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Rapid Communication

Preserving freshness: How antimicrobial preservatives keep food safe

Ejigayehu Teshome*

Department of Food Science and Post-Harvest Technology, Wachemo University College of Agricultural Sciences, Hosanna, Ethiopia

Email Id: Ejigayehuteshome@gmail.com

Food is a vital aspect of human life, providing essential nourishment and sustenance. However, the journey from farm to table is not a direct one. Food undergoes various stages of processing, packaging, and distribution, which expose it to potential spoilage and contamination. To combat this, antimicrobial preservatives play a crucial role in ensuring food safety and extending shelf life. In this article, we will delve into the world of antimicrobial preservatives, understanding their functions, types, and their impact on food safety. The purpose of antimicrobial preservatives- antimicrobial preservatives, commonly known as food preservatives, are substances added to food to inhibit or prevent the growth of microorganisms such as bacteria, molds, yeasts, and fungi. These microorganisms can cause spoilage, altering the taste, texture, appearance, and nutritional value of the food, rendering it unsafe for consumption (Bensid et al., 2022).

Preservatives help maintain food freshness, quality, and safety by controlling microbial growth. Types of antimicrobial preservatives- antimicrobial preservatives can be categorized based on their origin and composition. Here are the main types: Natural antimicrobial preservatives: natural preservatives are derived from natural sources such as plants, animals, or minerals. Common examples include salt, sugar, vinegar, citric acid, and honey. These preservatives have been used for centuries to extend the shelf life of foods. Synthetic antimicrobial preservatives: synthetic preservatives are chemically manufactured and include compounds like benzoates, sorbates, nitrites, and sulfites. These are typically used in processed foods, beverages, and condiments (Cen et al., 2020).

Organic acid antimicrobial preservatives: organic acids like lactic acid, acetic acid, and propionic acid have

antimicrobial properties and are used to preserve various food products, including dairy, bakery items, and processed meats. Antioxidants: while primarily known for preventing oxidative rancidity, antioxidants like vitamin c (ascorbic acid) and vitamin e (tocopherol) also possess antimicrobial properties and aid in extending the shelf life of certain foods. Mechanisms of action Antimicrobial preservatives work through several mechanisms to inhibit or kill microorganisms in food: Inhibition of microbial growth: Preservatives interfere with microbial metabolic processes, hindering their ability to grow, reproduce, and cause spoilage. This inhibition is crucial in preventing microbial overgrowth in food products (Kamal et al., 2023)

Ph alteration: Some preservatives, such as organic acids, lower the ph of the food, creating an acidic environment that inhibits the growth of many microorganisms. This is particularly effective for preserving products like pickles and sauces. Water activity reduction: Preservatives like salt and sugar reduce the water activity in food, making it an inhospitable environment for microorganisms to thrive and reproduce. Oxidation prevention: Antioxidants act by preventing or slowing down the oxidation of fats and oils, which can cause off-flavors and spoilage. By inhibiting oxidative processes, antioxidants extend the freshness and quality of food. Benefits of antimicrobial preservatives - The use of antimicrobial preservatives offers several benefits: Extended shelf life: Antimicrobial preservatives help extend the shelf life of food products, reducing waste and ensuring a longer duration of safe consumption. Food safety: By preventing the growth of harmful microorganisms, preservatives contribute to enhancing food safety and minimizing the risk of foodborne illnesses.

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Improved sensory properties: Preservatives maintain the taste, texture, color, and aroma of food, ensuring that consumers enjoy products that retain their intended sensory characteristics (Stroppel et al., 2023).

Global food security: By reducing spoilage and waste, preservatives play a vital role in ensuring a stable and abundant food supply, particularly in regions with limited access to fresh produce. Criticisms and controversies- While antimicrobial preservatives provide numerous benefits, they have also faced criticism and controversies, including concerns regarding potential health risks associated with certain synthetic preservatives. Some people may be sensitive or allergic to certain preservatives, leading to adverse reactions. Additionally, there are ongoing discussions about the impact of synthetic preservatives on long-term health and their potential contribution to chronic diseases. Antimicrobial preservatives are a fundamental aspect of modern food preservation and safety. They play a vital role in preventing spoilage, maintaining food quality, and ensuring a longer shelf life. By inhibiting the growth of harmful microorganisms, preservatives contribute to global food security and support a sustainable and accessible food

supply. As research and technology continue to advance, it's essential to strike a balance between the benefits of preservatives and potential concerns, allowing for informed decisions and continued improvements in food preservation techniques (Teshome et al, 2022).

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