DSM Food Specialties: *Better Food for Everyone*

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DSM Food Specialties

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Bright Science. Brighter Living™
We create solutions to bring healthier, better performing and more sustainable products to the lives of people today and for generations to come.

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<tbody>
<tr>
<td>Net sales</td>
<td>about € 10,000m</td>
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<tr>
<td>Workforce</td>
<td>25,000</td>
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Enzymes
Cultures
Savory flavors
Hydrocolloids
Food & Crop Protection

Vitamins
Nutritional lipids (Omega 3 & 6)
Carotenoids
Health ingredients

DSM Nutritional Products
DSM Food Specialties
DSM Food Specialties today

- Leading positions in food & beverage enzymes, cultures and yeast extracts
- Over 1500 employees worldwide
- Manufacturing locations in Europe, North South America, Asia, Australia
- Food Innovation Center with dedicated application and sensory specialists
- Regional application labs in China, the Netherlands, USA
Natamycin, also known as Pimaricin, was first discovered by DSM (then known as Gist Broccades) in 1955 in a soil sample in the Natal province of South Africa.

Characteristics
- Naturally produced by fermentation
- Source is a bacterium *Streptomyces natalensis* (*naturally occurring in nature*)
- It is a crystal, only active when it is dissolved
- Active against a wide spectrum of fungi and yeast, not against bacteria

Safe for food consumption and EPA Approved for Pre- & Post- Harvest agriculture applications
- Reconfirmed by latest EFSA approval (December 2009)
- Approved by CODEX
- Approved by JECFA*
- Approved by EPA

*Join Expert Committee on Food Additives*
How does Natamycin work?

Technical explanation
• Ergosterol is building block in cell walls of molds and yeasts;
• Natamycin interacts with ergosterol;
• Interaction between Natamycin and ergosterol takes places in the growing part of yeast and mold cells;
• Ergosterol-natamycin reaction destroys yeast and mold cells by interfering the dynamic cellular processes of growing hypha;
• Natamycin only affects active yeast and mold cells, including germinating spore;
• Natamycin avoids that spores are germinating;
• Natamycin not active against bacteria since bacteria do not contain ergosterol.
Zivion®M: Since 2014
The bio control agent controlling Dry Bubble disease in mushroom production.

*Natamycin: a natural biofungicide*
Zivion® M: Mushroom Pre-harvest Application Regulatory status

The formulation Zivion® M was approved in the US in May 2012 under the EPA registration numbers 87485-1 and 87485-2.

In Canada by the PMRA in December 2012 under registration number 30521). Organic status in Canada since May 2015
US EPA Registration Extended (Aug 2016)

For use to control several Post-Harvest diseases on Citrus, Pome, Stone fruit, Cherries, Avocado, Kiwi, Mango, and Pomegranate

ACTIVE INGREDIENT:
Natamycin* ................................................................................................................................. 10.34%

OTHER INGREDIENTS: ................................................................................................................. 89.66%
Total: ............................................................................................................................................ 100.00%

*CAS No. 7681-93-8
Contains 0.93 lbs Natamycin per gallon.
Broad Spectrum Efficacy

- **Blue Mold**  
  *(P. expansum)*

- **Green Mold**  
  *(P. digitatum)*

- **Brown Rot**  
  *(M. fructicola)*

- **Gray Mold**  
  *(B. cinerea)*

- **Sour Rot**  
  *(G. citri-aurelia)*

- **Gray Mold**  
  *(B. cinerea)*

- **Mucor Rot**  
  *(M. piriformis)*

- **Mucor Rot**  
  *(M. piriformis)*

- **Rhizopus Rot**  
  *(R. stolonifer)*
Zivion™ S for Pre-harvest Strawberry Applications

✓ Natural safe broad spectrum bio control agent

✓ Very effective against key fungal strawberry pathogens
  ✓ Anthracnose (*Colletotrichum* spp.), gray mold (*Botrytis* spp.), powdery mildew (*Sphaerotheca macularis*), Verticillium wilt, Rhizopus rot, Mucor fruit rot, Black Root rot (*Pythium* and *Cylindrocarpon*), Charcoal Rot (*Macrophomina phasiolina*)

✓ Can be applied both pre-plant & at-plant treatment,

✓ No resistance built up

✓ Strawberry pre-harvest application label extension is applied with EPA.

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The left row in each bed is cv. Portola, the right row is cv. Fronteras. Pictures taken April 8, 2016.
Key Features

• Proven safety as a food preservative for 50 years
• Expect to be exempt from tolerance
• Broad-spectrum against all major fungal diseases
• Excellent performance as a solo and mixture (IPM)
• Controls all resistant strains
• No cross-resistance
• Only fungicide that controls Mucor rot
• Potentially for organic use