



Dossier: Advantages of Bio-G-Bakery+ Over Chemical Preservatives in Bread and Pastry Production

Introduction

In the bakery industry, product preservation plays a crucial role in ensuring shelf life and quality. Traditionally, chemical preservatives like calcium propionate are used to prevent mold and bacterial growth. However, these chemicals come with certain limitations, both in terms of consumer health acceptance and their effectiveness over longer periods and under variable production conditions. Bio-G-Bakery+ offers a natural and effective alternative with additional antioxidant properties. These properties enhance the sensory and physical stability of baked goods, an aspect often overlooked by chemical preservatives.

1. Disadvantages of Chemical Preservatives

Health Concerns:

Chemical preservatives like calcium propionate and other propionates inhibit microorganism growth by blocking enzymes necessary for microbial metabolism. However, studies have also shown that these substances may cause side effects in humans, such as headaches, digestive issues, and allergic reactions. Propionates, in particular, have been linked to sensitivities and hyperactivity symptoms in children, which reduces consumer acceptance of propionate-containing products.

Toxicity and Regulatory Restrictions:

While propionate is considered safe in low doses, its toxicity increases with higher doses and long-term consumption. Many countries impose strict regulatory requirements on the amount allowed to minimize risks to consumers. In the European Union, the maximum allowable concentration of propionate is strictly regulated. Bio-G-Bakery+, by contrast, offers a solution free of toxic substances and is readily approved for use in international markets.

Impact on Sensory Quality:

Another issue with chemical preservatives like propionate is their impact on the taste and texture of the final product. Chemical preservatives can impart a sour or "preserved" flavor, which is particularly noticeable in bread and pastry products. This flavor is often described as "metallic" or "chemical," which significantly diminishes product enjoyment. Bio-G-Bakery+, on the other hand, is flavor-neutral and does not affect the sensory quality of the product.

Effectiveness and Dosage Sensitivity:

Propionates require precise dosages to be effective; higher concentrations can inhibit yeast activity and significantly affect taste. The delivery and effect of chemical preservatives also heavily depend on environmental conditions like humidity and temperature. Bio-G-Bakery+, however, can be adjusted to environmental conditions without compromising product quality. Additionally, the natural acid content in Bio-G-Bakery+ creates a stable environment for antimicrobial activity.

2. Detailed Analysis of Fermentation Products in Bio-G-Bakery+

The fermentation of wheat flour in Bio-G-Bakery+ produces a series of valuable metabolic by-products that provide antimicrobial and stabilizing effects on baked goods. During fermentation, microorganisms like lactic acid bacteria produce lactic acid, acetic acid, and various other organic acids. These acids lower the pH and inhibit the growth of undesirable microorganisms, such as bacteria and molds responsible for spoilage.

Effects of Fermentation Products:

1. **Lactic Acid:** Lactic acid has antimicrobial properties, especially against molds and yeasts, and helps improve shelf life. The acid lowers the pH, creating an environment unfavorable for most spoilage organisms, yet it does not inhibit yeast activity necessary for baking. Lactic acid also supports sensory quality, providing a mild, pleasant taste without a sour aftertaste.
2. **Acetic Acid:** Acetic acid is known for its strong antimicrobial effect. It is more effective than many other organic acids and acts against a wide range of microorganisms, including bacteria and molds. Acetic acid significantly enhances product safety and shelf life while preserving the flavor of baked goods.
3. **Other Organic Acids (e.g., Propionic and Butyric Acids):** These acids may also form in small amounts during fermentation and have specific inhibitory effects on mold and yeast growth. They interact synergistically with lactic and acetic acids, further enhancing the product's overall effectiveness.

3. Availability and Benefits of Antioxidants in Bio-G-Bakery+ and the Role of Rowan Berry (*Sorbus aucuparia*)

Bio-G-Bakery+ contains a unique plant extract from the rowan berry (*Sorbus aucuparia*), known for its high concentration of natural antioxidants and antimicrobial compounds. These antioxidants slow the oxidation of fats and flavors in baked goods, which is especially important for high-fat products like cakes and pastries. The antioxidant protection in Bio-G-Bakery+ helps maintain the sensory integrity of products and preserves their quality and freshness over longer periods.

Scientific Basis of Antioxidant Action:

Antioxidants work by neutralizing free radicals that arise from oxidation reactions, which can shorten the shelf life of fats and oils. The phenolic compounds and polyphenols found in the rowan berry in Bio-G-Bakery+ act as radical scavengers. They capture reactive oxygen species that typically break down fat and flavor molecules, thereby preventing their decomposition. Chemical preservatives like propionates do not provide this antioxidant protection and, therefore, cannot maintain the flavor and texture quality of baked goods during storage.

Additional Benefits of Rowan Berry:

- **Antimicrobial Effect:** Studies have shown that the polyphenols and organic acids in rowan berry have antimicrobial properties that inhibit the growth of pathogenic bacteria and spoilage organisms. This supports microbiological stability and extends product shelf life.

- **Health Benefits:** Rowan berry is rich in vitamin C and antioxidant compounds that contribute to overall cellular health and provide antioxidant protection. These compounds also offer nutritional benefits for consumers.

4. Benefits of Vinegar in Bio-G-Bakery+

Vinegar is a key component of Bio-G-Bakery+ and serves several functions:

1. **Antimicrobial Properties:** Freeze-dried vinegar contains acetic acid, which has a potent antimicrobial effect. It lowers the pH of baked goods, creating an acidic environment that inhibits the growth of bacteria, molds, and yeasts. Compared to other organic acids, vinegar is particularly effective, which is why it is used in Bio-G-Bakery+ for stabilization. In addition to pH reduction, the freeze-dried vinegar supports antimicrobial properties and enhances mold inhibition without adding extra ingredients to the label.
2. **Synergistic Effect with Other Fermentation Products:** Vinegar works synergistically with lactic acid and other fermentation products in Bio-G-Bakery+. This combination enhances the product's antimicrobial properties, ensuring consistent and reliable preservation in various baked goods.
3. **Flavor Stability:** Vinegar is used in small amounts, so it does not cause any undesirable flavor changes. Instead, it supports the mild flavor profile that consumers often perceive as natural and authentic.
4. **Improvement of Texture:** In combination with other acids, vinegar positively affects dough structure and texture. It can help optimize dough strength and create a uniform crumb structure in bread, further enhancing the quality of the final product.

5. Clean Label – Consumer-Friendly and Natural

Bio-G-Bakery+ meets the growing demand for clean-label products that are free from artificial and synthetic additives. By using natural ingredients like fermented wheat flour, freeze-dried vinegar, and an extract from rowanberry (*Sorbus aucuparia*), Bio-G-Bakery+ provides a clean and health-friendly alternative to chemical preservatives like calcium propionate. This clean-label compliance builds consumer trust and appeals to customers seeking a natural and authentic solution for extending the shelf life of their products.

6. Chemical Advantages of Bio-G-Bakery+ Over Propionates

A significant chemical advantage of Bio-G-Bakery+ over propionates like calcium propionate is its more effective antimicrobial action over a broader pH range, without complete dependence on free H⁺ ions. While propionate salts like calcium propionate rely on an acidic environment to form effective amounts of free propionic acid, Bio-G-Bakery+ provides a more consistent performance against microorganisms due to its natural blend of fermentation acids, regardless of pH.

1. **Mechanism of Propionate and Its pH Dependence:** Propionate salts like calcium propionate exist primarily in their ionized form at neutral to slightly acidic pH levels and need an acidic environment to convert to the active, undissociated propionic acid. This undissociated form can penetrate cell membranes and disrupt the metabolic

processes of mold. However, at typical dough pH values (5-6), the concentration of free propionic acid is limited, as there aren't enough H⁺ ions to efficiently convert propionate into propionic acid. This results in reduced antimicrobial effectiveness, requiring higher amounts of propionate – a disadvantage as this affects the flavor and texture of the product.

2. **Consistent Antimicrobial Performance of Bio-G-Bakery+:** Bio-G-Bakery+ contains lactic and acetic acids formed during fermentation. These acids are already active in their undissociated forms and can exert a stable antimicrobial effect over a broad pH range, as they are not solely dependent on the presence of free H⁺ ions. These organic acids lower the dough's pH in a controlled manner, inhibiting microorganisms without significantly affecting yeast activity.
3. **Flexible and Lower Dosage Options:** The balanced mix of lactic and acetic acids in Bio-G-Bakery+ enables reduced amounts of preservatives while maintaining reliable antimicrobial effectiveness. Since these acids are less pH-dependent than propionates, Bio-G-Bakery+ offers more stable and consistent action, improving product quality and shelf life while ensuring a neutral flavor.

Summary Advantage of Bio-G-Bakery+:

The less pH-dependent, chemically stable effect of Bio-G-Bakery+ allows for more effective preservation with controlled acidification that prevents mold growth without compromising product quality. This advantage shows that Bio-G-Bakery+ is not only a more natural but also a technically superior solution for the demands of modern bakery production.

7. Enhanced Proofing, Yeast Efficiency, and Umami Flavor with Bio-G-Bakery+

Recent findings indicate that Bio-G-Bakery+ can accelerate the proofing process, allowing dough to rise faster and potentially reducing the amount of yeast required. This effect is likely due to the presence of organic acids, particularly lactic and acetic acids, which lower the dough's pH and create ideal conditions for more efficient yeast metabolism. This accelerated proofing streamlines production and can reduce costs by enabling a reduction in yeast amounts without compromising dough quality or volume.

Umami Enhancement and Salt Reduction

Bio-G-Bakery+ also enhances the natural umami profile of baked goods, providing a richer taste that reduces the need for added salt. This umami effect is due to specific amino acids and peptides formed during fermentation. Amino acids like glutamic acid naturally contribute to umami flavor, creating a savory depth that consumers associate with richness. Bio-G-Bakery+ strengthens the umami profile, allowing for a lower salt content while maintaining excellent taste, meeting consumer preferences for lower-sodium and healthier formulations.

8. Comparative Overview

Property	Bio-G-Bakery+	Chemical Preservation (e.g., Propionate)
Ingredients	Fermented wheat flour, vinegar, plant extracts	Chemical substances like calcium propionate
Residues	Residue-free	May leave residues

Property	Bio-G-Bakery+	Chemical Preservation (e.g., Propionate)
Antioxidant Effect	Yes, protects against oxidation	No antioxidant effect
Flavor Impact	Neutral	Slightly sour, metallic aftertaste
Consumer Acceptance	High (Clean Label compliant)	Limited, especially for those sensitive to chemical additives
Microbial Stability	Highly effective over a broad pH range	pH-dependent; limited effectiveness at higher pH levels
Health Concerns	None	Possible side effects like headaches and digestive issues
Regulatory Acceptance	Internationally recognized, no restrictions	Regulated, subject to limits and controls
Flexibility and Dosage	Effective at low dosage, pH-independent	Higher dosage required at neutral pH
Adaptability to Various Conditions	Flexible, suitable for bread and pastries	Less flexible, dependent on specific chemical requirements

Conclusion

In summary, Bio-G-Bakery+ is an excellent alternative to conventional chemical preservatives. Combining natural ingredients like fermented wheat flour, vinegar, and antioxidant-rich plant extracts, Bio-G-Bakery+ provides a highly effective preservation solution that meets modern consumer demands for clean-label products and safe ingredients. The availability of natural antioxidants offers additional oxidation protection, particularly valuable for products like pastries with higher fat content.

In contrast, chemical preservatives like calcium propionate and other propionates present significant drawbacks. They may raise health concerns for sensitive consumers, often affect the flavor and texture of baked goods, and are subject to stringent regulations in many countries. Although chemical preservatives effectively inhibit microbial growth, they lack the antioxidant function that preserves the sensory quality of products over time. They also pose a risk of side effects and unwanted flavor changes.

The scientific basis of Bio-G-Bakery+ demonstrates its suitability for the demanding needs of industrial bakery production while offering consumers a natural and safe alternative. It is versatile, adaptable to various production conditions, and does not leave chemical residues in the recipe. Overall, Bio-G-Bakery+ represents a sustainable and future-oriented solution that not only extends the shelf life of bread and pastry products but also enhances their quality and appeal to consumers.

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