



CLEAN LABEL CONFERENCE
MARCH 28-29, 2017

**A NEW CONCEPT
FOR IMPROVING
FOOD & BEVERAGE
QUALITY**



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GROWTH THROUGH INNOVATION

TODAY'S DISCUSSION

We're happy to discuss this great new technology!

OUR VALUE PROPOSITION

BACKGROUND ON PHYTOSHIELD

- What it is
- Features & Benefits

PHYTOSHIELD TESTING

- Applications
- Flavor
- Labeling

TARGET APPLICATIONS

- Beverage
- Prepared Foods

REVIEW



GROWTH THROUGH INNOVATION

WHAT IS PHYTOSHIELD?

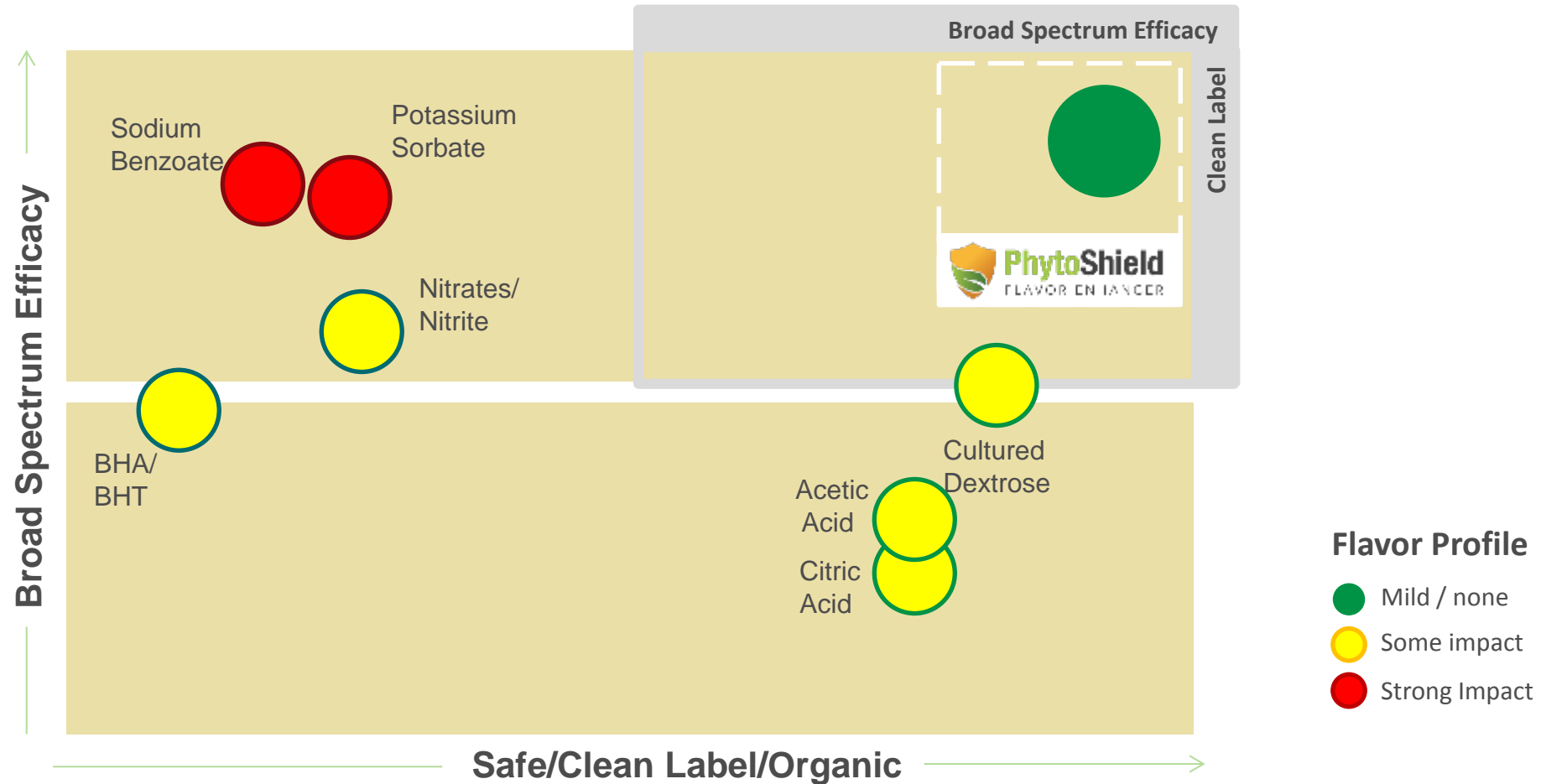
This is a line of ingredients with proprietary formulas..

- PHYTOSHIELD is a line of **natural flavor systems** that can be **organic compliant** with **strong antimicrobial properties** providing powerful, broad-spectrum protection
- These flavor systems are effective against a wide range of **bacteria** - both gram positive and gram negative - and **fungi (yeasts & molds)**
- PHYTOSHIELD acts mechanistically by destroying the cellular membrane of a micro-organism
- The anti-microbial power is a **synergistic effect** created by the reaction of bioflavonoids, flavor components, polyphenols and other organic acids



HOW DOES PHYTOSHIELD COMPARE?

Unique Solution: Efficacy, "Clean-ness", and Organoleptic Impact



WHAT ARE YOU SEARCHING FOR?

We believe we can help you in 3 different ways...

REPLACING SYNTHETIC SOLUTIONS

- Cleaner label
- Better performance/cost

REPLACING 'NON-PERFORMING' NATURAL SOLUTIONS

- Lack of efficacy
- Not broad-spectrum
- Lack of reliability
- Taste & Texture issues
- Labeling
- Cost

NEW PRODUCT DEVELOPMENT

- Clean label



FEATURES OF PHYTOSHIELD

A broad range of formulation friendly properties

Typical Label (as supplied)

- Plant Extracts
- Flavors
- Citric Acid
- Malic Acid
- *Solvent*

In-Product

- Cleaner label
- Enhanced organoleptics
- Strong anti-microbial properties
- Shelf life extension
- Improved overall product quality
- Less food waste

Formulating

- Low use rates: 0.3% to 1.0%
- Broad pH efficacy (2-10)
- Temperature stable (up to 130 C)
- Easy incorporation
- Custom solutions

Status

- GMO-free
- Organic-compliant grades
- Kosher
- Non-allergenic
- Non-mutagenic
- Non-corrosive
- Non-volatile
- Light stable




COMPARISON TO SYNTHETIC PRESERVATIVES

Broad spectrum efficacy at relatively low usage rates is unique in the world of natural antimicrobials

SODIUM BENZOATE AND POTASSIUM SORBATE ARE COMMONLY USED PRESERVATIVES IN FOOD INDUSTRY

- Typical usage rate of benzoate and sorbate is 0.025% to 0.1%
- The result of MIC (minimum inhibitory concentration) testing shows PhytoShield is:
 - Comparable or **more effective** against **Gram positive bacteria** compared to sorbates and benzoates
 - Comparable or **more effective** against **yeast** compared to sorbates and benzoates
 - Comparable against Gram negative bacteria

Time	Gram +	Gram -	Yeast	Mold
PhytoShield 	+++	++	+++	+++
Sorbates/ Benzoates	++	++	++	++




APPLE JUICE

In a challenge study with Apple Juice, PhytoShield effectively inhibited the growth of different microorganisms (mold, yeast, and bacteria).

TEST PARAMETERS:

- Freshly prepared apple juice with 0.25% PhytoShield 421719A
- Freshly prepared apple juice with no PhytoShield (control)
- pH: 5
- Juice samples were inoculated with *A. niger* (mold), *S. cerevisiae* (yeast) and *G. liquifaciens* (bacteria)

RESULTS:

Time	<i>A. niger</i> (mold)		<i>S. cerevisiae</i> (yeast)		<i>G. Liquifaciens</i> (bacteria)	
	0.25% 	Control	0.25% 	Control	0.25% 	Control
Day 1	2.5×10^2	2.5×10^2	6.8×10^3	6.8×10^3	5.5×10^3	5.5×10^3
Day 56	0	1.7×10^3	0	1.0×10^6	0	2.4×10^5




BLACK BEAN SALAD

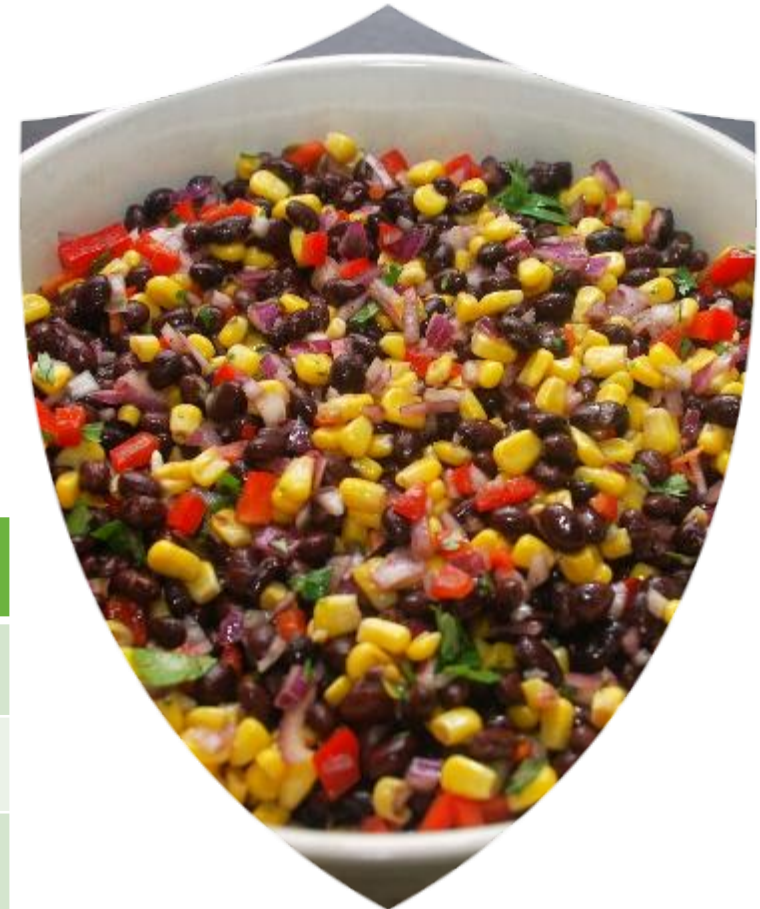
PhytoShield extended the shelf life of black bean salad by retarding microbial growth

TEST PARAMETERS:

- Fresh cut cilantro and peppers were blanched to preserve color
- PhytoShield (421719A) was added at 0.4% concentration (added to the juice from the diced tomatoes)
- The salad was stored at 50F and tested for aerobic plate count

RESULTS:

Time	 PhytoShield (0.4%)	Control
	APC/g	APC/g
Day 1	4900	3800
Day 22	3000 Tastes better than the control, stronger flavors, fresher	55,000 Mutated flavors



BROWN GRAVY

PhytoShield effectively extended the shelf life of brown gravy by inhibiting microbial growth

TEST PARAMETERS:

- Brown gravy with 0.25% PhytoShield 421719A (PhytoShield was added during the cool down cycle at about 120-140 F)
- Brown gravy with no PhytoShield (control)
- pH: 5.5

RESULTS:

Time	PhytoShield (0.25%)			Control		
	APC/g	Yeast/g	Mold/g	APC/g	Yeast/g	Mold/g
Day 1	50	0	0	80	0	0
Day 49	<1000	<10	<10	450,000 (spoiled)	>1500 (spoiled)	<10



A FEW WORDS ABOUT FLAVOR & TASTE

We're a 'multifunctional flavor technology' with a great deal of flexibility

LOW ADDITION RATE OF PHYTOSHIELD VERY OFTEN MEANS NO IMPACT ON FLAVOR

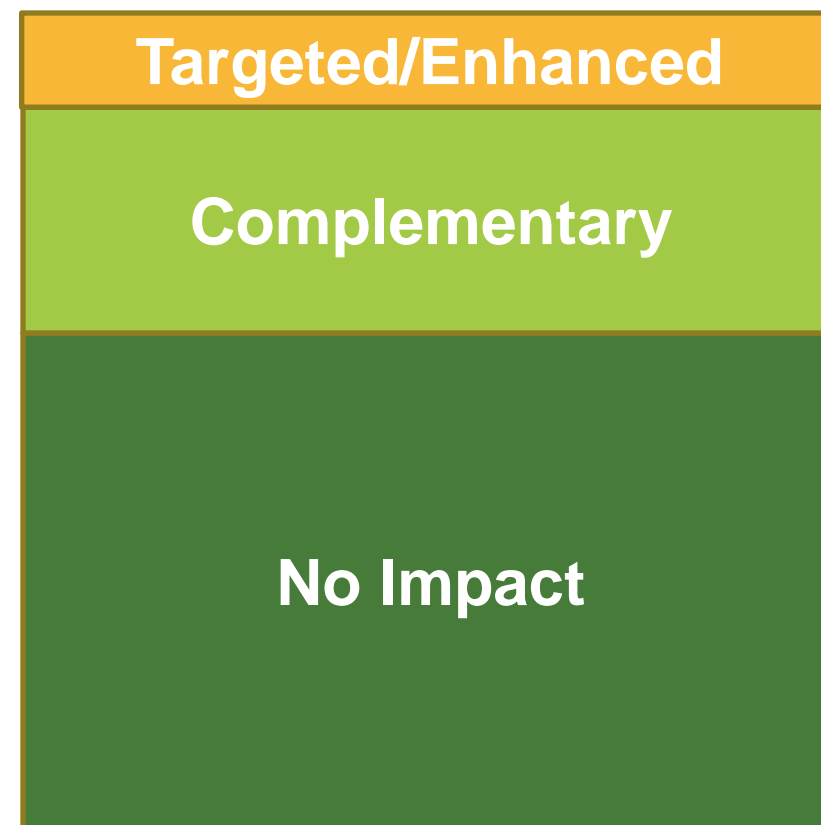
IN INSTANCES WHEN FLAVOR IS IMPACTED, INGREDIENT IS MATCHED TO THE SYSTEM AND/OR CAN BE CUSTOMIZED

- Flavored waters: Sweet flavor technology
- Gravies: Savory notes

FSI CAN WORK WITH CUSTOMER TO DEVELOP ENHANCED FLAVOR/ORGANOLEPTIC EXPERIENCE

- “Fresh” flavor in shelf life applications

FLAVOR IMPLICATIONS



WHAT ABOUT LABELING?

Typically, PhytoShield shows up as ‘natural flavor’

LABELING WILL BE FORMULATION DEPENDENT

TYPICALLY CONSIDERED ‘NATURAL FLAVOR’

PhytoShield:

- Natural Flavor (Plant Extracts)
- Citric Acid
- Malic Acid
- Non-Flavor Ingredient: glycerin



OTHER INGREDIENTS: PURIFIED WATER, EVAPORATED CANE SUGAR, NATURAL ORANGE FLAVOR, MALIC ACID, XANTHAN GUM, STEVIA EXTRACT (STEVIA REBAUDIANA LEAF).
PRODUCED IN A FACILITY THAT PROCESSES TREE NUTS, MILK AND SOY.

**SUGGESTED
APPLICATIONS FOR
PHYTOSHIELD**



BEVERAGE APPLICATIONS

Clear need from a taste standpoint. Potential for 'all natural' products

TOP SEGMENT APPLICATIONS

- Shelf-Stable RTD
- Refrigerated
- 'Shots' / Liquid Supplements
- Hot-fill or pasteurized beverages
- Syrups

KEY VALUE PROPOSITIONS:

- 'Taste'
- Broad Spectrum
- Clean Label



PREPARED FOODS APPLICATIONS

Extending shelf life for prepared foods offers significant economic benefits

TOP SEGMENT APPLICATIONS

- Soups & Sauces
- Salsas & Guacamole
- Hummus
- Ready-to eat
- Other

KEY VALUE PROPOSITIONS

- Shelf-life extension
- Clean Label
- Cost-in-use (related to Shelf Life Extension)



ALREADY SOME STRONG MARKET TRACTION...

We have been able to attract a variety of meaningful clients across multiple applications in a relatively short period of time.

- **Company A:** Used to replace Sodium Benzoate & Sorbates in a syrup product
- **Company B:** New product. Flavored Aloe water. Alternative to benzoates & sorbates
- **Company C:** Used in yogurt fruit preps for clean label (Natural Flavor)
- **Company D:** Used to prevent yeast & mold in a jam & jelly product line. Clean label. No off flavor.
- **Company E:** Used to inhibit mold growth in a functional Juice Drink. Hot fill process. Extended shelf life.



REVIEWING THE PHYTOSHIELD OPPORTUNITY

Comprehensive, reliable solutions for food product quality & shelf life enhancement

In-Product

- Cleaner label
- Enhanced organoleptics
- Strong anti-microbial properties
- Shelf life extension
- Improved overall product quality
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Formulating

- Low use rates: 0.25% to 1.0%
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TOTAL SOLUTION

**A NEW CONCEPT
FOR IMPROVING
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**FLAVOR ENHANCEMENT TECHNOLOGY THAT OFFERS STRONG ANTI-MICROBIAL
ACTIVITY, BETTER ORGANOLEPTICS AND LONGER SHELF LIFE**