



Tortilla preservation

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AB Mauri | Key facts & figures

AB Mauri is a united, global family of yeast & ingredients companies

100+ years
of experience



52 plant facilities
in 32 countries



7,000
employees



Annual revenue
of \$2+ billion



We concentrate our innovation efforts on strategic growth platforms to deliver high-value solutions for bread- and sweet bakery products

Bread



- Gluten replacement
- Emulsifier replacement
- Natural Preservation
- Sugar reduction
- Texture Improvement
- Frozen Technologies
- Sourdough

Rolls and Buns



- Gluten replacement
- Emulsifier replacement
- Natural Preservation
- Sugar reduction
- Texture Improvement
- Frozen Technologies
- Sourdough

Cake & Muffins



- Texture Improvement
- Sugar Reduction
- Egg reduction / replacement
- Fat Reduction
- Clean Label/ Chemical Leavening
- Emulsifier replacement

Doughnut



- Texture Improvement
- Fat Reduction

Flatbread/Tortilla



- Texture Improvement
- Natural Preservation
- Sourdough

Pizza



- Texture Improvement
- Natural Preservation
- Sourdough

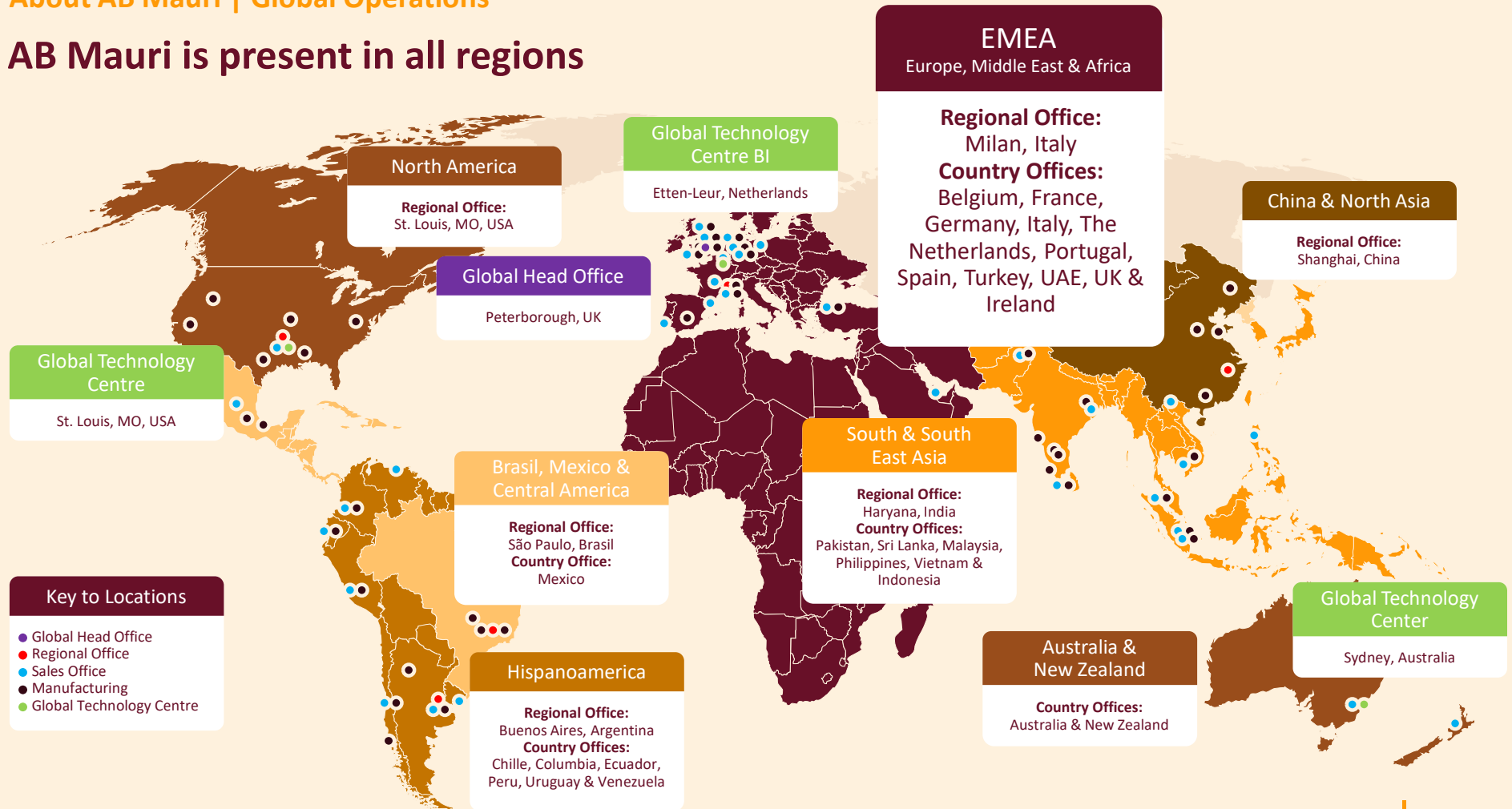
Croissant/ Danish



- Frozen Technologies
- Sourdough

About AB Mauri | Global Operations

AB Mauri is present in all regions



Consumer and Tortilla Market Trends

6 |



AB | MAURI

Changing dietary habits

36% of global consumers seek to avoid preservatives in their diet

- For over a decade, preservatives, along with artificial sweeteners, colourings, flavors, and trans fats, have consistently ranked among the top ingredients consumers seek to avoid in packaged food.
- Ongoing health concerns and the demand for 'clean-label' products continue to influence attitudes towards food additives.
- This trend reflects a broader desire for transparency and simplicity in ingredient lists.

Which additives and preservatives are you avoiding?

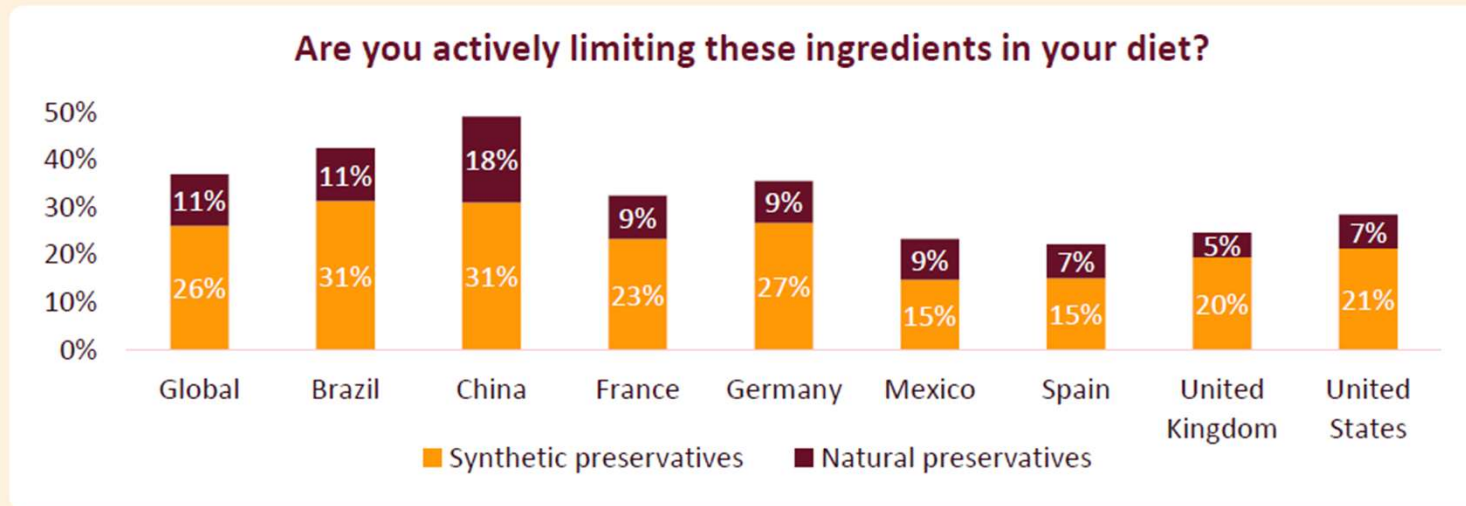
Answers	Global	BR	CN	FR	DE	MX	ES	UK	USA
1. Artificial sweeteners	46%	45%	33%	43%	50%	45%	43%	44%	37%
2. Artificial food colourings	44%	47%	36%	41%	35%	46%	44%	42%	37%
3. Trans fats	40%	60%	38%	33%	32%	48%	47%	34%	33%
4. Artificial flavours	36%	44%	34%	37%	34%	39%	32%	35%	32%
5. Preservatives	36%	42%	42%	33%	34%	27%	32%	29%	25%

Sources: Health & Nutrition survey 2025 – Innova.

Changing dietary habits

Avoidance of synthetic preservatives highlights the importance of natural solutions

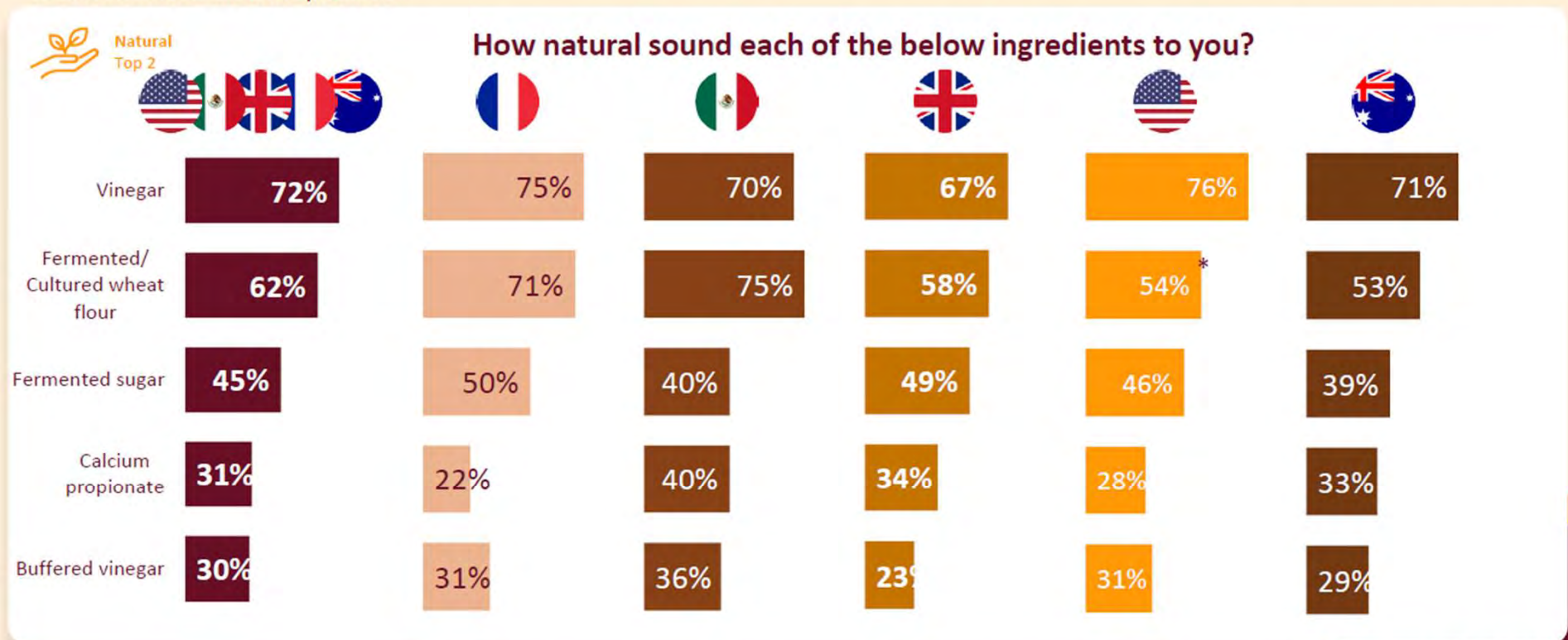
- 32% of global consumers are willing to accept preservatives.
- However, more than 1 out of 4 global consumers are actively limiting synthetic preservatives in their diets.
- The data underscores that consumer concern centres on artificial preservatives, highlighting the relevance of natural preservation solutions.



Consumer perceptions of natural preservation ingredients

Vinegar leads as the most recognised natural preservative

- As consumers increasingly seek out natural preservation solutions, their perceptions of ingredient naturalness play a crucial role in acceptance.



* Cultured Wheat Flour

Source: Consumer Research Human8, Aug 2024

Tortilla market trends

Strong regional differences are observed in product claims

	Europe	NA	LATAM
1	Vegan	Kosher	Gluten Free
2	No Additives/Preservatives	GMO Free	High/Source of Fibre
3	Vegetarian	Traditional	Low/No/Reduced Cholesterol
4	High/Source of Fibre	Low/No/Reduced Cholesterol	Traditional
5	Wholegrain	No Additives/Preservatives	Wholegrain
6	No Added Sugar	No Trans Fats	High/Source of Protein
7	Economy	Gluten Free	No Trans Fats
8	Gluten Free	High/Source of Fibre	Vegan
9	Halal	Organic	Low/No/Reduced Fat
10	Organic	Vegan	Low Sugar
11	Palm Oil Free	Wholegrain	No Added Sugar
12	Lactose Free	Low/No/Reduced Sodium	Natural
13	High/Source of Protein	Indulgent & Premium	No Additives/Preservatives
14	Indulgent & Premium	Low/No/Reduced Fat	Kosher
15	Low/No/Reduced Carb	Vegetarian	Indulgent & Premium

AB Mauri Capabilities for Tortilla Producers



About AB Mauri | Value creation model

We use our capabilities to develop ingredient technologies tailored to meet the unique needs of local markets and individual customers.

Co-developing successful concepts



Trends



New product concepts



Insights



Joint innovation

Product enhancement



Softness & freshness



Taste & texture



Nutritional values



Shelf-life extension

Successfully implementing manufacturing solutions



Technical support



Sharing knowledge



Trouble shooting



Validation of production process

Capabilities supporting (Natural) Preservation

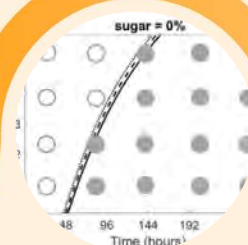
Screening methodologies

Including high throughput screening, in vitro, in vivo challenge tests



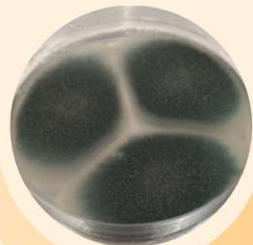
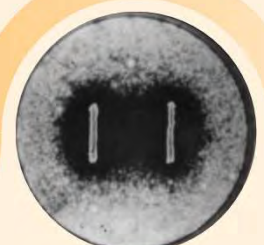
Predictive modelling

Design preservation strategies
Quantitative microbial ecology of bakery products



R&D of novel antimicrobials

Antimicrobial cultures, protecting baker's yeast, sensory analysis, microbial resistance, bioprocess design



Microbial identification

Environmental sampling, cultivation, isolation, PCR-based molecular identification

Microbial analysis

Media preparation, colony counting, microscopy, incubation, agar inoculation, strain library

Authenticity screening

¹⁴C Carbon dating, organic acid analysis, colour analysis, factory audits



AB Mauri Capabilities for tortilla producers

Our bespoke tortilla solutions are designed to align with your strategy and support in delivering on the expectations of your customers and consumers.

AB Mauri's tortilla capabilities & approach

- Global application capability in tortilla
- Offer bespoke solutions taking into account:
 - Product requirements (labelling, functionality, nutritional values, sensory requirements)
 - Type of Packaging (Ambient, Frozen, MAP)
 - Type of production line
 - Ease of supply of raw material
 - Qualification of the workforce
 - Labor cost
- Training can be offered in the Global Technology Centre, using pilot tortilla line and other equipment.



AB Mauri Tortilla Solutions Portfolio



AB Mauri Capabilities for tortilla producers

What makes a good tortilla?

Diameter



Fluffiness



Opacity



Microbial stability



Shape



Edges



Stickiness



Rollability



Tortilla solutions portfolio

AB Mauri's tortilla portfolio consists of three categories to meet local needs

SUPREMO
TORTILLA SOLUTIONS

Building blocks

- Enzymes systems
- Anti-stickiness agents
- Dough relaxer
- Mould inhibitors
- Leavening agents
- Plant Fibres
- Acidulants

Improver solutions

- Softening solutions
- Dough improvers
- Shelf-life extension
- Anti-stickiness solutions

Total tortilla mixes

- Retail
- Food Service / QSR
- Bespoke solutions

**Innovation
opportunities:
cleaner label
shelf life**



What attributes should be maintained during shelf life?



Microbial contamination

Spoilage microbes

Microorganism Type	Typical pH Growth Range	Optimum pH	Sensitivity Notes
Fungi (Moulds)	2.0 – 8.5	4.0 – 6.5	Prefer slightly acidic environments ; can tolerate lower pH than most bacteria. Some can grow at very low pH (e.g., <3).
Bacteria	4.5 – 9.0	6.5 – 7.5	Most prefer neutral to slightly alkaline pH . Acidophilic and alkaliphilic bacteria exist but are less common. Growth is inhibited at low pH.
Yeasts	2.0 – 8.0	4.0 – 6.0	Generally acid-tolerant, similar to moulds . Many can grow at lower pH than bacteria, but not as low as some moulds.

Microbial contamination

Spoilage microbes

**Aspergillus spp.*

(e.g., *A. niger*, *A. flavus*)

Can produce mycotoxins; often appear as black or greenish spots.



**Penicillium spp.*

(e.g., *P. chrysogenum*)

Blue-green mould, common in bread and tortillas.



**Rhizopus spp.*

(e.g., *R. stolonifer*, also known as bread mould)

Fast-growing, causes soft rot and black spots.



**Mucor spp.*

White to greyish mould.



Factors affecting Tortilla spoilage, an overview

INTRINSIC



- Water activity (<0.9)
- pH (<5.5)
- Preservatives

EXTRINSIC



- Temperature
- Humidity
- Contamination of environment and equipment
- Type of packaging: MAP, barrier and closure packaging

Ideal situation is to control extrinsic factors → allowing more friendly intrinsic factors.



Extrinsic factors, where to focus:

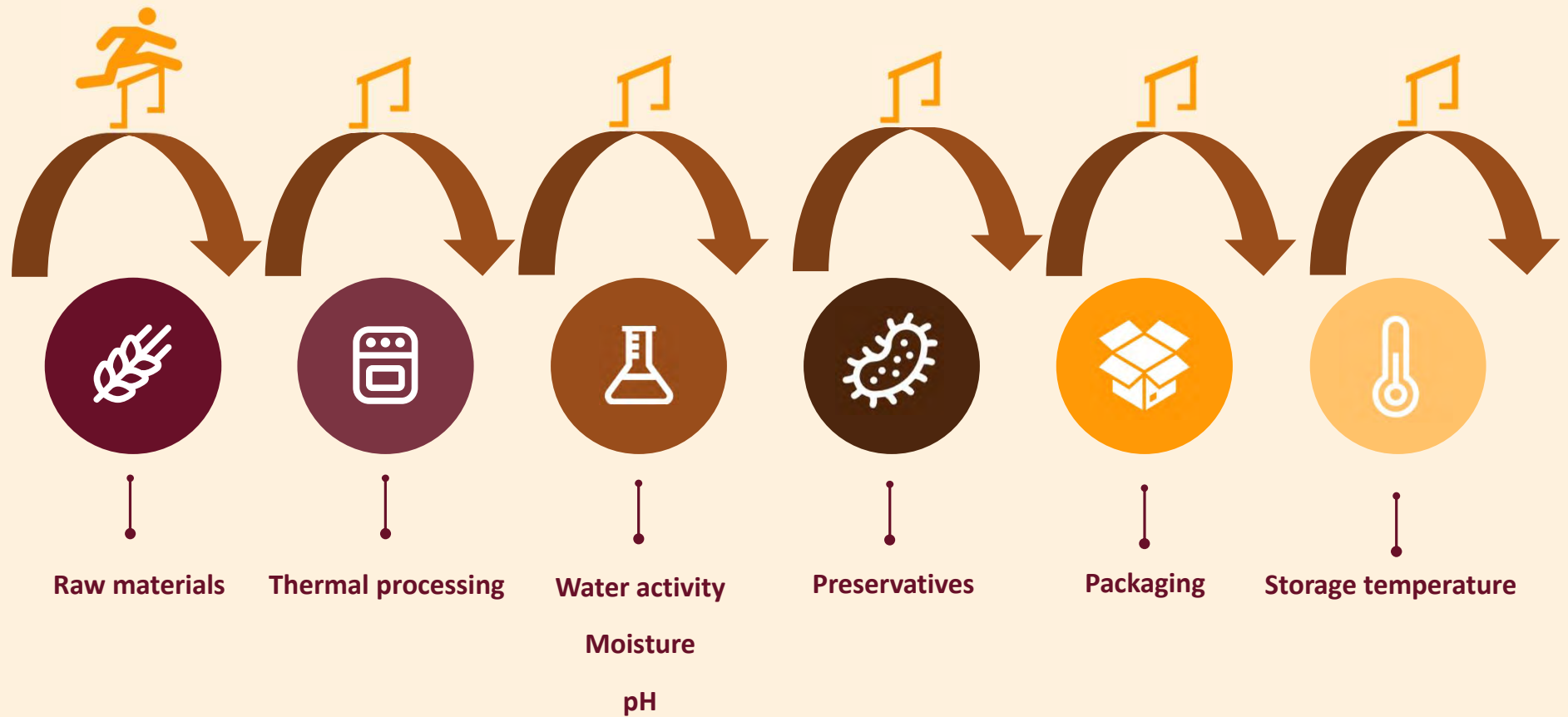


Critical: segregated area, traffic control, training

- Air turns per hour: 20-25 or higher
- Relative humidity: less than 70% -- Ideally < 60%
- Should maintain positive air pressure in the packaging area (HEPA filter)
- No dust/debris
- Adequate cleaning/sanitizing of surfaces and floor



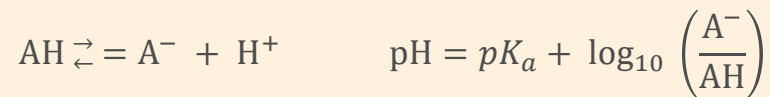
Strategies against spoilage: Hurdle concept



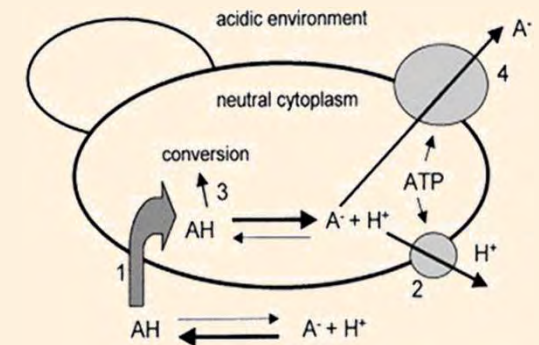
Preservation by organic acids: How does it work?

Weak organic acids are only anti-microbially active in their non-dissociated form as this form can transfer the cell membrane. In the cell, a higher pH is encountered, and the molecule dissociates and lowers the cytoplasmic pH.

pKa determines how much acid is in active form



Lowering the pH using a strong acidulant makes them more effective



Acid type	pKa	pH 2.5	pH 3.0	pH 3.5	pH 4.0	pH 4.5	pH 5.0	pH 5.5	pH 6.0	pH 6.5	pH 7.0	pH 7.5
Propionic acid	4.87	99.6%	98.7%	95.9%	88.1%	70.1%	42.6%	19.0%	6.9%	2.3%	0.7%	0.2%
Sorbic acid	4.76	99.5%	98.3%	94.8%	85.2%	64.5%	36.5%	15.4%	5.4%	1.8%	0.6%	0.2%
Acetic acid	4.74	99.4%	98.2%	94.6%	84.6%	63.5%	35.5%	14.8%	5.2%	1.7%	0.5%	0.2%
Phenyl lactic acid	4.31	98.5%	95.3%	86.6%	67.1%	39.2%	17.0%	6.1%	2.0%	0.6%	0.2%	0.1%
Benzoic acid	4.19	98.0%	93.9%	83.0%	60.8%	32.9%	13.4%	4.7%	1.5%	0.5%	0.2%	0.0%
Lactic acid	3.85	95.7%	87.6%	69.1%	41.5%	18.3%	6.6%	2.2%	0.7%	0.2%	0.1%	0.0%
Citric acid	3.13	81.0%	57.4%	29.9%	11.9%	4.1%	1.3%	0.4%	0.1%	0.0%	0.0%	0.0%

Natural preservation

Fermented flours



- Fermented flours are a natural source of propionate, with lower levels of other acids

Sourdough



- Sourdoughs are a natural source of lactate and acetate

Vinegar



- Vinegar is a natural source of acetate

Fermented flour

Authenticity of Fermented Flour Products

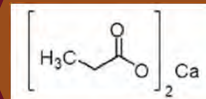
- **Calcium propionate** is the most widely used mould inhibitor in the baking industry.

Synthetic: Calcium Propionate

- Derived from petrochemical sources
- Very white, pure, often crystallised
- Labelling as preservative E282
- Low cost-in-use



Calcium propionate



Natural: Fermented Flour

- Derived from fermentation by *Propionibacterium*
- Less concentrated, less pure, less white
- Labelled as “fermented flour” or “cultured flour”
- High cost-in-use



- Authenticity testing of fermented flour is done to assure the product is truly obtained by fermentation, is not purified nor spiked with synthetic propionate.

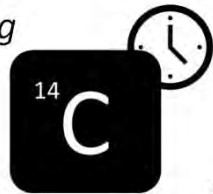
Fermented flour

Authenticity Toolkit | Verified 'Authentic' with Four Core Features

1

Isotope Analysis

¹⁴C carbon dating



2

Organic Acid Levels



3

Colour Analysis

Fermentation indicator



4

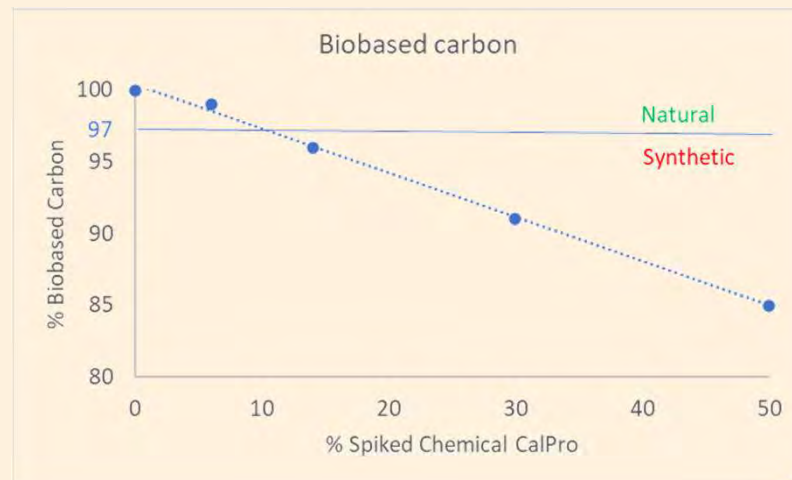
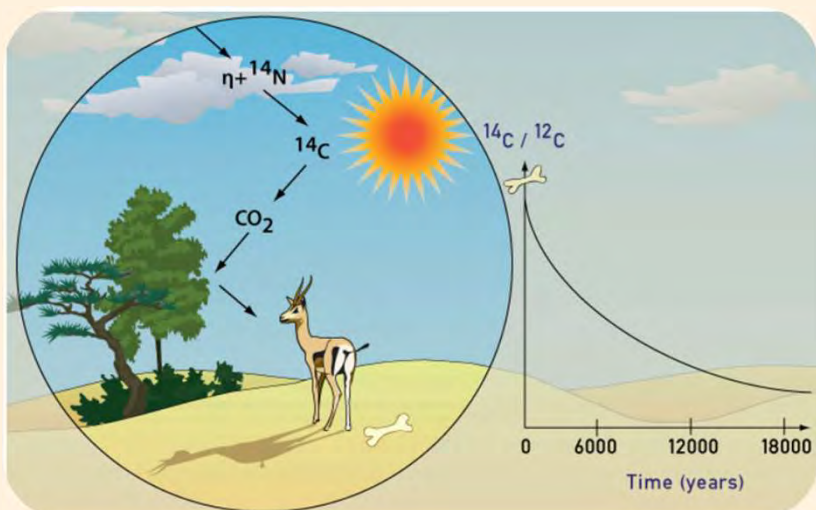
Factory Audit



Fermented flour

Authenticity Toolkit | Isotope Analysis: ^{14}C Carbon Dating

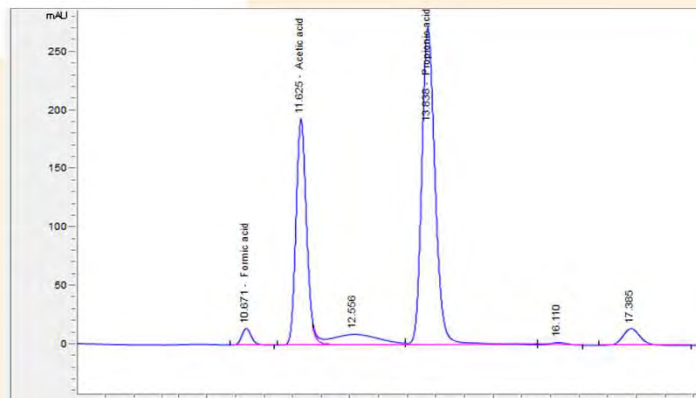
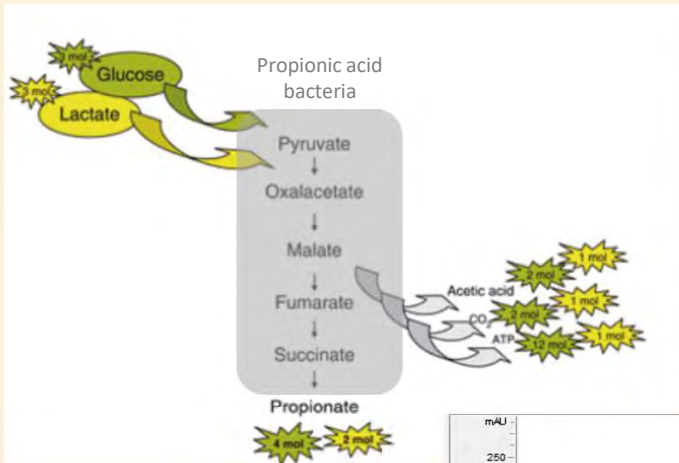
- In living organisms (plants/animals) ^{14}C gets renewed, the moment something dies, this renewal process stops, and ^{14}C starts to decay.
- This technique allows to identify presence of petrochemical derived material in the sample but gives no information on potential purification after fermentation.



Fermented flour

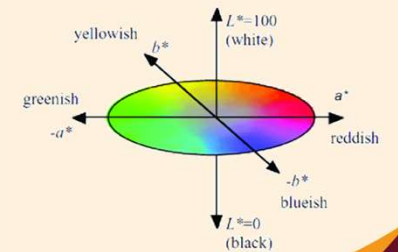
Authenticity Toolkit | Organic Acid Levels

- Realistic propionate level (< 50%)
- Realistic ratio with other organic acids (PA/AA < 10)



Authenticity Toolkit | Colour as Fermentation Indicator

- Fermentation derived products will be light yellow as heat is involved in the process for sterilisation and for final product drying, causing Maillard reaction
- * Petrochemically derived products are white



Fermented flour

Nabitor

- Clean label product designed for increasing mould free shelf life of baked goods without the use of artificial chemicals
- Guaranteed authentic product – AB Mauri works with an exclusive partner and has full traceability on the supply chain
- Inhibits a broad spectrum of moulds
- Usage rate: 0.4 – 1.0%

High concentration of clean label PROPIONIC ACID

Lower dose

Suitable	Tin Bread	Whole wheat	Parbaked Bread	Buns	Tortilla
Mould-free shelf life	✓	✓	✓	✓	✓

Sourdough

Sourdough – how does it work in preservation?

1. Acidification
LAB in sourdough produce lactic acid and acetic acid, lowering the pH of the dough.
2. Antimicrobial Compounds
Sourdough LAB can produce antimicrobial peptides, bacteriocins, and other metabolites (e.g., hydrogen peroxide, diacetyl) that further inhibit spoilage microbes.



The image shows the packaging for Aromaferm Wheat Bran Ferment 200. The packaging is dark with a gold and white logo at the top right that reads "Aromaferm™ NATURAL FERMENTS". Below the logo is a circular icon of a bowl with a spoon and the word "Ferment". The main text on the packaging is "AROMAferm™ WHEAT BRAN FERMENT 200". Below this, there is a photograph of several loaves of bread, some whole and some sliced, with a small bowl of butter and a butter knife. The background of the packaging is a dark, textured surface. The overall design is clean and professional.

YOU'LL LOVE...

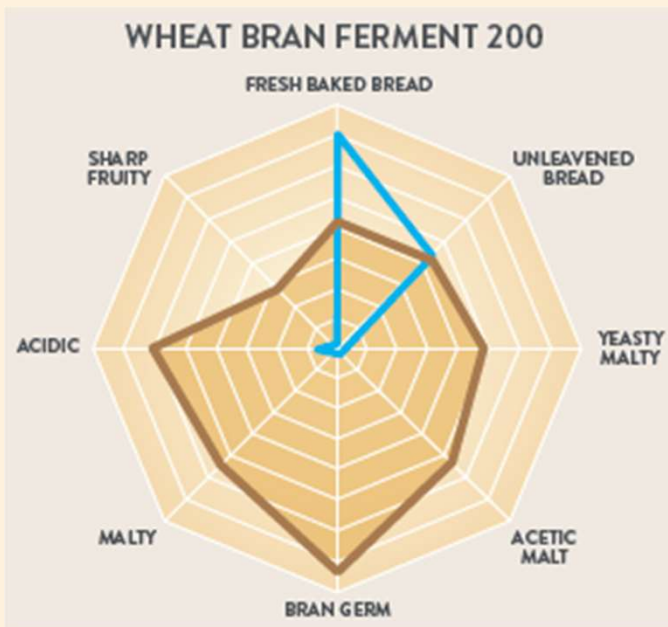
- ✓ Easy to store, handle and add directly to your current recipe.
- ✓ The **product consistency** it gives you compared to the more volatile natural fermentation.
- ✓ It's **low usage rate**.
- ✓ Clean label – **No E Numbers**, just natural sourdough!

THEY'LL LOVE...

Sourdough

Aromaferm

- High TTA, used in tortilla preservation trial
- Moreover, sourdough taste profile can partly mask negative taste acids from other acids



Control

WBF 200

Aromaferm™
NATURAL FERMENTS

AROMAferm™
WHEAT BRAN FERMENT 200

ment 200
atural
d from
ected
tures.

re:
dic sourdough with
d bran flavours.

RE FOR
artisanal breads
• Baguettes
• Sandwich bread
• Mediterranean bread

YOU'LL LOVE...

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THEY'LL LOVE...

Combining natural preservatives

Example of natural preservation Tortillas baked in AB Mauri Pilot line

Tortilla base formulation

- Coated malic acid, pH 5.3-5.4
- 1800 ppm Calcium propionate
- 1800 ppm Potassium sorbate

Conclusions

- Pilot tortillas made with natural preservation combinations can reach 6 months in ambient packaging
- Quality parameters as toughness, extensibility and foldability end of shelf are not significantly different from the base tortillas

Pilot line 19-20 cm tortillas - hand/ambient packaging

Ingredients	Bakers %				
	Base	Test 1	Test 2	Test 3	Test 4
Flour	100	100	100	100	100
Water	46	46	46	46	45
Fat	4	4	4	4	4
Oil	7	7	7	7	7
Glycerine	8	8	8	8	8
<i>Base Improver</i>	9.5				
<i>Base improver without conservation</i>		9.5	9.5	9.5	9.5
<i>Nabitor</i>			0.8	1	1
<i>Dry Sourdough Wheat Bran ferment 200</i>				1	
<i>Vinegar (25%)</i>					1
Shelf achieved in test environment	6 months	<1 month	2 months	6 months	6 months
pH	5.32	5.46	5.20	5.08	5.12

Innovation opportunities

We can support with (re)formulation of your tortillas to achieve cleaner label, good processability and end-product characteristics your consumers love.

Co-developing successful concepts



Trends



New product concepts



Insights



Joint innovation

Product enhancement



Softness & freshness



Taste & texture



Nutritional values



Shelf-life extension

Successfully implementing manufacturing solutions



Technical support



Sharing knowledge



Trouble shooting



Validation of production process

AB | MAURI

Passionate
about baking

