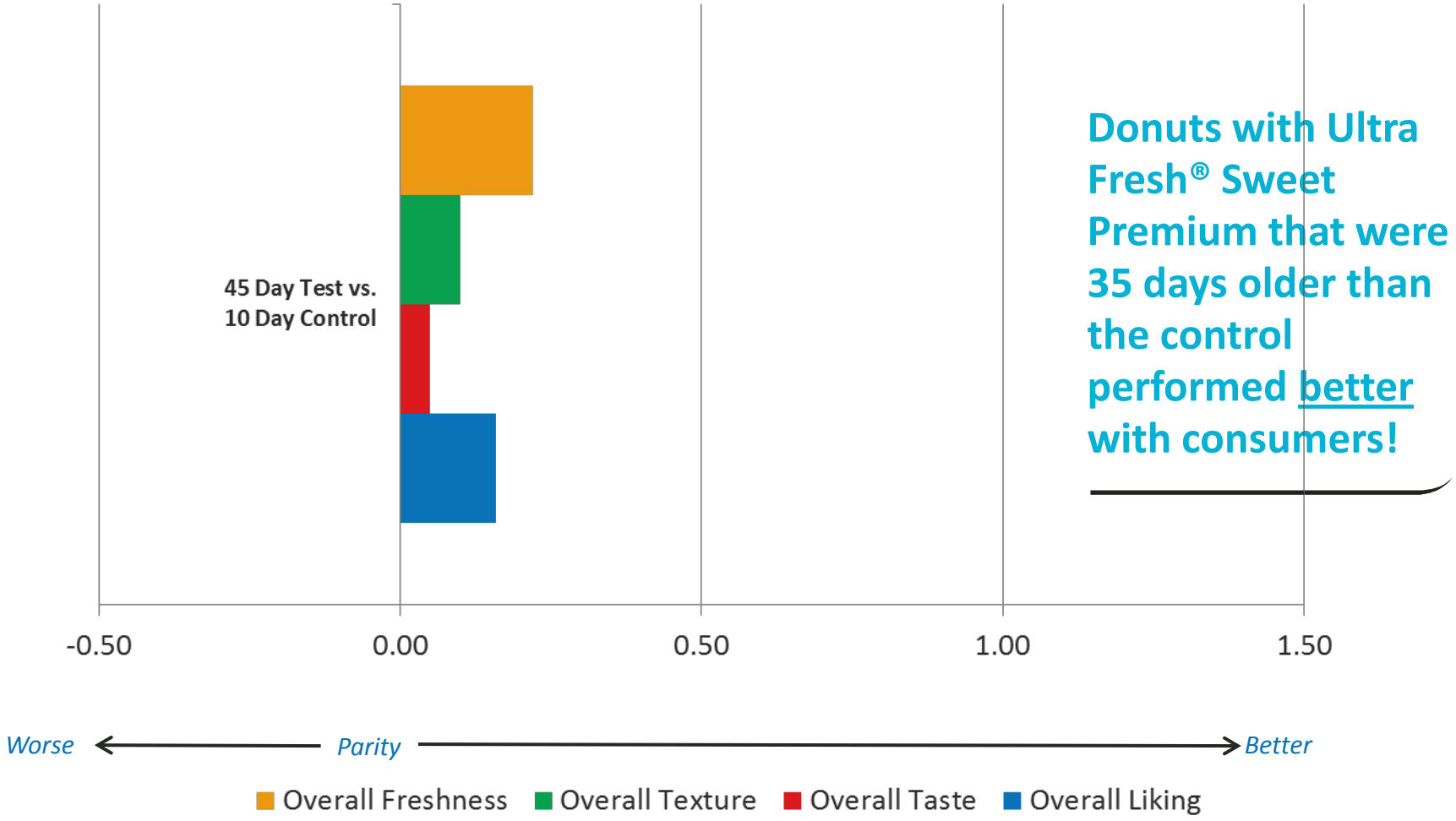
- 90% of consumers rate expiration date as extremely/very important
- 83% of consumers look at expiration dates
- 84% of consumers use taste/texture to determine when donuts have gone bad
- If donuts could last longer, 57% would purchase other varieties/types in addition to what they normally purchase

When purchasing muffins…

- 94% of consumers rate expiration date as extremely/very important
- 74% of consumers look at expiration dates
- 59% of consumers use taste/texture and 36% use appearance to determine when muffins have gone bad
- If muffins could last longer, 65% would purchase other varieties/types in addition to what they normally purchase

Source: Proprietary consumer study - January, 2013

Premium donut: liking characteristics



Donuts with Ultra Fresh® Sweet Premium that were 35 days older than the control performed better with consumers!

Source: Proprietary consumer study - January, 2013

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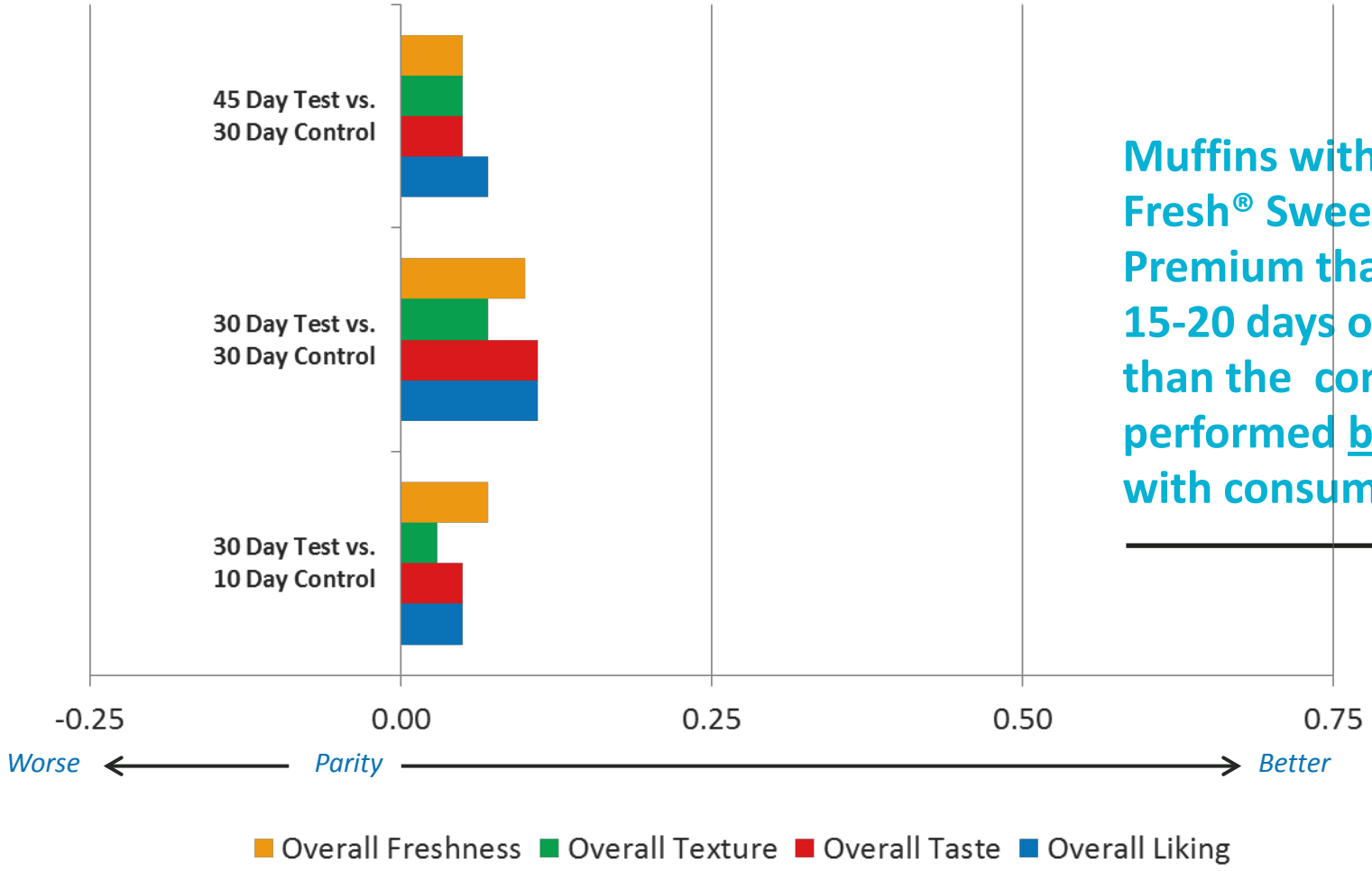
Premium muffin: liking characteristics



Muffins with Ultra Fresh® Sweet Premium that were 15-20 days older than the control performed better with consumers!

Source: Proprietary consumer study - January, 2013

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Attributes for donuts & muffins made with Ultra Fresh® Sweet

- Did not look stale
- Moist to chew
- Felt fresh
- Did not feel dry to touch
- Did not crumble while eating
- Melt in your mouth texture
- Did not look dry
- Tasted fresh
- Fresh texture while chewing
- Soft texture while chewing

Source: Proprietary consumer study - January, 2013

Note: Attributes with a statistical advantage vs. control

Validation proved product performance and consumer approval

Product performance improvement has been validated

- Post-production testing confirmed performance improvement – even through freeze/thaw cycles
- Consumers confirmed the quality – and intent to purchase more – with longer product freshness
- Proprietary consumer research

Improved product performance over an extended freshness period

Source: Corbion field and validation testing; Proprietary Consumer study – January, 2013

Formula optimization

Many ingredients in a sweet good formula function as tenderizers

- Sugar, shortening, leavening, egg yolks, emulsifiers, starches, gums, etc.

Ultra Fresh® Sweet is a powerful texture modifier and often overpowers the tenderizing effects of other ingredients

- There may be opportunity for a customer to optimize or “clean-up” a formula while enhancing product quality and performance via Ultra Fresh® Sweet

Factors not addressed by Ultra Fresh® Sweet when extending product life cycle

Mold
Increased inhibitors

Rancidity
Antioxidants or packaging

Component stability
May need higher quality glaze or icing

Corbion Ingredients has products that can help combat some of these issues – please ask your sales associate about complimentary products

Vanilla Muffin
• Mold inhibition: sorbic acid and potassium sorbate • Water activity: 0.81 • Moisture: 23% • pH: 6.7

Mini donut
• Mold inhibition: sorbic acid, potassium sorbate, and sodium propionate • Moisture: 20% • pH: 7.0

Which solution fits your application?

Product	Freshness Parameters					Processing Parameters	
	Crumb Softness	*Crumb Resilience*	*Crumb Moistness*	*Crumb Smoothness*	*Crumb Cell Size and Uniformity*	*Cake Volume*	*Reduced Crumbliness*
Cupcake, snack cake, and muffin applications							
Ultra Fresh® Sweet Premium 280	+++	+++	++	+++	++	+	++
Ultra Fresh® Classic 180	++	+	+++	++	+	+	+++
Yeast raised donut, cake donut, and honey bun applications							
Ultra Fresh® Sweet Supreme 475	+++	+++	+	+++	No Change	No Change	++
Ultra Fresh® Sweet Premium 275	++	++	++	++	No Change	No Change	++
Ultra Fresh® Classic 175	+	+	+++	+	No Change	No Change	+++

+ Discernible effect **++ Highly discernible effect** **+++ Maximum attainable effect**

Ultra Fresh® Supreme 480 is available to improve quality and freshness of large cake items
Ultra Fresh® Premium 255 is available to improve quality and freshness of Danish

Key Takeaways

Current ingredient solutions have been maxed out for improving sweet good freshness and shelf life.

Corbion has developed new enzyme solutions to improve the freshness of sweet goods

- Ultra Fresh® Sweet provides options to optimize product performance and freshness

Ultra Fresh® Sweet meets a proven and unmet need

- Reduces waste and stales
- Improves/customizable product texture and quality


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