

WHITE PAPER

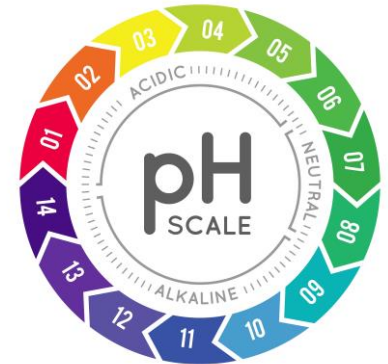
# pH in Bakery and Unique Functionality of Fumaric and Malic Acids

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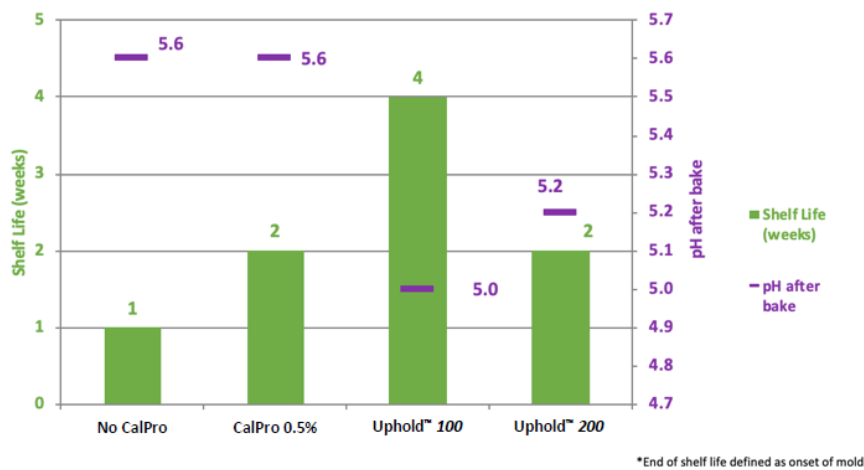
## Introduction

pH, a key measure of acidification, is very important as it helps bakers to control and optimize their processes and ensure the best end-quality and shelf life. Fumaric and malic acid are uniquely suited to control pH in bakery because of their functional properties that allow them to improve shelf life, process-ability and more. In addition, they are highly effective among common food acids making them the best choice for cost-in-use optimization.



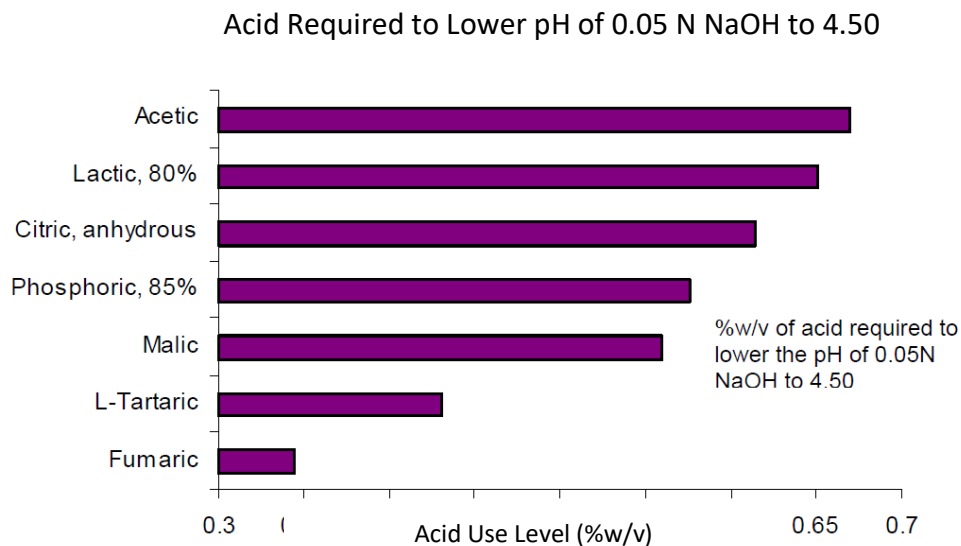
## pH and Preservation

The acidity level of a bakery system, as measured by 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 is used and the pH is closely controlled. This process is shown below for pan bread with the use of “Uphold™ 100” and “Uphold™ 200”.



## Effectiveness of Fumaric and Malic Acid to Control pH

Fumaric acid is proven to be the most effective among common food acids. For example, when considering bakery preferments such as sourdoughs and sponges, which have pH's as low as 4.5, the level of acid required to lower the pH of a model system to 4.5 is shown in the graph below.

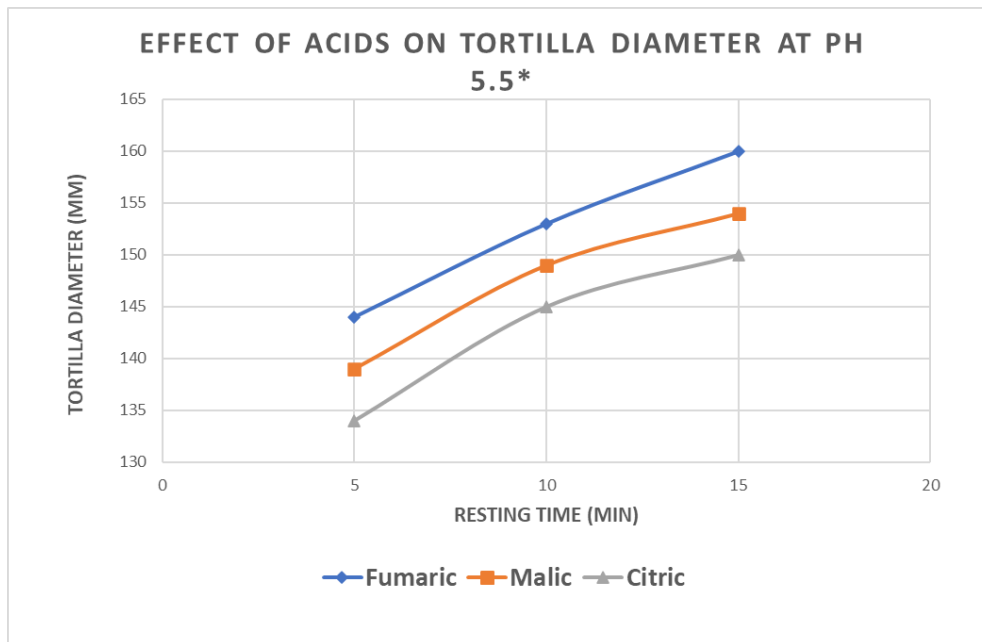


The amount required to achieve this reduction of pH is the least for Fumaric acid when compared to other acids. Thus, fumaric acid can substantially reduce costs and make the use of acids more practical for bakers trying to optimize fermentation processes. Malic acid and tartaric acids are also very effective however, tartaric can create a sharp sour/tart note that could affect the final product palatability.

## 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. This 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. (1995).

## Conclusion

Fumaric and malic acid are unique functional Ingredients that help bakers optimize their processes and finished products where pH is a key parameter. Their advantages include:

- A reduction of chemical preservatives while maintaining or extending shelf life
- Cost reduction in acidulant use
- Optimum flour tortilla processing and quality

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## References

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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