Savour SOLUTIONS
The missing piece in freshness

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# Sodium Nitrate/Nitrite Compared to Savacin as Antimicrobial Agents

## Introduction

Food companies around the world use additives to maintain freshness and flavour to prolong the shelf-life of their products. This is important so as to avoid unnecessary wastage of food and protect the investment in making, extracting, or assembling a particular product.

## Nitrates and Nitrites

Nitrites are used as curing agents in several types of food: mainly meat and meat products and cheese. Their role in curing meat is to deliver/improve colour and flavour whilst also inhibiting the growth and lethal toxin-production of *Clostridium botulinum* (a Gram-positive, spore-forming bacterium) and *Listeria monocytogenes* (Gram-positive, non-sporing bacterium).

Nitrites, rather than nitrates, are the functional constituent in this process. Nitrates, although ineffective against *C. botulinum*, are reduced to nitrites by the microflora present in many different types of foods. Prior to the 1940s, nitrates were thought to be the active antimicrobial agent in the process of curing. Later, once the concept of sodium nitrite being the actual active antimicrobial component was firmly established, sodium nitrate was relegated to serving as a precursor for the generation of sodium nitrite.

**Sodium nitrate** has been shown to **have low antibacterial activity** (both Gram-positive and Gram-negative) on its own. It has limited to no inhibition effect on yeasts and moulds.

Sodium nitrite is effective against some fungi. However its effectiveness depends on the targeted species. Fungi that are sensitive to sodium nitrite during preservation include: *Aspergillus brasiliensis, Penicillium chrysogenum* and *Fusarium oxysporum*. Species like *Aspergillus flavus, Aspergillus parasiticus* and *Candida albicans* are more resistant and may require higher concentrations for inhibition to be effective. Effectiveness is closely linked to concentration but also to pH and temperature.

Due to adverse health issues the application of limited quantities of sodium nitrate is approved by governments. Excessive addition of sodium nitrate as a preservative in cured meats can lead to acute health issues. In processed, heat-treated products, nitrites are converted to nitrosamines which are associated with an increased risk of cancer. Nitrites are also associated with Parkinson's disease, Alzheimer's disease and high blood pressure. Excessive ingestion of sodium nitrate is also associated with increased risk of mental impairment, abdominal pain, gastroenteritis and kidney abnormalities. It is therefore extremely important to be aware of and limit its consumption in our diets.

**Savacin**

Savacin is composed of natural, bio-disruptive ingredients that target a broad spectrum of Gram Positive, Gram Negative and fungal organisms. Savacin is effective against organisms on which sodium nitrate may only show reduced or no activity at all.

Savacin has broad-spectrum antibacterial activity i.e. Gram-positive and -negative bacteria as compared to sodium nitrate which principally attacks Gram-positive bacteria. It also has powerful activity against yeasts and moulds.

Savacin can be used both inside cheeses as well as on the outside. When Savacin is included in the production process, it prevents bacterial spoilage (early and late blow [*Clostridium tyrobutyricum*]) from the inside. It can also be applied as a spray or dip to the outside of cheese to keep it clear of fungi from the outside. Savacin is primarily used in the production process to prevent spoilage.

Another positive about Savacin in the correct dose, is that it does not alter the natural flavour of the product being treated.

**Summary of Range of Efficacy**

| Sodium Nitrite | Savacin |
|---|---|
| **Gram Positive Organisms:**<br>● *Clostridium botulinum* (spore-forming bacterium)<br>● *Listeria monocytogenes* | **Gram Positive Organisms:**<br>● *Arthrobacter oxydans*<br>● *Bacillus cereus* (spore-forming bacterium)<br>● *Clostridium botulinum* (spore-forming bacterium)<br>● *Clostridium perfringens* (spore-forming bacterium)<br>● *Lactobacillus curvatus*<br>● *Lactobacillus delbrueckii* subsp. *Lactis*<br>● *Lactobacillus paracasei*<br>● *Lactobacillus plantarum*<br>● *Listeria monocytogenes*<br>● *Leuconostoc mesenteroides*<br>● *Micrococcus luteus*<br>● *Staphylococcus aureus* |
| **Gram Negative Organisms:**<br><br>Little to no activity against this group of organisms. | **Gram Negative Organisms:**<br>● *Alcaligenes faecalis*<br>● *Citrobacter freundii*<br>● *Enterobacter faecalis*<br>● *Escherichia coli* (including serotype O157:H7)<br>● *Klebsiella aerogenes* (formerly *Enterobacter*)<br>● *Klebsiella pneumoniae* subsp. *Pneumoniae*<br>● *Proteus mirabilis*<br>● *Pseudomonas aeruginosa*<br>● *Pseudomonas fluorescens*<br>● *Salmonella enterica* serovars<br>● *Shigella dysenteriae*<br>● *Serratia marcescens*<br>● *Yersinia enterocolitica* |
| **Yeasts:**<br>● *Candida albicans* | **Yeasts:**<br>● *Candida albicans*<br>● *Rhodotorula rubra*<br>● *Saccharomyces cerevisiae*<br>● *Yarrowia lipolytica* |

| Sodium Nitrite | Savacin |
|---|---|
| | • *Zygosaccharomyces rouxii* |
| **Moulds**:<br>• *Aspergillus brasiliensis* (formerly *niger*)<br>• *Penicillium chrysogenum*<br>• *Fusarium oxysporum*<br>• *Aspergillus flavus*<br>• *Aspergillus parasiticus* | **Moulds**:<br>• *Aspergillus brasiliensis* (formerly *niger*)<br>• *Aspergillus oryzae*<br>• *Aureobasidium pullulans*<br>• *Chaetomium globosum*<br>• *Embellisia* species<br>• *Fusarium* species<br>• *Gliocladium virens*<br>• *Mucor racemosus*<br>• *Penicillium brevicompactum*<br>• *Penicillium chrysogenum*<br>• *Penicillium funiculosum*<br>• *Rhizoctonia* species<br>• *Rhizopus arrhizus* |

**Additional Reading Links**
https://www.bbc.co.uk/food/articles/nitrates_good_or_bad_health
https://savoursolutions.com/meat-solutions/

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