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WHITE PAPER

Fumaric Acid: The Acid of Choice for Bakery

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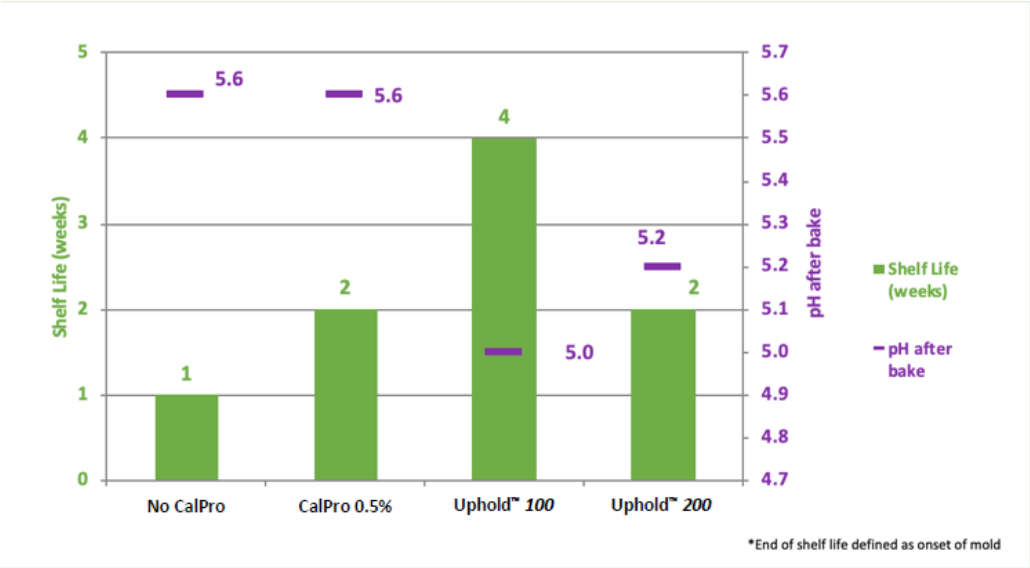
Fumarc Acid is a Practical Ingredient to Use

Fumaric acid is a highly functional organic acid in bakery applications due to its unique chemical and physical properies. Fumaric acid is non-hygroscopic, meaning that the acid absorbs virtually no atmospheric moisture. Without this absorption fumaric acid stays dry and free flowing. As a result, dry-mix products will not cake or harden, even during high humidity storage conditions, when fumaric acid is used as the acidulant. The benefits of fumaric acid benefits include: improving shelf life, enhancing taste (pleasant sour or tartness), managing pH/acidity, improving processing and baked product quality, and much more. Furthermore, fumaric is a powder which allows for easier storage and use in the bakery when compared to other common liquid acids such as acetic, lactic and phosphoric acids.

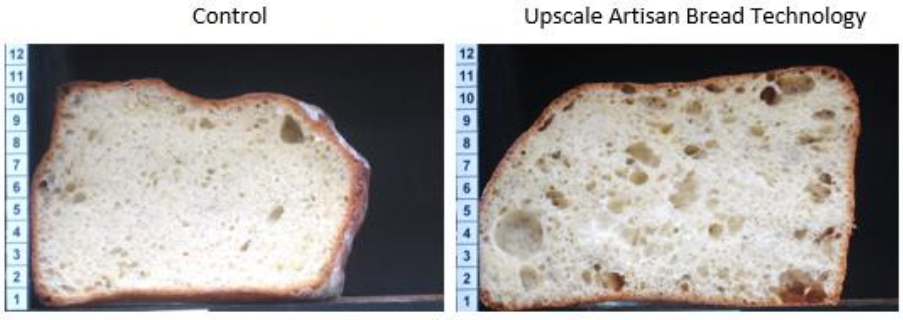
Fumarc Acid Function in Preservation

The acidity level of a bakery system, measured commonly as pH, is crucial to its shelf life. Fumaric acid-based systems are highly effective at optimizing shelf life. The use level of Calcium Propionate (CalPro) can be reduced, while matching or extending shelf life, when the right balance of acid and preservative are used and the pH is closely controlled. This process is shown below for pan bread in “Uphold 100” and “Uphold 200”.



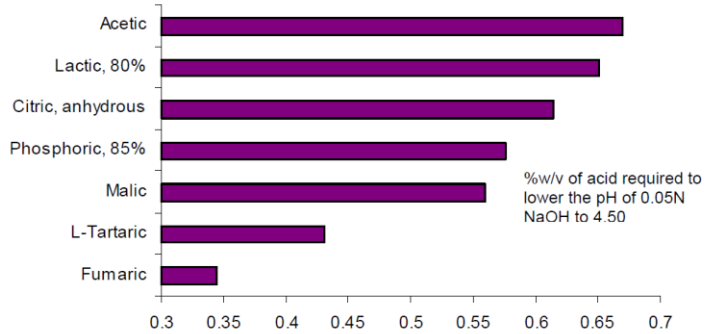
Artisan Bread Improvement

The new, patent-pending, fumaric acid-based system “Upscale™ Artisan Bread Technology” from Bartek optimizes the porosity and volume of artisan breads, such as ciabatta and baguettes. Additionally, sensory characteristics are enhanced with a more rounded and subtle complex flavor, with an improved overall appearance and shape.



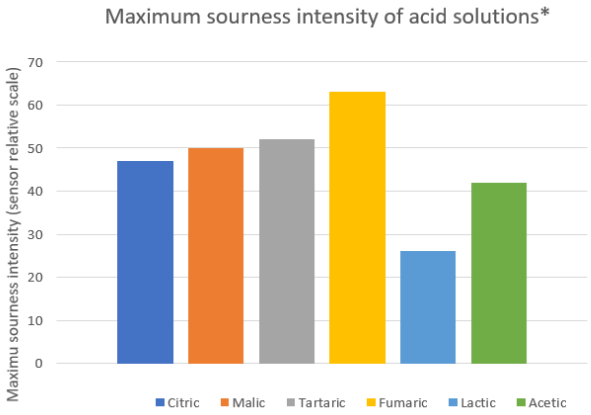
Effectiveness of Fumaric Acid as Acidulant

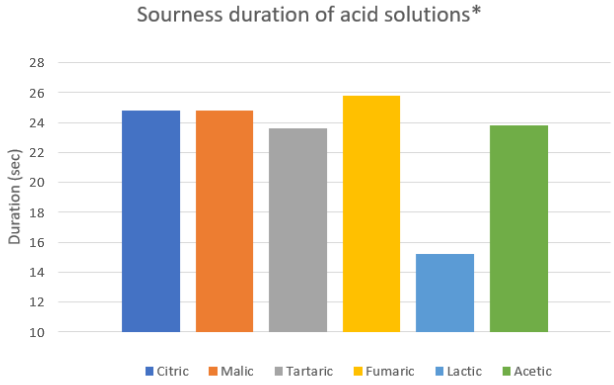
Fumaric acid is the most effective among common food acids. As an example, bakery preferments, such as sourdoughs and sponges, have pH’s as low as 4.5. The level of acid required to lower the pH of a model system to 4.5, are shown in the graph below, is the least for Fumaric acid when compared to other acids. Thus, fumaric acid can substantially reduce costs and make the use of acids more practical for bakers trying to optimize the fermentation processes. Malic acid and tartaric acids are also very effective however, tartaric acid can create unpleasant sensory attributes , such as a sharp sour/tart note, that can affect the final product palatability.



Effective Contribution to Sourness

Fumaric and malic acid provide more intense and persistent sourness than other acidulants commonly used in dry mixes. A comparison of sourness in acids can be seen in the chart below. Thus, the use of fumaric or malic acid substantially reduces the acidulant cost in rye and sourdough bread mixes. They also contribute a clean but persistent sourness in contrast to the objectionable “vinegar” aroma of acetic acid or the brusque sour notes of tartaric acid.

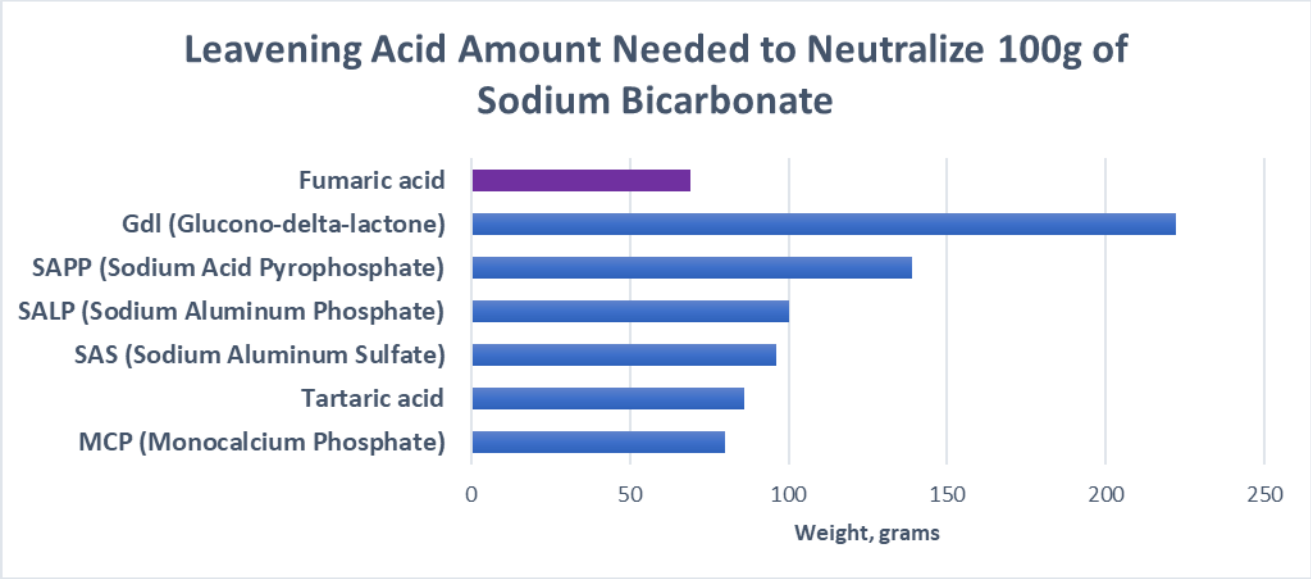




*Data from time-intensity curves of acids tested at pre-determined equi-sour concentration. Adapted from Straub, A. (1992).

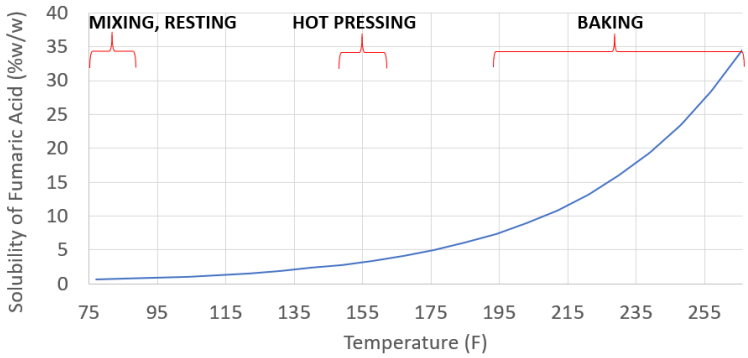
Fumarc Acid as an Optimum Choice for Leavening

Fumaric Acid has a 145 neutalization value which is high when compared to common leavening acids. In turn, less fumaric acid is needed to neutralize sodium bicarbonate which brings savings to the baker formulating a complete baking powder system for their recipe. Fumaric acid also has a clean label appeal unlike other common leavening acids with chemically-sounding names like MCP, SAS, SALP and SAPP. Moreover, due to its low dissolution rate, fumaric acid can help preserve the leavening power in frozen or refrigerated doughs for a better rise during proofing and baking.



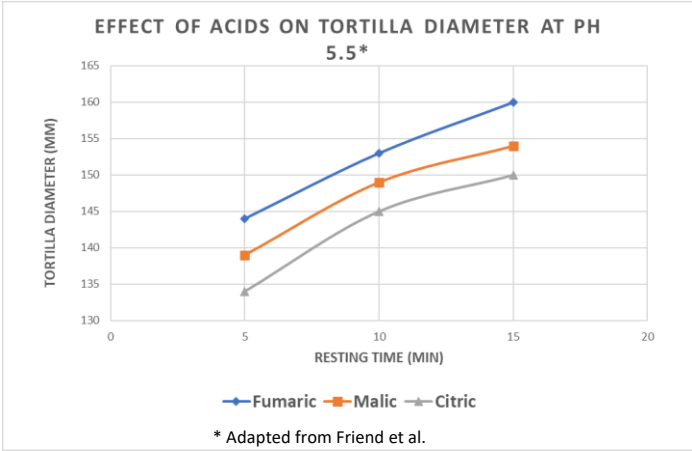
Fumaric Acid Enables Optimum Flour Tortilla Processing

Fumaric Acid's low solubility and heat activation are a unique advantage in some applications, such as wheat flour tortillas, where its dissolution is delayed until pressing and baking. This delay improves the overall quality and shelf life of the product by permitting the proper action of the leavening system while mainting the balance with the rest of the ingredients during the process.



Fumaric and Malic Acid Achieve Better Tortilla Diameter

A tight control of flour tortilla pH post-bake is necessary, with a target of 5.5-6.0, for a variety of functional reasons. For example , tortillas are harder to press the lower the dough pH. Fumaric and malic acid go beyond just pH control as they interact with wheat gluten to improve dough rheology, by altering the gluten cross-linking, which results in a more easily pressed dough. In addition, it has been observed that malic and fumaric acid provide increased tortilla diameter, at an equal pH, when compared to citric acid.



* Adapted from Friend et al.

Concluaion

Fumaric acid is a unique and functional ingredient due to its outstanding functionality compared to other food acids. This functionality helps bakers make quality products, that appeal to consumers, in a cost-efficient manner. Its advantages include:

- A reducion of chemical preservatives while maintaining or extending shelf life
- Improvement in the quality and production efficiency in artisan breads
- Cost reduction in acidulant use
- Pleasant sourness in sourdough or rye bread mixes with greater efficiency
- Cost-effective and clean-label leavening systems

contact

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Friend C.P. , Ross R.G. , Waniska R.D. and Rooney L.W. (1995). Effects of additives in wheat flour tortillas. Cereal Foods World 40(7): 494-497.

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