

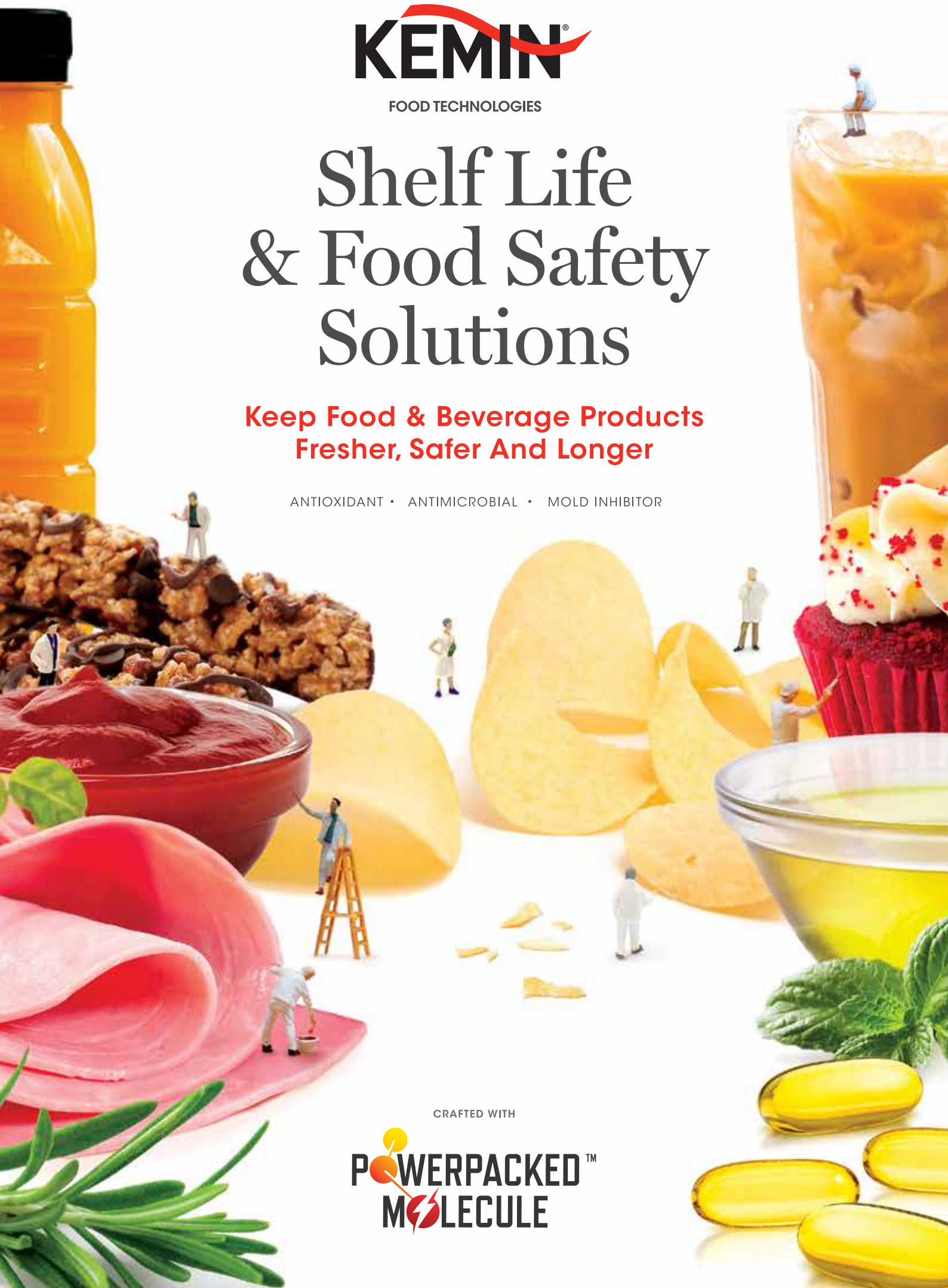
KEMIN®

FOOD TECHNOLOGIES

Shelf Life & Food Safety Solutions

**Keep Food & Beverage Products
Fresher, Safer And Longer**

ANTIOXIDANT • ANTIMICROBIAL • MOLD INHIBITOR



CRAFTED WITH

**POWERPACKED™
MOLECULE**

AT A GLANCE

Major Challenges Faced By Companies In The Food & Beverage Industry

We keep abreast with our customers' problems to provide improved, competitive solutions.



Short Shelf Life

Short shelf lives of food products causes food wastage, which results in higher operating, manufacturing, and logistic costs from a business point of view.

Deterioration In Food Quality

Food color, taste, smell, and texture deteriorate over time due to oxidation. Meat products will undergo fading in color, while oils in fried or fatty foods turn rancid and emit foul odors. Such inconsistencies and visible changes make food and beverage products unappealing for consumption.

Natural And 'Clean Label' Movement On The Rise

Consumers are increasingly demanding natural and clean label products, choosing healthier food with ingredients that are compliant to their lifestyles. The demand for transparency regarding food processes is also only going to increase.





Food Spoilage Due To Microbial Contamination

Microorganisms such as bacteria, mold spores, and yeasts rapidly accelerate food spoilage when in contact with food products. This further shortens the shelf lives of the food and beverage products.

International Regulatory Compliance

In order to export products globally, food and beverage manufacturers must source high-quality ingredients that meet international standards, halal, kosher, and food safety regulations. This, along with short shelf life, has become some of the main challenges in business expansion.

“ We have progressed to an era where informed consumers are making choices that have direct impacts on food manufacturers. Kemin knows those choices and has meaningful offerings to food and beverage manufacturers. ”

Fintan Sit

President Of Kemin Food Technologies, Asia

FOOD OXIDATION

How Oxidation Takes Place In Food & Beverage Products

1 Initiation

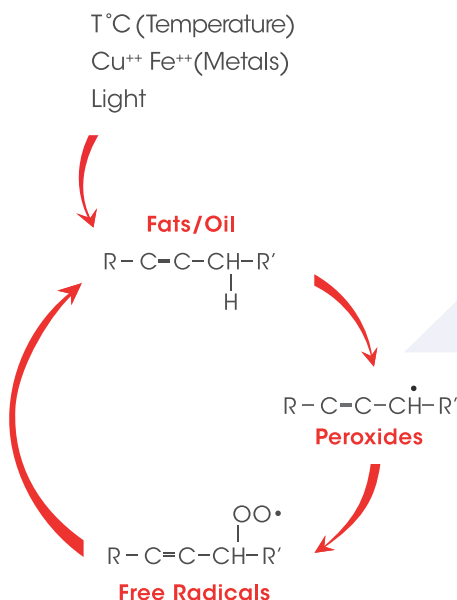
Oxidation is triggered by exposure to light, temperature and the presence of metal ions – these produce free radicals.

2 Termination

Recombination of various species of free radicals to produce stable end products, which results in off-flavors and off-odors in food.

3 Propagation

The free radicals then react with oxygen to produce peroxides which are converted to hydrogen peroxide resulting in secondary oxidation compounds.



Color, Flavor,
& Texture
Degradation

Quality
Deterioration

Shortened
Shelf Life

Oxidation Impacts Food And Beverage Products

Food products containing high amounts of fat and oils are highly susceptible to spoilage and oxidation, resulting in rancidity in taste and smell. Food items fried in oxidized oils will also result in a rancid taste and off-odors.

Protein-rich food products like meat and poultry are prone to color changes as the first sign of oxidation, notable when the fresh red or pink color fades from the meat.

In general, oxidation causes the quality of food products to deteriorate, becoming unsafe for consumption, thereby resulting in shortened shelf life and profit losses.

FOOD CONTAMINATION

Microbial Contamination Of Food Products

Microbial contamination is a result of the presence and growth of microorganisms on food products. Often, microorganisms thrive on food products that are high in moisture such as meat, poultry, and fish. In the worst case scenario, food poisoning bacteria such as E.coli, Salmonella, and Listeria can be present on the food products, rendering them dangerous to be consumed.

Did You Know?

Contamination by parasites, fungi, and bacteria can cause food borne illness such as Salmonella, Listeria, and Enteropathogenic Escherichia coli. Moreover, food recalls negatively impact sales and consumer confidence towards manufacturers and brands.

- In 2011, a company in the Philippines recalled a number of its instant noodle products for possible Salmonella contamination. The company said it found traces of Salmonella in two batches of the noodle product's beef variant.
- In one of the more recent cases which took place in 2016, a company in Malaysia recalled one of its milk brands due to bacterial contamination. The company made the discovery after receiving multiple feedback on the viscosity of the milk, appearing to be thicker than average.



Mold Growth In Food Products

Mold, while also classified as a microorganism, can inhabit dry food products such as bread, cookies, oats, and cereals. Molds are microscopic fungi, and they multiply through spores that are dispersed into the air. These spores then go on to fall onto food products and with sufficient humidity, they grow into mold. The mold feeds itself by breaking down the food with its chemicals, which is essentially food rot. While most molds are not dangerous to consume, food spoiled by mold can look and even taste bad.



THE SOLUTION

Protecting Food & Beverage Products From Oxidation, Microbes & Mold

Antioxidants

Antioxidants can be found in natural sources, or synthesized from chemical processes.

Antioxidants are molecules that slow down the process of oxidation by donating hydrogen atoms to quench free radicals, and form a stable antioxidant radical, thus slowing down oxidation and significantly lengthening the shelf life of food and beverage products.

In short, antioxidants are beneficial in:

- ✓ Delaying oxidation
- ✓ Extending the shelf life
- ✓ Maintaining freshness, quality, texture, taste, and color

Antimicrobials

Antimicrobials are organic acids derived from plants and synthetic solutions. The antimicrobials that are added to food work together with the food compounds to inhibit the growth of various bacteria, thereby lengthening the shelf life and increasing the safety levels of food and beverage products. For example, organic acids such as sorbic acid, propionic acid and acetic acid are effective antimicrobial agents against Salmonella and E.Coli in food products.

Mold Inhibitors

Organic acids can also function as mold inhibitors, depending on their types. How mold inhibitors function is that these acids will penetrate mold cells to acidify their internal pH environment. When mold cells are acidified, the molds are then unable to transport amino acids from protein. The result is a shorter lifespan of the mold and their inability to spread and multiply.



THIS IS WHERE WE COME IN



How Kemin Maintains The Highest Quality In Food & Beverage Products

At Kemin, our scientists dedicate their entire careers towards the study of how each food processing technique, ingredient, and packaging methods affect food & beverage products in terms of shelf life and consumer appeal.

Kemin is founded to innovate food protection solutions and combat challenges faced by our clients who are in the business of food and beverage manufacturing and processing. Oxidation of each food and beverage type can be significantly delayed, thereby increasing the quality of food and beverage products so that they are safe to consume.

INTRODUCING

Kemin's New Technology For Shelf Life Extension



Ingredient Blending Technology

At Kemin, our international network of scientists has devoted their careers into studying food ingredients at the molecular level. Leveraging on our expertise in shelf life extension and ingredient blending, Kemin developed a technological breakthrough which produces a new generation of antioxidants, proven to be more effective than the conventional antioxidant. We proudly call this new technology, the Powerpacked Molecule™. These antioxidants help keep food fresh for longer, and in smaller doses, so your business can enjoy better cost savings.

Powerpacked Molecule™ Offers The Competitive Advantage You Need

- ✓ Exceeds the shelf life performance of conventional single actives antioxidant
- ✓ Meets clean label demands for natural ingredients while reducing your costs
- ✓ Improves the ease of application

Solutions For Oxidation Control With Plant-Based Extracts

With the increase in demand for clean labels and natural solutions, Kemin now provides over 115 products formulated with the following plant-based extracts to cater to a wide variety of food & beverage product needs.



Rosemary

Spearmint

Acerola

Green Tea

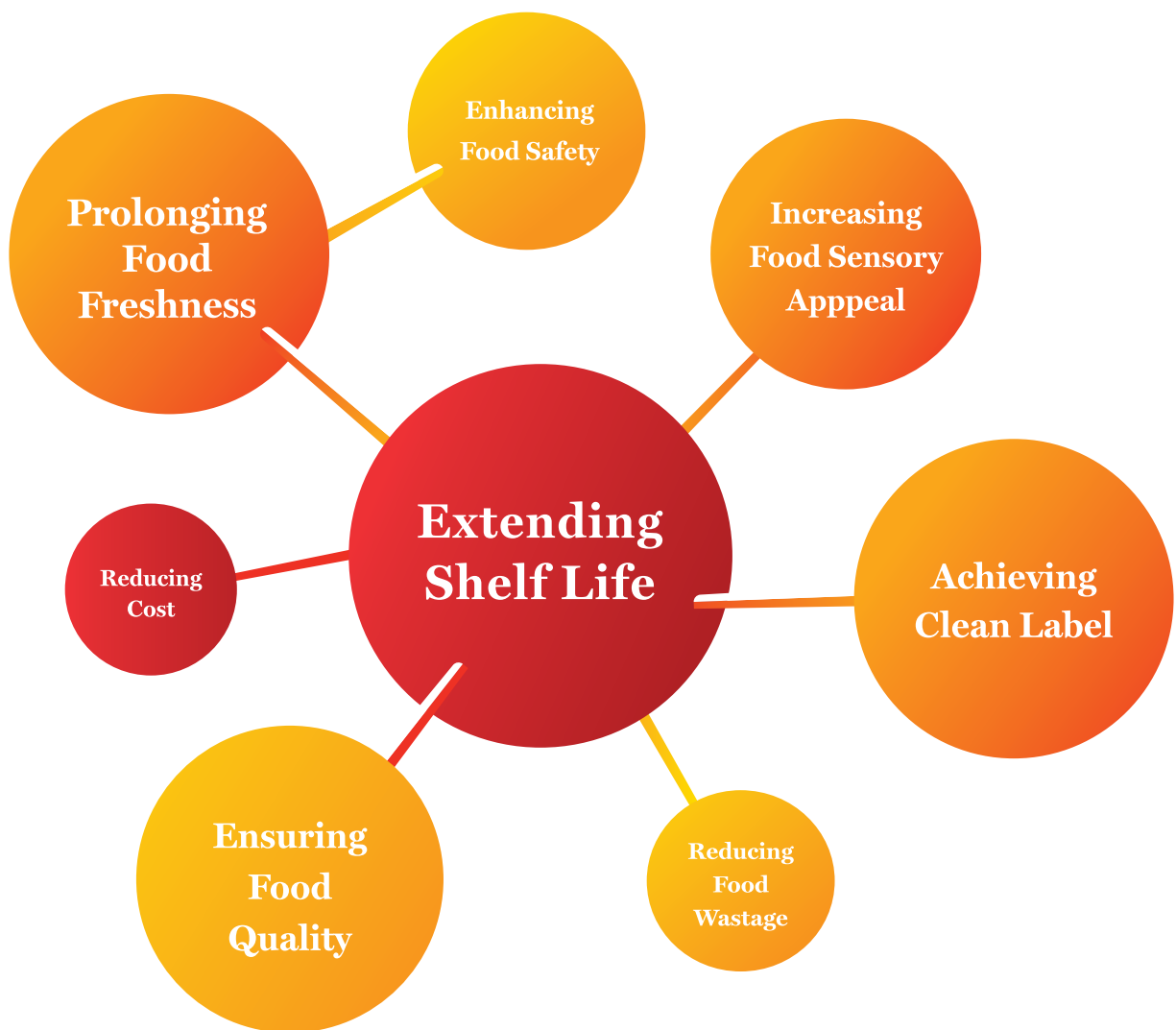
Tocopherol

Vinegar

HOW KEMIN ADDS VALUE TO YOUR BUSINESS

Beyond Extending Shelf Life With Kemin's Antioxidant & Food Safety Solutions

While your competitors are merely focusing on shelf life extension of their food and beverage products, our dedicated scientists are looking beyond - to provide your business with stronger competitive advantages in the food and beverage industry.



Did You
Know?

84%

of consumers prioritize TASTE when purchasing food products, followed by PRICE and HEALTHFULNESS of the product.

Source: 2017 Food & Health Survey, International Food Information Council Foundation, (www.foodinsight.org/2017-food-and-health-survey)





Shelf Life & Food Safety Solutions For All Segments

**We cover a broad range of aspects in
prolonging the shelf life for many types
of food and beverage products.**

With Kemin's antioxidant and antimicrobial solutions, our clients can maintain the appealing aesthetics of food and beverages, extend their shelf lives, and keep them fresher for longer.



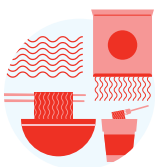
Bakery
& Confectionery



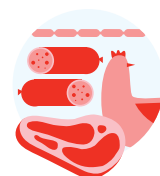
Beverages



Dairy



Instant
Noodles



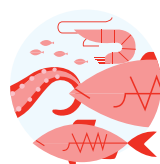
Meat & Poultry



Oils & Fats



Sauces &
Seasoning



Seafood



Snacks

Antioxidant Solution

Natural Antioxidant

Product	Description	Contains
FORTIUM™ R	Remarkable antioxidant protection derived from a natural and traceable source. Kemin's rosemary is one of the most vertically integrated rosemary plant in the world.	Rosemary
FORTIUM™ MT	Unique tocopherol blend that is enriched with delta and gamma isomers, offering high antioxidant activity for extra protection.	Tocopherol
FORTIUM™ Blends	Superior antioxidant blends that deliver synergistic effects to safeguard the freshness of the product by maintaining color and extending shelf life.	Lipid Soluble Green Tea Rosemary Gallic Acid Tocopherol
FORTRA™	Delays lipid oxidation. Superior in protecting and enhancing product's color and flavor. Robust formulation to withstand extreme temperature and pressure.	Spearmint
GT-FORT™	Unique solubility that is effective in delaying lipid oxidation without sensory attributes. Robust formulation to withstand extreme temperature and pressure.	Lipid Soluble Green Tea
Natur-FORT™	Versatile combination of natural extracts for synergistic effect to meet different shelf life challenges.	Natural Extracts Blend

Synthetic Antioxidant

EN-HANCE™	Synthetic blend that offers economical benefit and operational ease with uniform dispersion for consistent product performance.	BHA BHT TBHQ Propyl Gallate
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Frysmart

A service package designed for customers to help detect oil deterioration and increase the life cycle of frying oil

FORTI-FRY™	Label friendly solution to extend the life cycle of frying oil while preventing foaming. Improved heat transfer ability to promote uniform browning from the very first fry.	Natural Antioxidant Blend
FILTRATION AID	Proprietary technology formulated to prolong the life cycle of frying oil by removing impurities or residue formed during frying process.	Filtration Aid

Certain statements may not be applicable in all geographical regions.

Product labelling and associated claims may differ based upon government requirements.

Food Safety Solution

Natural Antimicrobial

Product	Description	Contains
BactoCEASE™ NV	Natural antimicrobial formulated with Kemin's acid neutralization technology for a non-corrosive and less pungent solution to inhibit microbial growth (e.g.: E.coli, Salmonella, Listeria).	Natural Buffered Vinegar

Synthetic Antimicrobial

BactoCEASE™	Unique liquid antimicrobial solution developed with less sodium and superior solubility for a healthier and thorough protection (e.g.: E.coli, Salmonella, Listeria).	Propionic Acid
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Mold Inhibitor

AMPLIFRESH™	Designed in easy to use form with superior solubility while not affecting the natural flavor of the product.	BHA Potassium Sorbate Sorbic Acid
AMPLIVITA™	Designed in easy to use form with superior solubility while not affecting the natural flavor of the product.	Potassium Sorbate Sorbic Acid
SHIELD™ CA	Formulated for better solubility and ease of handling, this ingredient is effective in mold inhibition without affecting the sodium content of the final product.	Propionic Acid Calcium Propionate
SHIELD™ FL	Formulated for better solubility and ease of handling yet does not react with baking powder.	Sodium Propionate Sorbic Acid
SHIELD™ NA Liq. B	A robust antimicrobial system proven to effectively increase shelf life at a reduced cost.	Sodium Propionate Propionate Acid
SHIELD™ SA (Encapsulated Technology)	Formulated with Kemin's proprietary technology that is proven to effectively restrain mold growth and provide cost saving in terms of yeast usage.	Sorbic Acid

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FROM FIELD TO YOU

One Of The Most Vertically Integrated Suppliers Of Rosemary & Spearmint Extract

Kemin controls the breeding, plant selection, growing, harvesting and extraction steps for our specialty crops. The vertically integrated supply chain allows Kemin to ensure that every batch of product is consistent. Our customers can expect the same efficacy every time they purchase our plant-based ingredients.

How We Do It

Throughout the process, Kemin prioritizes creating the ideal crop which contains the highest concentration of rosmarinic and carnosic acid content.

Selecting

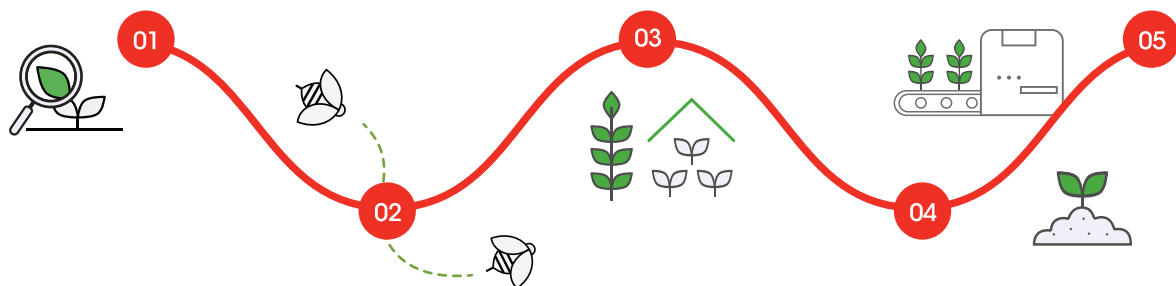
First, Kemin screens and analyzes for genetic variation to identify the ideal plant amongst hundreds of genetically different plants.

Propagation

It takes up to 5 years from breeding to plant cultivation. Propagules of selected plants are grown in greenhouses and moved to our fields to be tested in nature.

Extraction

Harvested plants will be sent to Kemin's facilities and extracted using Kemin's patented extraction method to obtain the highest quality of carnosic acid.



Breeding

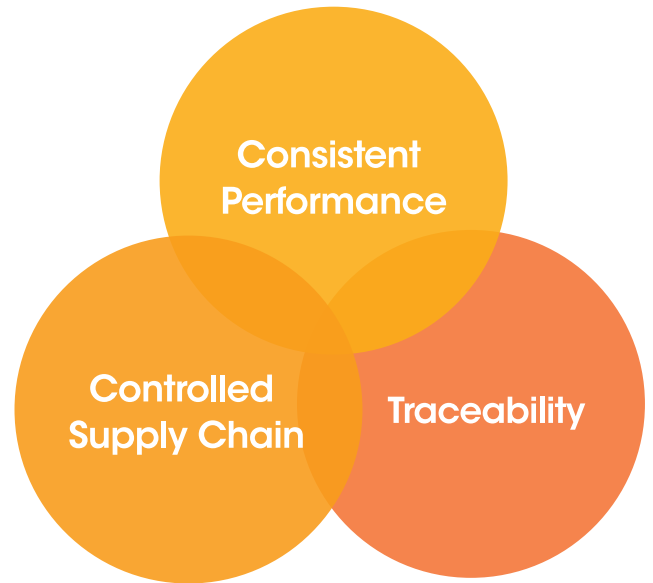
The selected plant will then undergo conventional non-GMO breeding (bee-pollination) to develop thousands of unique individuals of the said plant, which will be repeatedly screened for optimal performance until an even more ideal plant is found.

Growing

Once an ideal crop is produced, propagation scale-up will take place, followed by field scale-up. This process will be repeated every 10 years.

Compliant With International Best Practices In Sustainability

Certified by SCS Global Services, Kemin uses a sustainable agronomic growing approach.



Rosemary

Kemin is one of the world's leading rosemary producers

- ✓ One of the largest rosemary germplasm collections in the world
- ✓ One of the largest commercial productions in the world
- ✓ One of the most significant investments and scale-ups in the world



Spearmint

Kemin is one of the world's leading producers of scientifically advanced spearmint

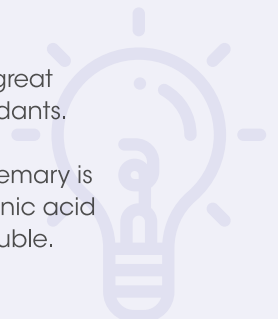
- ✓ Collaboration with some of the most knowledgeable mint farmers in the US
- ✓ A 7,000 square-foot manufacturing facility that houses our patented drying technology



Did You Know?

Both rosemary and spearmint are great sources of powerful, natural antioxidants.

The carnosic acid derived from rosemary is lipid & fat soluble, while the rosmarinic acid derived from spearmint is water soluble.



LET'S COLLABORATE!

How To Get Started



01

Talk To Our Customer
Lab Services Team

02

We Evaluate & Identify
Your Concerns

03

Lab Test For Oxidation &
Microbial Spoilage

04

Sensory Lab Test On
Final Outcome

05

We Determine The Most
Effective Treatment For The Food

06

We Optimize The Solution
To Meet Your Needs

How Kemin's Customer Lab Services Team Adds Value To Your Business

- ✓ Customer Lab Services Team to support and advise clients in meeting their business objectives.
- ✓ A dedicated team to work closely with clients.
- ✓ Assistance, technical support, and training is provided to the client's operation team.
- ✓ Regulatory compliance check to meet global supply needs & expansion plans.
- ✓ Accreditations include Food Safety System Certification (FSSC), Halal, and Kosher Certification

Global Expertise With A Local Touch

Touching More Than 3.8 Billion Lives Daily



We are Kemin, and we are improving lives by touching half of the world's population every day with our products and services. At Kemin, we are continuously finding and understanding the role of food ingredients at a molecular level - preserving and improving the quality of life. Built on exacting science and powered by human imagination, Kemin has developed more than 500 specialty ingredients made for humans and animals to improve the quality, safety, and efficiency of feed, food, and health-related products through our various business units:

- Animal Nutrition & Health
- Food Technologies
- Textiles Auxiliary
- Biofuels
- Human Nutrition & Health
- Pet Food & Rendering Technologies
- Crop Technologies
- Aquaculture



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