

# Serifel™

Fungicide

Technical Brochure



 **BASF**

We create chemistry

# Serifel

## A biological fungicide for smart protection

To combat quality-damaging disease, BASF has developed Serifel™. It's the biological fungicide with three modes of action to effectively complement conventional chemistries, delivering enhanced performance as well as resistance management. Serifel can also be used in organic production.

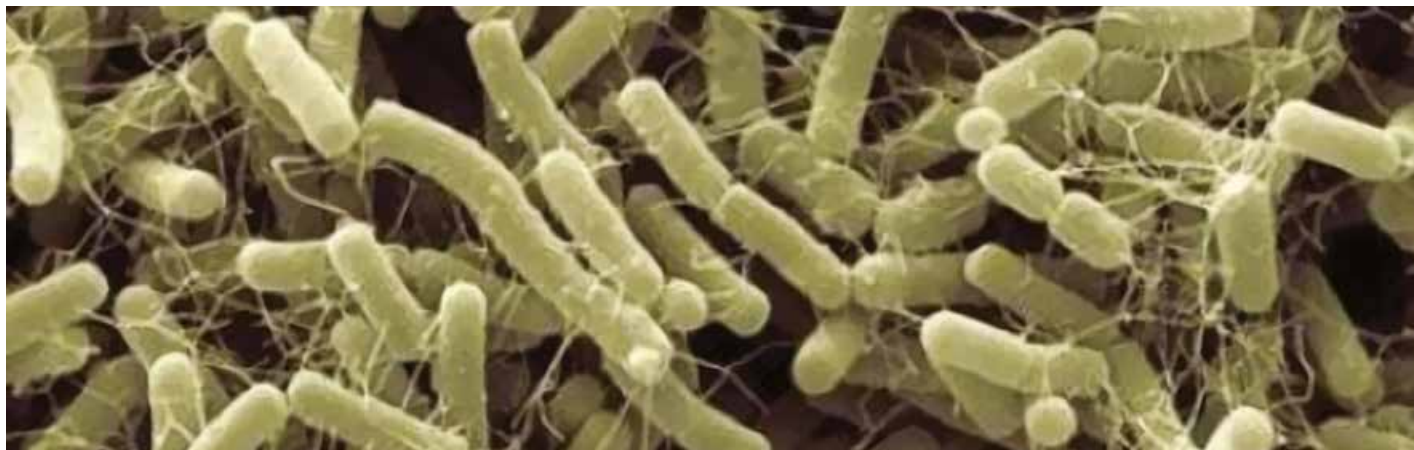
Despite being the most concentrated biological fungicide on the market, Serifel does not add recordable residue, providing growers with greater flexibility by extending the window of application, especially near harvest.

Serifel can be used on grapes and targets organisms including botrytis gray mold (*Botrytis cinerea*) and powdery mildew (*Erysiphe necator*). Serifel can be applied preventatively multiple times throughout the growing season.

### Key features and benefits

- Targets powdery mildew and botrytis in grapes
- Complements chemistry-based programs and helps manage the potential for resistance
- With no recordable residues, Serifel provides greater flexibility by extending the window of application, especially near harvest
- Sets the quality standard for concentration, purity, performance and reliability
- Can be used in organic production





### Product profile

<b>Active ingredient</b>	<i>Bacillus amyloliquefaciens</i> strain MBI600
<b>Group</b>	44
<b>Mode of action</b>	Three modes of action: <ul style="list-style-type: none"> <li>• Physically exclude fungal pathogens from the plant surface</li> <li>• Deplete the supply of nutrients on the plant surface so pathogen spores are starved to death</li> <li>• Produce anti-fungal metabolites</li> </ul>
<b>Formulation</b>	WP formulation, min $5.5 \times 10^{10}$ cfu/g
<b>Crops</b>	Grapes
<b>Target (organisms)</b>	<i>Botrytis cinerea</i> , <i>Erysiphe necator</i>
<b>Application rate</b>	0.25 – 0.5 kg/ha
<b>Spray interval</b>	5 – 10 days
<b>Re-entry interval</b>	4 hours
<b>Rainfast</b>	3 hours
<b>PHI</b>	0 days

### Recommendations for crop uses

Serifel should always be applied preventatively, using a shorter spray interval when the risk of disease is high. Thorough coverage should also be ensured.

Serifel can be used in combination with conventional chemistries to enhance efficacy and support resistance management. Consult your local BASF representative for information on tank-mix compatibility. When considering any new tank-mix, conduct a jar test to ensure physical compatibility and spray a small area of the crop before treating the full area to confirm crop safety.

# Mode of action

Serifel must be used as a preventative treatment before disease pathogens have established on the plant.

Serifel forms a “shield of protection” against a broad spectrum of plant pathogens thanks to three modes of action.

The active ingredient in Serifel is a beneficial, spore-forming, rod-shaped bacterium that colonizes the developing surfaces of plants.

Application before major disease pressure gives Serifel’s spores time to germinate, colonize the plant surface and produce its disease-fighting metabolites.

The mode of action of Serifel is classified by the Fungicides Resistance Action Committee (FRAC) as FRAC 44 “microbial disrupters of pathogen cell membranes”.



**Left:** Untreated culture of botrytis fungi spores

**Right:** Serifel’s three modes of action create an exclusion zone where target fungal spores are unable to germinate

## 1. Competition for space

By being the first to occupy the limited space on the plant, Serifel physically excludes plant pathogens from occupying the same space.

## 2. Competition for resources

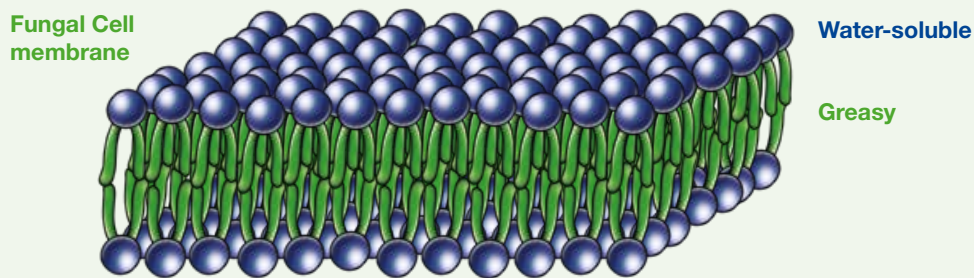
Serifel also depletes the supply of nutrients on the plant surface, so pathogen spores are starved to death.

## 3. Production of metabolites

Serifel produces specific metabolites that prevent different species of pathogens from germinating. The metabolites cause the pathogen spores and growing hyphae to collapse, by disrupting their cell membrane.

### Building blocks of fungal cell membranes

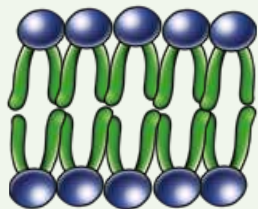
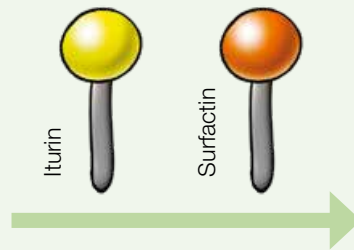
Biological membranes are complex structures of a lipid bilayer. The lipid building blocks of a biological membrane look like jellyfish, with many arms underneath and a smooth, roundish head protecting the parts below. A biological membrane consists of two layers. The heads form a stable, solid skin on the outside. Inside, the arms form a dense and very stable net which is nevertheless flexible.



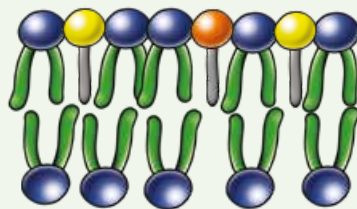
### Lipopeptides

Serifel is a pure spore formulation that doesn't contain metabolites. Metabolites are produced by the bacteria that grow on the plant surface after application. The most important groups of metabolites are iturins and surfactins. Being similar to membrane building blocks, these lipopeptide metabolites are able to insert deeply into membranes. Their conical shapes disrupt the normal packing of membranes. The altered membrane structure is less stable due to buckling and pore formation. The membranes begin to leech, and the cell functionality is disrupted.

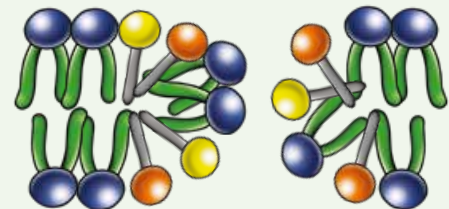
#### Serifel's metabolites



1. Healthy pathogen membrane



2. Serifel's metabolites insert into pathogen membrane



3. Structure of pathogen membrane disrupted by the formation of pores

#### Membrane building blocks

# Targeting key diseases in grapes

## Grapes

Serifel protects grapes from frequently occurring diseases, including gray mold (*Botrytis cinerea*) and powdery mildew (*Erysiphe necator*). Gray mold is found virtually everywhere plants are grown and can attack many different types of plants, causing significant losses of yield and quality. Another widespread disease in grapes is powdery mildew. Early powdery mildew infection can cause reduced berry size and reduced sugar content, potentially making the fruit unsuitable for any purpose.

Serifel can improve efficacy of a spray program depending on the local requirements. It can be used for additive efficacy by mixing with chemical fungicides. Frequent preventative applications of Serifel inhibit the establishment of pathogens on foliage and berry clusters.

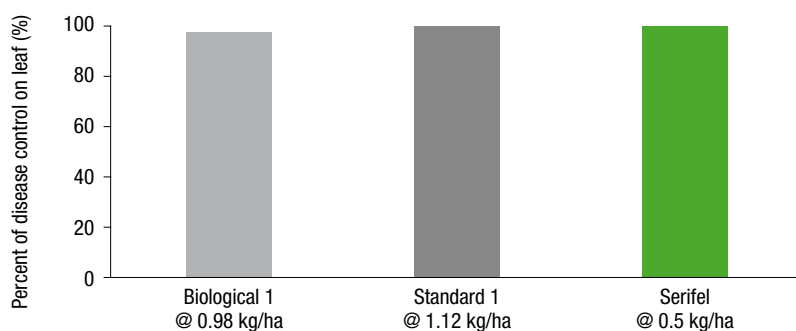


Gray mold



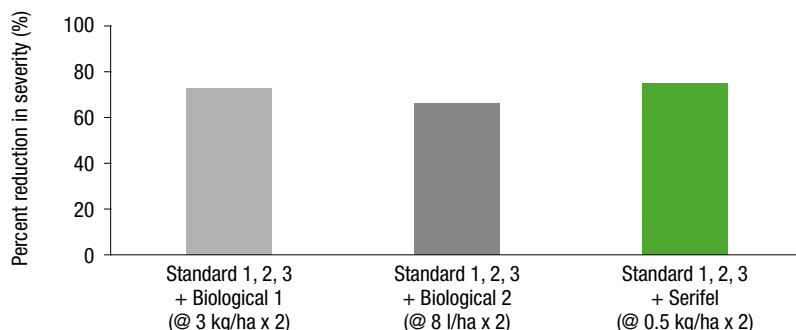
Powdery mildew

### Serifel use in grapes (VITVI) against Powdery mildew (UNCINE)



USA, 2014 –  
11 applications (7 day intervals)  
with 500–1,000 l/ha water volume,  
results taken before harvest,  
13 days after last treatment (DALT)

### Serifel use in grapes (VITVI) against *Botrytis cinerea* (BOTRCI)



Chile, 2015 –  
Five applications,  
Standard 1 at BBCH 61,  
Standard 2 at BBCH 69,  
Standard 3 at BBCH 83,  
Serifel and standard biologicals at  
14 and 7 days before harvest with 1,200 l/ha  
water volume, results taken 13 days after  
last treatment (DALT)

# Global MRLs and import tolerances

Serifel is currently being introduced to fruit and vegetable growers worldwide.

Serifel is Maximum Residue Level (MRL) exempt globally, allowing for flexible use in an integrated program and peace of mind in knowing that post-harvest movement of treated crops will not be limited. It will also appeal to growers who produce for markets where secondary standards (MRLs) are a driving factor. Serifel can be used for organic production.

## Quality and consistency

Serifel is the most concentrated biological fungicide on the market. Its concentrated, pure spore formulation makes it convenient for growers to use.

- Reduced handling
- Reduced clumping
- Easy mixing
- Stays in suspension



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**Always read and follow label directions.**

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